Driving Climate Resilience: Highlights from the 3rd International Symposium on Agri-Environmental Systems (ISCRAES 2024)

By

M. Ibrahim Khalil

Convenor, ISCRAES
School of Agriculture and Food Science, University College Dublin, Dublin 4, Ireland.
School of Applied Sci-Tech, Prudence College Dublin, Dublin 22, Ireland.

The 3rd International Symposium on Climate-Resilient Agri-Environmental Systems (ISCRAES 2024; www.iscraes.org) took place from June 25-28 at the UCD University Club and was a resounding success, showcasing groundbreaking research and fostering collaboration among experts in the field. The event commenced with a warm welcome address by Dr. Ibrahim Khalil, Convenor of ISCRAES. Mr. Charlie McConalogue TD, Ireland's Minister for Agriculture, Food and the Marine, delivered the opening speech, highlighting Ireland's advancements in agri-environmental systems and engaging with delegates' questions, thereby setting a collaborative tone for the symposium.

The symposium featured an array of esteemed speakers, each contributing unique insights into various aspects of climate-resilient agriculture. Dr. David Laborde, Director of the Agrifood Economics Division at FAO, Italy, delivered a compelling presentation on transforming agrifood systems for global food security and climate resilience, emphasising the need for a sustainable and low-carbon future. Mr. Juan L. Restrepo, Global Director at CGAIR, France, followed with a discussion on boosting climate action through partnerships and collaboration, underscoring the importance of collective efforts in addressing climate challenges.

Figure 1 (From the top left): Dr. Ibrahim Khalil, Convenor, ISCRAES, delivered a Welcome speech; Mr. Charlie McConalogue TD, Ireland's Minister for Agriculture, Food and the Marine Opening speech followed by Dr. David Laborde, Director of the Agrifood Economics Division at FAO and Mr. Juan L. Restrepo, Global Director at CGAIR.

Distinguished plenary speakers further enriched the symposium. Prof. Pat Dillon, Director of Research at Teagasc, Ireland, spoke on Ireland's ambitious strategy to reduce greenhouse gas emissions from agriculture by 25% by 2030, outlining key initiatives and technological advancements driving this goal. Dr. Ada Ignaciuk, Senior Economist/Policy Analyst at OECD, France, provided a comprehensive analysis of advancing Agriculture, Forestry, and Other Land

Use Policies, highlighting trends and assessments in mitigation efforts. Dr. Jens Leifeld, Head of the Climate and Agriculture Group at Agroscope, Switzerland, offered insights into climate-smart management of agricultural organic soils, proposing innovative approaches to sustainable soil management.

Figure 2 (From the top left): Dr. Ada Ignaciuk, Senior Economist/Policy Analyst at OECD delivered a plenary speech followed by Prof. Pat Dillon, Director of Research at Teagasc, and Dr. Jens Leifeld, Head of the Climate and Agriculture Group at Agroscope.

The symposium's scientific sessions covered a broad spectrum of topics, reflecting the diverse challenges and opportunities in climate-resilient agriculture. The Grassland Systems session featured presentations on various aspects of grassland management. Discussions included climate-resilient grasslands and the net-zero agricultural transition, total greenhouse gas balance from a four-year grassland rotation-nitrogen fertilizer experiment, and interactions between plant biodiversity and productivity in semi-natural grasslands. Additional talks explored eddy covariance fluxes of greenhouse gases from boreal mixed farming grasslands and the impact of climate change on soil macroaggregates and associated organic carbon in Alpine grasslands.

In the Climate Change and Agro-farming Policy session, scientific advancements were showcased, focusing on climate adaptation policies at the subnational level, grass production, and fodder deficits in Ireland under projected mid-century climatic conditions. Presentations also covered potential global sequestration of atmospheric carbon dioxide by drylands forestation, agriculture's greenhouse gas emissions in lower and upper-middle-income countries, and prospects of low-emission transformations in Saudi agricultural systems. A noteworthy talk discussed a bottom-up approach to inform policy beyond mitigation and adapting to climate change. The Australian Agriculture Sustainability Framework (AASF) was also highlighted, demonstrating advancements in global sustainability and climate change policy.

