2025 Brisbane

69TH ANNUAL CONFERENCE OF THE AUSTRALASIAN AGRICULTURAL AND RESOURCE ECONOMICS SOCIETY

Meeting the Challenges of Transition to a Sustainable Future

CONFERENCE HANDBOOK

11-14TH FEBRUARY 2025

Welcome to AARES 2025 in Brisbane!

On behalf of the Australian Agricultural and Resource Economics Society (AARES), we are thrilled to welcome you to the AARES 2025 Annual Conference, set in the vibrant city of Brisbane, Queensland. This year's conference brings together leading academics, industry professionals, policymakers, and students from around the globe to engage in critical discussions and share cutting-edge research in agricultural and resource economics.

Conference Highlights:

- **Keynote Speakers:** Renowned experts will address pressing issues in the field, offering fresh insights and innovative solutions.
- **Workshops & Panels:** Participate in interactive sessions covering a wide range of topics, from sustainable agriculture to resource management and climate change.
- **Networking Opportunities:** Connect with peers, forge collaborations, and expand your professional network through organized social events and informal gatherings.
- **Field Trips:** Experience Queensland's unique agricultural and natural landscapes with guided tours showcasing local initiatives and innovations.

Location: The conference take place at the Hotel Grand Chancellor (23 Leichhardt St, Spring Hill QLD 4000) in Brisbane. The city is known for its sunny weather, cultural diversity, and thriving economy, provides an ideal backdrop for this event. Enjoy the city's renowned hospitality, explore its beautiful riverfront, and discover the local cuisine and attractions.

Program Information: The conference program is extensive and packed with interesting sessions. To support our commitment to environmental sustainability, we encourage attendees to access the program digitally via our official conference app or website and avoid printing unless absolutely necessary.

Stay Connected: Follow us on our official conference website and social media channels for updates, schedules, and important announcements.

Website: https://www.aares.org.au/events/AARES-2025-Conference/

Program: https://virtual.oxfordabstracts.com/event/public/46978/program

Virtual Map: https://bernaz.shinyapps.io/aares25_network/

We look forward to an engaging and inspiring conference. Thank you for being a part of AARES 2025!

The local organising committee (LOC) members,

Dominic Smith, Peggy Schrobback, Gabriela Scheufele, Anthea Coggan, Bernardo Cantone, John Rolfe, Andrew Zull**,** Jeremy De Valck

Compiled on 10 February 2025, program changes after this date are not included.

The AARES society acknowledges Aboriginal and Torres Strait Islander peoples as the First Australians. We recognise their cultures, histories and diversity and their deep connection to the lands, waters and seas of Queensland and the Torres Strait.

We acknowledge the Jagera people and the Turrbal people as the Traditional Custodians of Meanjin (Brisbane), the lands on which our conference is located and where we meet, work and learn. We pay our respects to Jagera and Turrbal Elders past, present and emerging.

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REEF ECONOMIC1S & IMPROVED MGMT - Workshop

Location Chancellor 1, LVL0

Time: 9:00AM - 5:00PM

Convenor: John Rolfe, CQUniversity

Overview: The Great Barrier Reef (GBR) in Australia is the focus of substantial effort to improve protection and resilience, including from water quality impacts from agriculture and other land uses. On the marine side the challenges include identifying where conservation, restoration and other protection measures should be focused, given the scale of the system and the complexity of pressures on it. On the terrestrial side the challenges are largely around identifying cost-effective solutions to water quality issues from agricultural activities that will be supported by stakeholders.

The 2022 Scientific Consensus Statement that was released in August 2024 identified major gaps in knowledge around the economics of practice adoption, the potential for co-benefits from improved practices to be incorporated into mechanism design and improving adoption rates through better understanding of social drivers. Economic analysis can provide insights into each of these factors.

For this workshop the potential insights from economics analysis are organized in four sections: • Costing and prioritizing potential water quality solutions • Getting economics into mechanism design • Factors driving adoption • Assessing future issues. The target audience for this workshop are policy makers, researchers and stakeholders in the Great Barrier Reef policy space.

Format: The format of the workshop will be four panel sessions with approximately four speakers each. Each speaker will give a 15 - 20-minute presentation followed by moderated Q&A for 20 minutes and then open Q&A for 30 minutes. The different sessions will be chaired by different stakeholders.

Session 1: Costing and prioritizing potential water quality improvements
Session 2: Getting economics into mechanism design
Session 3: Factors driving Landholder adoption
Session 4. Assessing future options

DECARBONISATION / RESOURCES TRANSITION - Workshop

Location Chancellor 4/5/6, LVL 0

Time: 9:00AM - 5:00PM

Convenor: Stuart Whitten, CSIRO Environment

Overview: The Australian economy has experienced enormous growth in resources extraction over the past two decades with substantial structural implications for national, state and regional economies. The pressures of building a carbon neutral economy, both globally and nationally, are likely to drive further substantial structural changes over the coming decades. This workshop will focus on how recent resource booms have been experienced at scales from local communities to the national economy, what lessons we can learn to help guide future transitions, and on where, how and why future transitions may differ from those we have experienced in the past.

The objective of this workshop is to explore: - Our understanding of the impacts of recent resources booms on local, state and national economies, including how these have differed by commodity. - Explore the challenges facing the Australian resources sector as Australia, alongside other countries, strives to achieve net zero emissions over the coming decades. - Explore how future transitions may play out differently for communities, states and the nation to those we have experienced in the past. The workshop will timely for traditional AARES attendees and attractive to our Queensland audience given the mining sector is the largest economic contributor to the Queensland economy at $86.5b (GVA 22/23) and contributes more than 50,000 jobs.

Queensland's economy is also the most exposed amongst Australia's states and territories to the decline in fossil fuel extraction and exports as the global economy transitions towards net zero. Our aim is for workshop attendees to leave with an understanding of the how mining and resource transitions are likely to generate structural changes in local, state and national economy – past, present and future. Participants will leave better informed to consider and contribute to debates around the differential nature of past and future transitions across coal, gas, iron ore and transition minerals.

The workshop will predominantly target professionals who need to understand the likely transition challenges at scales from local to national, including those in state and national governments supporting policy development, consultants keen to understand the state of play, and stakeholders keen to identify sectoral challenges and opportunities.

Format:
Session 1 – Setting the scene: Resources transitions past present and future
Session 2 – The Queensland gas and coal boom – what did it mean for local, state and national economies?
Session 3 – The great transition –what does a net zero future mean for Queensland and Australia's resource economies?
Session 4 – Past, present and future – challenges and opportunities for the resource sector

FOOD SYSTEMS TRANSFORMATION - Workshop

Location Chancellor 2, LVL 0

Time: 9:00AM - 5:00PM

Convenors: David Shearer, Australian National University, Risti Permani, University of Queensland and Craig Johns, University of Adelaide

Overview: The key objective of the workshop is to build a framework to improve the partnership between research and innovation investors and providers contributing to the food system transformation. A case study approach will be used to investigate current public and private research partnerships to explore factors that influence success and failure. The case studies will be across the value chain, from pre-farm gate, on-farm innovation, through chain management and market engagement. This insight to critical factors will be used to develop a framework to improve future investment partnerships.

