International Conference

"FOOD-ENERGY-WATER BIOECONOMIES FOR NET ZERO TRANSITION"

March 18-20, 2024, Knoxville, USA
website: https://fewsus.utk.edu

SPONSORS, ORGANIZING INSTITUTIONS, & UNITS

FEWSUS (International Research Coordination Network for Creating Transdisciplinary Nodes of Food-Energy-Water to Support Sustainable Urban Systems) is funded by U.S. National Science Foundation.

The project aims to create a robust international research network for charting a new path forward in developing urban and peri-urban sustainability and resiliency within the framework of food-energy-water nexus systems. Specific objectives are to (1) develop multinational, transdisciplinary research teams to address the interests of stakeholders; (2) create a focused food-energy-water network to inspire urban outreach and engagement programs; (3) educate and train a future food-energy-water workforce capable of implementing a sustainable urban systems agenda; and (4) build a comprehensive food-energy-water database/repository to support global urban sustainability.

OBJECTIVES

The symposium aims to explore the contributions of the food-energy-water nexus and resource circularity to net-zero economy systems that make both urban and connected rural communities healthy and resilient to the changes of climate and demography and the degradations of natural resources and ecosystems. Specific goals of the conference are to network research resources and synthesize publications that summarize current research and priority findings and needs to support convergence of future sustainability research, policy development, and stakeholder perceptions. The symposium will offer a transdisciplinary forum for researchers, stakeholders, and students to exchange knowledge, perspectives, and practices, prioritize research, and build collaborative teams in the following areas:

- Circular bioeconomy systems
- Net zero urban system
- Sustainability of renewable energy technologies
- Food-energy-water nexus for one-health ecosystems

Scientific Committee

Chairs

David Zilberman, University of California, Berkeley, USA
Brad Day, University of Tennessee, USA

Member (in alphabetical order)

Ron Chan, University of Manchester, UK
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Virginia Dale, University of Tennessee, USA
Alex Guerra, Institute of Climate Change, Guatemala
Ted Henry, Heriot-Watt University, UK and Malaysia
Susan Hubbard, Oak Ridge Natonal Laboratory, USA
Gonzalo Irrazabal, Catholic University, Uruguay
Archileo Kaaya, Makerere University, Uganda
Keith Kline, Oak Ridge National Laboratory, USA
Jose Puppim de Oliveira, FVG- Getulio Vargas Foundation, Brazil
Alessio Russo, Queensland University of Technology, Australia
Gary Sayler, University of Tennessee, USA
Michael Seeger, Technical University Federico Santa Maria, Chile
Robert Spajic, Josip Juraj Strossmayer University of Osijek, Croatia
Jan Vymazal, Czech University of Life Sciences, Prague, Czech Republic
Justus Wesseler, Wageningen University & Research, The Netherlands

Organizing Committee

Chairs

Jie (Joe) Zhuang, University of Tennessee, USA
Gretchen Neisler, University of Tennessee, USA

Member (in alphabetical order)

David Ader, University of Tennessee, USA
Julie Carrier, University of Tennessee, USA
Tom Gill, University of Tennessee, USA
Mingzhou Jin, University of Tennessee, USA
Frank Löffler, University of Tennessee, USA
Deb Miller, University of Tennessee, USA
Sara Mulville, University of Tennessee, USA
Charles Sims, University of Tenenssee, USA
Tim Rials, University of Tennessee, USA
Marcelo Torres, AAPRESID, Argentina

OVERALL AGENDA

Date	Time	Scheduled Activity	Venue
March 17 Sunday	6:30-7:00 pm 7:00-8:30 pm	**Check-In & Registration** **Reception**	Hilton Hotel (Ocoee room at Lobby level)
March 18 Monday	9:00-12:00 pm	**Opening Ceremony & Keynote Presentation**	UT Conference Center 4th Floor
	12:00- 1:00 pm	**Lunch and Keynote Presentation**	
	1:00-4:25 pm	**Transdisciplinary Presentation on Socio-Environment Interactions**	
	4:25-5:10 pm	**Lightning Session of Junior Researchers**	
	5:30-7:00 pm	**Banquet**	The Foundry at the Fair Park
March 19 Tuesday	9:00-12:00 pm	**Concurrent Workshops** • Workshop 1: Circular bioeconomy systems • Workshop 2: Net-zero urban systems • Workshop 3: Sustainability of renewable energy technologies • Workshop 4: Food-energy-water nexus for one-health ecosystems	UT Conference Center 4th Floor
	12:00-1:00 pm	**Lunch**	
	1:00-1:30 pm	**Overview, Discussion on Collaboration, and Breakout Group Formation**	
	1:30-4:45 pm	**Breakout Group Work**	
	4:45-5:30 pm	**Preparation of Workshop Report**	
	5:30-7:00 pm	**Dinner**	
March 20 Wednesday	9:00-9:40 am	**Reporting by Each Workshop to Identify Prioritized Convergence Research**	UT Conference Center 4th Floor
	9:40-10:10 am	**Collaboration Opportunities and Transdisciplinary Team-Up**	
	10:10-11:40 am	**Transdisciplinary Breakout Discussion on How to Collaborate**	
	11:40-12:00 pm	**Closing Remarks**	
	12:00-1:00 pm	**Lunch**	
	1:00-5:00 pm	**Genera Facility and campus tour**	Departs from Hilton
	5:30-7:00 pm	**Dinner**	Calhoun's on the River

Monday, March 18, 2024 (Morning)	
WELCOME & OPENING REMARKS Chair: Hongwei Xin (Dean of AgResearch, University of Tennessee)	
9:00-9:30 am	• Keith Carver (Senior Vice President & Senior Vice Chancellor, University of Tennessee Institute of Agriculture, USA) • Gary Sayler (FEWSUS Research Advisory Board Chair, University of Tennessee, USA) • Lloyd Day (Deputy Director General, Inter-American Institute for Cooperation on Agriculture, Costa Rica) • Paul Langan (Associate Laboratory Director, Oak Ridge National Laboratory, USA) • Randy Boyd (President, University of Tennessee, USA)
OPENING KEYNOTES Chairs: Gary Sayler (FEWSUS Research Advisory Board Chair) and Brad Day (Associate Vice Chancellor, University of Tennessee, USA)	
9:30-9:40 am	**Objectives of Symposium —** Jie (Joe) Zhuang (FEWSUS Director, University of Tennessee)
9:40-10:10 am	**Contribution of the bioeconomy towards sustainable development: opportunities and challenges.** Justus Wesseler, Wageningen University & Research, The Netherlands
10:10-10:40 am	**Building the bioeconomy for rural development and educational renewal.** David Zilberman, University of California Berkeley, USA
10:40-11:00 am	**Break and Group Picture**
11:00-11:30 am	**Food systems transformation: opportunities for reducing GHG emissions and climate change impact in Uganda.** Archileo Kaaya, Makerere University, Uganda
11:30-12:00 pm	**Net-zero and the broader sustainable development agenda: maximizing benefits, minimizing trade-offs.** David McCollum, Oak Ridge National Laboratory, USA
12:00-1:00 pm	Lunch and Keynote Presentation Kelly Tiller, Genera, USA

Monday, March 18, 2024 (Afternoon)	
TRANSDISCIPLINARY KEYNOTES ON SOCIO-ENVIRONMENT INTERACTIONS Chairs: Tom Gill and Julie Carrier (University of Tennessee, USA)	
1:00-1:20 pm	**Food, energy and water implications of biofuel and climate policy.** Bruce McCarl, Texas A&M University, USA
1:20-1:40 pm	**Bioeconomy: A strategic commitment to sustainable development in Latin America and the Caribbean.** Lloyd Day, Inter-American Institute for Cooperation on Agriculture (IICA), Costa Rica
1:40-2:00 pm	**Stakeholder engagement improves decision making in food-energy-water systems that support the bioeconomy.** Virginia Dale, University of Tennessee, USA
2:00-2:20 pm	**Managing byproducts of agricultural production and agriculture industry.** Robert Spajic, Josip Juraj Strossmayer University of Osijek, Croatia
2:20-2:40 pm	**POLARIS: Pursuing opportunities for long-term arctic resilience for infrastructure and society.** Guangqing Chi, Pennsylvania State University, USA
2:40-2:55 pm	Break
2:55-3:15 pm	**Synergizing growth: some opportunities for sustainable development in Latin America.** Enrique Garcia Baumgartner, WeTTo (USA) ı BYONYEK (Argentina)
3:15-3:35 pm	**Future map: developing geographic futures for sustainability assessments using generative GeoAI, population synthesis, and agent-based modeling.** Carter Christopher, Oak Ridge National Laboratory, USA
3:35-3:55 pm	**Economic modelling of land use changes to disentangle economic, social, and environmental trade-offs.** Daniel De La Torre Ugarte, Oak Ridge National Laboratory, USA
3:55-4:15 pm	**Modeling benefits of planting climate-resilient perennial biomass crops in flood-prone agricultural landscapes.** Esther Parish, Oak Ridge National Laboratory, USA
4:15-4:25 pm	Session Summary
4:25-5:10 pm	Lightning Session of Junior Researchers
5:30-7:00 pm	Banquet

Monday, March 18, 2024 (Afternoon)	
LIGHTNING SESSION OF JUNIOR RESEARCHERS Chairs: Frank Löffler and Ashley Morgan (University of Tennessee, USA)	
4:25-4:30 pm	**Place and contribution of resource-poor communities to net-zero economy systems.** Abdelaziz Lawani, Tennessee State University, USA
4:30-4:35 pm	**Tackling the effects of climate change on smallholder farmers in the Caribbean.** Dimitris Herrera, University of Tennessee, USA
4:35-4:40 pm	**Integrated multi-trophic aquaculture—low-waste, energy-efficient, nutrient-dense seafood production.** Ashley Morgan, University of Tennessee, USA
4:40-4:45 pm	**Toward sustainable architecture: navigating the framework of energy transition within energy, buildings, and human.** We-An (Vivian) Chen, University of Tennessee, USA
4:45-4:50 pm	**Restorative diets: towards the health of humans and non-humans.** Erika Gavenus, University of British Columbia, Canada
4:50-4:55 pm	**Investigating die-offs in freshwater mussels: safeguarding ecosystem services in a changing world.** Jeronimo Silva, University of Tennessee, USA
4:55-5:00 pm	**Circular economy project: composting of organic wastes for biofertilizer production using enzymes.** Agustin Torres, National University of Mar del Plata, Argentina
5:00-5:10 pm	Session Summary
5:30-7:00 pm	Banquet

Tuesday, March 19, 2024	
Workshop 1: Circular Bioeconomy Systems Chairs: Tim Rials and Nicole Labbé (University of Tennessee, USA), Erin Webb and Keith Kline (Oak Ridge National Laboratory, USA)	
9:00-9:10 am	**Workshop Introduction**
9:10-9:30 am	**Keynote: Climate-smart technologies and food security in the context of a circular bioeconomy.** Gal Hochman, Rutgers University, USA
9:30-9:50 am	**Keynote: A sustainable dairy production model.** Alejandro López Moriena, Adecoagro, Argentina
9:50-10:10 am	**Keynote: An inclusive, climate-smart, circular economy: challenges and opportunities.** Keith Kline, Oak Ridge National Laboratory, USA
10:10-10:30 am	**Keynote: Accelerating the development of circular bioeconomy systems in Argentina.** Claudio Dunan, President, National Seed Institute of Argentina
10:30-10:45 am	Break
10:45-11:00 am	**Bio-based battery materials for circular energy storage systems.** William Joe Sagues, North Carolina State University, USA
11:00-11:15 am	**Diversifying agriculture, protecting the environment, stabilizing economies: the story of the black soldier fly.** Jeffrey Tomberlin, Texas A&M University, USA
11:15-11:30 am	**Shaping learning communities: the path of innovation in networks.** Marcelo Torres, The Argentine Association of Direct Seeding Producers (AAPRESID), Argentina
11:30-11:45 am	**Integrating edge AI and blockchain in precision dairy farming: towards sustainable and smart agricultural practices.** Charles Cao, University of Tennessee, USA
11:45-12:00 pm	**Design for a sustainable future: Advancing the sustainable production and use of renewable carbon.** Nicole Labbé, University of Tennessee, USA
12:00-1:00 pm	Lunch
1:00-1:30 pm	**Overview, Collaborative Task Prioritization, and Breakout Group Formation**
1:30-3:00 pm	**Group Work on the Prioritized Tasks**
3:00-3:15 pm	Break
3:15-3:45 pm	**Synthesis of Group Work Results**
3:45-4:45 pm	**Development of Outlines of Publications and/or Collaborative Research Projects**
4:45-5:30 pm	**Preparation of Workshop Report** (workshop chairs and group leaders)
5:30-7:00 pm	Dinner

Tuesday, March 19, 2024	
Workshop 2: Net-Zero Urban System Chairs: Frank Löffler and Kellie Walters (University of Tennessee, USA), Wei Liao (Michigan State University, USA), Jose Puppim (FGV - Getulio Vargas Foundation, Brazil), Adam Sochacki (Czech University of Technology, Czech Republic)	
9:00-9:10 am	**Workshop Introduction**
9:10-9:30 am	**Keynote: The dynamics of innovation in green and blue infrastructure in urban areas.** Jose Puppim de Oliveira, FGV - Getulio Vargas Foundation, Brazil, Brazil
9:30-9:50 am	**Keynote: Designing multifunctional nature-based solutions for sustainable, healthy, and resilient cities.** Alessio Russo, Queensland University of Technology, Australia
9:50-10:10 am	**Keynote: Ecosystem services of urban wetland.** Jan Vymazal, Czech University of Life Sciences, Prague, Czech Republic
10:10-10:30 am	**Keynote: Offset or reduce: how should firms implement carbon footprint reduction initiatives?** Gil Souza, University of Tennessee, USA
10:30-10:45 am	Break
10:45-11:00 am	**Low emissions during the production of sugar, banana, avocados and bioenergy.** Alex Guerra Noriega, Institute of Climate Change, Guatemala
11:00-11:15 am	**Optimization opportunities in greenhouses and vertical farms.** Kellie Walters, University of Tennessee, USA
11:15-11:30 am	**The use of wetlands for (waste)water treatment in urban areas.** Adam Sochacki, Czech University of Technology, Czech Republic
11:30-11:45 am	**System integration and optimization toward sustainable solutions for small-scale waste treatment.** Wei Liao, Michigan State University, USA
11:45-12:00 pm	**Ecological benefits of green roofs and green walls.** Martina Vítková, Czech University of Technology, Czech Republic
12:00-1:00 pm	Lunch
1:00-1:30 pm	**Overview, Collaborative Task Prioritization, and Breakout Group Formation**
1:30-3:00 pm	**Group Work on the Prioritized Tasks**
3:00-3:15 pm	Break
3:15-3:45 pm	**Synthesis of Group Work Results**
3:45-4:45 pm	**Development of Outlines of Publications and/or Collaborative Research Projects**
4:45-5:30 pm	**Preparation of Workshop Report** (workshop chairs and group leaders)
5:30-7:00 pm	Dinner

Tuesday, March 19, 2024	
Workshop 3: Renewable Energy Sustainability Chairs: Mingzhou Jin and Virginia Sykes (University of Tennessee, USA), Govindan Parayil (University of South Florida, USA), Ron Chan (University of Manchester, UK)	
9:00-9:10 am	**Workshop Introduction**
9:10-9:30 am	**Keynote: Charged up? impacts of green energy transition on local labor markets.** Ron Chan, University of Manchester, UK
9:30-9:50 am	**Keynote: Circular farm economy for bioenergy and carbon neutrality.** Manuel Ron, Bio4--Bioethanol Rio Cuarto S.A., Argentina
9:50-10:10 am	**Keynote: Electricity wholesale market design in the zero-carbon future: a review of challenges and solutions.** Zhi Zhou, Argonne National Laboratory, USA
10:10-10:30 am	**Keynote: Developing sustainable aviation fuel system from winter oilseeds.** Edward Yu, University of Tennessee, USA
10:30-10:45 am	Break
10:45-11:00 am	**Can we use domestic vegetable oil to replace carnauba or petrowaxes?** Toni Wang, University of Tennessee, USA
11:00-11:15 am	**Winter oilseed crops exhibit potential as a source for sustainable aviation fuel in the Southern US.** Virginia Sykes, University of Tennessee, USA
11:15-11:30 am	**How green fertilizer will boost energy transition?** Gonzalo Irrazabal, Catholic University, Uruguay
11:30-11:45 am	**Renewable energy servicing for residential homes in developing countries.** Gil Souza, University of Tennessee, USA
11:45-12:00 pm	**Energetic sustainability in Antarctica through the implementation of renewable energies aiming at net-zero generation.** Gabriel Guigou, Technological University of Uruguay, Uruguay
12:00-1:00 pm	Lunch
1:00-1:30 pm	**Overview, Collaborative Task Prioritization, and Breakout Group Formation**
1:30-3:00 pm	**Group Work on the Prioritized Tasks**
3:00-3:15 pm	Break
3:15-3:45 pm	**Synthesis of Group Work Results**
3:45-4:45 pm	**Development of Outlines of Publications and/or Collaborative Research Projects**
4:45-5:30 pm	**Preparation of Workshop Report** (workshop chairs and group leaders)
5:30-7:00 pm	Dinner

Tuesday, March 19, 2024	
Workshop 4: One-Health Ecosystem Chairs: Deb Miller and Charles Sims (University of Tennessee, USA), Ted Henry (Heriot-Watt University, UK, and Malaysia), Michael Seeger (Technical University Federico Santa Maria, Chile)	
9:00-9:10 am	**Workshop Introduction**
9:10-9:30 am	**Keynote: Environmental systems biology: the whole is greater than the sum of its parts – team science.** Terry Hazen, University of Tennessee and Oak Ridge National Laboratory, USA
9:30-9:50 am	**Keynote: Developing sustainable cooling and cold chains in emerging economies–meeting the technical and educational needs.** Ted Henry, Heriot-Watt University, UK and Malaysia
9:50-10:10 am	**Keynote: Genomics and metagenomics are useful for the design of novel bioremediation processes for urban site clean-up.** Michael Seeger, Technical University Federico Santa Maria, Chile
10:10-10:30 am	**Keynote: Plastic pollution: challenges and strategies.** Michael McKinney, University of Tennessee, USA
10:30-10:45 am	Break
10:45-11:00 am	**Prioritizing public and conservations investments to support human health at the rural-urban fringe** Charles Sims, University of Tennessee, USA
11:00-11:15 am	**Develop antibody-based immunoassays for microplastic and nanoplastic analysis.** Jun Lin, University of Tennessee, USA
11:15-11:30 am	**Untreated wastewater, farming, and human health: The Bogotá River** Johana Husserl, University of Ios Andes, Colombia
11:30-11:45 am	**Applications of precision livestock farming (PLF) in poultry industry.** Yang Zhao, University of Tennessee, USA
11:45-12:00 pm	**Smart sensing for animal health and welfare.** Hao Gan, University of Tennessee, USA
12:00-1:00 pm	Lunch
1:00-1:30 pm	**Overview, Collaborative Task Prioritization, and Breakout Group Formation**
1:30-3:00 pm	**Group Work on the Prioritized Tasks**
3:00-3:15 pm	Break
3:15-3:45 pm	**Synthesis of Group Work Results**
3:45-4:45 pm	**Development of Outlines of Publications and/or Collaborative Research Projects**
4:45-5:30 pm	**Preparation of Workshop Report** (workshop chairs and group leaders)
5:30-7:00 pm	Dinner

Wednesday, March 20, 2024	
COLLABORATION & OUTREACH Moderators: Brad Day (Associate Vice Chancellor, University of Tennessee), Jie (Joe) Zhuang (FEWSUS Director, University of Tennessee)	
9:00-9:40 am	**Reporting by Each Workshop to Identify Prioritized Convergence Research**
9:40-10:10 am	**Collaboration Opportunities and Transdisciplinary Team-up**
10:10-11:40 am	**Transdisciplinary Breakout Discussion on Research Collaboration Action**
11:40-12:00 pm	**Closing Remarks** • David Zilberman (Distinguished Professor, University of California Berkeley; National Academy of Sciences Member) • Gretchen Neisler (Vice Provost for International Affairs; Director of Center for Global Engagement, University of Tennessee)
12:00-1:00 pm	Lunch
1:00-5:00 pm	Facility and Campus Tour
5:30-7:00 pm	Dinner

Biographies and Abstracts

Welcome and Opening Remarks

Opening Keynotes

Hongwei Xin
Chair
Professor, Dean of AgResearch, Director of the Tennessee Agricultural Experiment Station
University of Tennessee, Knoxville, USA

Biography: Dr. Xin is Dean of AgResearch and Director of the Tennessee Agricultural Experiment Station at The University of Tennessee Institute of Agriculture. Dr. Xin is responsible for the research programs of more than 145 scientists and more than 400 specialized staff located on campus and at 10 strategically-located Research and Education Centers across Tennessee. Prior to joining UTIA, Xin was assistant dean for research of the College of Agriculture and Life Sciences at Iowa State University (ISU), director of the Egg Industry Center (EIC) located at ISU, interim director of the Iowa Nutrient Research Center, and a Charles F. Curtiss Distinguished Professor in the Departments of Agricultural and Biosystems Engineering (ABE) and Animal Science. Dr. Xin is known for his collaborative work in facilitating linkages between academics, research and economic development; supporting international academic partnerships; and raising significant private dollars to fund a state-of-the-art poultry teaching and research farm. He serves on numerous scientific advisory boards and committees for academia; industry organizations; and government agencies at state, national and international levels. He has also been instrumental and actively engaged in global capacity building and collaborations toward sustainable animal production. Before joining Iowa State in 1993, he spent more than three years as a postdoctoral research associate at the University of Arkansas conducting broiler housing research. Xin's technical expertise includes a) air quality issues relative to animal production; b) animal-environment interactions; c) livestock and poultry production systems engineering; and d) precision livestock farming. **Email**: hxin2@utk.edu

Keith Carver
Senior Vice Chancellor & Senior Vice President University of Tennessee Institute of Agriculture
University of Tennessee, USA

Biography: Keith Carver is the senior vice chancellor and senior vice president of the University of Tennessee Institute of Agriculture (UTIA), where he provides leadership for AgResearch, Extension, the College of Veterinary Medicine, and the Herbert College of Agriculture. Carver has worked with the UT System for twenty-six years. He most recently served as chancellor of UT Martin, and prior to that role, served as executive assistant to UT President Joe DiPietro for six years. Other leadership positions include interim vice chancellor for development and alumni affairs at the UT Health Science Center in Memphis, assistant vice chancellor for development at UT Martin, and director of development and alumni affairs for the UT College of Law in Knoxville. Carver has actively contributed to leadership at UT, including serving on the UT Foundation Board, the UT Martin Chancellor's Advisory Council and the UT Alumni Association Strategic Planning Steering Committee. He also serves on the board of directors for the Tennessee Chamber of Commerce and Industry, the philanthropy committee of Tennessee Fury Basketball, and he previously served as the major gifts chair for the Sequoyah Elementary Foundation.

