AGENDA
CFEWS International Workshop

"Circular Farming for Net Zero Transitions"

Thursday, May 9th | 9:00am-12:00pm Eastern Time U.S.

Virtual Event
https://tennessee.zoom.us/j/86286357178
Password: COIL

EVENT WEBSITE
2025 CFEWS INTERNATIONAL EARLY CAREER WORKSHOP | FEWSUS

Lead Organizer:
The University of Tennesee, Knoxville

Co-Organizing Institutions:
Durban Technological University, South Africa
Austral University in Rosario, Argentina
National Institute for Agricultural Technology, Argentina.
Technological University of Panama

WORKSHOP OBJECTIVES

Background:

In the upcoming decades, agriculture systems are going to be plagued with opposing and intersecting demands: climatic threats, population growth and migration, increasing food and energy pressures, decreasing water and land availabilities, as well as degrading natural habitats and ecosystem services. As the global demand for food and fiber continues to rise, the need for sustainable agriculture practices has never been more urgent. Circular agriculture, which embraces the principles of a circular bioeconomy, offers a holistic approach to addressing the challenges of feeding a growing global population while building a resilient and sustainable food system for future generations. Practices include promoting responsible sourcing, reducing waste, reusing resources, recycling materials, generating renewable energy, and maximizing byproduct values. Innovations, such as food-energy-water nexus, digital agriculture, waste-valorizing biotechnology, agrivoltaic farming, and regenerative soil management can help farmers optimize resource use, improve productivity, reduce costs, and minimize environmental impact.

The symposium aims to strengthen academic-business-government partnership for developing sustainable urban systems that have robust resilience in the context of global environmental change. Scientific objectives are to:

- Identify challenges and opportunities for achieving rural system sustainability regionally and globally;
- Develop international academic-business networks to promote collaborative actions for decarbonization and sustainability;
- Stimulate transdisciplinary ideas for decarbonization and sustainbility projects encompasisng research, education, outreach, and policy development.

SPONSOR

U.S. National Science Foundation
Climate-Smart Food-Energy-Water Nexus in Small Farms (CFEWS)

Note: U.S. Eastern Time 9am—12pm. Panama 8am-11am; Arg/Urug 10am-1pm; South Africa 3pm-6pm; Ethiopia 4pm-7pm

Thursday, May 14, 2022, 9:00-12:pm (U.S. Eastern Time) Opening and Presentations	
9:05-9:15	**WELCOME & OPENING REMARKS** — FEWSUS Student Chair: Kaitlyn Daniels (University of Tennessee) Moderators: Kaitlyn Daniel (University of Tennessee) & Lucia Belga (Austral University Rosario Argentina),
	• Welcome and Introduction of Workshop Goals • FEWSUS Student Network https://youtu.be/DcrOVOImUro
9:15-9:30	**Title: Regenerative Agriculture in Ethiopia: The case of Parkland Agroforestry practices.** Girmay Gebramlak, Tigray Agricultural Research Institute, Ethiopia
9:30-9:45	**Title: Methane emissions of cows in the livestock feeding industry.** Lucia Belga, Austral University Rosario, Argentina
9:45-10:00	**Title: Biofertilizer and food waste.** Anele Mfolozi, Durban University of Technology, South Africa
10:00-10:15	**Title: Circular Agriculture in South Africa.** Nomfundo Ndaba, Durban University of Technology, South Africa
10:15-10:30	**Title: Biohydrogen from agro-industrial waste** Dr. Miguel Morales, Technological University of Panama
10:30-10:45	**Break (Student Network video) https://youtu.be/DcrOVOImUro**
10:45-11:00	**Title: Building Resilience of Food-Energy-Water Nexus to Mitigate Extreme Weather Damage.** Kaitlyn Daniels, University of Tennessee, USA
11:00-11:15	**Title: Methane emissions of cows in the livestock feeding industry.** Pablo Mac Clay, Universidad Austral, Rosario, Argentina.
11:15-11:30	**Title: Switchgrass Biofuel Production in regards to the Nexus of Food, Energy, and Water.** Ian Bobbett, University of Tennessee, U.S.A
11:30:11:45	**Title: Photovoltaic solar irrigation in Uruguay.** Alejandra Salome Morales Presa, Technological University of Uruguay
11:45:12:00	**Title: Establishing Sustainable Urban Food Ecosystem at Food-Energy-Water Nexus** Jannat Bahanni, University of Tennessee, USA

Speakers' Abstracts and Biographies

Girmay Gebramlak

Institution: Tigray Agricultural Research Institute,
Country: Ethiopia

Title: "Regenerative Agriculture in Ethiopia: The case of Parkland Agroforestry practices."