Research and development (R&D) has underpinned improvements in agricultural productivity contributing to improvements in global food security. However, there are also downsides with the costs of the global food system estimated at USD19.8 trillion, almost double current global food consumption, valued at USD9 trillion (Hendriks et al, 2021). Addressing these externalities is key to the transformation of the food system. Investment, by both the public and private sector, will be critical in the transformation, but estimates vary. CPI (2023) highlighted three scenarios (FOLU, 2019, UNEDP, 2022 and Thornton et al, 2023) which ranged from USD212B to USD1.3T. The study also identified current level of investment is well below need.

The role of the private sector in the global food system has changed dramatically (Denning, 2023). Today, investment by the private sector in agricultural R&D is greater than that by the public sector in developed economies (Pardey, 2023: Chancellor, 2023). Although there is some evidence that the investment is increasingly oriented towards developing country markets there is little evidence of direct private investment in agricultural R&D in developing countries (Fugile, 2016). In this changing dynamic, the private sector is becoming more crucial as a research and innovation provider and as a key mechanism to sustainably scale innovation. There are many examples, and various approaches, of public investment trying to partner with the private sector to deliver impact, however, there does not seem to be a clear approach or framework to maximise the impact of the investment from both the public and private sectors.

Improved partnership between public and private research investors and providers may improve the capacity to address ongoing development challenges, such as food security, address newly important issues including health and nutrition, and also contribute to addressing the impacts of climate change in the agricultural sector, where climate change has reduced productivity growth by 21% since the 1960s (Ortiz-Bobea et al, 2021).

Practitioners working in research and innovation partnerships that engage with both the public and private sector that are seeking ways to improve, and want to contribute to, the co-design, co-production, collective implementation, and impact of their research in the transformation of the global food systems, with a particular focus on developing country food systems. Key learning outcomes will be an improved understanding of current public and private arrangements to fund and implement research focused on food systems transformation along with approach to improve partnerships and impact.

Format: Presentation of case studies, capturing key learnings and formulating this into a potential framework to guide future investment. Speakers would be invited to contribute (and also contribute to a subsequent special issue journal) to both present and discuss, as below, with audience participation open. The main output of this event would be the establishment of a plan to build the framework as described in the objectives as well as commit key authors for the development of the papers (as described below)

Key Topics • Historical overview of public and private sectors have interacted in research and innovation in the global agri-food system – perhaps a focus on food security • The current state of play – globally, a developed country case and a developing country case • What can we learn from the renewables sector • On-farm • In the value chain • What about at the broader food system level • It's not just about technology – finance and policy innovation is critical • What about building capacity to form effective partnerships • Co-design and co-production with the private sector – approaches, costs and benefits • What does this mean for future challenges – partnerships to lower GHG emissions from global agri-food systems • A framework to enhance partnerships to meet the challenges of transition to a sustainable future

Wednesday 12th February

Special Session 1A - The Value of a Non-Market Value
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Parallel 2C - Practice Change & Adoption 2
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Egg-Timer Presentations Parallel 2

Special Session 1A - The Value of a Non-Market Value

Location Main Room 1 (ROMA), LVL1

Time: 10:30 - 12:10

Chair: Michael Burton

A number of longstanding debates about non-market valuation (NMV) remain unresolved for lack of evidence: whether NMV studies are worth doing at all (is "some number better than no number"), whether a NMV study needs to comply with agreed "best practice" to be worth doing, and whether revealed-preference studies should be preferred to stated-preference studies.

In this Mini-Symposium, the presenters will make important contributions to answering these questions.

We start with an investigation of the accuracy of various NMV methods conducted to different levels of best practice. Experts who participated in the elicitation process for that study will share some reflections on the process and the results obtained.

Then the results for NMV accuracy will be placed in the much broader context of the Bayesian Value of Information (VOI) framework. The VOI framework will be described in detail and then applied to a case study for a water-pollution mitigation project.

Results show that decisions about which NMV method to use (if any) depend on various factors, including project scale (i.e., what is at stake from the policy decision), the quality of existing knowledge, the accuracy of NMV methods, and the costs of applying different NMV methods. It is clear that both sides in the existing debates about NMV have been too simplistic in their thinking. A more nuanced, targeted and evidence-based approach to decision making about these methods is needed.

Session description:

10:30AM   Michael Burton (UWA) (Chair): Introduction
10:35AM   Sayed Iftekhar (Griffith Uni.): Expert perceptions of the accuracy of non-market valuation methods
10:55AM   John Rolfe (CQU), Darla Hatton-McDonald (UTas): Expert panel members' reflections on the elicitation process and results
11:10AM   David Pannell (UWA): Applying the Bayesian Value of Information framework to Non-Market Valuation methods
11:25AM   Robert Johnston (Clark Uni.): The Benefits and Costs of Improving Decision Making Informed by Non-Market Valuation
11:45AM   Michael Burton (UWA) (Chair): Q&A Panel
12:10PM   Close

Special Session 1B - The Future of the Murray Darling Basin Plan

Location Main Room 2 (TERRACE), LVL1

Time: 10:30 - 12:10

Chair: John Quiggin

The special session will examine recent developments in the Murray Darling Basin plan and consider future issues including the prospects for meeting existing targets and the implications of climate change.

Session program:
10:30AM   John Quiggin (UQ) (Chair): Introduction & Presentation
10:55AM   Sarah Wheeler (Flinders University): Presentation
11:15AM   Alec Zuo (Flinders University): Presentation
11:35AM   John Quiggin (UQ) (Chair): Q&A Discussion panel
12:10PM   Close

Parallel 1A - Development & Agricultural Production

Location Main Room 3 (WICKHAM), LVL 1

Time: 10:30 - 12:10

Chair: Martin Andersson

The welfare effect of Climate Smart Agriculture on Smallholder Farmers: Insights from the Strategic Irrigation Modernization and Urgent Rehabilitation Project (SIMURP) in Indonesia

Hery Toiba, Moh Shadiqur Rahman
Brawijaya University, Malang, Indonesia

Keywords: 8. Climate Change; 10. Development Economics

Paper Abstract:

The Strategic Irrigation Modernization and Urgent Rehabilitation Project (SIMURP) is a key initiative aimed at modernizing irrigation and addressing urgent rehabilitation needs in Indonesia. A central component of this program is the implementation of Climate Smart Agriculture (CSA), which has been introduced in the country since 2019. Despite its implementation, there is limited empirical evidence on how CSA has impacted the welfare of smallholder farmers. This study seeks to evaluate the effects of CSA adoption within the SIMURP program on the welfare of farmers in Indonesia. Using Inverse Probability Weighted Regression Adjustment (IPWRA), a method designed to produce more robust estimates, this research analyses the productivity and income levels of farmers who have adopted CSA practices compared to those who have not. The results indicate that farmers who adopted CSA exhibit higher productivity and income levels, suggesting a positive impact on household welfare. This study contributes to the existing literature by providing empirical evidence on the benefits of CSA in improving the well-being of smallholder farmers and highlights the importance of CSA in promoting sustainable agriculture in Indonesia.