Gary Sayler
Co-Chair for Opening Keynotes
FEWSUS Research Advisory Board Chair, Distinguished University Professor Emeritus and Alvin and Sally Beaman Distinguished Professor of Microbiology Emeritus, Department of Microbiology; Adjunct Professor, Department of Biosystems Engineering and Soil Science, University of Tennessee, Knoxville, USA

Biography: Dr. Gary S. Sayler is the distinguished professor emeritus in the Departments of Microbiology, Ecology and Evolutionary Biology and adjunct professor in the Department of Biosystems Engineering and Soil Science at the University of Tennessee, Knoxville (UTK). He is the President and Co-founder 490 BIOTech. He is the founding Director of Center for Environmental Biotechnology (CEB) at UT (1986-2015) and was the first Director of the UT-ORNL Joint Institute for Biological Sciences (JIBS) (2006-2014). As Director for the Waste Management Research and Education Institute **Tennessee Center of Excellence** (1991-2005) he conducted a consolidation and reorganization to create the Institute for a Secure and Sustainable Environment (ISSE) serving as interim director (2005-2006). He served on the Science Advisory Board for the US Defense Department, Strategic Environmental Research Defense Program (2011-2015); and was a member of the US Department of Energy, Biological and Environmental Research Advisory Committee (2008-2013). He served as Executive member and Chair of the Board of Scientific Counselors for the EPA Office of Research and Development (2002-2010) and served on the EPA, Science Advisory Board drinking water committee (2002-2009), the Water Environment Research Foundation Research Council (1995-2001) and was Peer Review Chair for the EPA Exploratory Biology Program (1990-1993). He has served on National Academy/NRC Committees; Evaluating the US EPA Laboratory Enterprise (2013-2014), DOE NRSB-Environmental Management Roadmap (2007-2008), Stand-Off Explosives Detection (2003) and DOE Site Decontamination and Decommissioning (2002). He is Co-founder of China-US Joint Research Center for Ecosystem and Environmental Change (JRCEEC), Beijing, (2006-2016) and US State Department EcoPartnership (2011-2016) and has held honorary professorships in many universities worldwide. Dr. Sayler was an Associate Editor of **Environmental Science and Technology** (1999-2015) and elected to AAAS Fellowship in 2012 and fellow of American Academy for Microbiology (1995). He received the DOW Foundation Support for Public Health Environmental Research and Education (SPHERE) Award (1998), the Distinguished Alumni Award of University of Idaho (1995), and the Procter and Gamble Prize in Applied and Environmental Microbiology from the American Society for Microbiology (1994) and was named a Top 100 Innovator in Science by **Science Digest** (1985). In 2018 he was designated a Distinguished Researcher "Einstein Professor" by the Chinese Academy of Science. His research interests include microbiology, toxicology, and molecular biology of biodegradation of toxic pollutants such as PCB and PAH. He pioneered the development of environmental molecular diagnostics including the extraction and analysis of nucleic acids from the environment and wastes, environmental gene probe analysis, bioluminescent bioreporter/sensor technology, and conducted the first field release of a genetically-engineered microorganism for remediation process monitoring and control. Over his career, Gary Sayler has directed and administered over $100 million of research and guided 100 PhD and MS students and postdocs during his forty-year career; contributing to 410 peer reviewed publications (with a Google Scholar h-index of 92 and 27,000 citations), 18 patents, and over 600 lectures and seminars worldwide. A hallmark of his research and training program has been the highly collaborative and interdisciplinary science and engineering approach to hypothesis development, experimental design, and problem solving as exemplified by the research agenda of the CEB. Through JRCEEC, Gary Sayler extended this commitment to multinational interdisciplinary communication and collaboration. Committed to research as a continuum of the education and learning process; hundreds of students ranging from high school, to undergraduate and graduate have contributed to and gained experience in his laboratory and have moved on to careers in academia, medicine, finance, government and industry worldwide. **Email**: sayler@utk.edu

Lloyd Day
Deputy Director General, Inter-American Institute for Cooperation on Agriculture
Costa Rica

Biography: Mr. Lloyd C. Day is a United States citizen and assumed his position as Deputy Director General of the Inter-American Institute for Cooperation on Agriculture (IICA) on July 1, 2012. Started career with the Governor of California eventually becoming the Assistant Secretary of International Trade and Investment for California. Moved to Washington, D.C. to serve as Administrator of USDA´s Agricultural Marketing Service, Head of Federal Government Affairs at Syngenta, and now Deputy Director General of IICA.

Paul Langan
Associate Laboratory Director
Oak Ridge National Laboratory, USA

Biography: As ORNL's Associate Laboratory Director for Biological and Environmental Systems Science, Paul Langan stewards a research portfolio targeting the convergence of biology, ecology, engineering, data discovery, physical sciences, and computing to advance U.S. competitiveness in the global bioeconomy and Earth system sustainability. Paul returned to ORNL in April of 2023 after nearly two years as director general of the Institute Laue Langevin (ILL) in Grenoble, France – the premier center for neutron science and technology in Europe. As director general, he helped forge connections among research, higher education, and industry that accelerate technical breakthroughs. He also partnered with the molecular biology, synchrotron, and structural biology facilities co-located with ILL on Grenoble's European Photon and Neutron science campus to provide researchers with coordinated access to some of the most advanced experimental platforms for bioscience research.

Paul previously held several leadership roles at ORNL. After arriving as a senior scientist in 2011, he directed the Center for Structural Molecular Biology and served as founding director of the Biology and Soft Matter Division within the Neutron Sciences Directorate, building collaborations across the lab in both leadership roles. He became associate lab director for neutron sciences in 2015 and oversaw the directorate's growth for six years before joining ILL. Paul received a BSc in Physics from Edinburgh University and a PhD in Biophysics from Keele University (England). He serves as a member of the editorial board for the journal **Cellulose,** co-editor for **Acta Crystallographica Section D**, and is a fellow of the American Crystallographic Association. In 2021, he and his colleagues were recognized with the Department of Energy Secretary's Achievement Award to the National Virtual Biotechnology Laboratory Team for harnessing the "formidable scientific facility and research capabilities" of the DOE national laboratories to meet challenges posed by the COVID-19 pandemic. Paul's contributions to science have ranged from leading internationally recognized research teams to directing advanced world-class research facilities, while delivering science discoveries across different levels of organization and scales of resources. Research in areas of interest including biology, chemistry, physics, and computing have led him to appreciate the power of bringing together technical and scientific staff from diverse areas of science to solve complex problems and to make new discoveries.

Randy Boyd
President, University of Tennessee, USA

Biography: Randy Boyd has served as UT's 26th president since November of 2018. Boyd serves as the chief executive officer of a statewide university system. The flagship campus in Knoxville includes the Space Institute in Tullahoma and the statewide Institute of Agriculture. The UT System also includes campuses in Chattanooga, Pulaski and Martin; the Health Science Center in Memphis; and the Institute of Public Service. The UT System also manages Oak Ridge National Laboratory through its UT-Battelle partnership, where Boyd serves as co-Chairman.

In 1991, Boyd founded Knoxville-based Radio Systems Corporation, a company that produces over 4,000 pet related products under the brand names PetSafe, Invisible Fence, ScoopFree and SportDOG. The company employs more than 1,400 people with offices in six countries around the world.

Boyd also owns Boyd Sports, LLC, which owns five minor league baseball teams including the Tennessee Smokies.

In 2007, Boyd began a journey transitioning from entrepreneur and businessman to full time public servant. Boyd is a founder and Chairman of tnAchieves, a non-profit which has helped send over 133,000 students to community college free of tuition and fees. This success led Governor Haslam to invite him to serve as Special Advisor on Higher Education in 2013. During his tenure, he is credited with being the architect of the Drive to 55 and the Tennessee Promise. In 2015, Governor Haslam recruited him back to serve as Commissioner of Economic and Community Development. During his tenure his team recruited 52,000 new jobs and $9 billion in new investment in the State. He also founded and co-Chaired the Governor's Rural Task Force and Chaired the Governor's Workforce Sub-Cabinet.

Randy and Jenny Boyd have dedicated their lives to giving back. In 2018, the couple formed the Boyd Foundation to further promote youth education, mental health, the arts and animal welfare. Among the Foundation's many philanthropic commitments is the Boyd Center for Business and Economic Research and Boyd Venture Challenge seed grant program for student entrepreneurs, both through the Haslam College of Business at UT Knoxville.

Boyd is the first in his family to graduate from college. He earned a bachelor's degree in business with an emphasis on industrial management from UT Knoxville. He also earned a master's degree in liberal studies with a focus on foreign policy from the University of Oklahoma.

When not working for UT, Boyd enjoys running and has run over 85 half marathons and 47 full marathons, including one in Antarctica. But his favorite time is spent as Jenny's husband of 37 years, father to his two sons, and being Poppi to his two granddaughters.

Brad Day
Co-Chair of the Scientific Committee and, Opening Keynotes
Professor, Associate Vice Chancellor for Research & Innovation Initiatives
University of Tennessee, Knoxville, USA

Biography: Dr. Brad Day is the Associate Vice Chancellor for Research Innovation Initiatives at the University of Tennessee, Knoxville. He joined the university in November 2021, is responsible for the development of new, cross- disciplinary, research activities which capture the strengths, and opportunities of faculty at UT. Importantly, in this role, he is focusing on convergence research activities to eliminate traditionally, siloed disciplinary-focused research and innovation. In 2023, he became responsible for the Division of Research Integrity and Assurance (DRIA). DRIA helps researchers and administrators support the responsible conduct of research and navigate research regulatory requirements as well as support researcher's goals of excellent research, outreach, and advancement for all your scientific, creative, and scholarly activities while developing future researchers in an ethical, safe, and supportive environment. Prior to UT, Dr. Day was a Foundation Professor at Michigan State University (MSU) where his research focused on the molecular-genetic regulation of plant immune signaling. His research was funded by a breadth of national and international funding agencies, including NSF, USDA, NIH, Asian Development Bank, the Gates Foundation. During his time at MSU, he spent 1 year as a Program Director at the National Science Foundation (NSF). Prior to MSU, he was a National Institute of Health-funded postdoctoral scholar at the University of California, Berkeley, and an NSF postdoc at the National Institute of Agro-environmental Resources in Japan. He has a PhD and BS in Microbiology from the University of Tennessee. **Email**: bradday@utk.edu

Jie (Joe) Zhuang
FEWSUS Director, Professor
CO-Chair of the Organizing Committee, Objectives of symposium
University of Tennessee, Knoxville, USA

Biography: Dr. Jie (Joe) Zhuang is a professor in Department of Biosystems Engineering and Soil Science, director of environmental and soil science graduate studies, and the lead of cluster faculty hire initiative of climate-smart agriculture and forestry at the University of Tennessee (UT), Knoxville, USA. He is also affiliated faculty of UT's Institute for a Secure and Sustainable Environment. Dr. Zhuang has (co)founded four international multidisciplinary research centers, more than ten international research working groups, and one international graduate study program at doctoral level. The graduate program has recruited 40 doctoral students for UT, contributing $4 million dollars to the graduate programs of 11 UT departments. He has organized or chaired over 40 international transdisciplinary workshops benefiting more than 6,000 researchers and students across the world. He served on many national and international award committees as well as many review panels of national and international funding agencies. Over the past 25 years, Dr. Zhuang has worked on many challenging research projects in the United States, Japan, and China. He was a postdoctoral fellow of Japan Scoiety for the Promotion of Science (JSPS) during 1998-2000. Dr. Zhuang is a transdisciplinary researcher, and he has rich research experiences in fate and transport of contaminants, soil viruses, soil hydrology, soil carbon sequestration, crop-water relations, and food-energy-water

nexus. He created the first course on food-energy-water nexus (ESS 561) in the nation for graduate and undergraduate students in 2020. He has published over 150 refereed articles and book chapters and over 80 conference abstracts. Dr. Zhuang has given more than 40 invited talks worldwide. He has been the editor or editorial board member for 15 international journals and served over 60 international journals as ad hoc reviewer. Currently, Dr. Zhuang leads NSF-funded projects aiming to develop a global research center for climate-smart food-energy-water nexus at varying setting and scales, which involve researchers, students, stakeholders, and policymakers from over 20 countries. **Email**: jzhuang@utk.edu

Wendy Tate
FEWSUS Co-Director, McCormick Endowed Professorship
William J. Taylor Professor; Haslam Family Faculty Research Fellow
University of Tennessee, Knoxville, USA

Biography: Dr. Wendy Tate is a professor in the Department of Supply Chain Management. She teaches strategic sourcing and sustainability to undergraduate, MBA, executive and doctoral students. She is interested in the financial impacts of business decisions across the supply chain.
Dr. Tate received her B.S. in Operations Management in 1989, MB.A. in International Businesses in 1993, and Ph.D. in Supply Chain Management in 2006 from Arizona State University. She specializes in translating academic work into classroom learning activities and disseminating her work globally. Her research can be broadly classified under purchasing but focuses primarily on two types of business problems. The first is in services purchasing, including outsourcing, offshoring and reshoring. The second area is on environmental business practices and understanding how these initiatives can be diffused across a supply chain and a supply network.

Mingzhou Jin
FEWSUS Co-Director, John D. Tickle Professor and Head of the Department of Industrial and Systems Engineering
Director of the Institute for a Secure and Sustainable Environment, University of Tennessee, Knoxville, USA

Biography: Dr. Mingzhou Jin, John D. Tickle Professor at the University of Tennessee and department Head of Industrial and Systems Engineering, has expertise in sustainability, climate change, data analytics, operations research, additive and smart manufacturing, energy efficiency, supply chain, manufacturing systems, logistics, and transportation. He is directing both the Institute for a Secure and Sustainable Environment and the Logistics, Transportation, and Supply Chain Engineering Lab. His research has been well sponsored with more than $10 million in grants and contracts from a board spectrum of federal, local government agencies and corporations including US National Science Foundation, US Department of Energy, US Department of Transportation, and US Department of Homeland Security. He is a fellow of the Institute of Industrial and Systems Engineers (IISE). Currently, he is Editor-in-Chief for Cleaner and Circular Bioeconomy and the executive editor of the Journal of Cleaner Production. **Email**: jin@utk.edu

OPENING KEYNOTES

Justus Wesseler
Contribution of the bioeconomy towards sustainable development: opportunities and challenges
Wageningen University & Research, The Netherlands

Biography: Justus Wesseler holds the chair in Agricultural Economics and Rural Policy at Wageningen University, The Netherlands. He has a degree in agriculture, environment, and natural resource economics from the University of Göttingen, Germany. His research work is on bioeconomy economics and policies. The major focus is on the contribution of value chains to improve sustainability and the impact of new technologies and regulations on the value chain in this respect. He is president of the International Consortium of Applied Bioeconomy Research (ICABR). He has been involved in a number of international research projects as team member and/or coordinator (PRICE and BioMonitor) and been invited to serve as an adviser in academia and research. He currently serves on the Scientific Advisory Board of the German Federal Ministry of Food and Agriculture and on the working group on future perspectives for agricultural, food and nutritional sciences of the German Science and Humanities Council. **Email**: justus.wesseler@wur.nl

Abstract: The world faces a number of challenges for realizing sustainable development of the food system. The bioeconomy, understood as the conversion of biological resources into food and other products, has the potential to generate a wide range of solutions to adopt to climate change, mitigate greenhouse gas emissions, and strengthening the resilience of food systems and hence, food security. This contribution summarizes how the bioeconomy can support sustainable development of food systems within a net-zero transitions and highlights important issues that are considered to be of relevance. Examples include experiences made in the European Union under the Green Deal and the Farm-to-Fork strategy highlighting challenges and opportunities and lessons to be learned beyond the European Union (EU).

David Zilberman
Building the bioeconomy for rural development and educational renewal
Closing Remarks
University of California Berkely, USA

Biography: David Zilberman holds the Robinson Chair in the Agricultural and Resource Economics Department, University of California at Berkeley. He is the recipient of the 2019 Wolf Prize in Agriculture and was elected a member of the U.S. National Academy of Science 2019. David served as the 2018-2019 President of the Agricultural & Applied Economics Association (AAEA). He's a Fellow of the AAEA, Association of Environmental and Resource Economists, European Association of Environmental and Resource Economists, and Honorary Life Member of the International Association of Agricultural Economists. David has published in both professional and popular outlets. He has more than 350 refereed articles in journals ranging from Science to ARE-Update and has edited 20 books. In addition, he has served as a Consultant to the U.S. Environmental Protection Agency, the World Bank, and FAO. David's research analyzes innovation supply chain and policy economics, emphasizing the interactions between agriculture, energy, and the environment. He has researched the economics and political economy of agricultural biotechnology and the potential of the bioeconomy. In addition, he has been working on water policy programs and the economic impacts of the COVID pandemic. **Email**: zilber11@berkeley.edu

Abstract: The bioeconomy is using natural resources and modern biotechnology to produce food, fuel, chemicals, recreation, and sequestration. It integrates the natural resources sector, agriculture, forestry, and fishery to contribute much beyond food fiber. It transfers major jobs from mining to various forms of farming. Its evolution would lead to the establishment of new supply chains for multiple commodities and services, transferring resources towards the rural sector. To build a bioeconomy, we need to rethink land use and technology regulations and reinvest in intensifying research and education in the life and natural resource sciences. The bioeconomy is global and its expansion can solve rural poverty and enhance development globally. The success of the bioeconomy depends on the establishment of smart policies, both domestic and global.