Abstract: Parkland agroforestry practices, which integrate the cultivation of trees or shrubs with crops or livestock, have emerged as a viable nature-based strategy to mitigate the multifaceted challenges confronting the agricultural sector in Ethiopia. Nevertheless, most of the studies were predominantly conducted on experimental plots or smallholder farms characterized by heterogeneous farm attributes, tree species, and agroecological zones, achievements and lessons at a national level have not been comprehensively reported. Thus, a systematic review was conducted using empirical evidence and data from pertinent literature that discusses the role of tree species within agricultural systems. The reviewed literature explicitly demonstrates that parkland agroforestry practices provide multiple benefits, including improving soil fertility, thereby boosting crop yield and fortifying smallholder farms against adverse climate variability in the study area.

Biography: As a forestry and agroforestry researcher, I worked for over 13 years at Tigray Agricultural Research Institute, Tigray, Ethiopia, on managing sustainable forest resources, restoring degraded landscapes, and Biomass modeling and introducing climate change adaptation and mitigation techniques. CLIFF-GRADS fellow at INTA Balcarce, Argentina. Participated and presented climate change-related research findings at international conferences and seminars (China and South Korea). Published over ten articles and book chapters in reputable peer-reviewed journals. Winner of the Young Scholar Award 2024 from Sun Moon University, South Korea. Agroforestry, forestry, biodiversity, climate change, and degraded land restoration-related tasks are my research interests.

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Lucia Belga

Institution: Austral University, Rosario
Country: Argentina
Faculty Advisor: Pablo Mac Clay

Title: “Methane emissions of cows in the livestock feeding industry.”

Abstract: Agrosintex is a start up that produces an additive of cows with antimethane properties. With this we are reducing 95% of methane emissions. Also, during the inhibition of this gas we discovered that we improved the milk production and the Animal weight gain.

Biography: I studied business administrator at Austral University in Rosario and during my career I discovered that I am really interested in global solutions that improve our quality life, for that I took subjects like new economies, social entrepreneurship and others. In my last year, I decided to start a project with two Biotechnologists and now we are bringing that project to reality.

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Nomfundo Ndaba

Institution: Durban University of Technology
Country: South Africa

Title: “Circular Agriculture.”

Abstract: Circular Agriculture in South Africa focusing on the importance, key practices of circular agriculture in South Africa, the challenges, opportunities, success stories and our part in advocating for agricultural resilience

Biography: I am a student from the Durban University of Technology currently studying an Advanced Diploma in Sustainable Horticulture with a keen interest in circular agriculture in South Africa. I also possess a Higher Certificate in Project Management from the Durban University of Technology. I have experience working with a nonprofit wildlife & environment conservation organization, which deepened my commitment to environmental sustainability and community-based solutions. I have also worked with the South African Biodiversity Institute creating climate resilience programs for schools and encouraging young learners to become advocates for the environment.

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Anele Mfolozi

Institution: Durban University of Technology
Faculty Advisor: Bonga Lewis Ngcobo
Country: South Africa

Title: “Biofertilizer and Food waste”

Abstract: Significant amounts of food waste are generated daily causing environmental issues and a smart method for handling this food waste around the world(Chenyu.2018). While on the other hand the dependance of fertilizers such as nitrogen and Phosphorous impacts negatively on the soil structure, microbial biomass and diversity in micro-organisms (Geisseler.2017).

Biography: NEED .

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Dr. Miguel Morales
Institution: Technological University of Uruguay
Country: Panama
Title: "Biohydrogen from agro-industrial waste"
Abstract: Biohydrogen is hydrogen obtained from photosynthetic microorganisms in a process developed at room temperature using water, sunlight, and micro- or macronutrients, such as microalgae or cyanobacteria. It is an attractive option for hydrogen production due to the growing need for the transition from fossil fuels to a cleaner energy production means, with the purpose of generating fewer greenhouse gas emissions and combating climate change. Biophotolysis consists of employing solar energy and water to produce hydrogen and oxygen, and iron hydrogenase is usually used by microorganisms that use protons to produce biohydrogen
Publications: Miguel Angel Morales-Zapata (0000-0002-5020-8702) - ORCID
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Kaitlyn Daniels

Institution: University of Tennessee
Country: U.SA.
Faculty Advisor: Jie Zhuang

Title: “Building Resilience of Food-Energy-Water Nexus to Mitigate Extreme Weather Damage”

Abstract: This presentation explores how hurricanes, intensified by climate change, disrupt the global Food-Energy-Water (FEW) nexus and highlights innovative strategies to build resilience. Through case studies like Hurricane Helene, we examine the cascading impacts on agriculture, energy systems, and water quality. Solutions such as renewable microgrids, constructed wetlands, and cross-sector policy integration are presented to show how stormwater can be transformed into a resource for drought mitigation. A resilient FEW nexus is essential for climate adaptation, requiring coordinated infrastructure, smart technology, and proactive policy to ensure sustainable, secure systems in the face of growing extreme weather events.