Climatic hazards and agricultural feminization: Evidence from Cambodia Agriculture Survey 2019-2021

Sonia AKTER, Linh Bui
Australian National University, Canberra, Australia

Paper Abstract:

The phenomenon of agricultural feminization is widespread in numerous Southeast Asian countries. Rapid urbanization and structural transformation are commonly considered the main drivers of agricultural feminization. As climate change-driven natural hazards increase in frequency and intensity, many rural farm households are finding it necessary to diversify their livelihoods to spread the risks of climate change. Thus, climatic hazards are also a key driver of women's growing role in agriculture. Although it is widely accepted that women's roles are increasing in agriculture, debate persists about the nature of the role, whether women are participating as farm laborers or farm managers. In the former case, women increase their time in agriculture with little or no decision-making power. In the latter case, women have decision-making power and access to resources and income. Furthermore, there is a lack of clarity on whether agricultural feminization contributes positively or negatively to climate change adaptation. The predominant perspective suggests that agricultural feminization is exacerbating the vulnerability of farming households to climate change by limiting their adaptive capacity.

This research is driven by three primary objectives. Firstly, it investigates the trends of two forms of agricultural feminization in Cambodia. They are: (i) the extent of women's involvement in agriculture in comparison to men, both as (a) family and hired labor, and (ii) the effective participation of women in agriculture in comparison to men, with effective participation denoting decision-making authority. Secondly, it seeks to gain insights into the ways in which climatic hazards impact feminization across diverse geographical areas and cropping systems. Lastly, it assesses whether households experiencing agricultural feminization exhibit heightened or diminished capacity to adapt to climatic hazards.

We utilized household-level data from the Cambodia Agriculture Survey 2019, 2020 and 2021, which included over 40,000 nationally representative households. Our analysis focused on understanding how these households were exposed to climatic hazards during this time period and evaluated various climate change adaptation indicators. We employed an ordinary least squares regression model, factoring in time and province fixed effects, to provide insight into the three specific research questions at hand.

Our findings indicate that there has been a significant increase in women's involvement in agriculture in Cambodia during the study period. This increase is evident in both overall labor engagement (family and hired labor) as well as in women's effective participation in agriculture, measured in terms of their decision-making authority in relation to men. We observed a significant positive correlation between the incidence of climatic hazards and the rise of feminization in agriculture in Cambodia during 2019-2021. Specifically, women's involvement in agriculture in all forms was higher in households that experienced at least one climatic hazard during this period. Lastly, our results indicate that the participation of women in agriculture was associated with increased adaptive capacity in production and resource domains, but reduced capacity in the input domain. Specifically, households with greater participation of women in comparison to men were significantly more likely to have diversified crops and livelihoods and increased access to loans but decreased access to pesticides.

The Women's Empowerment and Labour Scale: Validating a Novel Measure in South Asia

Sophie Lountain, Bethany Cooper, Lin Crase
University of South Australia, Adelaide, Australia

Paper Abstract:

In recent years, the field of measuring women's empowerment has seen significant advancements, reflecting a growing recognition of the importance of gender equality in global development. Research in this area has focused on creating tools and methodologies that accurately capture the multifaceted nature of empowerment. One of the primary tools that emerged from this research is the Women's Empowerment in Agriculture Index (WEAI), which has been widely used to assess women's empowerment in agricultural settings. While the WEAI and its variants have been widely recognised for their contributions, they are not without limitations. These indices, though comprehensive, tend to emphasise economic and agricultural dimensions of empowerment, which can result in the oversight of other crucial aspects, such as time-use agency. Time-use agency, the ability of a woman to control and make decisions regarding how she spends her time, is a critical component of overall empowerment that is not fully addressed by these existing indices.

Acknowledging the limitations of time diaries and other widely used approaches, researchers have begun to explore measuring time use in agriculture in developing countries. For example, Sinharoy et al. (2023) developed the Time-Use Agency Scale, a tool designed to measure the degree of control women have over their time. This scale measures women's empowerment by considering how women allocate their time, underscoring the importance of autonomy in time management as a critical factor in empowerment.

Concurrently, the Women's Empowerment and Labour (WEaL) Scale was independently developed, sharing a similar focus with the Time-Use Agency Scale. This scale measures individuals' perceived property rights over their own labour as a proxy for empowerment. Both tools aim to fill the gaps left by the WEAI, particularly in addressing the broader context of women's lives, including their control over time and resources. This approach is grounded in the assumption that control over labour and resources is directly linked to individual empowerment.

This paper explores and contrasts the effectiveness of the Abbreviated Women's Empowerment in Agriculture Index (A-WEAI) and the Women's Empowerment and Labour (WEaL) Scale in capturing the nuances of women's empowerment in rural agricultural settings. The research process began with expert interviews, which provided a foundational understanding of the context and informed the subsequent qualitative data collection. Following this, Focus Group Discussions (FGDs) were conducted with over 120 participants in rural Bangladesh and Nepal in August 2024, offering in-depth insights into women's lived experiences in agriculture. These discussions provided in-depth insights, which informed the subsequent design and administration of a quantitative survey. This survey, conducted in August 2024, collected over 400 responses from rural communities in India and Nepal. The study aims to critically assess how these two empowerment measurement tools compare in different cultural and geographic contexts, offering

valuable insights for future policymaking and empowerment initiatives within and beyond agricultural settings.

Woman empowerment and organic farming adoption: Insight from rice farmers in Indonesia

Fahriyah Fahriyah, Rachman Hartono, Nuhfil Hanani AR
Brawijaya University, Malang, Indonesia

Paper Abstract:

The role of gender in economic development is widely recognized, yet the impact of gender on women's empowerment remains underexplored in the literature. This study examines how women's empowerment influences the decision of farming households to adopt organic farming practices. Using survey data from 275 rice farming households in Indonesia and applying a two-stage predictor substitution method, the findings reveal that women's empowerment is significantly and positively influenced by factors such as the education level of both the wife and husband, farming experience, asset ownership, and social capital. In contrast, the number of family members and age do not show significant effects. Moreover, the study highlights that women's empowerment in the agricultural sector has a positive and significant impact on the household's decision to adopt organic farming practices. These results underline the importance of empowering women to encourage sustainable agricultural practices in rural communities. This study contributes to the growing body of research by shedding light on the role of women's empowerment in promoting organic farming adoption, with implications for policy development aimed at enhancing gender equality and sustainability in the agricultural sector.

