



BOOK OF ABSTRACTS

AESI Early Career Day

Teagasc Ashtown, 25th Jan 2024

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DISCUSSION SESSIONS

The Economic and Environmental Impacts of Small-Scale Afforestation Adoption in Ireland

Zohreh Rafiee (UCD, Teagasc) [4th year PhD], **James Breen** (UCD), **Kevin Kilcline** (Teagasc), **Peter Witzke** (Bonn), **Monika Kesting** (Bonn)

This study evaluates the impact of adopting Small-Scale Afforestation Measures (SSAM) on farming activities, in terms of income, costs, and environmental factors, specifically at a NUTS II regional level for Ireland. Analysing projections for 2030 and 2050, it examines SSAM-induced shifts in land use, farming economics, greenhouse gas emissions (GHG), and carbon sequestration, using the Common Agricultural Policy Regional Impact (CAPRI) model.

Key findings indicate that SSAM practices are likely to bring modest environmental benefits, including reductions in GHG emissions and increased carbon sequestration. Economically, SSAM's impact on agricultural income is minimal overall, though regional variations were observed, with the South and Eastern (SE) region showing positive trends, while some areas in the Border, Midlands and Western (BMW) may face profitability challenges, especially relating to beef activities.

While SSAM adoption leads to income reduction overall, the change would be minor, which could be offset by enhancing the current afforestation grant and premia rates for these afforestation measures. Therefore, SSAM adoption in Ireland demonstrates a cautious yet beneficial approach to balancing agricultural productivity with environmental sustainability, particularly in reducing GHG emissions and enhancing carbon sequestration. Such initiatives will not only support farmers in implementing sustainable practices but also contribute to the broader goals of national afforestation and GHG emissions.

Behavioural Drivers and Barriers for Adopting Climate Mitigation Actions on Farm

Niamh Dunphy (UCD, Teagasc) [4th Year PhD], **Seamus Kearney** (UCD) & **Sinéad Flannery** (Teagasc)

Introduction: The world is now at a crossroads where balancing the need to produce enough food to feed our population and the pressing need to produce food sustainability needs to be achieved. By growing our understanding of the drivers and barriers affecting farmer uptake of climate mitigation actions at farm level we can strive to achieve emission reduction targets set out by the European Union.

Purpose: The purpose of this study is to identify behavioural drivers and barriers in the adoption of climate mitigation actions at farm level.

Method: 24 in-depth semi-structured interviews with dairy farmers across Ireland were conducted as the data collection phase of this study. The COM-B model was applied to this study as the analytical and theoretical framework.

Results: This study shed light on the barriers and drivers farmers experience when opting to implement climate mitigation actions on their farms. Barriers such as an increase in workload, an increase in costs incurred and being sceptical of the benefits of mitigation actions are cited in this study. Drivers such as an increase in farm revenue, advisory support and wanting to do good for the environment are all influential for farmers when deciding to implement climate mitigation actions on their farm.

Conclusion: There are various factors that both act as barriers and drivers for farmers when implementing climate mitigation actions on their farm. Policy and AKIS recommendations are made based on the findings of this study.

DISCUSSION SESSIONS

Analysis of Marginal Abatement Cost Curve for N₂O Emissions including local environmental factors

Alberto Francisco-Cruz Carlos (UCD, Teagasc) [4th year PhD], Cathal Buckley (Teagasc), James Breen (UCD)

This paper introduces a refined Marginal Abatement Cost Curve (MACC) approach that incorporates environmental factors, offering a more precise assessment of cost-effective mitigation measures across agriculture sector. By enabling a regional-level analysis, the study underscores the significance of site-specific conditions in optimizing Greenhouse Gas (GHG) emissions reductions while safeguarding agricultural practices. The results highlight the importance of considering environmental factors when mitigation options are assessed. Furthermore, the cost-effectiveness of the measures vary according to the farm's location, allowing the identification of the most cost-efficient measures according to the type of farm and its location.

Behind the Application of Chemical Fertilizers: What Influences Farmers' Demand?

Felipe Aguiar-Noury (University of Galway, Teagasc) [4th Year PhD], Cathal Buckley (Teagasc), Stephen Hynes (University of Galway)

Application of chemical nitrogen (N) fertilizers is a main driver of greenhouse gas emissions and consequently of climate change. It not only triggers emissions but also deteriorates soil fertility and water quality. Despite the environmental damage they cause, chemical N fertilizers continue to play a significant role in food production. Facing the urgency to reduce their application, it is essential for policy makers to first understand their demand. Nowadays, the presence of high prices, substitute technologies, environmental schemes and regulations aimed at reducing application makes it difficult to explain what is driving their demand. Irrational application might be at play. In this paper, we estimate the elasticity of demand for chemical N fertilizer using a 10-year panel data (2013-2022) from the EU Farm Accountancy Data Network for Ireland. Important contributions to the literature are offered, highlighting the influence of climate change on the demand for chemical N fertilizers. Variability of weather data was obtained by matching real spatial coordinates of farms with climate data rasters. Using static and dynamic models, the influences of farmers' characteristics, economic variables, and mitigation measures are also explored. Results indicate that farmers' demand is sensitive to weather variability, thus complicating optimal application. For example, a higher variability in soil temperature increases application, while a higher variability in precipitation levels decreases it. Besides, weather patterns significantly influence demand, where increases in previous year's soil temperature and wind speed raise current year's application, while increases in previous year's precipitation levels decrease it. Additionally, we discover three key challenges to reducing application: farmers are inelastic to price changes, chemical N fertilizer is positioned as a good of necessity for farmers, and farmers exhibit a path dependence on chemical N fertilizer, in which an increase in previous year's application raises that of the current year. These challenges need to be addressed from a policy perspective, and important recommendations are drawn based on these findings.