Archileo Kaaya
Food Systems transformation: opportunities for reducing GHG emissions & climate change impact in Uganda
Makerere University, Uganda

Biography: Professor Archileo N. Kaaya has teaching and research experience of more than 30 years in the Department of Food Technology and Nutrition, Makerere University, Uganda. He possesses a PhD in Food Science and Technology from Virginia Tech USA/Makerere University and MSc from University of Florida, USA. His main areas of research are Food Safety and Nutrition where he has published widely in international journals and books. Recently, he has developed interest in Food Systems transformation in Uganda where he has been the National Consultant on Strategic Analysis of Policy, Legal and Institutional frameworks related to Food Systems. He is the Winner, Uganda Food Systems Award 2023. He has been a principal investigator of several research projects networking with scientists all over the world. He belongs to several technical committees in Uganda including those addressing issues of food quality, safety and nutrition. He has been awarded several consultancies by international organizations like USAID, WHO, FAO and WFP to address issues of food and nutrition security in the country. He is a Fellow of the Uganda Academy of Sciences. **Email**: kaaya.archileo48@gmail.com

Abstract: A circular bio-economy emphasizes the use of renewable natural capital to minimize waste, biodiversity loss and greenhouse emissions. In Uganda, changes in land use, deforestation, and agricultural activities are the highest contributors to greenhouse gas emissions. There are also visible and increasing effects of climate change-related phenomena. Whereas the country is party to international and continental commitments on net zero emissions and has a defined path towards net-zero transitions with policies and legislation in place to mitigate climate change, the level of emissions continues to increase. Several challenges hinder net zero transition in the country, including among others: increasing population pressure on natural resources; urbanization and demographic transitions; biodiversity and natural resources degradation; limited adoption of renewable and other appropriate energy resources in especially on-farm agro-processing; inadequate recycling technologies; weak enforcement and inadequate implementation of relevant policies and laws. Going forward, given Uganda's nature of predominantly smallholder agriculture, sustainable transformation of agrifood systems requires the positioning of a circular bio-economy approach at all levels of the food value chain development. This will significantly contribute towards a more inclusive path for accelerating the reduction of greenhouse gas emissions and enhancing livelihoods across Uganda.

David McCollum
Net-zero and the broader sustainable development agenda: maximizing benefits, minimizing trade-offs
Oak Ridge National Laboratory, USA

Biography: Dr. David L. McCollum is a Senior R&D Staff in the Mobility and Energy Transitions Analysis (META) Group at Oak Ridge National Laboratory, with expertise spanning economics, engineering, policy analysis, and corporate advisory services. His research attempts to inform state, national, and global energy and environmental issues on matters related to, among others, deep decarbonization, net-zero emissions pathways, energy-transport-climate policies, electric sector planning, end-use sector electrification (transport, buildings, industry), Sustainable Development Goals (including inter-dependencies), financing needs for the energy system transformation, and human dimensions of climate change. He employs energy-economic systems and integrated assessment models in support of this work. Before joining ORNL, David was a Senior Research Scholar with the Energy Program at the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria, and a Principal Technical Leader at the Electric Power Research Institute (EPRI) in Palo Alto, California. He currently holds a secondary appointment as Research Fellow at the Howard H. Baker Jr. School of Public Policy and Public Affairs at the University of Tennessee. David has led numerous activities within the context of the U.S. Department of Energy; Intergovernmental Panel on Climate Change (IPCC); Global Energy Assessment; World Bank; and International Science Council; among others. David received a PhD and MS in Transportation Technology & Policy from the University of California, Davis; an MS in Agricultural & Resource Economics from the same institution; and a BS in Chemical Engineering from the University of Tennessee. **Email**: mccollumdl@ornl.gov

Abstract: An equitable and nature-inclusive transition to a decarbonized economy is the defining challenge of our time. The scale is massive, the urgency unprecedented. To avoid the worst impacts of climate change, the world has until 2030 to bend the curve on greenhouse gas emissions. By 2050, net-zero technologies will need to be deployed in every corner of the US at levels >10x or even >1000x of today's levels, impacting every person and ecosystem nationwide Along the different possible pathways to net-zero emissions, there are opportunities for co-benefits as well as risks of unintended consequences, be they environmental, economic, socio-cultural, or institutional. Decision-makers and planners, across all domains, need science-based analytical expertise to help them plan net-zero emission strategies that are simultaneously reliable, equitable, welfare-improving, nature-inclusive, and that provide energy security and economic development for the nation. This becomes especially critical as society moves from niche demonstration projects to scaled deployment of net-zero technologies.

Kelly Tiller. Founder and Chief Strategy Officer
GENERA, USA

Biography: Dr. Kelly Tiller founded Genera in 2008 and grew it from a university spin-out to become North America's largest vertically integrated biomaterials manufacturer, producing a range of agricultural fiber packaging and bioproducts from locally grown regenerative crops. Dr. Tiller spent the first 15 years of her career in academia as an agricultural and resource economist at the University of Tennessee. She is widely recognized as a visionary leader helping shape and advance the transition to a more circular bioeconomy and sustainable future, evidenced across her multiple congressional testimonies, federal advisory committee appointments, service on industry and academic advisory boards, and accolades spanning business, science, and leadership. Following 15 years as Genera's CEO, she recently moved into the role of Chief Strategy Officer to focus on expanding Genera's footprint, driving innovation, and stakeholder engagement.

Monday, March 18, 2024

Transdisciplinary Keynotes on Socio-Environment Interactions

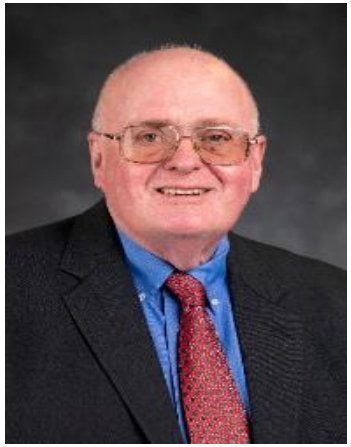
Tom Gill
Co-Chair for Transdisciplinary Keynotes on Socio-Environment Interactions
FEWSUS Co-Director
Associate Professor and Smith Chair
University of Tennessee, Knoxville, USA

Biography: Dr. Thomas (Tom) Gill is an international, interdisciplinary development professional who has worked in agriculture and rural development for the past 20 years. Gill currently serves as the Smith Chair in International Sustainable Agriculture and Director of International Programs at the University of Tennessee's Institute of Agriculture, leading strategic vision and global program development across the institute. Gill has served as President (2019-2020) of the Association for International Agriculture and Rural Development (AIARD) and as Chair (2015-16) of the International Agriculture Section for the Association of Public and Land Grant Universities (APLU). His experience and research interests include smallholder household decision-making in sustainable agroecosystems and participatory approaches to capacity development, with a focus on sub-Saharan Africa and Southeast Asia. **Email**: tgill4@utk.edu

Julie Carrier
Co-Chair for Transdisciplinary Keynotes on Socio-Environment Interactions
Professor and Head of the Department of Biosystems Engineering and Soil Sciences
University of Tennessee, Knoxville, USA

Biography: Dr. Carrier is a Professor & Department Head in the Department of Biosystems Engineering and Soil Sciences at the University of Tennessee. Dr. Carrier received her doctorate in general engineering in 1992 from McGill University before joining UTIA in 2016. In addition to her role as department head, she is a lauded researcher whose work includes improving the harvesting and storage of medicinal plants as well as seeking new ways to maximize biomass quality, composition and production. She has also worked as a professor for more than 16 years at the University of Arkansas and now at the University of Tennessee, teaching topics such as engineering design, behavior of construction materials, design presentation and reporting, scientific writing and professional development. Throughout her career, Carrier has published almost 100 peer-reviewed journal articles and served on more than 20 scientific panels with the USDA, National Science Foundation and Department of Education. She was also the recipient of the John L Imhoff Outstanding Research Award in 2015 at the University of Arkansas College of Engineering and has been a member of ASABE for more than 18 years. In 2023, she was awarded the James R. and Karen A. Gilley Academic Leadership Award during the annual international meeting of the American Society of Agricultural and Biological Engineers (ASABE). During her almost two decades of service at ASABE, Carrier has held numerous leadership and development roles. In addition to serving as trustee on the Society Board of Trustees from 2019-2022, she also served in multiple roles on committees within the Processing Systems Technical Community and Professional Department Heads committee. **Email**: dcarrie1@utk.edu

TRANSDISCIPLINARY KEYNOTES



Bruce McCarl
Food, energy and water implications of biofuel and climate policy, Texas A&M University, USA

Biography: Dr. Bruce McCarl is an agricultural economist who was trained in management science/optimization theory. The main thrust of his work has addressed national level agricultural and in cases forest sector appraisal of the economic consequences of environmental outcomes and policy actions. He has addressed food, energy and water, climate change effects, greenhouse gas mitigation, biofuel production/policy, bioelectricity, farm program revisions, and climate change adaptation. Models he led development of have been adopted for use by USDA, and USEPA. He is a fellow of three agricultural economics associations and was a participant in the 2007 Nobel Peace Prize awarded to the IPCC. **Email:** mccarl@tamu.edu

Abstract: The US has chosen promotion of agricultural based fuels as one of its responses to energy and climate issues. We have analyzed the implications of biofuel promoting policy and developments on food prices, water issues in the US. Studies have shown that such policy has diverted commodities from traditional food and feed markets, raised agricultural prices, increased aquifer drawdown rates, increased erosion and nitrogen runoff while decreasing greenhouse gases and increasing energy supplies. We have also investigated the simultaneous effect of carbon prices and marginal land use finding that under carbon prices renewable electrical power is preferred and that marginal lands relieves pressure on food markets but still has water depletion and quality implications.

Lloyd Day
Bioeconomy: A strategic commitment to sustainable development in Latin America and the Caribbean
Inter-American Institute for Cooperation on Agriculture, Costa Rica

Biography: Mr. Lloyd C. Day is a United States citizen and assumed his position as Deputy Director General of the Inter-American Institute for Cooperation on Agriculture (IICA) on July 1, 2012. Started career with the Governor of California eventually becoming the Assistant Secretary of International Trade and Investment for California. Moved to Washington, D.C. to serve as Administrator of USDA´s Agricultural Marketing Service, Head of Federal Government Affairs at Syngenta, and now Deputy Director General of IICA.

Abstract: The Inter-American Institute for Cooperation on Agriculture (IICA) is the specialized agency for agriculture within the Inter-American System. It supports the efforts of its 34 member states in achieving agricultural development and rural well-being. The Institute's efforts are currently geared to helping its Member States achieve sustainable, competitive and inclusive agriculture by means of actions focused on four strategic objectives: 1) improving the productivity and competitiveness of the agricultural sector; 2) strengthening agriculture's contribution to the development of territories and rural well-being; 3) enhancing agriculture's capacity to mitigate and adapt to climate change and make better use of natural resources; and, 4) improving agriculture's contribution to food security. This presentation will discuss IICA's Innovation and Bioeconomy Program; strategies, policies and institutional frameworks to accelerate progress in bioeconomy initiatives; and provide examples of IICA's work on intensification of agri-food systems, Pan-American Coalition for Liquid Biofuels; Biotechnology (Gene Editing); Bioinputs; Synthetic biologics.

Virginia Dale

Stakeholder engagement improves decision making in food-energy-water systems that support the bioeconomy

University of Tennessee, USA

Biography: Dr. Virginia Dale is a landscape ecologist whose research focuses on quantifying progress toward sustainability of agricultural landscapes and energy systems, ecosystem management in the context of large disturbances and climate change, and stakeholder engagement. Dr Dale is a research professor in the Department of Ecology and Evolutionary Biology and in the School of Natural Resources at the University of Tennessee. She is also a Corporate Fellow emeritus at Oak Ridge National Laboratory, where she worked for 33 years. She was among the members of the international science community who contributed to the Intergovernmental Panel on Climate Change Scientific Assessment that in 2007 received with Al Gore the Nobel Peace Prize. She has served on national scientific advisory boards for five agencies of the United States and several committees of the National Academies of Science.
Email: vdale@utk.edu

Abstract: The bioeconomy refers to economic activity requiring biomass and biotechnology to produce goods, services, or energy. It is essential to engage people in identifying and understanding the causes and effects of decisions around the food, water, and energy systems that support the bioeconomy. Effective stakeholder engagement in such decisions requires substantial time and resources by project organizers and the stakeholders themselves. Such co-production of knowledge is critical yet challenging. To help projects prioritize, prepare, and sustain stakeholder-engagement, we developed an approach for effective co-production based on six gears of engagement: diversity, listening, value, trust, accountability, and flexibility/adaptability. Building local capacities for continual improvement is also an enabling factor for more sustainable bioeconomies. We discuss the gears, and the challenges of implementing them, in the context of the bioeconomy. While it is difficult to incorporate all the gears, this approach can help to foster more sustained, actionable, equitable, inclusive, and timely engagement of people in addressing concerns and opportunities related to the bioeconomy.

Robert Spajić

Managing by products of agricultural production and agriculture industry

Josip Juraj Strossmayer University of Osijek, Croatia

Biography: Dr. Spajić is presently employed at Central Agrobiotechnical and Analytical Unit under the Faculty of Agrobiotechnical Sciences Osijek at Josip Juraj Strossmayer University of Osijek, Croatia and is Adjunct Professor at the University of Tennessee, USA. Prior to his employment at the University, he was employed as a Director of Swine Production within the Agrokor Company in Croatia. His work within the Agrokor Company was focused on developing large commercial swine production systems in Croatia, including introduction of technological processes and waste management solutions on a large-scale livestock farm operation, followed by development of biogas plant technical solutions. In the period from 2004 - 2007, Mr. Spajić worked for Development Alternatives Inc. (DAI) for four years as an extension agricultural consultant on US Embassy agricultural development projects in Croatia. From 2000 - 2004, Dr.

Spajić was employed on several large-scale dairy and beef operations and led the development of several large-scale dairy operations in Croatia. In the period from 2008 – 2009 he was a Fulbright Scholar as a Scientist at Iowa State University, pursuing his doctorate degree in Biotechnical Science and Agricultural Engineering, focusing on waste management, fermentation processes and biogas plant engineering. He holds Ph.D. in Biotechnical Science and Agricultural Engineering, from University of Josip Juraj Strossmayer Osijek in Croatia. Dr. Spajić also served as an external adviser to the Ministry of Agriculture of Croatia in the process of adjusting Croatian agricultural laws to meet European Union Standards as Croatia prepares to seek membership in the European Union. Mr. Spajic has worked on livestock byproducts (manure and digestate) management projects in Croatia, USA, Germany, Finland, Nederland, Romania, Russia, Ukraine, Czech, Serbia and Italy. Since 2000 he has been involved in the livestock Industry with his focus on large industrial farm projects with an aim to provide the best technical and technological solution for livestock byproducts management. He is a member of American Society of Agricultural and Biological Engineers (ASABE) and member of Fulbright Alumni. He is also a member of Croatian Agricultural Society and Croatian Association of Court Entrepreneurs. In more than 20 years of work experience, he published more than 60 scientific papers and conducted numerous public presentations focused on livestock and agricultural industry waste management issues. From 2015 Dr. Spajić is a member of the Board of Directors at the International Research Center for Animal Environment and Welfare in China. Presently he is a Member of European Commission Technical Working Group for IPPC/IED Directive (Integrated Pollution Prevention and Control/Industrial Emission Directive) implementation in two sectors – Food Drink and Milk Sector and Intensive Rearing of Pigs and Poultry Sector.
Email: rspajic@fazos.hr

Abstract: Various by-products in agricultural production and agricultural industry were treated as a waste through the decades. With an aim to use more and more of the mentioned materials as raw materials instead of being waste, the agricultural industry tries to turn the new page with the view to become environmentally sustainable, but still economically feasible. Several models and practical technologies of use of agricultural by-products are presented. How we should turn waste into a quality raw material for reuse in different segments of the agricultural industry is a key to future sustainability in the whole agricultural sector. Is it acceptable and reasonable to use the phrase "zero waste" in the agriculture sector? Environmentally sustainable agriculture production will be a main guidance policy in the following period, where practice and techniques of reuse of the agricultural by-products will be a focus for the existing agricultural producers. Different agricultural industry by-products reuse and practical techniques (dairy sector, beef sector, swine sector, sugar sector, wine sector, aquaculture sector etc.) are shown as an overview in the presentation.

Guangqing Chi
Pursuing opportunities for long-term arctic resilience for infrastructure and society
Pennsylvania State University, USA

Biography: Guangqing Chi (https://theedenresearch.org) is professor of rural sociology and demography and also director of the Computational and Spatial Analysis Core at Pennsylvania State University. His expertise is in socio-environmental systems, seeking to understand the interactions between human populations and the built and natural environments and to identify important social, environmental, infrastructural, and institutional assets to help vulnerable populations adapt and become resilient to environmental changes. Chi's work has led to innovative methods for identifying and measuring human–environment hotspots and spatial methods for population forecasting. His current methodological focus is to build an infrastructure for collecting, integrating, and analyzing multidimensional and multi-scale data, including big social data. Dr. Chi's research has been supported by more than $50 million grants through NSF, NIH, NASA, USDOT, DOD, and SSRC. He has published over 150 publications

including nearly 100 peer-reviewed journal articles, contributing to foundational advances in environmental demography and population-infrastructure nexus. Chi is lead author of the textbook Spatial Regression Models for the Social Sciences (SAGE 2019). **Email**: gchi@psu.edu

Abstract: Alaskan coastal Indigenous communities face severe, urgent, and complex social and infrastructural challenges resulting from environmental changes. However, the magnitude and significance of impacts are unclear; as is how local communities will respond to resulting disruptions and disasters. This transdisciplinary POLARIS project investigates how interconnected environmental stressors and infrastructure disruptions are affecting coastal Arctic communities and identifies important social, environmental, infrastructural, and institutional assets to help them adapt and become more resilient to climate-related changes. The POLARIS project (https://arcticpolaris.org) has identified three convergent and interconnected research pillars to help communities adapt: food in complex adaptive systems, environmental hotspots of disruption to communities and infrastructure, and migration and community relocation. The ultimate goal of this integrated research project is to enable communities to become more resilient with both stronger societies, civic culture, and improved infrastructure needed as the new Arctic continues to emerge.

Enrique Garcia Baumgartner
Synergizing growth: some opportunities for sustainable development in Latin America
WeTTO (USA) and BYONYEK (Argentina)

Biography: Enrique Garcia Baumgartner has a Ph.D. in Biology and with more than 30 years of experience in the environmental sector, he currently serves as CEO and co-founder of BYONTEK, a start-up that operates in the AgTech segment and actively participates in the process of improving and converting environmental assets into financial assets through scientific-technological activities, focusing on environmental remediation and the application of science and technology to address soil and water contamination problems, as well as climate change mitigation. He has worked in recent years in environmental risk assessment and mitigation projects for both the private sector and different governments in Latin America, including as (1) Researcher in the framework of the International Convention on Biodiversity under the Nagoya Protocol (2) Consultant in Geographic Information and Informatics System (ERDAS / ARC INFO) for the project RLA/99/G31 & Environmental Protection of the Rio de la Plata and its Maritime Front. Consultant for eight years for the International Strategy for Disaster Reduction (ISDR) Working Group 3, focused on risk, vulnerability, and disaster impact assessment. (3) A pioneer in obtaining the first permit in South America for a hydrocarbon recovery project in obsolete fields within a Natural Protected Area (Laguna Yancanello). The environmental database developed was donated to the Municipality for the first Environmental Data Interpretation Center. (4) Expert for UNDP in the First Environmental Risk Study of Oil Spills in the Colorado River Basin, Argentina (1999). (5) Director of environmental contamination study developed in the Peruvian Amazon. In addition, as CEO of WeTTo, a US-based company, he provides strategic advice in complex environmental situations to global companies with assets in emerging countries. He actively participates in international cooperation agreements between Argentine entities and academic institutions in developed countries. **Email**: enrique.garcia@wetto.net

Abstract: The presentation “Synergizing Growth: Some Opportunities for Sustainable Development in Latin America” will delve into the transformative opportunities and challenges facing Latin America to achieve sustainable growth and their linkages to energy, water, and food. We will explore energy transition, circular economy, digital transformation, and sustainable water management strategies, highlighting how these initiatives can foster economic, environmental, and social sustainability. We will also address the current situation in the region, the importance of international investments, and scientific-technological cooperation for Latin American countries.