Are Rural Women Marginal Beneficiaries in Pakistan? Analyzing Gender Dynamics in the Chickpea Value Chain

Shahzad Kouser[1], Rajendra Adhikari[2], Kuntala Lahiri-Dutt[3]
[1]COMSATS University Islamabad, Islamabad, Pakistan. [2]The University of Queensland, Australia, Brisbane, Australia. [3]The Australian National University, Canbera, Australia

Paper Abstract:

Women's empowerment initiatives play a significant role in poverty reduction, but unpaid domestic and caregiving duties often limit women's ability to engage in paid work. This paper explores whether empowerment efforts targeting poor women engaged in the chickpea value chain help alleviate different forms of poverty—income poverty, time poverty, and double poverty. The study draws on data collected through a gender survey conducted in 2021 among chickpea-producing households in the Chakwal district of Punjab, Pakistan. Two primary tools were employed in the questionnaire: a time-use diary and the Women's Empowerment in Agriculture Index (WEAI). The survey data were analysed using the Household Panel Random Effects Logistic Regression method to assess intra-household gender inequalities related

to income, time, and double poverty, and to evaluate the effects of women's empowerment on these poverty indicators. The findings reveal pronounced intra-household gender inequalities in chickpea-producing households in Pakistan. While empowerment in agriculture contributes to reducing income poverty, it simultaneously exacerbates time poverty among vulnerable women. This dual effect underscores the intricate dynamics of empowerment within the agricultural value chain. The study highlights the need for integrated policy solutions that not only foster women's economic empowerment but also address their time constraints, through supportive infrastructure and initiatives aimed at advancing gender equality within households and agricultural sector.

Economic shrinking and the agricultural transformation: leadership, commitment, and policy space

Martin Andersson
Lund University, Lund, Sweden

Paper Abstract:

Recent research has shown that the transition to a path leading to economic prosperity and sustained development depends on the ability to over time reduce incidences of economic shrinking (North et al. 2009; Broadberry and Wallis 2017). Indeed, the economic history over the long run suggests that the main characteristic in achieving a well-functioning and well-to-do open access society is not the ability to generate high economic growth, but to build resilience to economic shrinking. This line of research suggests that the art of avoiding economic shrinking in current day developing countries requires nurturing key social capabilities (Andersson et al 2024).

One such element is related to the advancement of the agricultural transformation and the complexity of the sector, since a more diversified and productivity driven agricultural sector are more resilient to economic shrinking. How to strengthen this resilience is however a neglected area in the policy debate and in particular when it comes to the role played by the political leadership in providing long-term commitment and support for agricultural development.

This paper addresses not only what type of agricultural policies that successfully paved the way for long term agricultural transformative processes, but how and through what means such policies were implemented.

The aim is on finding an association and possible causal relationship between successfully initiating a de facto agricultural transformation and leadership visions and policy actions with respect to the agricultural sector. To do so the following key dimensions are of special interest:

A revealed vision, meaning a strategy for building a nation that has as its centerpiece sustained and broad-based increases in agricultural productivity and farm/rural incomes. Such leadership must have the ability to turn the vision into on-the-ground change. This requires commitment to, and prioritization of, the agricultural sector in public sending and policy support, as well as a timeframe that is long-term and shows stable prioritization of agricultural reforms that survive individual leadership change and is maintained for approximately 25+ years. In addition, reforms should be inclusive and affect the majority of the rural population.

The paper will draw on the political-economy of building resilience to economic shrinking through agricultural change in a number of successful cases of transformation in the post-WW-period such as South Korea and Taiwan, China.

Parallel 1B - Climate Change 1

Location Main Room 4 (LEICHARDT), LVL 1

Time: 10:30 - 12:10

Chair: Stefanos Xenarios

Beyond the Temperate: Exploring the Health Impacts of Air Pollution in the Tropics under Climate Change and the High Costs of Environmental Agreement Breakdown

Yue (Joyce) Yu
The University of Manchester, Manchester, United Kingdom. University of Melbourne, Melbourne, Australia

Paper Abstract:

Introduction: Most research on air pollution focuses on temperate, developed regions, highlighting significant health and economic impacts. This study shifts the focus to tropical, developing regions under changing climatic conditions, as projected by the IPCC. Using Indonesia—a tropical country with severe air pollution and no distinct seasons—as a case study, this paper examines the combined effects of long-term air pollution, heat, and humidity on health

Objectives: The study aims to (1) evaluate the combined impact of long-term air pollution, high temperatures, and humidity on health in Indonesia, and (2) compare the effects of these climatic factors on subjective (self-reported) and objective (clinical) health outcomes, providing a nuanced understanding of the relationship between environmental stressors and health perceptions versus actual health metrics

Methods: Studying the health impacts of climate presents three main challenges. First, health is influenced by multiple factors, including genetics, and can respond to climate both immediately and over time. Second, finding exogenous variation in air pollution to estimate its causal effects is difficult, leading to potential confounding factors. Third, detailed individual health data over time is scarce, complicating the comparison of subjective and objective health outcomes

To address these challenges, the study incorporates daily weather conditions, regional monthly averages, and interview days in its analysis to capture both the immediate and mid-term effects of climate. To handle the endogeneity of air pollution, thermal inversion—a meteorological phenomenon that traps pollutants—is used as an instrumental variable in a 2SLS model, providing a source of exogenous variation. Data is drawn from an Indonesian household survey, which includes both subjective health reports and objective measures collected by trained nurses. Supplemented by NASA's high-resolution satellite climatic data, this paper provides a robust framework for analyzing the health impacts over a period extending from 1993 to 2015

Results: Initial estimates, without adjusting for endogeneity, showed no significant impact of air pollution on health. However, after accounting for thermal inversions, a negative relationship between air pollution and health emerged. Higher temperatures and humidity consistently worsened health outcomes. Subjective health was particularly affected, indicating that people's perceptions align with increased discomfort during adverse weather. Objective health measures, though less responsive, still showed significant declines, especially in respiratory and cardiovascular health, in response to pollution and unfavourable weather conditions

Conclusion: This study is one of the first to explore the compounded effects of air pollution, temperature, humidity and other climatic factors on health in a tropical region. The findings reveal significant negative impacts on both perceived and clinical health outcomes in Indonesia, highlighting the urgent need for public health interventions in tropical settings facing climate change and environmental degradation. Future research should refine these insights and explore effective mitigation strategies.

Some economics of electrifying long-distance container shipping: an illustration using Asia- Europe

Anthony Wiskich
CSIRO, Brisbane, Australia

Keywords: 8. Climate Change; 13. Energy and Utilities

Paper Abstract:

Research on decarbonising long-distance shipping focuses on increasing fuel efficiencies and substituting fuel oil for cleaner high-density fuels. The perceived challenges with using batteries include their high costs and low energy densities: we provide economic insights for their use under a couple of speculative assumptions. First, in addition to a battery-on-container-ship configuration typically considered, we study a "separate vessel" concept where a dedicated battery vessel can power the ship en route. Second, we allow charging for the battery-on-container-ship configuration and (dis)connection of separate battery vessels at sea, where land is nearby. We describe an economic model that optimises ship speed, number of charging stops at sea and battery capacities for a hybrid (fuel oil plus battery power) container ship on a round-trip between Asia and Europe. Our main insights: (i) battery uptake is more sensitive to battery costs than their energy density, (ii) optimal speeds vary depending on the route segment and increase if batteries can power propulsion, and (iii) separate battery vessels have more favourable economics and enable partial decarbonisation at higher battery costs. We hope these insights promote research into the technical feasibility of separate battery vessels.