STANDARD PAPER SESSIONS

Modelling Adoption of GHG Mitigation Measures Among Dairy Farmers

Saeed Shahabi (UCD, Teagasc) [3rd Year PhD], James Breen (UCD), Cathal Buckley (Teagasc)

Incentivizing dairy farmers to adopt GHG mitigation measures is crucial if sustainability targets in agriculture are to be achieved. However, the rate and extent of this adoption are driven by more than economic incentives alone. Social dynamics, peer influences, and farmers' perceptions play pivotal roles. The paper describes an agent-based model (ABM) developed to simulate the long-term uptake of mitigation measures in an Irish dairy farming context. The model integrates elements of behaviour from the Theory of Planned Behaviour (TPB) and the farmers as agents in the social network arranged around the discussion groups and advisory links. Each agent's decision is based on attitudes, perceived norms, and perceived behavioural control.

A Systematic Review of Bio-Economic Models: Identifying Key Indicators of Sustainability in Crop Rotation Systems.

Chathurrdhika Yogarajah (UCD, Teagasc) [2nd Year PhD], Fiona Thorne (Teagasc), Michael Wallace (UCD)

The agricultural sector faces challenges, including climate change, resource constraints, and the need for sustainable food production. To address these issues, bio-economic models have emerged as pivotal tools for evaluating farming practices and policies. While bio-economic models are well-developed for Ireland's dairy and livestock sectors, there is a significant gap in their application to tillage crops and more specifically, protein crops, which are essential for food security and sustainable agriculture. This study conducts a systematic review of bio-economic farm models (BEFMs) focusing on sustainability indicators in crop rotation systems, with a particular emphasis on protein crops in Ireland's tillage sector. The objective is to identify existing indicators that assess the economic, environmental, social and innovation dimensions of sustainability, for stakeholders, including farmers, policymakers, and researchers. Thus, the findings aim to enhance decision-making processes, optimize resource utilization, and promote resilient agricultural systems. Ultimately, this study highlights the potential for comprehensive key indicators of sustainability to address knowledge gaps and support sustainable practices, contributing to the long-term viability of Ireland's crop rotation systems.

Weathering the Storm: A Systematic Review of Climate Change Adaptation in Agriculture. Methods, Metrics, and Impacts

Tanisha Waring (Università degli studi della Tuscia, Queen's University Belfast, and FiBL), Martina Bozzola, Luigi Biagini & Simone Severini

Much attention has been paid to the impact of the agriculture sector on the environment and its contribution to climate change. However, the sector is also vulnerable to the impacts of climate extremes. Thus, a growing number of studies have focused on adapting to these changes. We conducted a systematic literature review and assessment of the evidence gathered from 124 studies on the impacts of and adaptation to climate change in the agriculture sector in OECD member countries. Results highlight a significant knowledge gap in understanding the full economic effects of climate change as the impacts of climate change on input costs is not extensively studied in the way that impacts on farm output is. Additionally, there is a need to understand the indicators used to assess climate impacts in agriculture for easier comparison across studies. We recommend targeted research and funding to close this knowledge gap including conducting long term analyses to evaluate the costs and benefits of adaptation strategies as well as capacity building and knowledge exchange.

STANDARD PAPER SESSIONS

Towards a Bio-economic Framework for Circular and Integrated Farming Systems: A Systematic Review of Bio-economic Models

Anastasios Aristotelis Chatzichristou (Teagasc, UDC) [3rd Year PhD], Jonathan Herron (Teagasc), Michael Wallace (UCD), Magdalena Necpalova (UCD, ETH Zurich), Bruce Osborne (UCD)

Modern agriculture is set to tackle economic, environmental, and social challenges in order to maintain sustainable food production. Integrated crop and livestock farming systems have the potential to provide a sustainable alternative to reduce greenhouse-gas emissions and maintain family farm income. Bio-economic models provide a framework for simulating and assessing the impact of farm integration. Thus, we seek to identify the most suitable simulation framework for integrated systems in Ireland through a systematic literature review. Our preliminary results indicate a need for a framework that encompasses three main characteristics: transferability, scope, and flexibility