Biography: Kaitlyn "Katy" Daniels is a Biosystems Engineering PhD candidate with her BS/MS in Industrial Engineering at the University of Tennessee, where she specializes in agricultural robotics and environmental systems. Through her platform, ROPES (Rural Outreach for Prospective Engineering Students), they engage students across East Tennessee in hands-on STEM activities focused on sustainability, the Food-Energy-Water nexus, and climate resilience. Her work bridges classroom learning with real-world environmental solutions, particularly in rural and agricultural communities. She aims to pursue a career in sustainable engineering education and environmental policy, with a focus on climate adaptation and community resilience.

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Pablo Mac Clay

Institution: Austral University, Rosario
Country: Argentina

Title: “Industrial dynamics and business strategies in the emergence of agricultural biological inputs.”

Abstract: Biological products present a sustainable alternative to synthetic agricultural inputs, yet the industrial dynamics triggered by these solutions remain unexplored. This study examines the strategic responses of dominant agricultural input firms to the rise of biological solutions. Through qualitative textual analysis of press releases, company reports, and other public sources, we identify five key strategies followed by incumbents: portfolio expansion, marketing and distribution, technological complementarities, product development, and window of technology. These exploration strategies are pivotal in shaping the technological and market trajectories of sustainable innovations, particularly in a sector characterized by market concentration.

Biography: Pablo Mac Clay is an economist with research experience in the Argentine agribusiness sector. His academic background includes a master’s degree in Agribusiness and a bachelor’s degree in economics. He has recently obtained a PhD in Agricultural Economics at the University of Bonn (Germany). His main research interests are agri-food value chain analysis, innovation in agribusiness, and bioeconomy.

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Ian Bobbett

Institution: University of Tennessee
Country: U.SA.
Faculty Advisor: Jie Zhuang
Title: "Switchgrass Biofuel Production in regard to the Nexus of Food, Energy, and Water"
Abstract: Shifting our energy reliance to increased biofuel production through switchgrass-biofuel production could pose a reliable, economical, and sustainable look at changing energy sectors. However, looking at how FEW Nexus can be affected by switchgrass production and biofuel creation needs to be addressed before large-scale implementation.
Biography: I am a recent graduate from the University of Colorado, Boulder and have continued my studies here at the University of Tennessee as a master's student with a focus on Environmental Soil Sciences (ESS).
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Alejandra Salome Morales Presa

Institution: Technological University of Uruguay
Country: Uruguay
Title: "Photovoltaic solar irrigation."
Abstract: Biological products present a sustainable alternative to synthetic agricultural inputs, yet the industrial dynamics triggered by these solutions remain unexplored. This study examines the strategic responses of dominant agricultural input firms to the rise of biological solutions. Through qualitative textual analysis of press releases, company reports, and other public sources, we identify five key strategies followed by incumbents: portfolio expansion, marketing and distribution, technological complementarities, product development, and window of technology. These exploration strategies are pivotal in shaping the technological and market trajectories of sustainable innovations, particularly in a sector characterized by market concentration.
Biography: My name is Alejandra Morales, and I'm currently studying Renewable Energy Engineering at the Universidad Tecnológica del Centro (UTEC), with a specialization in solar energy. I'm working on my final project, which focuses on green hydrogen—an area I'm passionate about due

to its potential in the energy transition. I hope to continue my studies with a master's degree in environmental engineering or a related field to keep contributing to sustainable solutions. In 2024, I had the opportunity to participate in an international skills competition in Chile, where I was awarded a Medal of Excellence in the Renewable Energy category—an experience that strengthened my dedication to this field.
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Bahanni Jannat

Institution: University of Tennessee, USA
Country: U.S.A.
Title: "Establishing Sustainable Urban Food Ecosystem at Food-Energy-Water Nexus."
Abstract: Urban food systems face growing challenges from food waste, supply chain inefficiencies, climate change, and unequal access to nutritious food. Rapid urbanization and socioeconomic gaps deepen these issues, creating food deserts and excess waste. Urban agriculture, hydroponics, and anaerobic digestion are sustainable solutions that can decrease waste and enhance food security. Promoting community engagement and collaboration with the private sector, alongside other innovative investments into digital agriculture and green infrastructure, helps build resilience. Policy support and education are essential for creating more equitable and sustainable urban food ecosystems.
Biography: Jannat Bahanni is a sophomore majoring in Environmental Science at the University of Tennessee, Knoxville. She has a strong passion for sustainability, from everyday practices like recycling to large-scale solutions like renewable energy. Her curiosity about the natural world drives her eagerness to grow through research and hands-on opportunities. She has contributed to environmental conservation projects involving monarch waystations, arboretums, and mosquito population studies. Jannat hopes to pursue a master's degree and continue exploring the intersections of ecological health, community resilience, and sustainable development.
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