Weather and Kiwifruit Production in New Zealand from 2001 to 2023

Sazia Ahmed[1,2], Frank Scrimgeour[1]
[1]University of Waikato, Hamilton, New Zealand. [2]Khulna University, Khulna, Bangladesh

Keywords: 1. Agribusiness; 8. Climate Change

Paper Abstract:

This study identifies the effects of weather on kiwifruit production in the Bay of Plenty region in New Zealand. Kiwifruit is New Zealand's largest horticultural industry with over 80% of the crop produced in the Bay of Plenty. However, yields have fluctuated greatly over the last decade, adversely affecting growers and the economy. The authors have used panel data analysis to examine the relationship between dependent variables, green and gold varieties of kiwifruit yield (trays per hectare), and explanatory variables, including days with temperatures above 25ºC, temperatures below 0ºC, wet days, total growing degree days above 5ºC, total growing degree days above 10ºC, and winter chill hours. The analysis included fixed effect and random effect models and use of the Hausman test to determine the nature of weather impacts on kiwifruit yields. The findings indicate that the yields of gold kiwifruit consistently surpass those of green kiwifruit, apart from the years affected by PSA Virus. Furthermore, there exists a significant inverse association between rainy days, frost days, winter chill hours, and green kiwifruit yields, respectively. Additionally, frost days further exert a substantial negative influence on gold kiwifruit. However, days with high temperatures have a markedly beneficial impact on the production of green and gold kiwifruit in the Bay of Plenty. The results highlight the importance of effectively utilising weather data in operational decisions and in strategic choices to address the local effects of global climate change. The paper concludes with recommendations for future research.

Investigating Greenhouse Gas Emission and Its Determinants in Various Rice Cultivation Systems in Indonesia

Iqbal Saleh Sitompul, Risti Permani
The University of Queensland, Gatton, Australia

Paper Abstract:

Rice is the world's third most widely grown cereal crop, contributing to approximately 20% of total calorie intake. It serves as a vital food source and carries significant economic, political, and cultural importance, especially in Asian countries, leading to its massive production. For instance, Indonesia, with a harvested area of 10.2 million hectares, produced 53.6 million tons of rice in 2023. Despite being one of the world's top rice producers, Indonesia still imported 3,06 million tons of rice in the same year, highlighting the crop's critical role as a staple food, with an average consumption of 1.5kg/capita/week. Rice production activities, such as the use of fertiliser, machinery, and others, have worsened greenhouse gas (GHG) emissions, including Carbon Dioxide (CO_2), Methane (CH_4), and Nitrous Oxide (NO_2). Rice cultivation accounts for about 1.5% of global GHG emissions and 48% of all GHG emissions from cropland. In Indonesia, it accounts for 15.77% of GHG emissions from agriculture. This condition is dire due to the climate change effect of GHG emissions, especially with the global population rising yearly, increasing the demand for food production. Thus, there has been a growing interest in studying various rice cultivation systems to identify practices with lower GHG emissions. However, the majority of these studies only focus on quantifying GHG emissions from different rice cultivation systems, and little is known about factors associated with GHG emissions. Therefore, this study investigates GHG emissions from rice cultivation and their determinants in Indonesia. First, using the Lice Cycle Assessment (LCA) with a cradle-to-gate approach, this study compares rice production's Global Warming Potential (GWP) of four different cultivation systems: a) open-field conventional, b) open-field fertigation, c) open-field organic, and d) organic fertigation; and investigates the hotspots of the emissions in the farm. Second, the determinants of GHG emissions, which comprise socioeconomic characteristics, agricultural services, and agricultural

inputs, are assessed. The study suggests a different GWP in rice cultivation systems, with the open-field conventional being the highest GHG emitters. Additionally, the analysis shows that determinants have varying effects on GHG emissions. This research provides information to help stakeholders identify more sustainable rice cultivation systems. Stakeholders can understand the hotspots and determinants of GHG emissions, which will help decide applicable interventions to reduce the emissions. The topic of low-emission rice cultivation is critically important in countries with dependence on rice as a staple food, especially with carbon-neutral agriculture, which is now gaining traction to reduce environmental impacts. Besides, this research is relevant to achieving Sustainable Development Goals (SDG), including SDG 1 (No poverty), SDG 2 (Zero hunger), SDG 8 (Decent work and economic growth), SDG 12 (Responsible consumption and production, and SDG 13 (Climate action). Finally, it can inform policymakers to plan their Nationally Determined Contribution Efforts through rice field decarbonisation.

Assessing agricultural sector transformations for greenhouse gas emission reductions: Insights from GLOBIOM-Australia

Adam C. Castonguay[1], Ray Marcos Martinez[2], Duy Nong[1], Michiel van Dijk[3], Martin Nolan[4], Javier Navarro Garcia[1], George Verikios[1], Stuart Whitten[1]

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Keywords: 3. Agricultural Production; 4. Agricultural Technology and Innovation; 24. Mathematical Programming

Paper Abstract:

Australia has committed to reducing its emissions to 43% below 2005 levels by 2030 as part of the Nationally Determined Contributions (NDCs) and pledged to cut methane emissions by 30% by 2030 in alignment with the Global Methane Pledge. Achieving these targets will either require significant agricultural transformations or substantial trade-offs between agricultural production and emissions reduction.

Here, we evaluate the efficacy of demand and supply-side strategies within the agricultural sector in Australia within the global context up to 2050. We do so by applying for the first time GLOBIOM-Australia, a version of the Global Biosphere Management Model (GLOBIOM) parameterised and calibrated to the Australian context. We also investigate the trade-offs between GHG emission reduction and agricultural revenues for seven scenarios.

We first explored three scenarios to assess the impacts of global socio-economic trends, food demand and trade on the Australian agri-food system through the Shared Socioeconomic Pathways (SSPs), with SSP2 considered as the baseline scenario. In addition to global trends, we looked more specifically at the impacts of demand and supply-side strategies within Australia. The first domestic scenario consists in a transition towards a flexitarian diet aligned with the EAT-Lancet dietary recommendations by 2050, while global demand evolves according to SSP2 scenario, characterised by moderate growth in food consumption and increasing share of livestock products in diets. The second domestic scenario consists of closing the crop yield gap for major crops by 2050. Finally, we assess the effectiveness of combining demand and supply side strategies in the final scenario.

All strategies explored in this study fell short of achieving the 43% CO2eq reduction target relative to 2005 emissions in agriculture by 2050. The scenario characterised by global sustainability and flexitarian diet with Australia (SSP1_EAT) comes the closest with 40% reduction in 2050. The Methane Pledge, applied to agriculture, could be achieved through global sustainability and flexitarian diet within Australia (SSP1_EAT), however, the targeted reduction would only occur in 2050. Therefore, significant and drastic transformation of the food system in Australia both in food demand and production beyond diet shifts and yield increases will be required to achieve the two targets within the specified timeline.

Transitioning from the baseline scenario (SSP2) to a scenario with both demand and supply improvements (SSP2_EAT_YLDGP) would reduce emissions for a small loss in economic returns (1.4 kg CO2eq reduction per USD loss). In comparison, shifting from the baseline scenario to an improved diet would reduce emissions more significantly, but at a greater economic cost, i.e., 0.2 kg CO2eq reduction per USD loss.