Application of an IPM metric for food horticulture to cross-national data

Jennifer Byrne (Teagasc, University of Warwick)[4th Year PhD], Robert Lillywhite (University of Warwick), Fiona Thorne (Teagasc), Lael Walsh (Teagasc), Henry Creissen (University of the Highlands and Islands)

Integrated Pest Management (IPM) is a crop protection framework for sustainable pest management, encouraging the integration of control measures to minimise risks associated with pesticides. To optimise IPM it is necessary to understand how growers are faring in their application and to identify measures lagging in uptake. This research is concerned with quantifying adoption in temperate jurisdictions, through the application of an IPM metric. This compound metric, based on three subsector-specific weighting structures, was originally applied to Irish horticulture as a case study but is herein extended to include English and Scottish data, thereby testing the transferability of the model. Results indicate IPM is being adopted but there is room for improvement. This confirmation of the adaptability of a dynamic IPM measurement instrument provides the means to benchmark IPM performance and chart cumulative progress.

Farm Successor's in waiting – Initial insights.

Holly Mullan (Ulster University) [3rd Year PhD], Professor Anne-Marie Ward (Ulster University), Dr Stuart Henderson (Ulster University), Dr Emma Dillon (Teagasc), Dr David Meredith (Teagasc)

Existing farm succession literature in Ireland has primarily focused on incumbent farmers and the 'young farmer' population to explore and promote generational renewal. However, a third, highly influential group has been largely overlooked within farm succession literature: those who fall outside the typical 'young farmer' category but are still likely to assume control or ownership of the farm. In-depth interviews were conducted with individuals over the age of 35, focusing on beef and sheep farms—two of the most prevalent yet economically challenged farming systems across Ireland. As anticipated, these potential successors were often well-established in their own off-farm careers and, therefore, faced distinct obstacles in the succession process compared to younger counterparts. This presentation will outline key findings from the study, providing insight into the degree of 'fit' exhibited between the potential successor and the farm environment.

STANDARD PAPER SESSIONS

An economic and environmental analysis on the performance of spring barley farmers: A case study of Ireland whiskey distillers' suppliers

Carel Johannes Kriek (UCC)[1st Year PhD], Thia Hennessy (UCC), Fiona Thorne (Teagasc)

The world is grappling with significant environmental challenges, including climate change and the loss of biodiversity and ecosystems, placing greater strain on agricultural systems. To tackle this, incoming regulation, capital markets and consumer demand have driven companies to engage in greater urgency with their suppliers and other value chain stakeholders to reduce their greenhouse gas (GHG) emissions and environmental impact. This is particularly evident with food and business (F&B) companies and subsequently of multinational alcoholic beverage companies, as they focus on their respective value chains to achieve sustainability and carbon neutrality from their suppliers. As F&B companies face increasing pressure to reduce Scope 3 emissions, that of their procured inputs, understanding the cost of transitioning to more sustainable practices becomes critical for both economic and environmental decision-making. This highlights the need for greater engagement with value chain stakeholders, particularly farmers, to identify opportunities and challenges in reducing emissions while maintaining productivity. This paper used a major distilling company in the Republic of Ireland as a case study to examine the environmental, economic, and productivity performance of its local spring barley suppliers. The paper compares and analyse economic and environmental indicators of Irish spring barley farmers supplying a distilling company with that of a nationally representative sample from the National Farm Survey (NFS) over two years (2020 and 2023).

Preliminary results found that corporately sourced farmers exhibited higher emissions, greater inputs, and higher direct input costs compared to NFS farmers across both years. However, both groups showed a decrease in emissions over the study period. These findings suggest that while corporately sourced farmers demonstrate higher productivity and economic performance, they face a significant trade-off with higher emissions, emphasising the need for strategies to balance economic efficiency with sustainability. Collaborative efforts between corporations, farmers, and policymakers are essential to balance emissions reductions, economic viability, and long-term sustainability.

Determinants of Food Security in Rural Households in Punjab, Pakistan

Uzma Shahid (QUB, Lahore College for Women University Lahore) [4th Year PhD], Martina Bozzola (QUB)

This study analyzes the determinants of food insecurity in rural households in Punjab, Pakistan, using food insecurity scores developed across multiple dimensions. Employing binary logistic regression, the analysis identifies key factors influencing food security in different regions (North, South, and Central Punjab), with a focus on factors such as household size, income, education, gender of the household head, livestock ownership, landholding size, food prices, and access to resources like loans and financial aid. The results reveal significant regional variation in determinants, with factors showing differing impacts across dimensions such as calorie intake, dietary diversity, and food stability. Household size consistently emerged as a significant determinant, with its effect varying across regions and dimensions, particularly in relation to calorie intake and food stability. Monthly income was found to be a crucial factor, with higher incomes generally reducing food insecurity. Gender dynamics also played a role, with female-headed households exhibiting higher food insecurity, particularly in South and Central Punjab. Education emerged as significant for long-term food security in specific regions, especially in terms of stability. Livestock ownership, landholding size, and access to markets and loans showed varying impacts across regions and dimensions.

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