Carter Christopher

Future map: developing geographic futures for sustainability assessments using generative GeoAI, population synthesis, and agent-based modeling

Oak Ridge National Laboratory, USA

Biography: Dr. Carter Christopher is Head of the Human Dynamics R&D Section at Oak Ridge National Laboratory. Dr. Christopher leads Human Geography, Built Environment Characterization, and Geoinformatics Engineering research groups at the lab, to solve national- and global-scale challenges for National and Energy Security. Prior to joining ORNL, Dr. Christopher was Head of Geospatial at an aerospace start-up, and he had a distinguished 12-year career in the Intelligence Community (IC). Carter spent 11 years at the National Geospatial-Intelligence Agency (NGA), where he led a number of transformational efforts at the agency. He led organizations and programs that delivered ML and CV-derived object detection and mapping for mission operations; he was a founder and leader of NGA's program for cloud modernization, DevOps, SaaS provisioning for the IC; he established and staffed the agency's data science and advanced geospatial analysis mission organizations; and he led global GIS training for the agency. Dr. Christopher closed his Federal career at the US State Department as Deputy Director of the Office of the Geographer and Global Issues in the Bureau of Intelligence and Research. In that role, he served as deputy to the Geographer of the United States, he led and managed intelligence and humanitarian analysis and mapping in support of policy makers, and helped stand up the Department's enterprise GIS. Prior to Federal service, Carter held management and technical roles in the private sector, supporting Federal, state, and local clients. Dr. Christopher has a PhD in Earth Systems and Geoinformation Science from George Mason University, a MS in Geography and Remote Sensing from the University of Southern Mississippi, and a BA in Government from the College of William and Mary. **Email:** christophesc@ornl.gov

Abstract: The forecast of climate change and its impacts through 2100 is highly variable and uncertain at the local level and attempts to understand those impacts are typically based on today's geographic knowledge of the world. Just as we can expect climate and environmental change over the next 70 years, humans will undoubtedly alter the landscape, both to (hopefully) stem the tide of climate change and to afford further human progress. While the climate modeling community has long developed reliable climate models grounded in trusted earth systems data and physics, it has not been until recently that human dynamics and social feedbacks have been viewed as a necessary coupling within these climate models. And while these new modeling approaches have yielded important insights for policy making, as well as potential tipping points in both climate and human effects, few are based on upon high-fidelity geospatial data, geographic knowledge, or models of human behavior.

The geospatial science domain is likewise highly data-driven and data dependent; however, our domain has typically not looked forward through simulations. Whether using satellite imagery, infrastructure data layers, streamflow sensors, or mobility trajectories, geospatial scientists heavily focus on building models of spatiotemporal relationships of today, based on recent observational data. While agent-based modeling (ABM) has emerged as a robust technique over the past 40 years, recent advances in computing and geospatial data precision have opened new possibilities for high-resolution microsimulations. Novel statistical techniques also enable the creation of synthetic population datasets that can be used to understand human effects within today's landscape or tomorrow's. Additionally, GeoAI, and generative AI, are presenting new opportunities for rapid exploitation and inferencing from geospatial data, as well as the creation of synthetic datasets that themselves can be further exploited through GeoAI. These techniques can be used develop scenario-specific datasets, synthetic satellite imagery, land cover, land use, built environment dynamics, population dynamics, and more. This presentation will explore the boundaries of geospatial modeling, inferencing, and simulation, to share possibilities for how this science and technologies can illuminate possible climate and sustainability futures and impacts, ultimately informing bioeconomic strategies at the Food-Energy-Water nexus.

Daniel De La Torre Ugarte
Economic modeling of land use changes to disentangle economic, social, and environmental trade-offs
Oak Ridge National Laboratory, USA

Biography: Dr. Daniel De La Torre Ugarte has B.S. in Economics from the Universidad del Pacifico, Lima, Peru and a PhD in Agricultural Economics from Oklahoma State University. He joined ORNL's Environmental Science Division as a distinguished research staff in Land Use and Carbon Economics in 2023. Dr. De La Torre Ugarte was a member of the faculty of the University of Tennessee for more than 20 years, and since then as an adjunct professor. From 2013 to 2023 he returned to his native Perú and joined the faculty of the Universidad del Pacifíco (Lima) with the environmental and natural resource economics research group. Dr. De La Torre Ugarte has more than thirty years of experience developing simulation models for the analysis of economic and environmental policies and regulations related to agriculture, forestry, and energy sectors. His research continues to be focused in estimating environmental costs of agricultural and forest policies and practices, analysis of biofuels impacts on agricultural land use change and markets, estimating costs and benefits of interventions leading to reductions in GHG, sustainability of water resources. Right before joining ORNL his work included modeling decarbonization pathways to reduce emissions from the AFOLU and Energy sectors, the green economy, and the valuation of ecosystem services. He has ample experience working with multidisciplinary teams and mentoring young professionals. **Email**: danieltu@ornl.gov

Abstract: Increased use of biomass for energy and materials as the bioeconomy expands, will bring changes in land use allocation, and consequently in the supply and prices of crops for food, feed, fiber, and feedstock for fuels, energy, and biomaterials. Usually, the increase in crops for food and fiber are seen as negative impacts, and a deforestation driver. A framework and consequent modeling approach is discussed under which the expansion of the land use demand from the bioeconomy, results in economic, social, and environmental gains.

Esther S. Parish
Modeling benefits of planting climate-resilient perennial biomass crops in flood-prone agricultural landscapes
Oak Ridge National Laboratory, USA

Biography: Dr. Esther S. Parish has been a researcher with Oak Ridge National Laboratory's Environmental Sciences Division for ~15 years. Dr. Parish leads interdisciplinary research projects for the US Department of Energy's BioEnergy Technologies Office (BETO) and Water Power Technologies Office (WPTO). As a geographer and landscape ecologist, Esther's primary research interests include utilizing geographic information science (GIS) and integrated models and datasets to assess (1) potential tradeoffs between environmental and socioeconomic indicators of sustainability and (2) climate change impacts on human populations and water resources. With a Ph.D. in Energy Science & Engineering through the Bredesen Center for Interdisciplinary Graduate Research and Education, an M.S. in Geography from The University of Tennessee, and B.S. in Geology & Geophysics from Yale University, Esther has expertise in landscape ecology, sustainability indicators of renewable energy resources, watershed hydrology, and pollution prevention. Dr. Parish has published nearly 40 articles in a variety of peer reviewed journals, including **Applied Energy**, **PNAS**, **Ecology & Society, Ecological Indicators, Environmental Management**, **Computers & Geosciences,** and **Sustainability**. **Email**: parishes@ornl.gov

Abstract: US farmers have frequently experienced catastrophic losses from flooded croplands over the past decade, and the frequency and magnitude of floods are projected to increase under a warming climate. This raises concerns about the future sustainability of an economy based on growing annual row crops in flood-prone areas. Although the US has large potential to grow flood-tolerant perennial energy crops like switchgrass and willow for multiple uses, including the production of bioenergy and animal feed, these perennial crops are rarely grown in current agricultural landscapes. This talk will present recent modeling work undertaken to estimate the flood losses that could be avoided in the Mid-Atlantic region by replacing annual crops (e.g., corn and soy) with perennial grasses and shrubs in riparian buffers under current and future climate conditions. This talk will also present modeling work undertaken to assess the potential benefits of incorporating partially harvested riparian buffers into Iowa's agricultural landscapes, including increased avian biodiversity and improved water quality.

Presented by: Esther Parish, Henriette Jager, Ganesh Ghimire, Yan Liu, Jasmine Kreig, Christopher DeRolph, Sudershan Gangrade, Karen Maguire, Shih-Chieh, Matthew Langholtz, Anthony King

March 18, 2024

Lightning Session for Junior Researchers

Frank Löffler
Co-Chair Lightning Session for Junior Researchers
FEWSUS Co-Director, Professor, Goodrich Chair of Excellence in Civil Engineering, Department of Civil and Environmental Engineering
University of Tennessee, Knoxville, USA

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 his 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. During 2010-2023, Dr. Löffler 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. The Löffler laboratory explores the physiology, diversity, distribution, and ecology of microbes that control the turnover of nutrients and pollutants, with the goal to harness, manipulate, and predict their functions in both natural and managed habitats. His research has been funded by the DOE, EPA, NIH, DOD, and NSF. He has published over 200 manuscripts and book chapters and has edited a seminal book, Organohalide-Respiring Bacteria. His work has been cited more than 16,000 times and he has an H-index of 67. Dr. Löffler is a fellow of the American Academy of Microbiology. **Email**: frank.loeffler@utk.edu

Ashley Morgan
Co-Chair of Lightning Session for Junior Researcher
Integrated multi-trophic aquaculture – low waste, energy efficient, nutrient-dense seafood production
University of Tennessee, USA

Biography: Ashley Morgan is a post-doctoral research associate with the One Health Initiative. She received her degrees in Marine Science and Biology at the University of Miami before attending Veterinary School here at UT where she obtained her DVM and a Master's in Public Health. After graduating, she worked as an Emergency Clinician for several years before starting a PhD at Florida Atlantic University studying the health impacts of prebiotic and probiotic supplementation and toxicant loads in the Florida pompano, a fish raised for the seafood market. She enjoys employing an integrative approach to health research and working with experts across varying disciplines to answer difficult questions at the interface of human, animal, and environmental health. **Email**: aschenk1@utk.edu

Abstract: The growth rate of aquaculture is higher than any other food production method globally, highlighting the aquaculture industry as a crucial contributor to meeting the world's food demand through reliable and consistent farming practices. Land-based recirculating aquaculture systems, improved monitoring technologies, and novel techniques for the remediation of aquaculture effluents have all reduced the ecological impacts and improved the sustainability of aquaculture production. Integrated Multi-Trophic Aquaculture systems utilize multiple species to create a chain of waste consumption resulting in circular and sustainable seafood production. Freshwater and saltwater recirculation technology is used in this land-based system and occurs via a hub-and-spokes concept in which the hub is a computer-controlled filtration and distribution system and the spokes lead to the different culture areas. In the prototype system, all components are indoors apart from the macroalgae

cultures and solar panels. Additionally, novel autonomous monitoring systems are employed to improve efficiency and productivity of the system. This prototype system has resulted in the successful cultivation of four sea vegetables: sea lettuce (*Ulva lactuca*), red seaweed (*Gracilaria tikvahiae*), sea asparagus (*Salicornia bigelovii*), and sea purslane (*Sesuvium portulacastrum*). These vegetables are low in calories, almost fat-free, contain no added sugars, and are a good source of high-quality protein, fiber and potassium. The system has also successfully cultured three species of fish: red drum (*Sciaenops ocellatus*), Florida pompano (*Trachinotus carolinus),* and cobia (*Rachycentron canadum*) as well as Pacific white leg shrimp (*Litopenaeus vannamei),* sunray venus clams (*Macrocallista nimbosa*), and sea cucumbers (*Holothuria floridana*). Integrated Multi-Trophic Aquaculture systems represent a feasible solution to low-waste, energy efficient, and nutrient dense food production. The success of this prototype system is promising in the endeavor toward improved sustainability in the food sector. Future research will involve the implementation of sponges and urchins into the system and the incorporation of omnivorous fish species to further its productivity. Additionally, the use of AI-integrated monitoring technologies will be investigated to further improve system efficiency. This presentation will delve into the transformative opportunities and challenges facing Latin America to achieve sustainable growth and their linkages to energy, water, and food. We will explore energy transition, circular economy, digital transformation, and sustainable water management strategies, highlighting how these initiatives can foster economic, environmental, and social sustainability. We will also address the current situation in the region, the importance of international investments, and scientific-technological cooperation for Latin American countries.

LIGHTENING SESSION SPEAKERS

Abdelaziz Lawani
Place and contribution of resource-poor communities to net-zero economy systems
Tennessee State University, USA

Biography: Dr. Lawani's research and extension programs are at the intersection of agribusiness management, applied economics, entrepreneurship, and machine learning. His training in agronomy, economics, rural sociology, and geography allows him to work on a variety of topics and facilitate interdisciplinary collaborations. Dr. Lawani is also a serial digital entrepreneur who has developed innovative solutions such as climate-smart precision agriculture using drones, community renewable energy initiatives in Africa, and a direct marketing app that connects small-scale farmers with consumers. **Email**: alawani@tnstate.edu

Abstract: The contributions of resource-poor communities towards achieving net-zero economy systems are often overlooked. The narrative linking resource-poor communities to discussions on achieving the net-zero emissions targets frequently presents them as requiring significant investments from more advanced economies to adapt to climate change, curb their greenhouse gas emissions, and aid the global net-zero objective. However, these communities play an essential role in the ongoing global reduction of greenhouse gas emissions and will have an increasingly critical role in achieving the net-zero emissions goals in the future. For example, peatlands in the Cuvette Centrale depression in the Democratic Republic of the Congo (DRC) currently store carbon equivalent to the world's emissions over three years of burning fossil fuels (Dargie et al.2017). The conversion of peatlands into agricultural lands could result in the emission of billions of tons of carbon dioxide, as the stored carbon in these peatlands is vulnerable to land use change (Qiu et al. 2021, Tanneberger et al. 2021). Similarly, resource- poor countries like Nigeria, Egypt, DRC, and Namibia supply the rare minerals needed for the world's green energy transition. This lightning talk highlights case studies of resource-poor communities contributing to net-zero economies while addressing poverty, unemployment, and sustainability goals.

Dimitris Herrera
Tackling the effects of climate change on smallholder farmers in the Caribbean
University of Tennessee, USA

Biography: Dimitris Herrera is a climate scientist interested in tropical hydroclimate variability during the last millennia. His research aims to understand how climate change might increase drought risk in the Tropical Americas, especially in the Caribbean and Central America. Dimitris is currently an Assistant Professor at the Department of Geography & Sustainability at the University of Tennessee-Knoxville, and an Adjunct Associate Professor in the Department of Geography at Universidad Autonoma de Santo Domingo, in the Dominican Republic. His current research focuses on hydroclimate variability and dynamics in the Tropical Americas and how climate change might increase drought risk in this region. **Email**: dherrer3@utk.edu

Abstract: Climate models project significant drying in the Caribbean during climate change. However, the impacts of the projected drying at local scales, especially on smallholder farmers, are not well-constrained. Here, we present the use of a high-resolution drought forecasting system as a tool to inform smallholder farmers and stakeholders in the Caribbean. Results from this forecasting system could be used as a benchmark to improve drought resilience to the benefit of ~45 million people in this region.

We-Au (Vivian) Chen
Toward sustainable architecture: navigating the framework of energy transition within energy, Buildings, and human
University of Tennessee, USA

Biography: Dr. Wei-An Chen received her Ph.D. degree from the University of Tokyo, Japan in 2020. She is now a postdoctoral research associate at the Institute for a Secure and Sustainable Environment (ISSE) of the University of Tennessee, Knoxville. She specializes in architecture and architectural engineering, and her research centers in the built environment, energy efficiency, and clean energy transition in buildings. Specifically, she focuses on indoor/outdoor thermal comfort, occupant behavior, urban and building energy modeling, and clean energy transition towards sustainable buildings and societies. She also specializes in renewable energy adoption, especially the utilization of waste heat in sewage at the regional scale, green and resilient building design strategies, measures and policy for low/zero carbon buildings and cities. She is actively involved with several interdisciplinary networks to integrate human-centric research regarding energy efficiency, energy justice, and energy policy.

Email: wchen52@utk.edu

Abstract: This presentation will explore the important issues and challenges posed by climate change and energy transition in the field of building energy efficiency, discussing corresponding coping methods and policies within the framework of "buildings", "energy" and "human". First, the focus will be on the perspective of "energy" and emphasizing the renewable energy adoption in architecture. Using the innovative clean energy source of "wastewater heat" as an example, innovative energy strategies for the field of architecture will be provided. Next, introducing the interaction between

building energy efficiency and indoor environmental quality (IEQ). This part not only focuses on energy but also introduces the factor of "people", exploring the relationship between IEQ, human well-being, and productivity in different types of buildings, and emphasizing the trade-off between energy conservation and indoor thermal comfort. The final part will explore the research concepts of human-centric and justice. In this section, the justice issues in the built environment and the challenges faced by underserved communities and vulnerable populations are discussed, drawing insights from the policy recommendations for vulnerable groups while achieving decarbonization. The goal of this presentation is to comprehensively explore the intertwined challenges and opportunities among architecture, climate change, energy transition, and social justice, aiming to provide researchers with a more diverse perspective. While pursuing architectural energy efficiency, the aim is also to pursue resilience and equity in architecture.

Erika Gavenus
Restorative diets: toward the health of humans and non-humans
University of British Columbia, Canada

Biography: Erika is currently a PhD candidate at the University of British Columbia, Vancouver within the Institute for Resources, Environment and Sustainability, supervised by Dr. Terre Satterfield. She uses a lens of food justice to examine how fisheries regulations can challenge food access for coastal First Nations. Erika grew up on the lands of the Nichiłt'ana and learned to love fish and fishing on waters long stewarded by Dena'ina and Sugpiaq peoples. Erika is grateful for her time living and learning on the traditional, ancestral, and unceded territory of the Musqueam and Nuxalkmc. She brings academic training in public health, nutrition, and food security to this research and deep appreciation for the role of collective well-being and relationships with place. She holds a BSc in Global Health from Georgetown University and a MSc in Global Health and Environment from UC Berkeley. Erika currently lives with her family in Knoxville and is thankful for the ways this land nourishes her and her thinking, and for the peoples who have long stewarded it, including the Cherokee and Yuchi. **Email**: egavenus@gmail.com

Abstract: First Nations face persistent interruptions to the relationships that make up their food systems along the coast of, what some call, British Columbia. Some of these interruptions are social in nature, such as the fisheries management strategies imposed by the Crown and State that have deeply disrupted First Nations diets and fishing practices. Unfortunately, restoration goals and management decisions continue to use these contemporary, disrupted diets as their starting point, causing a "shifting baseline" effect that can frustrate efforts to respond to ecological shifts in ways that promote the health of humans and non-humans in these coastal systems. In particular, the tendency to base management decisions on evidence of disrupted diets can hold repercussions for First Nations working to restore their fisheries, diets, and food systems. Instead, I worked in partnership with First Nations along the Central Coast of British Columbia and colleagues to develop a set of methods for exploring diets less disrupted by colonial fisheries policies—restorative diets. In this poster, I introduce the concept of restorative diets as diets accessible under the interdependent conditions of ecological restoration and reassertion of Indigenous governance, and I expand on the central tenet that First Nations diets and their food systems are central to both efforts. I then share the methods developed and present an example, using the case of Pacific salmon, of the magnitude of the difference between harvest rates consistent with restorative compared to contemporary diets.

Jeronimo Silva

Investigating die-off's in freshwater mussels: safeguarding ecosystem services in a changing world

University of Tennessee, USA

Biography: Jeronimo Silva received his B.S. in Wildlife Sciences from Virginia Tech and M.S. in Agricultural Sciences from Tennessee State University. Jeronimo has collaborated with researchers and conservation managers throughout the Southeast, contributing to a variety of field and laboratory research projects. These projects have encompassed a wide spectrum of species and ecosystems including federally endangered species and critical habitat areas. His primary research projects incorporate landscape ecology, habitat and occupancy modeling, and aquatic wildlife health and disease. Prior to joining the University of Tennessee College of Veterinary Medicine to pursue his PhD, Jeronimo served as an aquatic biologist for USDA's Natural Resources Conservation Service. In this capacity, his main focus was on the execution of strategic, landscape-level conservation projects and programs, designed to systematically enhance aquatic wildlife habitats. **Email**: jgsilva@vols.utk.edu

Abstract: Freshwater mussels are a vital component of riverine ecosystems, playing a crucial role in maintaining their health and functionality. As ecosystem engineers, they provide essential services such as filtering water, habitat enhancement, and nutrient cycling. Recently, freshwater mussel die-off events with unknown causes have occurred in two biodiversity hotspots in Tennessee and Virginia. These mortality events reflect a broader trend of the loss of freshwater mussel populations across the United States that is a major concern for biodiversity and ecosystem function. Humans rely on freshwater ecosystems for drinking water, recreation, and economic activities such as fishing and tourism. Thus, disruptions in freshwater mussel populations can have a cascading effect on both ecosystem health and human well-being. To address these challenges, we are adopting a comprehensive One Health approach. This approach integrates in-situ experiments, extensive field surveys, disease diagnostic techniques, and epidemiological analysis to identify drivers of freshwater mussel die-offs. By identifying these factors, we aim to inform effective strategies for monitoring, diagnosing, and managing diseases in freshwater mussels. Ultimately, our research seeks to safeguard the invaluable ecosystem services provided by freshwater mussels amidst the complexities of a changing world.