Here, we assessed for the first time the trade-offs and efficacy of demand and supply-side measures in meeting two national emission reduction targets applied to the agricultural sector in Australia. Future developments of GLOBIOM-Australia will include the inclusion of reforestation to offset emissions and the integration with a computable general equilibrium model to improve the representation of economy-wide impacts of achieving net zero emissions. This tool will help decision-makers identify strategies to minimise trade-offs associated with emission reduction targets.

Economic assessment of climate resilient investments for regional planning in Australia

Stefanos Xenarios[1], Abdulrasheed Zakari[2], Russ Wise[1], Paul Box[3], Peter Heinmiller[4], Gemma Edwards[5]
[1]CSIRO, Canberra, Australia. [2]Wollongong University, Sydney, Australia. [3]CSIRO, Sydney, Australia. [4]Value Advisory Partners, Melbourne, Australia. [5]Bega Valley Shire Council, Bega, Australia

Paper Abstract:

It is becoming increasingly clear that mitigating the physical risks of climate change and extreme weather events has become a top priority, especially for vulnerable regions and communities. Climate-driven exacerbations of hazards have increased the vulnerability of assets and infrastructure, redefining how resilience investment is understood and implemented. There have been attempts to incorporate the resilience concept into local and regional investments, mainly by applying engineering-based solutions (e.g., reinforcing structures, adding new materials, etc.) to address the impacts of climate-induced hazards.

 However, many social, economic and environmental parameters affect the scale and impact of hazards to public infrastructure investments and, eventually, the communities who rely on these assets. Also, inherent uncertainties around the frequency and intensity of future climate-induced hazards make it more difficult to calculate the damage probability and scale from these events and identify the avoided costs resulting from the development of resilient infrastructure.

In our study, we attempt to identify the economic impact of resilient infrastructure on the local government level and, more broadly, on regional planning by adopting a case study of the Bega Valley Shire situated on the South Coast of Australia. Bega Valley is characterised by a diverse landscape and terrain with high levels of exposure and vulnerabilities to climate-induced hazards. In the last decade, Bega Valley Shire has repeatedly experienced major bushfires and flood events, which deteriorated the livelihoods and well-being of local communities, as described in the following section. The recent hazard impacts in the Bega region underscore the need to define and prioritise resilient investments for disaster risk reduction in Australia's public infrastructure and associated community services.

We initially assess existing vulnerability indices, with a particular emphasis on their applicability at the regional level. The assessment also considers the unique characteristics of the Australian context, typified by low population densities and extensive geographical distances. We further review socioeconomic, technical, and environmental indicators to explore the suitability and data availability for the selected case study area. We conduct an econometric analysis to understand potential variations in resilience across Bega Shire by also exploring the effects of past hazard events (e.g. floods, bushfires) on the economic development and livelihoods of the local communities.

We adopt a hypothetical resilience investment case focusing on the road network and the associated services that rely on it in the Bega Valley Shire. The selection of the transportation sector and its related assets and infrastructure is based on the significant economic burden the Council faces in maintaining the road network effectively. Indicatively, nearly 50 per cent of the annual budget has been devoted to road maintenance over the last decade due to a series of hazards that have had a major impact on the network. The study findings provide some refined approaches to quantifying resilience infrastructure impact and actionable insights to enhance resilience in the case study area and other regions challenged with hazard impacts in Australia.

Parallel 1C - Practice Change & Adoption 1

Location Chancellor 1, LVL0

Time: 10:30 - 12:10

Chair: Rick Llewellyn

How Do Non-Farmer Stakeholders Perceive Agricultural Technology Adoption Behaviors of Farmers? A PLS-SEM Analysis.

Anta Atalantia[1,2], Nazrul Islam[1,3], Mohammed Quaddus[4], Mostafizur Rahman[1], Rifah Nanjiba[1], Fazlul Rabbanee[4], Elizabeth Jackson[4]

[1]North South University, Dhaka, Bangladesh. [2]University of Glasgow, Glasgow, United Kingdom. [3]The University of Western Australia, Perth, Australia. [4]Cartin University, Perth, Australia

Abstract

The issue of technology adoption and diffusion is widely researched in the context of farmers' technological adoption behavior, but there is a gap in the study of understanding stakeholders' views about farmers' technology adoption behaviors in Bangladesh. This paper presents Partial Least Squares Structural Equation Modeling (PLS-SEM) to find out the significant factors affecting the agricultural technology adoption behaviors of farmers from non-farmer stakeholders' points of view. A conceptual model based on a systematic literature review (SLR) was identified through a series of in-depth expert interviews and focus group discussions. The SLR-based framework identifies four adoption drivers: technological, organizational, environmental, and individual factors. Each of these factors is further subdivided into three or four constructs for greater specificity following the TOEI (technological, organizational, environmental, and individual factors) theory. Required Likert scale data base was collected through conducting a qualitative survey among the non-farmer stakeholders (output seller, input seller, agents, researchers, retailers) in five major zones (Central, North-West, North-East, South-East, and South-West) of Bangladesh. Then, adopting the PLS-SEM approach for adoption modeling, a thorough quantitative analysis is conducted to identify statistically significant adoption factors. In determining the significant factors for the adoption behaviors of farmers we have conducted a PLS-SEM analysis by examining Outer loadings, Outer Weighs, Path Coefficient, Average Variance Extraction (AVE). Along with the other construct and factors, the model is further explained by mediating (farmers' talents, attitudes, trust, and technology use skills) and moderating (market circumstances, technological experience, government assistance, production efficiency, and weather and climate act) factors. The study findings show that there are 7 technological, 8 organizational, 15 individual, and 8 environmental factors that significantly affect the agricultural technological adoption behaviors of farmers according to stakeholders' views. Added to that mediation and moderation effects by PLS-SEM analysis shows the relationship between different constructs and output in this technological adoption model. Using an all-encompassing approach helps us better understand all the factors that influence Bangladesh's adoption

of agricultural technology. This study findings will contribute to the body of knowledge and offer recommendations for enhancing technology adoption initiatives by the policy makers and researchers, which will ultimately result in the support of sustainable agricultural growth in Bangladesh.

Why beneficial innovations can still take decades to become widely adopted: an empirical study of awareness and adoption rates

Brendan Brown, Masoud Azeem, Rick LLewellyn
CSIRO, Adelaide, Australia

Paper Abstract:

Due to the many diverse interacting factors, predicting and discussing adoption expectations can be difficult. Yet governments and organisations need to do this to best allocate scarce resources in the pursuit of more productive and sustainable agricultural systems. Because of this, most work in this area is based on undiscussed assumptions and lacks a transparent and collaborative approach, and may lead to a lack of data-driven decision making and unrealistic assumptions of rates of change.

Tools such as the Adoption and Diffusion Outcome Prediction Tool (ADOPT) have been developed to address these issues, but validation of ex-ante model predictions has been difficult due to a lack of longer-term panel data to use for validation. To address this, we analyse a large representative dataset that explores preparation, planting, irrigation, harvest and postharvest machinery adoption decisions across 10 districts of Bangladesh. From the 660 awareness and adoption curves generated, we identify 31 mature adoption curves to be used to compare to additionally generated ADOPT predictions relevant to individual district by machinery combinations (undertaken with the context of the initial years of adoption occurring).