The Regenerative Agriculture & Nature-based Solutions session provided valuable insights into sustainable agri-food systems. Key presentations included "Cultivating Tomorrow: Unveiling the Potential of Regenerative Agriculture," which emphasized the transformative potential of regenerative practices. Other topics included systemic change for resilient and climate-neutral agriculture, the combined effects of drought and salinity stress on baobab seed germination, and defining regenerative agriculture for Ireland's tillage sector. Discussions also focused on scaling nature-based solutions for resilient agriculture systems.

Following invited expert insights on the role of precision agriculture in combating climate change, the Arable Cropping Systems sessions included a diverse range of topics. Presentations covered CO_2 emissions from winter wheat-summer maize soil in the North China Plain, the development of an integrated farming systems bio-economic model for HOLOS-IE, and assessing diversified crop rotations for climate change mitigation and adaptation in Canada. Additional talks included evaluations of *Brassica napus* nitrogen use efficiency, seasonal changes in reflectance and vegetation biophysical properties of wheat, rape, and maize, and modelling global high-protein crop cultivation suitability across various shared socioeconomic pathways (SSPs). The potential of quinoa as a climate-resilient crop for dryland agro-farming systems and sustainability challenges for Irish agriculture, such as herbicide-resistant grass weeds, were also discussed.

The session on Agroforestry Systems highlighted innovative approaches and research in agroforestry. Key presentations included climate resilience across a European long-term agroforestry experimental network, modelling land-use change through agroforestry pig production systems in Ireland, and creating an agroforestry module for the HOLOS-IE digital platform to assess carbon-neutral farming. Discussions also focused on agroforestry as a response to climate change adaptation and mitigation in Northern Ireland, quantifying carbon sequestration in soil and woody biomass with the CARAT tool, and the effect of ecological intensification on soil organic carbon sequestration potential of Mediterranean wood pastures.

During the Decision Support Systems in Agro-Farming session, the importance of technology and modelling in climate-resilient agriculture was emphasized. Presentations covered crop modelling and decision support systems, effects of manure application on productivity and soil carbon storage in grasslands using the DNDC model, and bridging gaps for sustainable agriculture and carbon neutrality with the HOLOS-IE model, an agricultural systems digital platform. Talks also included helping farmers reduce emissions through the Holos model, showcasing a Canadian experience, and technical support systems for decision-making in precision agriculture in greenhouses.

The symposium also featured invited expert insights on an Irish initiative that aims to create a climate-neutral and nature-positive commercial dairy farm in Ireland. The Biodiversity in Agriculture session started with a discussion on the influence of policy and practice on farmland pollinators and pollination. Further talks explored the relationship between plant diversity and ecosystem condition in results-based agri-environment schemes, supporting rural economies through such schemes, and strategies for protecting farmland biodiversity. Presentations also highlighted maximizing recycling-derived fertiliser use and closing the nutrient cycle.

The final session on Biogeochemical Processes in Agro-Farming included a range of topics, starting with the role of soil fauna in the transition towards sustainable agriculture. Discussions covered N_2O emissions from agricultural peat, phosphorus as a key variable influencing spatial variation, DayCent model calibration to assess the impact of animal slurry application on Irish grassland, and optimising carbon storage on farmers' land using CO_2-balance tools. The symposium concluded with a workshop titled "Pros and Cons of Livestock Reintegration," sponsored by the ReLive Project funded by ERA-NET. This interactive session provided a platform for delegates to discuss and debate the benefits and challenges of reintegrating livestock into farming systems.

The organising committee expressed heartfelt gratitude to the opening and plenary speakers, invited experts, national and international delegates, and sponsors, including EPA Ireland, Failte Ireland, HOLOS-IE Project, ReLive Project, MDPI, UCD Earth Institute, and Prudence College

Dublin. Special thanks were extended to the assistants from HOLOS-IE and the TrueSoil Team, whose efforts contributed significantly to the event's success.

The 4th ISCRAES is scheduled to be held in 2026, promising to build on the achievements of ISCRAES 2024 and continue advancing the discourse on climate-resilient agri-environmental systems. The symposium demonstrated the critical importance of collaboration, innovation, and policy in addressing the pressing challenges of climate change in agriculture. The diverse and comprehensive discussions provided a robust platform for knowledge exchange, inspiring continued research and action towards a sustainable and resilient agricultural future.