Agustin Torres
Circular economy projects: composting of organic waste for biofertilizer production using enzymes
National University of Mar del Plata, Argentina

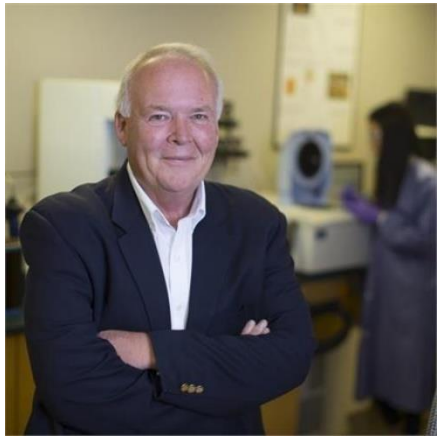
Biography: I am an undergraduate researcher from the National University of Mar del Plata (UNMdP) in industrial engineering. I am finalizing my undergraduate thesis. For my major study I had done a few environment focused courses, I strongly think that such courses should be mandatory to almost all engineering degrees. Knowing is the first step to caring! My interest in environmental issues goes beyond those few courses I did. I want to pursue a career that allows me to work on solving these problems that affect our world today, and will only get worse if we don't do anything to stop them. That is why I chose this circular economy project as my Final Project, I want it to be my letter of presentation if I want to do a master in environmental engineering or to work in that engineering field. Being able to present my project and participate in this symposium is an unique opportunity to meet fellow students and professionals who are as committed as I am to reducing the environmental impact we have as society in the world. **Email**: torrresag@gmail.com

Abstract: The Final Project for my industrial engineering degree is mainly based on the technology used by the Taiwanese company "Tetanti AgriBiotech Inc." The combination of a bioreactor and enzymes, called TTT technology, allows to complete the composting process of organic waste in only 3 hours; obtaining a ready-to-use organic fertilizer. The amount of treatable waste depends on the reactor's size, with daily capacity ranging from 12 tons (t) to 250 t. The process starts with the shredding of the organic waste. Then the waste is ready to be mixed with the enzymes in the bioreactor, with heating (176 ºF) the composting process is done in less than 3 hours. In comparison with traditional composting methods, the TTT technology saves time, space, reduces the emission of greenhouse gases and the loss of nutrients and organic matter in the biofertilizer. My Final Project is the design of a factory that would produce biofertilizer using the TTT technology. The organic waste treated would come from the industrial activity of my hometown Mar del Plata´s industrial park. In order to obtain information about organic waste generation in the "Parque Industrial General Savio" I interviewed several professionals from companies such as PepsiCo, Havanna (local sweets company), Cabrales (local coffee company), Panacity (local bread company) and others. The hypothetical capacity of the factory was set in 12 tons (t) of organic waste treated daily. The utility ratio of the process is 55% so it would produce 6,6 tons of biofertilizer per day. This circular economy project aims to mitigate two environmental issues. Firstly, it would reduce the amount of waste that is destined to the local landfill (extending its lifespan) or that goes untreated. Secondly the use of biofertilizers can reduce the need for chemical fertilizers.

Biographies and Abstracts

Workshop 1: Circular Bioeconomy Systems

Chairs: Tim Rials and Niki Labbé (UT, USA), Erin Webb and Keith Kline (ORNL)



Tim Rials, Ph.D. and Professor
Associate Dean of AgResearch at the University of Tennessee, Institute of Agriculture (UTIA)
University of Tennessee, U.S.A.

Biography: Tim Rials is the Associate Dean of AgResearch at the University of Tennessee, Institute of Agriculture, following 15 years as the Director of the UT Center for Renewable Carbon. Dr. Rials is a graduate of Mississippi State University, and earned his M.S. and Ph.D. in wood science from Virginia Tech. He joined the university following 13 years with the U.S. Forest Service, after two years on the faculty of the University of California–Berkeley. Tim's research career has focused on the development of renewable chemicals, including sustainable aviation fuels. Tim focuses on UT AgResearch programs by facilitating the development of multi-disciplinary faculty teams that cut across departments and institutions. He also promotes AgResearch relationships with commodity groups, agencies, and professional groups. **Email:** trials@utk.edu

Erin G. Webb
Senior R&D and group leader, Bioresource Science & Engineering
Oak Ridge National Laboratory, USA

Biography: Dr. Erin Webb leads the Bioresource Science & Engineering Group in the ORNL Environmental Sciences Division. The Bioresource Science and Engineering Group, part of the Biodiversity and Sustainable Systems Section, is focused on developing and applying quantitative tools to advance our understanding of how bioresources can be sustainably and reliably produced, delivered, and utilized to expand the US bioeconomy while also preserving ecosystem services. Erin is a Senior R&D Staff Member and Joint Associate Professor in the Department of Biosystems Engineering and Soil Science at the University of Tennessee. Dr. Webb received a B.S. in Agricultural Engineering from the University of Tennessee, an M.S. in Biosystems Engineering from the University of Kentucky, and a Ph.D. in Agricultural and Biological Engineering from the University of Florida. Her graduate research, supported by fellowships from NSF and NASA, focused on modeling plant growth and evapotranspiration for improving environmental control systems. She conducted her doctoral research at the Space Life Sciences Laboratory at the NASA Kennedy Space Center on simulating and modeling plant transpiration in a greenhouse on Mars. She is a licensed professional engineer.

Building on her academic research on plant-environment interactions and a desire to develop new economic opportunities for rural communities, Dr. Webb now leads multiple projects sponsored by the DOE Bioenergy Technologies Office focused on simulation and analysis of supply chains to deliver biomass as a feedstock for production of fuels, products, and power. Her research aims to build and apply models of biomass harvest, storage, transportation, and preprocessing to evaluate the impacts of equipment design and system operational parameters on costs and required inputs for a variety of feedstocks. Her work has been instrumental in assessing impacts of DOE-funded feedstock harvest technologies and in estimating the delivered costs of biomass feedstocks in the highly-regarded DOE report *"2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving*

Bioeconomy". Dr. Webb's research also assists biorefineries and biomass suppliers in addressing the fire risk associated with storing bales of corn stover and switchgrass. She leads an industry panel that has successfully proposed changes to fire codes and standards to better reflect the fire risk in modern biomass-handling facilities. She is leading experiments to better understand fire growth and dynamics in biomass storage and handling for designing safer storage facilities. Erin also works with material scientists, plant scientists, and other engineers to develop technologies for using biomass in additive manufacturing. Dr. Webb serves as lead of the Center for Bioenergy Innovation (CBI) Economics and Sustainability Team (2020-present) and co-lead of the Crosscutting Analysis Team for the BETO Feedstock-Conversion Interface Consortium (2019-present).
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WORKSHOP 1 KEYNOTES

Gal Hochman
Climate-smart technologies and food security in the context of a circular bioeconomy
Rutgers University, USA

Biography: Professor at the Department of Agricultural, Food, and Resource Economics at Rutgers University. Dr. Hochman received his Ph.D. in Economics at Columbia University in 2004. Although, while coming out of his Ph.D., he focused on international trade agreements and crony capitalism, his stay at UC Berkeley introduced him to energy and agricultural biotechnology; his current focus includes issues related to development, energy, the environment, technology, and trade. Dr. Hochman is also keen on understanding the importance of policy in facilitating the transition to sustainable and resilient supply chains and an improved understanding of aquaculture technologies and their role in future food supply chains. Dr. Hochman presented his work at numerous conferences, has 62 peer-reviewed publications, some in top journals, and has 121 publications. He is currently the Council On Agricultural Food & Resource Economics board chair.
Email: gal.hochman@rutgers.edu

Abstract: The world faces several challenges, including an increasing demand for food, climate change, and the need to preserve biodiversity. To address these challenges, we can adopt a climate-smart circular bioeconomy (CSCB) strategic approach, which uses modern life science techniques and renewable resources to reduce agricultural and natural resource emissions. Implementing the CSCB approach can also improve food security while preserving biodiversity. To shift towards a circular system, we need to emphasize the importance of research and human capacity. We must also use benefit-cost analysis to guide decision-making and consider the social costs of externalities in the decision-making process.

Alejandro López Moriena
A sustainable dairy production model in the Humid Pampas
Adecoagro, Argentina

Biography: Alejandro works in the company since inception and reports directly to the CEO of the company. His responsibilities include the definition of ESG corporate policy and strategy. Additionally, he has a key role in developing the most efficient and sustainable technologies for the company. Alejandro has spoken in numerous Ag conferences, with special focus on Sustainability and Technology matters, such as The World Food Prize (Iowa, US), Sustainable Food Lab (London, UK), World Agri Tech Summit (San Francisco, US and Sao Paulo, Brazil), Global AgInvesting (New York, US) and Financial Times Climate Capital conference, among others. Alejandro is Argentine and Italian citizen, and Master in Agronomy by the University of Buenos Aires. Adecoagro is one of the leading companies in the production of food and renewable energy in South America. Present in Argentina, Brazil and Uruguay, its main activities include the production of sugar, ethanol, bioelectricity, grains, oilseeds, peanut, milled rice and dairy products among others. Adecoagro is listed on the NYSE by AGRO.

Abstract: We have developed a sustainable production model in Humid Pampas (Argentina) where we produce food and renewable energy, while we recycle a lot of water, and everything in the most efficient way. The feed for the cows is produced in the same farm, under Regenerative practices such as No Till and cover crops, among others. Cow comfort is the key in this model, and with it we can double cow productivity, when compared to traditional models. Not only milk doubles, but manure as well, so we have introduced digesters in the region in order to process the latter. With the digesters we are able to produce biogas, and with it we can generate renewable electricity for the local community. In addition to this, all the material that goes out from the digesters, turns into biofertilizers that goes back to the fields where we grow the feed for the cows. On top of all these processes, we are certifying the digesters in order to get Carbon Credits as they dramatically reduced GHG emissions of the operation.

Keith Kline
An inclusive, climate-smart, circular economy: challenges and opportunities
Oak Ridge National Laboratory, USA

Biography: Keith assesses renewable energy options to identify approaches that improve land management and livelihoods. Keith spent 24 years in developing nations supporting community forest management, biodiversity conservation, and Sustainable Development Goals. At Oak Ridge since 2008, Keith has authored 90 publications on resource management and development. Keith currently supports DOE on the Biofuture Clean Energy Ministerial Initiative (sustainability), the Net Zero World Initiative (Just Transitions), ISO Technical Committee 323 (Circular Economy), and International Research Networks on the nexus of Food-Energy-Water. **Email**: klinekl@ornl.gov

Abstract: The process to develop a set of International Standards for Net Zero and a Circular Economy (ISO IWA 42 and ISO Technical Committee 323) will be reviewed along with corresponding principles, definitions, and performance metrics. Initiatives supported by the US State Department (Net Zero World) and the Department of Energy Bioenergy Technology Office (Biofuture Platform Initiative under the Clean Energy Ministerial) will also be highlighted to underscore the role of collaborative research and development, and methods to engage global stakeholders. A key message is that good natural resource management – of land, soil, and water by local communities – is essential to enable a more resilient and sustainable, circular economy.

Claudio Dunan
President, National Seed Institute of Argentina
Accelerating the development of circular bioeconomy systems in Argentina

Biography: Claudio Dunan is the President of the National Seed Institute of Argentina. He is a founding partners of Bioceres Group and Head of Strategic Initiatives for the company from 2012-2023. Prior to that, he held the position of General Manager in three multinational agroinput companies: Zeneca (today Syngenta), Makhteshim-Agan (today Adama), and Síntesis Química (Punjaab Chemichala). He has a bachelor's degree in Agricultural Engineer from the University of Buenos Aires and obtain his Ph.D in Weed Ecology at Colorado State University (1993) and a Doctorate in Business Administration at the University of CEMA (2021). Between 1990 and 1996 he was a professor and researcher at Colorado State University, University of Padova Italy, and at Louisiana State University. **Email:** claudiodunun@gmail.com

Abstract: The development of circular bioeconomy systems is considered a key strategy to reduce extreme poverty, increase economic empowerment, and reduce the environmental impact of human activities. These are global goals and very much needed in Argentina. The Public R&D in Argentina has been developing knowledge as the basis of a sound bioeconomy. Several university programs are available to educate on the benefits and opportunities of the bioeconomy. The private sector has been implementing financial schemes and business models to create bio-based companies and start-ups. Farmers are eager to diversify their product basket by adding bioenergy, biofuels, biomaterials, new crops, and carbon credits. The recently elected government has created the Secretary of Bioeconomy to support the current public and private efforts with policies and regulations that place the bioeconomy as a key development strategy for the country.

William Joe Sagues
North Carolina State University, USA
Bio-based battery materials for circular energy storage systems

Biography: Dr. Sagues is the Principal Investigator of the Biocarbon Utilization & Sequestration (BUS) Lab in the Biological & Agricultural Engineering Department at North Carolina State University. He has experience in research, development, and demonstration of innovative bioprocessing technologies at corporations, startup companies. universities, and national labs. The BUS Lab takes an integrated approach to innovate technologies that utilize and sequester biogenic carbon. The aim of his work is to leverage the bioeconomy for carbon drawdown. He is bridging fundamental advances in synthetic biology and chemical catalysis with bioprocess engineering to innovate carbon-negative bioproducts that range from feed, chemicals, fuels, and materials. When developing a new technology, the BUS Lab takes into account the entire technology-to-market pathway, starting with fundamental research and ending with commercialization. Such a comprehensive approach increases the odds of commercial success by eliminating developmental hurdles and pitfalls at an early stage. **Email**: wjsagues@ncsu.edu

Abstract: The demand for electrochemical energy storage is increasing rapidly due to a combination of decreasing costs in renewable electricity, governmental policies promoting electrification, and a desire by the public to decrease CO2 emissions. Lithium-ion batteries are the leading form of electrochemical energy storage for electric vehicles and the electrical grid. Lithium-ion cell anodes are mostly made of graphite, which is derived from geographically constrained, non-renewable resources using energy-intensive and highly polluting processes. Thus, there is a desire to innovate technologies that utilize abundant, affordable, and renewable carbonaceous materials for the sustainable production of graphite anodes under relatively mild process conditions. A novel catalytic graphitization method shows great promise at producing low-cost, battery-grade anode material from sustainable biomass resources. Further, the opportunity exists for carbon-negative bio-batteries that remove atmospheric CO2 over their lifetime.

Jeffery K. Tomberlin

Diversifying - agriculture, protecting the environment, stabilizing economies: the story of the black soldier fly

Texas A&M University, USA

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 alternative protein sources for use as livestock, poultry and aquaculture feed from these resources. Predominantly, 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).
Email: Jeffery.Tomberlin@ag.tamu.edu

Abstract: The ability to digest organic wastes and produce insect biomass for use as feed clearly is a disruptor of the cyclic economy concept globally. An insect that was once viewed as a pest, is now seen as a channel through which economies can diversify, environments can be protected, and concerns with feeding the global human population are lessened. The purpose of this presentation is to provide background on the value of this insect as part of the agro-economic sector, recent advancements with deciphering its biology, and possible pathways leading to enhanced production and greater value to the agro-industrial sector globally.

Marcelo Torres
Shaping learning communities: the path of innovation in networks
AAPRESID, Argentina

Biography: Dr. Torres is an agricultural engineer, graduated from the National University of Buenos Aires with training in Crop Production from the National University of Mar del Plata. He is currently Director of Grupo Ceres Tolvas, member of the Technology Innovation Department of Grupo Ceres Tolvas and representative of Ceres Tolvas in the Agtiva innovation ecosystem. He is President of the Argentine Association of Direct Sowing Producers (Aapresid), where he has previously served as Vice President (2021-2023), Deputy Director of the Aapresid Prospective Program (2018-2021), Deputy Director of the Aapresid Farms Program (2016-2018). He is a member of the Innventure evaluation committee, an Investment Fund made up of producers and agricultural companies that invests in companies with Agtech development. **Email**: torres@aapresid.org.ar

Abstract: The Argentine No Till Farmers Association (Aapresid) is a non-governmental and non-profit organization founded in 1989, in response to the high rate of soil erosion caused by conventional tillage. Nowadays, Aapresid encompasses a network of farmers and agronomists who share a common interest in the conservation of soil, their main resource, through the adoption and promotion of an agricultural paradigm based on no till farming, a paradigm of care, regeneration and continuous improvement. Aapresid has 1800 members producing and consulting on over 11 million hectares in Argentina, spread across all over the country. Aapresid organizes and delivers on several activities: Annual National Congress (almost 6000 attendees in 2023); development of field trials, field days and seminars for technological exchange between domestic and foreign farmers; promotion of joint research and extension activities with universities, agricultural research centers and private companies. Aapresid plays a fundamental role in the evolution and spread of regenerative agriculture, in Argentina and worldwide. Aapresid is protagonist on the conformation of collaborative innovation networks and is determined to share this successful case, sharing experiences and promoting the exchange of knowledge to contribute to the advancement of responsible and transformative agricultural practices at an international level. This presentation will highlight the value of sustainable agricultural production systems, the development of local farmers' networks that promote innovation and the formation of learning societies. The presentation will also focus on Aapresid's current challenge, which is to extend the collaborative networks of innovation beyond the limits of the farms, generating links with the different actors of the agri-food chain and the consumer.

Charles Cao
Integrating edge A1 and blockchain in precision dairy farming: towards sustainable and smart agricultural practices
University of Tennessee, USA

Biography: Dr. Charles Cao is an associate professor of the Electrical Engineering and Computer Science Engineering Department at the University of Tennessee, Knoxville. He obtained the Bachelor of Science degree in Computer Science from Fudan University in Shanghai, China, in 2002, his Master of Science degree in Computer Science from the University of Virginia in 2005, and a Doctor of Philosophy degree in Computer Science from the University of Illinois at Urbana-Champaign in 2008. He then joined the faculty of the Electrical Engineering and Computer Science Engineering Department at the University of Tennessee, Knoxville. Over the years, Dr. Cao has worked in multiple research areas, including Cyber-physical systems, IoT, cyber-security, and networking systems. His work was funded by multiple NSF grants in these areas, including an NSF CAREER grant on IoT system software, NSF CPS grants on smart grid and precision agriculture, among others. **Email**: qcao1@utk.edu

Abstract: In this presentation, we describe our efforts applying AI to precision agriculture, integrating Edge AI and blockchain technology to enhance sustainability and efficiency. We focus on deploying advanced sensor technologies for real-time disease detection and farm-wide analytics. Edge AI is utilized for immediate processing of sensor data, crucial for early anomaly detection. Concurrently, a blockchain-based system ensures data integrity and security, essential for reliable farm management. Finally, we also describe our work on using LLMs for digital twin simulations. This integrated approach promises significant advancements in precision dairy farming, optimizing both productivity and environmental sustainability.

Nicole (Niki) Labbé
Design for a sustainable future: Advancing the sustainable production and use of renewable carbon
University of Tennessee, USA

Biography: Dr. Nicole (Niki) Labbé is a Professor of Biomass Chemistry and the Assistant Director of the Center for Renewable Carbon, with an academic appointment in the School of Natural Resources at the University of Tennessee. She received her Ph.D. in Wood Sciences from University of Bordeaux, France. Over the past 20 years, Dr. Labbé's research has focused on the development of new biological and chemical pathways through sustainable chemistry to effectively fractionate lignocellulosic biomass and produce unpolluted building blocks that can be converted into fuels, chemicals, and products. She has been awarded numerous grants from NSF, USDA, DOE, and private industries and frequently publishes peer-reviewed articles that advance the fundamentals of Circular Bioeconomy Systems. **Email**: nlabbe@utk.edu

Abstract: Biodiversity loss, strain on food systems, threats to water systems, and many other impacts threaten sustainable life on our planet. Technology has advanced exponentially since the Industrial Revolution bringing many benefits; however, most of this technology is designed to work in a linear fashion – taking, using, and disposing of resources in a way that we now know is unsustainable. Circular economy is a concept that has

been around for some time with a focus on maximizing resource use and reducing waste. Recent interests have shifted the focus to the development of Circular Bioeconomy Systems (CBS) which takes the circular economy concept and adds the goal of moving from carbon-intensive products to lower carbon alternatives. To develop CBS, we are focusing our effort on three critical themes to guide the design of integrated feedstock systems, sustainable cascading products, and CBS metric systems. This presentation will focus on the design of sustainable products that maximize every carbon atom through cascading use. Our research aims to optimize the life of captured carbon in order to develop industrially viable, cost-effective products with end-of-service-life solutions. These products and materials will be designed to keep materials in use for as long as possible using a holistic, life-cycle-based design. Through these initiatives, CBS will help ensure humanities' needs for food, fiber and fuels are met while protecting healthy ecosystems by utilizing the over 1.5 billion tons of renewable carbon that the US can harvest sustainably each year.