ADOPT is accurate in predicting peak adoption (rho of 96%), but vastly overestimates the time taken to peak adoption, predictably by approximately double (rho = 65%). This highlights that diffusion processes that are already thought to be slowed to account for more complex knowledge and innovation environments in smallholder settings still overestimate expected speed of adoption. Even innovations that offer substantial productivity benefits, demonstrated by eventual high levels of adoption, appear to be only slowly adopted over several decades, with often long early lags being evident. Adjusting the start year of ADOPT predictions and slowing the speed of adoption by half creates a much closer match to the empirical data. The results point to the slow 'diffusion' of awareness of an innovations existence and availability, in some cases decades of initial adoption within a region. The results also highlight the risk of overlooking the time required for extensive innovation awareness for example, when impact evaluation studies base awareness assumptions too heavily on direct project participants rather than the broader population of potential adopters.

By analysing a wide range of awareness and adoption curves covering several decades we are also able to better parametrize adoption curves that tend to have an asymmetrical inflection point later in the curve, and a lengthier lag phase while awareness growth occurs. The ADOPT model was found to provide good prediction of peak adoption levels and shown to also predict rate of adoption if initial awareness rates could be better represented. Through the addition of more in-depth nonbinary analyses of awareness

and adoption processes, additional learnings about how adoption occurs can be garnered that offer improved predictive models, but also of the need to refine more generally expectations about the speed of adoption processes, even for highly beneficial innovations that we expect to be rapidly adopted.

Adoption of Multiple Agricultural Technologies Among Rice Farmers in Bangladesh

Mostafizur Rahman[1], Amin Mugera[2], Nazrul Islam[1,2]
[1]North South University, Dhaka, Bangladesh. [2]The University of Western Australi, Perth, Australia

Paper Abstract:

The adoption of modern agricultural technologies is crucial for enhancing productivity, ensuring food security, and promoting sustainable farming practices, particularly in countries like Bangladesh where rice is the staple crop. However, the adoption of these technologies, including improved seed varieties, fertilizers, and irrigation, remains low among smallholder farmers, primarily due to various socio-economic and institutional barriers. This study addresses the significant issue of technology adoption by examining the joint adoption of multiple agricultural technologies among rice farmers in Bangladesh. The existing literature largely focuses on the adoption of individual technologies, overlooking the potential benefits of adopting multiple complementary technologies simultaneously. This gap in understanding joint technology adoption represents a critical challenge to maximizing agricultural productivity and sustainability. To address this gap, our research employs the Random Utility Theory (RUT) and the Multivariate Probit Model (MVP) to analyze the decision-making processes of farmers in adopting multiple technologies concurrently. The dataset, collected via surveys from 426 households across 20 districts in Bangladesh, allows for a comprehensive analysis of the factors influencing joint technology adoption in five agro-ecological zones. The results indicate that farmers are more likely to adopt multiple technologies when they perceive synergistic benefits, and that factors such as agricultural training, access to extension services, and social networks significantly influence these decisions. Furthermore, the study highlights the importance of targeted interventions that consider the inter-connectedness of technologies and address specific barriers faced by different groups of farmers. This research provides valuable insights into the dynamics of joint technology adoption in agriculture, offering practical implications for policymakers and development practitioners. By understanding the factors that drive joint adoption, this study contributes to the development of more effective strategies to promote the widespread use of agricultural technologies, ultimately improving food security and promoting sustainable agricultural development in Bangladesh.

Understanding Push-Pull Technology Adoption and Dis-adoption in East Africa: Insights from Discrete Time Proportional Hazard Models and Machine Learning-based Survival Analysis

Denis Waiswa[1,2], Beatrice Muriithi[1], Alice Murage[3], Dave Mwangi Ireri[3,4], Fredah Maina[3], Fahri Yavuz[2]

[1]International Center of Insect Physiology and Ecology (icipe), Nairobi, Kenya. [2]Ataturk University, Erzurum, Turkey. [3]Kenya Agricultural and Livestock Research Organization (KALRO), Nairobi, Kenya. [4]Chuka University, Chuka, Kenya

Paper Abstract:

This study examines the adoption and dis-adoption dynamics of push-pull technology (PPT), a sustainable pest management approach targeting stemborer, fall armyworms, and striga weed. Using a panel dataset from two comprehensive household surveys conducted in 2021 and 2023 across Kenya, Uganda, Tanzania, Rwanda, and Ethiopia, we apply Discrete Time Proportional Hazard models to estimate the hazard functions for PPT adoption and dis-adoption. Additionally, we explore the potential of machine learning-based survival analysis, specifically Extreme Gradient Boosting (XGBoost), to improve prediction accuracy. These two approaches provide insights into the factors driving farmers' transitions into adoption and dis-adoption. Key findings from both approaches reveal that farmers' perception of the effectiveness of PPT on striga, stemborers, and fall army worm, social interaction variables, information sources, and country-specific variables significantly influence adoption and dis-adoption decisions, while household characteristics generally have a lesser impact. For instance, gender and credit constraints delay adoption, while household size delays dis-adoption in Rwanda, underscoring the importance of financial sources and labor availability. Off-farm income expedites adoption, while extension constraints delay adoption in Ethiopia, highlighting the critical role of effective extension services. Positive perceptions of PPT's effectiveness significantly expedite adoption and delay dis-adoption across all countries, emphasizing the role of subjective beliefs and attitudes. The extent of a farmer's social network with other PPT adopters, frequent contacts with extension, and group memberships are crucial for adoption and sustained use, validated by SHAP values and feature importance from the XGBoost algorithm. Moreover, diverse information sources expedite adoption, while participation in PPT training programs and the frequency of training sessions attended are also essential for the continued use of PPT. Significant spatial disparities exist, with Rwanda showing faster adoption and slower dis-adoption compared to Kenya, while Uganda and Tanzania show slower adoption and faster dis-adoption. These contextual differences underscore the need for tailored interventions to address specific challenges and leverage opportunities in each country. Enhancing farmers' perceptions of PPT efficacy through targeted education, demonstrations, and evidence-based communication strategies, along with promoting supportive social networks, fostering peer learning networks, and strengthening extension services, can overcome barriers to adoption and ensure sustained use of PPT throughout East Africa.

Adaptive Strategies in Action: Adoption of Climate-Smart Agriculture as a Response to Extreme Weather and Climate Change in Ethiopia

Tadiwos Z. TIRUNEH, Alexandra Peralta, Emiliano A. Carlevaro, Adam Loch
University of Adelaide, Adelaide, Australia

Paper Abstract:

The increasing frequency and severity of extreme weather events present significant challenges to agricultural systems worldwide, jeopardizing food security and rural livelihoods. Climate-Smart Agriculture (CSA) offers a vital solution to mitigate these impacts, enhancing resilience and sustainability through adoption of multiple CSA practices from crop and livestock sector.