Biographies and Abstracts

Workshop 2: Net-Zero Urban System

Chairs: Frank Löffler and Kellie Walters (UT, USA), Jose Puppim (Brazil), Adam Sochacki (Czech Republic), Wei Lao (MSU, USA)

Frank Löffler, Ph.D., Goodrich Chair of Excellence in Civil Engineering, Department of Civil and Environmental Engineering, Tickle College of Engineering; Department of Microbiology, College of Art and Sciences, University of Tennessee, USA

Biography: Frank Löffler is Goodrich Chair of Excellence in Civil Engineering, Department of Civil and Environmental Engineering, Tickle College of Engineering; Department of Microbiology, College of Art and Sciences; former UT-ORNL Governor's Chair Professor of Environmental Microbiology and Director of the Center for Environmental Biotechnology. He has a B.S. in Agricultural Sciences and Biology and an M.S. in Microbiology from the University of Hohenheim in Germany, a Ph.D. in Technical Biochemistry and Microbiology from the Technical University Hamburg/University of Hohenheim and completed a postdoc in microbial ecology at Michigan State University. He is the Principal Investigator for the Biogeochemical Controls over Corrinoid Bioavailability to Organohalide-Respiring Chloroflexi NIEHS R01 grant. His lab focuses on discovering microorganisms and processes to clean the environment, counter damage done to ecosystems by human activity, and improve environmental health. For more information, please refer to Dr. Loeffler's Lab Website. **Email:** frank.loeffler@utk.edu

WORKSHOP 2 KEYNOTES

Jose A. Puppim de Oliveira
The dynamics of innovation in green and blue infrastructure in urban areas
Getulio Vargas Foundation, Brazil

Biography: Jose A. Puppim de Oliveira is a faculty member at FGV (Fundação Getulio Vargas), a think-tank in Brazil, and Visiting Chair Professor at the Institute for Global Public Policy (IGPP), Fudan University, China. He has extensive international experience in teaching, research and academic management in planning, management and global environmental change. His work is multi and interdisciplinary to understand urban dynamics involving applied social sciences and their links to the natural and health sciences and engineering. His research and policy interests concentrate in the political economy of governance, institution building and policy implementation at different levels, looking at how global environmental change and local institutions are interlinked to steer governance and action. His experience comprises work in more than 20 countries in all continents. He has been an instructor, consultant and researcher for several organizations such as different United Nations agencies, the OECD, the World Bank, sub-national and national governments, and various NGOs and small and large firms. He held positions of Senior Research Fellow and Assistant Director of the UN University Institute of Advanced Study of Sustainability (UNU-IAS) in Japan between 2009 and 2015. Previously, he worked as faculty member at the University College London (UK) and the University of Santiago de Compostela (Spain) as an EC Marie Curie Fellow. He has published twelve books and more than 100 articles in peer-reviewed journals. He serves as a member of several journal editorial boards and advisory panels, such as Sao Paulo State Research Foundation, Belmont Forum and Wellcome Trust. He is among the most influential researchers worldwide. **Email**: jose.puppim@fgv.br

Abstract: Urban innovation can significantly improve the quality of public services and increase the problem-solving capacity of organizations for addressing societal challenges, particularly those new issues in the global agenda, such as climate change. Local governments have been acknowledged as key stakeholders for boosting innovations using collaborative initiatives between diverse sectors and levels. However, the mechanisms that foster the innovative capabilities through intersectoral interactions, including international collaborations, are still under research. This presentation will discuss the dynamics of innovation process in the local governments using the results of the Belmont Forum project "IFWEN-Understanding Innovative Initiatives for Governing Food, Water and Energy Nexus in Cities" (https://jpi-urbaneurope.eu/project/ifwen/). Innovations in the use of green and blue infrastructure in cities can improve the trade-offs between food, water, and energy (FWE), the main idea behind the FWE Nexus (FWEN). The IFWEN is a transdisciplinary research project that studied cities in Asia, Africa, and Latin America to develop a framework to assess innovation in FWEN using Green and Blue Infrastructure (GBI) at the urban level.

Alessio Russo
Designing multifunctional nature-based solutions for sustainable, healthy, and resilient cities
Queensland University of Technology, Australia

Biography: Dr Alessio Russo is a Senior Lecturer in Landscape Architecture at the Queensland University of Technology (QUT) in Brisbane, Australia. Originally from Italy, Dr Russo has over 15 years of international experience researching, lecturing, and consulting on urban green infrastructure, urban forestry, and ecosystem services. Before joining QUT, he served as a Senior Lecturer in Landscape Architecture and Academic Course Leader for the Master's in Landscape Architecture at the University of Gloucestershire in England (2019-2024). Prior to that, he was an Associate Professor (2018) at RUDN University in Moscow, Russia. Earlier, he served as Professor and Head of Laboratory of Urban and Landscape Design (2016-2018) at Far Eastern Federal University in Vladivostok, Russia. He has published over 80 publications, including peer-reviewed papers, book chapters, and conference proceedings, and has co-edited four books. His current and past research projects are diverse, ranging from urban ecosystem services to health and wellbeing in urban green spaces. Outside of academia, Dr Russo has practiced as a Landscape Architect in the UK, Italy, and the UAE, focusing on sustainable design and planning.
Email: alessio.russo@qut.edu.au

Abstract: Rapid urbanization has negatively impacted the health and well-being of city dwellers, necessitating innovative approaches to secure a healthier future for upcoming generations. This talk explores the promise of Nature-Based Solutions (NBS) as a transformative approach to enhancing urban resilience and sustainability. NBS provides an action-oriented framework for addressing contemporary challenges faced by urban areas. In this talk, we will look into the multifaceted benefits of NBS, including improved air and water quality, enhanced biodiversity, food security, and increased recreational opportunities. We will also critically examine potential challenges and drawbacks, such as health issues (allergies), implementation costs, and maintenance requirements. Through well-designed NBS, we can achieve key goals related to biodiversity, health, and food security, revolutionizing the way we design and build cities that promote both environmental sustainability and the well-being of their citizens.

Jan Vymazal
Ecosystem services of urban wetland
Czech University of Life Sciences, Prague, Czech Republic

Biography: Jan Vymazal received his degrees from the Institute of Chemical Technology in Prague, Czech Republic. Between 1985 and 1991 he was affiliated with the Water Research Institute in Prague at the department of wastewater treatment. In 1991, Jan joined Duke University Wetland Center, North Carolina, USA as a visiting scholar. During his stay at Duke University until 1993 he focused on the wetland plant communities in Florida Everglades. Between 1994 and 2006 Jan worked as a freelance researcher focusing mostly on constructed wetlands for wastewater treatment. In 2007, he joined Faculty of Environmental Sciences at the Czech University of Life Sciences in Prague. He is currently the head of Department of Applied Ecology and vice-rector for research and science. Jan has authored more than 170 papers indexed in Web of Sciences with over 14,500 citations (H-index 56). He wrote two books and edited nine books on natural and constructed wetlands. He is Editor-in-Chief of the journal Ecological Engineering and Associate editor for journals Science of the Total Environment and Wetlands. **Email**: vymazal@fzp.czu.cz

Abstract: Urban wetlands provide many ecosystems services within all four major services categories, i.e., provisioning, regulating, supporting and cultural. Probably the most important services in urban environments are those which can be classified as cultural, i.e., recreational, educational, and aesthetical. However, provisional services such as food production, regulating services such as flood protection, climate change mitigation or water purification or supporting services such as biodiversity enhancement may be important. Most of the mentioned services are usually derived from constructed wetlands but the cultural services are commonly derived for existing natural wetlands.

Gil Souza
Offset or reduce: how should firms implement carbon footprint reduction initiatives
University of Tennessee, USA

Biography: Gil Souza is the Haslam Chair in Business and Distinguished Professor of Business Analytics at the Haslam College of Business at the University of Tennessee. He also holds a part-time professorship appointment at the University of Graz, Austria. Prior to coming to Haslam in 2022, Gil held appointments at the Kelley School of Business at Indiana University from 2009 to 2022, and at the Smith School of Business at the University of Maryland from 2000 to 2009. He received a Ph.D. from the University of North Carolina in 2000, an MBA from Clemson University in 1995, and a BS in aeronautical engineering from ITA (Brazil) in 1990. He worked at Volkswagen of Brazil in new product development and product planning. His research focuses on sustainable operations, in particular carbon footprint reduction, the circular economy, closed-loop supply chain management, and renewable energy. He has over 40 publications in premier refereed academic journals, is a Senior Editor for Production & Operations Management (POM), and a Departmental Editor for Decision Sciences. He wrote the book “Sustainable Operations and Closed-Loop Supply Chains, Second Edition” (Business Expert Press), and co-edited the book “Closed Loop Supply Chains: New Developments to Improve the Sustainability of Business Practices” (CRC Press). Gil won the Wickham Skinner Early–Career Research Accomplishments award from the POM Society in 2004. He is the former president of the Sustainable Operations Special Interest Group of the Manufacturing & Service

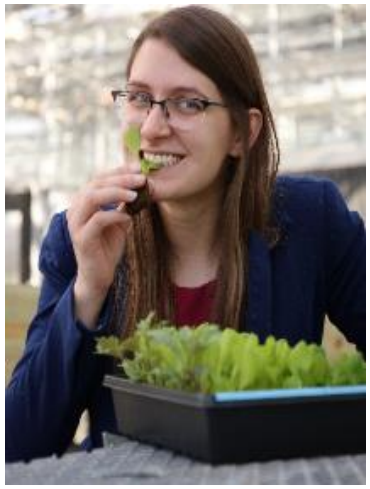
Operations Management Society of INFORMS and served as the president of the College of Sustainable Operations of POMS. In his spare time, he enjoys swimming, walking, riding his electric bike, music, and Brazilian soccer. **Email**: gsouza@utk.edu

Abstract: Carbon emissions reduction initiatives have received considerable attention at the corporate level. Companies such as Daimler, Apple and Amazon have publicly declared their goal of becoming carbon neutral, or "net zero" in the near future. They are responding to a growing demand for sustainable products and services. Companies have a variety of options for carbon emission reductions available to them, including internal reductions such as adopting renewable energy, as well as buying carbon offsets. This raises the question of whether consumers perceive the different types of carbon emission reductions as equivalent, or whether they favor the implementation of internal measures. We investigate this issue empirically through surveys and incentive-compatible discrete choice experiments. We find clear consumer preferences and willingness to pay for companies to reduce their carbon footprint when companies internally reduce their controllable emissions rather than buying carbon offsets for these emissions, and it is especially true for eco-conscious consumers. Consumers place roughly the same value, however, to internal reductions in controllable emissions, and buying offsets for the same amount of uncontrollable emissions.

Alex Guerra Noriega
Low emissions during the production of sugar, banana, avocados and bioenergy
Institute of Climate Change, Guatemala

Biography: Alex has been the General Director of the Climate Change Research Institute (ICC) in Guatemala since 2010. He holds a master's degree in Water Science, Policy and Management and a PhD in Geography and the Environment, both from the University of Oxford, UK. Alex was a lecturer at a master's program at the Del Valle University in Guatemala from 2012 to 2017. The institute directed by Alex carries out applied research and works alongside different stakeholders including sugarcane, banana, and avocado producers in Guatemala and El Salvador. His work and publications include integrated water resources management, climate change mitigation and adaptation, and environmental sustainability. **Email**: aguerra@icc.org.gt

Abstract: Global food-energy-water challenges require immediate action as they are part of the problem, but they are also strongly affected by pressing issues such as climate change. Through this presentation, information will be presented on the challenges, progress, and opportunities for key crops in Central America, namely sugarcane, bananas, and avocados. In the case of sugarcane, it is also important for electricity generation (from biomass) in Guatemala and El Salvador. It will be argued that producers of these crops face pressing issues because they are based in developing countries, with their particular physical and institutional vulnerabilities, but they are required more and more to comply with developed country standards because they are part of value chains globally. Specific examples will be provided on some of the performance indicators such as the carbon and water footprints of these crops, which are a starting point to understand what they can do and how.



Kellie Walters
Optimization opportunities in green houses and vertical farms
University of Tennessee, USA

Biography: Kellie is an Assistant Professor in the Department of Plant Sciences at the University of Tennessee. Her research team focuses on food crop physiology in controlled environments including greenhouse and indoor production systems, spanning from potted culture to hydroponics. The overall goal is to determine how to leverage environmental controls (i.e. light intensity, duration, temperature, and CO_2), plant nutrition, and plant growth regulators and hormones to improve vegetable, leafy green, and culinary herb production efficiencies, yield, and crop quality. In addition to general physiology and production research, her lab is focusing on metabolites contributing to crop flavor and nutritional value to improve taste, appearance, overall consumer appeal, and producer profitability and sustainability. **Email**: waltersk@utk.edu

Abstract: Controlled-environment agriculture gives us the opportunity to precisely control the growing environment to elicit our desired plant responses. The problem is, what should that environment be? How can we "optimize" the production environment to enhance resource-use-efficiency, yield, nutritional quality? We will discuss current research and opportunities in greenhouse and vertical farm production.

Adam Sochacki
The use of wetlands for (waste) water treatment in urban areas
Czech University of Technology, Czech Republic

Biography: Adam Sochacki has been a postdoctoral researcher at the Wetland Group (group leader: Professor Jan Vymazal) of the Czech University of Life Sciences Prague (Czech Republic) since 2016. Adam obtained his PhD degree in 2013 from the Silesian University of Technology (Poland) and Mines Saint-Étienne (France). He has been studying the ability of treatment wetlands (TWs) to remove organic contaminants from various types of wastewater (e.g., sewage, greywater and agricultural drainage) and the methods to improve the TWs' performance. Since 2024, Adam has been involved in the projects "Reactive Interfaces for Degrading Contaminants of Emerging Concern and Pathogenic Viruses in Constructed Wetlands" from NSF and Czech Science Foundation and "Management of rainwater runoff in urban areas for tackling extreme hydroclimatic events" (Water4All-2022-FP- 00121, European Water4All partnership). **Email**: sochacki@fzp.czu.cz

Abstract: Treatment wetlands (TWs) have been initially used to treat sewage in rural and peri-urban areas. Since the 2020s, TWs have been increasingly used in the urban settings because of their great treatment efficiency and considerable environmental and societal benefits. One of the primary uses of TWs in cities is to manage the stormwater runoff. The other applications are the treatment of sewage, greywater, combined sewer overflow and finally the effluents of municipal wastewater treatment plants. The environmental benefits of TWs in cities include reduction of pollution, habitat creation, and mitigation of heat islands. TWs have also important societal and aesthetic benefits like recreation and education and property value enhancement. This presentation will be supplemented with case studies from the Czech Republic (including the campus of the Czech University of Life Sciences Prague) and foreign collaborators (Australia, Denmark, Germany and other countries).

Wei Liao
System integration and optimization toward sustainable solutions for small-scale waste treatment
Michigan State University, USA

Biography: Dr. Liao, a registered professional engineer (PE), is a professor and director of the Anaerobic Digestion Research and Education Center (ADREC) in the Department of Biosystems & Agricultural Engineering (BAE) at Michigan State University (MSU). Dr. Liao's research and teaching focus on renewable energy and environmental sustainability. Dr. Liao is leading an active research program on developing integrated systems to utilize organic residues for energy and chemical production. Current research areas Dr. Liao's group is working on are: integrated farm-based biorefining, solar-bio-based solutions to convert organic wastes/wastewater into energy and clean water, and one-carbon platform of food/fuel/chemical production, etc. Dr. Liao is a member of the American Society of Agricultural and Biological Engineering (ASABE), American Institute of Chemical Engineering (AIChE), Algal Biomass Organization (ABO), Coalition for Renewable Natural Gas (RNG), and American Biogas Council (ABC). Dr. Liao currently serves as an associate editor for the Journal of Biotechnology for Biofuels and Bioproducts, and is on the editorial boards of Journal of Biomass and Bioenergy and Journal of Industrial Biotechnology. He was the chair of the Global Engagement Committee at ASABE, and organized an ASABE global engagement conference – Sustainable Energy for a Sustainable Future in Costa Rica in 2022. **Email**: liaow@msu.com

Abstract: The purpose of this study is to create a novel self-sustainable and scalable organic wastes and wastewater treatment system by integrating solar, biological, electrochemical, and membrane technologies. The system needs to not only reduce the mass of organic wastes and reclaim the wastewater but also generate renewable energy. Multiple-objective optimization was used to carry out the system integration of individual unit operations and conclude suitable systems to satisfy the needs of different operational conditions. Based on the research results, a demonstration system has been designed and tested. The new integrated technology will provide suitable waste/wastewater treatment solutions for small-scale waste management practices.

Martina Vítková
Ecological benefits of green roofs and green walls
Czech University of Technology, Czech Republic

Biography: Martina Vítková is currently an Associate Professor and a key member of the Environmental and Isotope Geochemistry Research Group of the Faculty of Environmental Sciences, Czech University of Life Sciences Prague. She received a multidisciplinary education at the Charles University in Prague, Faculty of Science, obtaining a Ph.D. in Environmental Geochemistry in 2013. Since that time, she has been focused on characterization and testing of different sorbent materials for various environmental applications. After her postdoctoral research (2013-2018), she completed her habilitation in Applied and Landscape Ecology (2019) at the Czech University of Life Sciences Prague. During her research stays abroad, she gained valuable experience and knowledge in waste material leachability testing (DTU, Denmark), contaminated sediment characterization (Université de Limoges, France), and assisted phytoremediation using soil amendments including biochar (BOKU Vienna, Austria; CEBAS-CSIC, Spain). She has been involved in research projects dealing with wastewater treatment plant residues or waste material reuse and their environmental risks and benefits. She has published 40 articles as author/co-author in highly ranked peer-reviewed journals with 1000 citations (h=19, WoS) and 4 book chapters. **Email**: vitkovam@fzp.czu.cz

Abstract: A green roof, also referred to as a roof garden is a roof that is covered with a vegetation layer. Similarly, a green wall represents a vertical garden. In any case, they are designed (i) to increase the resilience of cities to the impacts of rising temperatures in urban areas (cooling effect) and (ii) to provide sustainable measures for water retention and recycling. Depending on local conditions and building construction, the vegetation cover and substrate type and thickness may vary considerably. Special focus is placed on retention capacity and the possibility of using rain and gray water that could be filtered through the media of the structures used. Therefore, innovative additives with high water retention and low density (e.g. biochar) are at the forefront of efficient green roof solutions. Practical examples will be presented, including the rooftops and green walls in the campus of the Czech University of Life Sciences Prague, Czech Republic.

Biographies and Abstracts

Workshop 3: Renewable Energy Sustainability

Chairs: Mingzhou Jin and Virginia Sykes (UT, USA), Govindan Parayil (University of South Florida), Ron Chan (UK)

Mingzhou Jin
FEWSUS Co-Director, John D. Tickle Professor and Head of the Department of Industrial and Systems Engineering. Director of the Institute for a Secure and Sustainable Environment, University of Tennessee, Knoxville, USA

Biography: Dr. Mingzhou Jin directs the Institute for a Secure and Sustainable Environment (ISSE) and the FERSC Center (a DOT/UTC Tier-1 Center) at the University of Tennessee, Knoxville (UTK) and is a professor and Department Head at the Department of Industrial and Systems Engineering. He currently holds the John D. Tickle Professorship. His research interest includes sustainability, climate change, optimization, transportation and logistics, supply chain, additive and smart manufacturing, and energy efficiency. His research has been well sponsored with more than $19 million in grants and contracts from a board spectrum of federal, local government agencies and corporations including US National Science Foundation, US Department of Energy, US Department of Transportation, US Department of Homeland Security, three state Departments of Transportation, Tennessee Valley Authority, American Trucking Associations, America Makes, FedEx, Boeing, Lockheed Martin, Nissan, Schneider Electric, CyManII, Material Handling Industry, etc. In addition, he has received multiple research, teaching and service awards from professional organizations, Tickle College of Engineering (TCE), and the University of Tennessee, including 2020 UTK Chancellor's Research and Creative Achievement Award and 2020 TCE Research Achieve Award. He also received TCE Teaching Fellow, Outstanding Advising, and Outstanding Service awards in the past five years. He is a fellow of the Institute of Industrial and Systems Engineers (IISE). Before joining UT, he worked at Mississippi State University for 10 years, from 2002 to 2011. **Email:** jin@utk.edu

Govindan Paravil
Dean, Patel College of Global Sustainability
University of South Florida, Tampa, FL, USA

Biography: Professor Govindan Parayil (PhD, Virginia Tech; MS Rensselaer Polytechnic Institute; BS, National Institute of Technology Calicut, India) has been serving as Dean of the Patel College of Global Sustainability at the University of South Florida (USF) since 2017. He was Vice-Rector of United Nations University (UNU), Tokyo, Japan (2008-2014) and Director of UNU Institute for the Advanced Study of Sustainability (2009-2013) while on leave from the University of Oslo, Norway, where he was Professor of Science, Technology and Innovation (2004-2015). He has held faculty positions at the National University of Singapore and Hong Kong University of Science and Technology. Professor Parayil has held visiting appointments at Tokyo Institute of Technology, Virginia Tech, Illinois Institute of Technology, and Fudan University in Shanghai. He was a Rockefeller Foundation Fellow in global climate change at Cornell University (1993-1994). He served as the 2016-2017 Mark and Melody Teppola Distinguished Visiting Professor at Willamette University in Salem, Oregon. He has authored, edited and co-edited six books and published more than 40 peer-reviewed journal articles, as well as numerous book chapters. A leading expert in the field of global sustainability with particular interest in energy and climate change, Professor Parayil follows an interdisciplinary approach to sustainability – from describing problems using knowledge and analytical tools from engineering, management and social sciences to finding innovative solutions that are user-focused and market-driven. By nurturing collaborative research and education in sustainability and fostering local and global academic, business, government and civil society engagement, Professor Parayil aims to work toward transitioning to a resilient and sustainable future. **Email**: gparayil@usf.edu

WORKSHOP 3 KEYNOTES

Ron Chan
Charged up? Impacts of green energy transition on local labor markets
University of Manchester, UK

Biography: Ron Chan is a senior lecturer (equivalent to associate professor) in environmental economics at The University of Manchester and he is currently a visiting faculty fellow at the Wilton E. Scott Institute for Energy Innovation at Carnegie Mellon University in 2023-2024. Ron obtained his Ph.D. from the University of Maryland in 2014 and joined The University of Manchester in the same year. His research studies the economic impact of air pollution, energy transition and climate change. More recently, his work focuses on a number of policy issues, including impact of energy transition on labor market outcomes, policy effectiveness in decarbonizing the electricity grid, and the impact of agricultural exports on water quality. **Email:** ron.chan@manchester.ac.uk

Abstract: This paper studies the overall and distributional effects of utility-scale renewable energy expansion on local labor markets in the United States from 2005 to 2019. Utilizing exogenous solar and wind potentials derived from remote sensing data, we identify the causal impact of the expansion in solar and wind energy. We find that the growth in solar and wind capacity has led to a modest and significant increase in employment and labor force participation, with solar energy also contributing to wage growth. Importantly, these positive effects are not short-lived. Our results indicate a growing local economy resulting from solar and wind growth, reflected in (i) a notable increase in jobs and business establishments in the manufacturing sector, in addition to sectors directly linked to renewable projects such as construction, (ii) a rise in population, and (iii) a reduction in various public transfer benefit payments. The most substantial gains, both in terms of job opportunities and wage increases, are concentrated among younger, lower-educated, non-Hispanic white workers.

Manuel Ron
Circular farm economy for bioenergy and carbon neutrality
President Bio4-Bioethanol Fio Cuarto S.A., Argentina

Biography: Agronomic engineer, MBA, farmer with agriculture and cattle operations, cofounder of bio4 first corn to ethanol plant of Argentina,, cofounder of bioelectrica a biogas company, co-founder of Rio Beef a beef export company, cofounder of Carbon Neutral + a platform for Carbon neutrality.

Abstract: Farming is blamed to produce almost 30% of the global emissions. Cattle and agriculture are the top activities in terms of CO_2 production. The need of reducing emissions has arrive to Argentina too and farmers are trying to capture Carbon in their operations. Reducing the input amounts and increasing the yield per acre is part of the solution. The other part is bioenergy, using crops or residues to produce energy. Our company bio4 has an integration of corn ethanol-feedlot-biogas-carbon neutrality. We are a group of 26 farmers that gather in 2006 to copy the ethanol industry in the US. We started operations in 2012, being the first corn to ethanol plant in Argentina. In 2014 we open our feed lot to transform WDGS in animal protein. In 2015 we sat up the first biogas plant using thin stillage from the ethanol process and manure from our nearby feedlot. In 2018 we found a startup, a platform, to

measure the carbon footprint of companies and trade Carbon certificates of all kinds. Carbon capture in the soils, circular economy and decarbonization is our goal. Contributing to a more sustainable world.

Zhi Zhou
Electricity wholesale market design in the zero-carbon future: a review of challenges and solutions
Argonne National Laboratory, USA

Biography: Dr. Zhi Zhou is a Principal Computational Scientist in the Center for Energy, Environmental, and Economic System Analysis at Argonne National Laboratory. His research interests include optimization, machine learning based forecasting, decision making under uncertainty, and applications on power grid, electricity markets, renewable energy, and the interdependency between power grids and other infrastructure systems. Zhi Zhou received his M.S. in Operations Research and Statistics, and Ph.D. in Decision Sciences and Engineering Systems from Rensselaer Polytechnic Institute. **Email**: zzhou@anl.gov

Abstract: This study examines the need for electricity market redesign in future systems dominated by zero-carbon generation. We start by outlining the basics of electricity market design and review the current operational practices in U.S. markets. We highlight challenges that arise in a zero-carbon grid, where the cost profiles of renewable resources significantly differ from traditional thermal generation. We then explore proposed solutions for maintaining market efficiency in such systems, including relevant policies and incentives to support the transition. Additionally, we discuss the ongoing revisions across the seven U.S. regional markets, their objectives, and the challenges they may encounter. Focusing on hydropower as an example of flexible resources, we assess its role and the unique challenges it faces in a market increasingly dominated by zero-cost marginal resources. We conclude with key insights and research questions critical for understanding and enhancing market design and efficiency in zero-carbon power systems.

Edward Yu
Developing sustainable aviation fuel system from winter oilseeds
University of Tennessee, USA

Biography: Dr. Edward Yu is a professor of agricultural and resource economics at the University of Tennessee. He has led and co-investigated various projects totaling more than $15.6 million to evaluate **the economics of developing a bioenergy supply system from different feedstocks and the nexus of bioenergy, agriculture, and the environmental outcomes on carbon emissions and water quality**. His research has been funded by various federal agencies, such as the Federal Aviation Administration (FAA), the U.S. Department of Agriculture (USDA), and the U.S. Department of Transportation. He now serves as PI for several projects on sustainable aviation fuels funded by the FAA and a food waste and loss reduction project funded by USDA. His research has been disseminated in prestigious journals and national/international meetings and featured in public press, such as the Wall Street Journal and the New York Times, among others. He has received several research awards from domestic and international professional associations and programs. **Email**: tyu1@utk.edu

Abstract: Sustainable aviation fuel (SAF) has been identified as a promising method for mitigating aviation CO2 emissions in the near- and medium-term. SAF can be derived from various renewable feedstocks and meets technical and certification standards for commercial aircraft use. Various feedstocks can be utilized to produce SAF via different pathways. The hydro-processed ester and fatty acid (HEFA) technology that utilizes lipids as feedstock, such as vegetable oil, animal fats, and cooking oil, is a fully operational and mature method expected to retain its primary position for the next decade or longer. Integrating winter oilseeds as a SAF feedstock within the corn-soybean cropping system has been proposed to address concerns about the food vs. fuel debate and minimize land use change. Using winter canola in Tennessee as a case study, our study illustrates the potential of developing a SAF ecosystem from winter oilseeds to mitigate the aviation sector's CO_2 emissions.

Toni Wang
Can we use domestic vegetable oil to replace carnauba or petrowaxes
University of Tennessee, USA

Biography: Tong (Toni) Wang has been an applied chemist since her training in pharmacy school and a few Ag colleges' food chemistry programs, and through applying fundamental knowledge during her 25- year faculty research and teaching to improve food quality and create applications of biobased materials in food, feed and energy. Some examples of her research are developing scalable processes for phospholipid recovery from dairy processing waste streams, creating and evaluating anti-freezing peptides, and modifying domestic vegetable oil to create alternatives of natural waxes. Her research has been supported by $12 million funds that led to more than 200 peer-reviewed publications by about 70 graduate students and visiting scientists. Her work has been recognized by many awards, such as the American Oil Chemists' Society (AOCS) Alton E. Bailey Award for outstanding research and exceptional service. **Email**: twang46@utk.edu

Abstract: There is an interest from industry to replace conventional petroleum-based waxes or expansive imported carnauba wax with domestic oleo feedstock. We investigate how chemical modification of common fatty acids impact physical and functional properties of biowaxes. Such fundamental understanding will lead to tunable properties for coating of food and biomaterials with desirable barrier performance.

Virginia Sykes
Winter oilseed crops exhibit potential as a source for sustainable aviation fuel in the Southern US
University of Tennessee, USA

Biography: Dr. Virginia Sykes is an Associate Professor at the University of Tennessee with Extension and research responsibility in the areas of agroecology and variety testing. Dr. Sykes earned her Ph.D. in Plant Breeding and M.S. degrees in Statistics from the University of Tennessee and M.S. in Plant Pathology and B.S. in Business from Virginia Tech. She coordinates the Tennessee corn and soybean variety trials and leads the Southern cover crop variety trials, which covers a 10-state region. Her agroecology work focuses on optimizing economic and environmental benefits of conservation agriculture practices such as cover crops, dual-use cover/forage and cover/bioenergy crops, crop rotations, and inter-cropping. **Email**: vsykes@utk.edu

Abstract: The global aviation industry has proposed a goal of net zero carbon emissions by 2050. Sustainable aviation fuel (SAF) from winter oilseed crops is a promising avenue to help achieve this goal. Winter oilseeds are grown off-season from the majority of food crops in the US, resulting in greater land use efficiency and preventing competition between food and fuel crop production. Few potential oilseed species have been examined fully for utility in SAF production and, those that have, have primarily been evaluated in Midwestern productions systems. With longer growing seasons and proximity to major transportation hubs, the MidSouth and Southeastern US are likely regions of untapped potential for winter oilseed production. This presentation will summarize results from several research projects performed over the last six years examining yield and quality of potential winter oilseed species (camelina, carinata, canola, pennycress, crambe, safflower, flax, mustard, radish, turnip) examined under varying production practices across multiple locations in Tennessee.

Gonzalo Irrazabal
How green fertilizer will boost energy transition
Catholic University, Uruguay

Biography: Gonzalo currently co-leads the Corporate & Energy Department of Irrazabal & Asociados. He has more than 8 years of experience advising in corporate matters, especially regarding social restructuring, financing and mergers and acquisitions of companies. In energy he has vast experience giving advice on: pricing, tariff determination, micro-generation and self-consumption projects, determination of national components of the investment, public bids, among others. From 2020 to 2023 he advised the Minister of Industry, Energy and Mining as an external consultant hired by Inter-American Development Bank in a whole range of subjects related to the energy sector. In this role, he was President of the Expert Commission that analyzed the Oil & Gas sector in Uruguay and proposed amendments to laws, decrees of the Executive Power and regulation in general. Additionally, he leads the Uruguay H2 Program. Focused on designing and implementing a roadmap for green hydrogen in Uruguay, providing guidance to investors and carrying out a pilot project with public support. He acted as leader of an ad-hoc team appointed by Ministers working on a strategy to a massive roll-out of electric vehicles in Uruguay, particularly, electric buses for public transport. In such capacity, Gonzalo was co-author of several regulations related to the electricity sector. Finally, he acted as coordinator of strategic plans and contingency actions between the Ministry and the state-owned energy companies. During the last quarter of 2018, he worked for the Energy Charter Treaty as part of the Knowledge Centre, collaborating in carrying out different investigations regarding the energy sector in Europe, Latin America and Asia. Before joining the Firm,

Gonzalo worked at the Banking & Energy Department of Guyer & Regules, advising financial institutions and companies in regulations, mergers & acquisitions and corporate matters in general. During his time at Guyer & Regules, he was part of the team of advisors involved in the majority of wind and solar projects in the country. Gonzalo also teaches graduate and postgraduate courses at the Universidad Católica and the Universidad de Montevideo, and is the Director of the Sustainable Development Program at the Business School of the Catholic University of Uruguay. Member of the Sustainable Development Centre Part of the technical committee in charge of carrying out energy research and studies. National Future Energy Leader appointed by WEC Uruguay´s board as part of the first group of National Future Energy Leaders. Gonzalo is the author of several papers of his expertise and collaborator in the book "Derecho de la Energía" (Energy Law) of the Universidad de Montevideo (2014). He obtained his law degree at the Universidad de Montevideo and is also a Magister in Energy and Natural Resources at the Queen Mary University of London, United Kingdom. Languages: Spanish, English (advanced), Portuguese (basic). **Email**: gonzalo.irrazabal@ucu.edu.uy

Abstract: The global need to decarbonize economies by 2050 to meet the commitments of the Paris Agreement is becoming increasingly urgent, and efforts to achieve the set goals are still insufficient. Uruguay is globally recognized for a successful first energy transition (renewable percentage in the electricity generation matrix) and is now taking steps to make the second energy transition equally successful (renewable percentage in the energy matrix). The direct substitution of fossil fuels with electric power will be one of the main challenges in this regard, including electromobility and heat pumps, among others. However, not all fossil fuel consumption can be electrified due to the nature of consumption or their use as raw materials rather than as an energy source. These sectors are usually referred to as "hard-to-mitigate" including heavy industry, petrochemicals, and heavy long-distance transportation. As mentioned, Uruguay does not currently produce ammonia, but the imported urea has a significant carbon footprint. Producing green urea would contribute to the decarbonization of the national agro-industrial sector and one of the globally challenging-to-mitigate sectors, such as ammonia production. While the preliminary analysis suggests that the price at which green urea would be obtained in Uruguay could be higher than the current average import price of conventional urea, there are several reasons to view this potential industry with optimism, warranting further study of this potential market.

Gil Souza
Renewable energy servicing for residential homes in developing countries
University of Tennessee, USA

For biography, see Workshop 2

Abstract: Energy access remains a critical challenge in developing countries, where unavailability and unreliability are power supply characteristics. This paper explores the potential of servicing renewable energy for residential consumers in these regions. By shifting ownership and maintenance responsibilities to service providers, households can access clean and reliable solar energy without the upfront costs. We address the economic viability of this model by developing a mathematical model, considering investment costs, supply-demand variability, and consumer adoption. Our results indicate the profitability of the servicing model, particularly in areas heavily reliant on gasoline generators. With this approach, we determine the optimal charge per unit consumption of energy, the optimal solar generation capacity, and the optimal battery capacity offering valuable insights for firms aiming to provide sustainable energy solutions in developing nations. We also develop a stochastic simulation that utilizes actual solar irradiation and demand data from households in Nigeria. This simulation validates the reliability and robustness of our findings.

Gabriel Guigou
Energetic sustainability in Antarctica through the implementation of renewable energies aiming at net-zero generation
Technological University of Uruguay, Uruguay

Biography: Gabriel Guigou, an expert in renewable energy, has an academic background that spans multiple universities. Originally from Uruguay, he completed his undergraduate studies in Energy Engineering at the University of the Highlands and Islands in Scotland. Driven by a passion for contributing to sustainable energy solutions, Gabriel furthered his studies with a Master's in Energy at the University of the Republic in Uruguay. With a solid academic foundation, Gabriel has distinguished himself as a specialist in renewable energies, contributing knowledge and experience to the field. He has conducted research and work related to Antarctica, showcasing his dedication to addressing unique challenges in the field. His educational background, combined with practical experience, positions Gabriel as a driving force in the quest for innovative and sustainable energy solutions. His commitment to advancing renewable energy technologies is evident in his academic achievements and his dedication to shaping a sustainable future. Currently, Gabriel works at the Technological University of Uruguay and the Uruguayan Meteorological Institute. **Email**: gabriel.guigou.1@utec.edu.uy

Abstract: In continental Uruguay, we have made significant strides in the introduction of renewable energies. In Antarctica, energy usage becomes more intensive and equally indispensable. Thus, we face the challenge of developing renewable energy systems to ensure sustainability, considering extreme climatic conditions and logistical limitations. The goal is to identify and evaluate renewable energy sources for application below the 60o parallel, determine the technological maturity of each resource, and analyze restrictions, advantages, and disadvantages. An additional objective is to design a configuration that allows energy autonomy for the Antarctic Scientific Base Artigas, contributing to the net-zero transition goal. The assessment of resources was based on local conditions and specific atmospheric phenomena in the region. Available resources and technologies are presented, emphasizing solar photovoltaic and wind energy, along with others such as geothermal and marine energy. Results indicate that certain technologies are suitable for the Uruguayan base. Furthermore, the possibility of massively integrating renewable energies and their economic, environmental, and logistical impact is evaluated. The results of the implementation of new systems are presented, changing the paradigm of energy generation.

Biographies and Abstracts

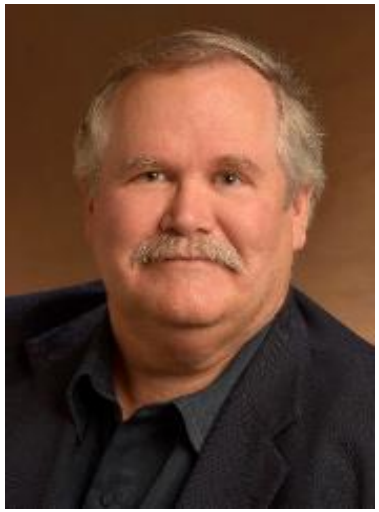
Workshop 4: One-Health Ecosystem

Chairs: Drs. Deborah Miller and Charles Sims (UT, USA), Ted Henry (Heriot-Watt, University, UK), Michael Seeger (Chile)

Deb Miller, Ph.D., Professor and Director of the Center for Wildlife Health
University of Tennessee Institute of Agriculture, University of Tennessee, USA

Biography: Dr. Debra Miller is Professor and Director of the Center for Wildlife Health in the University of Tennessee Institute of Agriculture. She has a split appointment between the College of Veterinary Medicine and the Department of Forestry, Wildlife and Fisheries. She received her BS in wildlife from the University of Wisconsin-Stevens Point, her MS (wildlife), DVM and PhD (wildlife and veterinary science) from Mississippi State University, and completed a postdoc in comparative pathology at the University of Miami School of Medicine. She spent 10 years at the University of Georgia before making the University of Tennessee her home. Dr. Miller is interested in all aspects of wildlife (including fisheries) health. Her expertise is in pathology, particularly pathology of herpetofauna (especially amphibians). Her primary research areas are amphibian diseases (particularly those caused by ranaviruses and chytrid fungi), sea turtle (especially leatherbacks) hatchling health and the impact of environmental stressors, and the impact of contaminants on marine mammals. Her research approach is multidisciplinary, with institutional, national, and international collaborations. Her primary research partner in amphibian disease studies is her husband, Dr. Matthew Gray. Together they conduct experimental challenges combined with field surveillance to identify factors contributing to ranavirus-related mortality events and to identify mitigation strategies to thwart the expansion of Batrachochytrium salamandrivorans (Bsal). Recently, they launched the Global Ranavirus Reporting System (mantle.io/grrs), which will provide scientists a portal for uploading information regarding ranavirus-associated mortality events. Currently, they are actively engaged in an NSF-funded study to investigate transmission pathways and immunological factors driving the invasion potential of Bsal. In collaboration with Dr. Jeanette Wyneken (Florida Atlantic University), Dr. Miller investigates issues related to sea turtle hatchling health, such as mercury and selenium. In collaboration with Dr. Todd O'Hara (University of Alaska Fairbanks) she investigates pathological changes in marine mammals (e.g., dolphin skin) associated with contaminants. To date, she has published over 100 peer-reviewed articles, 6 book chapters, served as the editor for 1 book, and delivered over 150 professional presentations. Dr. Miller teaches in the wildlife health program and her teaching philosophy is similar to her research philosophy: It takes a team of experts to investigate issues in One Health. Thus, she provides students opportunities to work as members of teams of experts. This is accomplished at multiple levels, in the classroom for team projects and in the field on research studies. Dr. Miller is also dedicated to service. She is currently the president of the Wildlife Disease Association and co-chairs or is a member of various regional, national and international committees and task teams focused on herpetofaunal diseases. **Email:** dmille42@utk.edu

WORKSHOP 4 KEYNOTES



Terry Hazen

Environmental systems biology: the whole is greater than the sum of its parts – team science

University of Tennessee and Oak Ridge National Laboratory, USA

Biography: Dr. Hazen received his B. S. and M. S. degrees in Interdepartmental Biology from Michigan State University. His Ph.D. is from Wake Forest University in Microbial Ecology. Dr. Hazen was Professor, Chairman of Biology and Director of Graduate Studies at the University of Puerto Rico. He was the Head of the Ecology Department and Center for Environmental Biotechnology, Co-Director of the Virtual Institute for Microbial Stress and Survival, and DOE BER Distinguished Scientist at Lawrence Berkeley National Laboratory. He is currently the UT/ORNL Governor's Chair Professor at the University of Tennessee in the Departments of Civil & Environmental Engineering, Microbiology, and Earth & Planetary Sciences and Biosciences Division at Oak Ridge National Laboratory. He was also director of the Methane Center in the Institute for a Secure and Sustainable Environments. He is a fellow of the American Academy of Microbiology and the American Association for the Advancement of Science and has authored more than 412 scientific publications (H-index=84), not including more than 2000 abstracts and chapters in several books. He has 5 patents on bioremediation (2 of which use methane) that have been licensed by more than 50 companies and are being used world-wide. He also has received 2 R&D 100 awards and the Federal Technology Transfer Medal. His research group has received extreme recognition for their work on the Deepwater Horizon Oil Spill and deep subsurface microbial ecology and his work at the Y-12 legacy site. In 2021 the American Society for Microbiology awarded him the Environmental Microbiology Career Award at the World Microbe Forum. His research is focused on Environmental Systems Engineering as it relates to bioenergy, bioremediation, climate change, and environmental biotechnology. **Email**: tchazen@utk.edu

Abstract: The whole is greater than the sum of its parts. By using an environmental systems biology approach to our greatest environmental problems and cross-linkage of systems at all levels providing multiple lines of evidence involving environmental observations, laboratory testing, microcosm simulations, hypothesis refinement, field testing and validation, and multiple iterations of this circle, we will be able to make new theories and paradigms for changing pristine and contaminated environments. Pollution is everywhere. Changing environments are everywhere. Microbes are also everywhere, and many have the ability to degrade environmental contaminants and dramatically alter biogeochemistry related to climate change. Understanding how these microbial communities work to degrade environmental contaminants and alter biogeochemistry will enable us to use these microbes to clean up the pollution and alter long-term and short-term changes to the environment. Understanding, monitoring, and controlling the environment with biogeochemical processes, i.e., an environmental systems biology approach. By using an environmental systems approach, we make sure we know of any "fatal flaws" in the approach, get a much better handle on life-cycle cost analysis, and can grade an engineered solution into a natural solution. Examples of this approach and their outcomes will be given for nuclear reactor thermal effluent effects; fish and alligator epizootiology related to nitrate, pulp mill, cortical steroids, and animal immune response; Legionella in cooling towers and thermal effluents; fecal coliforms in the tropics; Vibrio in coral reefs and tropical rainforests; chlorinated solvents in groundwater; oil in marine environments; deep subsurface environments that may suggest ways to determine life on other planets; oil spill natural recovery; nuclear legacy site natural attenuation and predictions of nuclear activity; landfill control; metal contamination of soil and groundwater; and phosphorus dynamics in tropical soils.

Ted Henry
Developing sustainable cooling and cold chains in emerging economies-meeting the technical and educational needs
Heriot-Watt University, UK and Malaysia

Biography: Theodore (Ted) B. Henry is a Professor of Environmental Toxicology in the Institute of Life and Earth Sciences in the School of Energy, Geoscience, Infrastructure and Society at Heriot-Watt University Edinburgh. He is currently serving on secondment as the Deputy Provost of the Heriot-Watt University Malaysia campus. He is also Adjunct Professor in the School of Natural Resources at the University of Tennessee Knoxville. Ted has published extensively on the effects of toxicants in surface waters and currently is engaged in 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 the Centre for Master's Training and aligned scholarships to enhance in-country ability to address the UN-SDGs. While much of his work is conducted internationally, he is based in Campinas, Brazil, where he and his wife live. **Email**: T.Henry@hw.ac.uk

Abstract: Developed economies and societies depend on our ability to keep things cool. In a world that continues to become more globally connected, the provision of reliable cold chains will be essential to connect producers with consumers, ensure safe and healthy food supplies for all, and enable medical treatments to secure the health of the global population. Keeping things cool is not without cost, removing heat from one thing means releasing heat into something else – an energy requiring process that can itself further feed the trajectory of global temperature increases and climate change. The challenges are massive but so are the opportunities, and sustainability within the context of net-zero economies will be essential. Reliable cold chains reduce waste and enhance efficiency of production, reduce the spread of infectious diseases, human suffering, and livestock animal welfare. In many emerging economies, cold chains do not yet exist or are unreliable and these challenges must be addressed both by technological innovations and by education to provide the appropriate skill sets within communities. This presentation will introduce the Africa Centre of Excellence for Sustainable Cooling and Cold Chains (ACES) and Centre for Master's Training and describe our approach first from the ACES campus in Rwanda and then expansion to other emerging economies. Developing partnerships is a key element of this initiative and for work towards achieving the United Nations Sustainable Development Goals (UN-SDGs).

Michael Seeger

Genomics and metagenomics are useful for the design of novel bioremediation process for urban site clean-up

Technical University Federico Santa Maria, Chile

Biography: Michael Seeger Pfeiffer is Full Professor in Biotechnology, Biochemistry and Microbiology at Chemistry Department, Technical University Federico Santa Maria in Valparaiso, Chile. He is Director of the Center of Biotechnology CBDAL and director of Laboratory of Molecular Microbiology and Environmental Biotechnology. He is Biochemist and PhD in Biology of Universidad de Chile, with a PhD thesis at German Center of Biotechnology GBF, Brauschweig, Germany. He is author of 119 WoS paper, 2 books and 36 scientific publications on microbial ISMEIS metabolism and genomics, biodegradation & bioremediation (pollutants, aromatic compounds, heavy metals), synthesis of biotechnological products (e.g., bioplastics, bioactive compounds), interactions of microorganisms and plants, and environmental microbiology (H index 43, >6260 citations). He is the inventor of 6 international patent families. He has guided 18 postdocs, 39 PhD, 46 Master/undergraduate students. He is Director of the Biotechnology PhD program UTFSM-PUCV, Coordinator of the Latin American Network of Biotechnology PhD programs RIABIN, and member of Milano-Bicocca Environmental Sciences PhD program (Italy). He received the “Scopus-Conicyt" 2013 award for the highest impact research in Biology & Biotechnology in Chile, American Academy of Microbiology fellowship (2009), German Max Planck Society fellowship (2010 -2011) and was awarded with the Honorary Membership of the Chemical Society of Cuba (2018). He is vice president (2023-2025) of the Chilean Society of Biology. He was president of Latin American Association of Microbiology (2004-2006) and Chilean Society of Microbiology (2004-2008), member of National Biotechnology Committee (2001-2006), and SOMICH Membership Committee (2012-2019), and co-Chair of First Latin-American ISME 2019 meeting (Valparaiso, Chile). **Email**: michael.seeger@usm.cl

Abstract: The clean-up of polluted industrial urban sites is crucial for sustainable development. Biological, physicochemical, and thermal technologies have been applied for the remediation of polluted sites. Bioremediation, which is driven by microorganisms, is a bio-based and efficient technology capable of restoring ecosystems and mitigating climate change. However, in many countries the application of bioremediation in urban sites is scarce. The aim of this study was to design a set of tailor-made bioremediation strategies based on native bacteria for the clean-up of a chronically hydrocarbon-polluted coastal urban soils, including i) bioaugmentation through the application of native bacteria, and ii) biostimulation with nutrients and antioxidants. Due to their hydrocarbon degradation capabilities specific native bacteria (e.g., Stutzerimonas, Acinetobacter, Rhodococcus, Alcaligenes) were characterized. Genome-guided metabolic reconstruction revealed their potential for biodegradation and adaptation to harish environmental conditions. The biodegradation of aliphatic and aromatic hydrocarbons was quantified. Bioaugmentation and biostimulation processes of chronically polluted coastal urban soils removed 80% of hydrocarbons. The dynamics of the microbial communities and inoculated microorganisms during the bioremediation were analyzed by NG sequencing and qPCR, revealing an increase in the abundance of specific genera and the persistence of inoculated bacteria. Novel bioremediation processes for the clean-up of an urban site in the Valparaiso Region were established and approved by the Chilean Environmental Ministry. The genomic and metagenomic analyses and multidisciplinary studies are helpful to design urban bioremediation processes towards a sustainable development.

Michael McKinney
Plastic pollution: challenges and strategies
University of Tennessee, USA

Biography: Michael McKinney is a professor and former department head in the Department of Earth and Planetary Sciences at the University of Tennessee, Knoxville (UTK). He is Director of the Environmental Studies Program and is the Sustainability Fellow for the new College of Emerging and Collaborative Studies. He serves as the Editor-in-Chief for the journals Urban Ecosystems and Urban Naturalist. He has published over 100 peer reviewed scientific articles and several books, including Environmental Science (7th edition). **Email**: mmckinne@utk.edu

Abstract: Since plastics were invented over 100 years ago, their use has accelerated in all aspects of modern life across the globe. Currently, almost 400 million tons of plastic are produced each year. Less than 10% of this is recycled, around 50% ends up in landfills and much of the remainder is deposited in soil, freshwater and ocean sinks where plastic is stored for 100's-1000's of years. This so-called "Plasticine Epoch" has emerged as a focus of much research as concerns grow over the ecological and human health impacts of nanoplastics, microplastics and macroplastics that now circulate in massive amounts throughout all natural global cycles (hydrosphere, atmosphere, lithosphere and biosphere). Many studies now document significant potential impacts on food production and quality, drinking water, contaminant transport, ecological food webs and human longevity, to name just a few concerns. In addition, most plastics are produced from nonrenewable and highly polluting carbon sources (fossil fuels) that also contribute greatly to greenhouse gas production. Strategies to mitigate this emerging problem are highly relevant to the bio-circular economy. The most immediate (and effective) strategy, and one gaining in popularity, are "plastic-free" campaigns to reduce their use and stem the flow of plastic into the environment. However, the overwhelming global reliance on plastics in many aspects of human life (e.g., clothing, packaging, construction, agriculture) will make elimination a slow and difficult process. Thus, a more viable strategy for the near future may be the rapid substitution of non-plastic and biodegradable plastic materials that not only have fewer impacts of production and recycling and also biodegrade more rapidly than traditional plastics.

Charles Sims
Prioritizing public and conversations investments to support human health at the rural-urban fringe
University of Tennessee, USA

Biography: Sims's research interests center on environmental and natural resource economics with a specific emphasis on the role of risk and uncertainty in natural resource, environmental, and energy policy. His past research has investigated issues related to invasive and endangered species, forest management, infectious diseases, renewable energy, and climate adaptation. Sims's work has been published in environmental and natural resource economics journals, agricultural economics journals, general interest economics journals, applied ecology journals, and general interest science journals. With an eye toward adding physical and natural science realism to his economic models, Sims often collaborates with ecologists, mathematicians, engineers, foresters, biologists, hydrologists, and computer scientists. **Email**: cbsims@utk.edu

Abstract: The United States Department of Agriculture (USDA) has a multi-faceted rural development and land management mission that supports human health in rural communities directly by promoting access to healthcare services and indirectly by preventing damage to natural resources. We develop a theoretical model to better understand how USDA investments in rural communities support human health and relate to private self-protections. We highlight the importance of understanding how rural households and communities respond to human health risks in the case of groundwater pollution. Conservation investments upstream of households may mitigate exposure to bacteria and chemicals that might otherwise contaminate private well systems whereas improved access to healthcare services may improve a household's ability to treat resulting illness. We display that the permanence of households' risk responses – i.e., short-run private avoidance versus long-run private adaptation - to environmental exposures matters when prioritizing investments in rural conservation and healthcare services. Yet, risk of environmental exposures, responses to those risks and access to healthcare services are often undocumented in rural areas and vary across households. We display this heterogeneity in four rural North Carolina counties that are home to an intensive animal agriculture industry using spatial proximity to concentrated animal feeding operations (CAFOs), private well construction records and time of travel to hospitals when giving birth. Our findings highlight that rural development and conservation investments should be coordinated internally across USDA agencies and responsive to the time horizon of community-specific risk management strategies already adopted. Further investigation and documentation of elusive risk management strategies, already adopted in rural candidate areas for public infrastructure and conservation awards, is essential to assessing the marginal benefit of and prioritizing potential USDA projects.

Jun Lin
Develop antibody-based immunoassays for microplastic and nanoplastic analysis
University of Tennessee, USA

Biography: Dr. Jun Lin is a Professor in the Department of Animal Science at The University of Tennessee, Knoxville, in the US. Dr. Lin received both B.S. (1991) and M.S. (1994) in Microbiology & Immunology at Fudan University in China and his PhD (1998) in Animal Science from The Ohio State University in the US. He received major postdoctoral training (2000-2003) in molecular microbiology in the Food Animal Health Research Program at The Ohio State University. He joined faculty at The University of Tennessee in 2004. Dr. Lin's molecular microbiology & immunology training together with his expertise in infectious disease allow him to address a broad range of important microbial organisms significant in animal health, food safety, and public health. Specifically, Dr. Lin's research is primarily focused on molecular mechanisms of pathogenesis and antimicrobial resistance in zoonotic bacterial pathogens. Dr. Lin also has long-term experience studying the complex interactions between gut microbiota and the host. His functional microbiome research has led to the discovery of novel target and translational innovations for enhanced animal health and human health. His laboratory has a strong "One Health" emphasis on the interface of livestock, wildlife, environment, and human health. Dr. Lin is highly active in professional societies and has served in leadership roles in various organizations. Recently, Dr. Lin was selected as inaugural Fellow of the society CRWAD that has featured cutting-edge research on animal health and diseases, population health, and translational medicine for over 100 years. **Email:** jlin6@tennessee.edu

Abstract: Micro- and nanoplastics (MNPs) are emerging pollutants that have drawn worldwide attention due to their potential negative impacts on the health and sustainability of our ecosystem. Growing evidence suggests that the prevalent MNPs pose significant risks to human health. At present, analysis of MNPs is a time- consuming process and still relies on expensive and technically demanding equipment. Despite using state-of-

the-art instrumentation, generation of reliable data for both qualitative and quantitative analysis of MNPs is still challenging. Therefore, lack of a cost-effective, user-friendly, sensitive, and reliable analysis tool is a significant bottleneck issue that has impeded our understanding of exposure and health effects of MNPs, particularly for those at nano scale (< 100 nm) that are recognized as the major type of health threatening MNPs. Antibody-based immunoassays have been widely used for rapid analysis of diverse targets with a wide range of sizes. The advantages of antibody-based immunoassays include, but are not limited to, high specificity and sensitivity, easiness of standardization for both qualitative and quantitative analysis, and cost-effectiveness. Generation of specific antibodies is crucial for developing antibody-based immunoassays. Using a unique polystyrene (PS) conjugate for rabbit immunization, we have developed novel PS-specific polyclonal antibodies that specifically reacted with pristine PS and further demonstrated the reliability of antibody-based immunoassays for PS analysis in diverse matrices. Recently, we also successfully generated mouse monoclonal antibodies directed against PS. With aid of the PS-specific antibodies, we are developing different immunoassays that would greatly leverage our capabilities to perform quantitative and spatial analyses of MNP for both biomedical and environmental research, such as ELISA, immunohistochemistry, and ultra-sensitive biosensor. Together, development of antibody-based immunoassays for MNP analysis is highly significant and has tangible practical applications for global MNP risk assessment and management.

Johana Husserl

Untreated wastewater, farming, and human health: The Bogotá River

University of Los Andes, Colombia

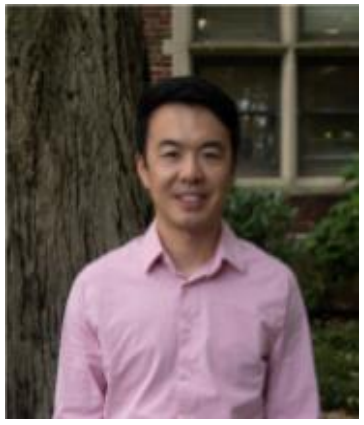
Biography: Johana Husserl is an Associate Professor based at the Universidad de los Andes in Bogotá, Colombia. Her academic background includes a bachelor's and master's degree in environmental engineering from Tulane University, along with a Ph.D. from the Georgia Institute of Technology. Specializing in environmental chemistry and microbiology, Johana leads a research lab dedicated to assessing pollution in water and soil environments. Her work involves quantifying health risks linked to these contaminants. Additionally, she is actively engaged in developing technologies that leverage environmental microbiology, chemistry, and biotechnology tools to control pollution in both water and soil. **Email**: jhusserl@uniandes.edu.co

Abstract: The Bogotá River flows through the central region of Colombia, where its mid-basin collects both partially treated and untreated domestic and industrial wastewater from approximately 10 million people. Downstream from Bogotá, the water serves agricultural purposes in the La Ramada irrigation district, and further downstream, it is utilized for energy production at several hydroelectric plants, catering to over 2 million people. However, the river faces challenges due to the substantial influx of untreated wastewater before reaching the Ramada Irrigation District. This results in water quality issues for irrigation, with chemical oxygen demand often exceeding 1000 mg O2/L and dissolved oxygen levels consistently below the threshold necessary to support fish life, averaging less than 2 mgO2/L. Beyond high organic matter and low oxygen, the river exhibits frequent bacterial contamination, with E. coli concentrations reaching up to 10 6 MPN/100 mL, and many strains showing resistance to antibiotics. Given that this water is used for irrigating raw-consumed vegetables, we conducted studies to assess the concentration of Salmonella sp. and Salmonella sp. resistant to common antibiotics in both irrigation water and lettuce irrigated with this water. The findings indicated a potential daily risk of illness with Salmonella sp. from consuming lettuce irrigated with this water of up to 50%. In a separate study, we measured the concentration of H. pylori in irrigation water and lettuce (washed and unwashed) and established an even higher risk of infection, which is consistent with the high prevalence of H. pylori in the area. These observations underscore the link between water quality and public health, emphasizing the critical need for wastewater treatment to safeguard human, ecosystem, and animal health.

Yang Zhao
Applications of precision livestock farming (PLF) in poultry industry
University of Tennessee, USA

Biography: Dr. Yang Zhao is an associate professor of Animal Science at The University of Tennessee. With a focus on precision livestock farming, his research addresses various challenges in poultry industry, including behavior monitoring, welfare assessment, and environment management. Zhao has secured multi-million-dollar research funding from USDA-NIFA, USDA-ARS, FFAR, US Poultry and Egg Association, and industry partners. He has an extensive publication record with over a hundred scientific articles. Zhao has served as the chair and member of several professional committees of the American Society of Agricultural and Biological Engineers (ASABE) and is an associate editor of the Transactions of the ASABE. Some of his example recognitions include ASABE Sunkist Young Designer Award, AOC Early Career Award, Gamma Sigma Delta Research Award, UT AgResearch Dean's Grantsmanship Award, and T.J. Whatley Distinguished Young Scientist Award. **Email**: yzhao@utk.edu

Abstract: Global poultry meat production surpassed pork production in 2020 to become the world's largest meat industry. Advancements in genetics, housing, and nutrition have enabled broiler producers to achieve unprecedented efficiency in growing market-size birds. However, the U.S. broiler industry confronts significant challenges, including rising demand, labor shortages, effective flock maintenance, resource optimization, animal welfare concerns, and resilience against pandemics or disease outbreaks. Precision Livestock Farming (PLF) offers a promising solution to these challenges. PLF uses advanced sensing technologies and artificial intelligence for real-time monitoring of poultry responses and production components. This enables farmers to make informed decisions promptly, ultimately enhancing poultry well-being and production efficiency. Through PLF tools, farmers can measure animal-based responses throughout the production process and better control and improve animal health and welfare. This presentation provides a summary of a few example applications of PLF in the poultry industry, highlighting its potential to enhance poultry farming practices and address pressing industry demands.



Hao Gan
Smart sensing for animal health and welfare
University of Tennessee, USA

Biography: Hao Gan is an assistant professor in the Department of Biosystems Engineering and Soil Science at the University of Tennessee. Gan's research focuses on developing sensing and robotic systems for various crop and animal production systems. His most recent research projects are related to computer vision and low-power sensing of animal health and welfare conditions, including imaging-based and audio-based poultry lameness and welfare behavior detection, cattle body condition scoring and respiration rate detection. **Email**: hgan1@utk.edu

Abstract: The worldwide demand for more animal products is increasing while at the same time the concern about animal welfare, animal health, and environmental impact by the livestock sector is rising worldwide. We need to produce more animal products with less feed input, fewer emissions, and less manure to create a more sustainable livestock sector. To do so, we need to optimize the process management which requires the monitoring of important parameters. Dr. Gan will present a few examples of the development and application of smart sensing technology that facilitates the monitoring of cattle and poultry health and welfare conditions.

Gretchen Neisler
Co-Chair of Organizing Committee
Closing Remarks
Vice Provost of International Affairs, Director of the Center for Global Engagement
University of Tennessee, Knoxville, USA

Biography: Dr. Gretchen Neisler has been the senior international officer at the University of Tennessee Knoxville since August of 2018. She provides leadership intended to help transform the University of Tennessee into a globally engaged modern R-1 university. She works closely with the university community to lead the development of the university's strategic international agenda, and oversees the Center for Global Engagement., which encompasses the offices of Asia Engagement, Programs Abroad, International Support Services, International House, English Language Institute, and Global Research Neisler received her Ph.D. in Higher Education Administration, Master of Science in Agriculture Extension Education, and B.S. in Agri-science Education and Animal Science from the Michigan State University. **Email**: gneisler@utk.edu

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