While the importance of CSA is well-established, it is crucial to understand how extreme weather events and long-term climate change influence its adoption. This paper examines the extent to which these climatic factors drive the adoption of multiple CSA practices in Ethiopia, providing insights into how farmers adapt their strategies in response to both short-term weather shocks and long-term climate change.

Utilizing a panel dataset from rural Ethiopian households for the years 2018/19 and 2021/22, and historical village-level climate data, namely precipitation and temperature, we estimate panel data econometric models, namely fractional response pooled regression and difference-in-difference, to explore the impacts of weather variability in adoption of CSA practices. Moreover, we consider CSA as a portfolio of practices to be adopted according to their suitability to different farming systems. Finally, we conduct heterogeneity analysis to estimate the effects of extreme weather on CSA adoption for different farming systems in Ethiopia.

This research highlights the need to understand behavioural responses to the cumulative effects of climate change, in contrast with the immediate reactive effects of short-term extreme weather events. This analysis is critical for the development of targeted policy and development initiatives to support both immediate and strategic long-term adaptation measures.

Developing and delivering a tool to predict innovation adoption rates: lessons from ADOPT

Rick Llewellyn[1], Shreya Nidumolu[1], Brendan Brown[1], David Pannell[2]
[1]CSIRO, Urrbrae, Australia. [2]University of Western Australia, Crawley, Australia

Paper Abstract:

Estimating and understanding the likely adoption of new technology and practices is an important step in research, development, extension and policy. When ADOPT (Adoption and Diffusion Outcome Prediction Tool) was in development over a decade ago it was recognised that there was no existing user-friendly tool that applied established socio-economic principles to forecasting and evaluating likely adoption of agricultural innovations. It remains the only tool of its type and has been further adapted to meet demand for use in smallholder international scenarios and more recently non-farmer applications in online formats. By integrating well-established adoption factors based on characteristics of both the innovation and the target population, ADOPT has met increasing demand as a workshop tool for informing and engaging users as well as its predictive capability. The number of registered users since 2018 has reached over 1200, including many large organisational users. The number of scenarios modelled has doubled every 2 years since the online format was offered in late 2017. Approximately 60% of users are from Australia-New Zealand with other major user regions being North America (12%), Europe (11%) and Asia (10%). Research organisations, governments, research and development investment organisations,

consultancy firms and commercial businesses including start-up companies form the largest proportion of users.

Increasing use and demand has come from 'professional applications' such as those engaged in ex ante quantification of likely impacts of R&D investment, identification of long-term adoption likelihood or potential for agri-environmental practices, and evaluating commercial opportunities. This includes efforts to identify the longer-term trajectory of adoption impact, which due to the typically long time frames of agricultural and environmental innovation diffusion processes extend well-beyond the typical life of projects and initiatives. Of particular interest has been increasing demand for use beyond the initial intended focus on farmer adoption. Examples include use to better understand adoption of nature-based solutions among landholders other than primary producers, adoption across land manager organisations, and in some cases as a tool to inform commercial technology demand by non-agricultural multi-national corporations. ADOPT has not been validated across non-agricultural uses, but the demand most likely reflects the unique applicability and integration of the widely applicable principles of relative advantage, learning and population characteristics.

The smallholder version now comprises approximately 20% of uses. As more long-term validation data becomes available from diverse adoption settings, opportunities to identify key differences in smallholder environments and further model adaptations have arisen. This includes increasing evidence of the importance of relatively slow increases in innovation awareness and availability particularly affecting predictions of time to peak adoption.

As well as being used to generate forecasts, the structure and usability has seen continued demand as a workshop tool for promoting participative engagement in practice change policy and planning initiatives. Beyond direct use of the model, citations for the ADOPT framework and model descriptive paper (a Highly Cited Web of Science article) provide further evidence of demand for efforts to make socio-economic principles available in formats with high usability for multi-disciplinary application.

Parallel 1D - Agribusiness & Food Systems

Location Chancellor 2, LVL 0

Time: 10:30 - 12:10

Chair: Robin Roberts

Health Food Innovation: Incentives, Challenges and Opportunities

Stavroula Malla[1], Richard Gray[2]
[1]University of Lethbridge,, Lethbridge, Canada. [2]University of Saskatchewan, Saskatoon, Canada

Paper Abstract:

Despite the abundance of food, an expanding pool of nutritional knowledge, and access to many tools to develop health foods (functional foods), diet related disease remains one of the most important issues for policy makers worldwide. Functional foods are defined as foods that provide additional health benefits beyond basic nutritional requirements (Hobbs et al., 2021). According to WHO (2023), 80% of deaths globally were attributed to chronic disease or non-communicable diseases (NCD), such as cardiovascular diseases (44% of all NCD deaths), cancer (23%), diabetes (10%) and chronic respiratory illnesses (4%). Further, more than 2.1 billion people, or roughly 30% of the global population were overweight/obese, while the global total economic impact of overweight/obesity was roughly $2 trillion a year, or 2.8% of the global GDP. If the current trend continues, almost half of the world's adult population will be overweight/obese by 2030 (WHO, 2021)

Globally, poor quality diets are resulting in trillions of dollars in health care costs and lost productivity. The widespread market and government failure to address this apparent and burdensome problem speaks to its importance. The goal of this study is to better understand the economics of health food innovation. The study shows that the existence of several factors contributing to market failures associated with health food innovation denotes the necessity of examining dietary issues considering the interaction of multiple externalities impacting the health food industry.

To explore these effects, the study develops and employs a theoretical model of a monopolistically competitive industry investing in the development and sale of health food products around a Salop circle in the presence of research spillovers, regulatory costs, incomplete information, and health-care cost externalities. The analysis accounts for the consumption and production inefficiencies in health food markets

By developing a common model to address externalities, it is illustrated the limitations of the market place to incentivize health food innovation and the social imperative of doing so.

The existence of any externalities creates a prima fascia rationale for government policy interventions. Arguably, the coexistence and interaction of externalities need to be understood and incorporated into policy design

It is shown that while each externality can impede the development and use of healthy food and social welfare, the combined effect is significantly larger. Policy implications are discussed, and a number of policy recommendations are made that could contribute to the health food section growth, health care cost reduction, and enhancement of social welfare and individuals' wellbeing.

The integrated framework outlined in this study should assist in understanding the opportunities and constraints for health food innovation, and the value of public policies to stimulate innovation in this sector.

Revealing food system connections and dynamics: A network analysis approach

Pradeepa Korale-Gedara[1], Damian Hine[1], Leonardo Ferreira[2], Jeremy Farr[3], Bruno De Almeida Moreira[1], Yuba Subedi[3], Selina Fyfe[1], Rohan Nelson[3]
[1]The University of Queensland, Brisbane, Australia. [2]Samsung Research Brazil, Campinas, Brazil. [3]Commonwealth Scientific and Industrial Research Organization, Brisbane, Australia

Paper Abstract:

Over 100 countries have committed to developing national food system strategies to enhance the sustainability of their food systems, aligning with the Sustainable Development Goals (SDGs). The success of these strategies depends on a comprehensive understanding of how socio-economic, demographic, and ecological changes influence the food system, as well as how the food system, in turn, impacts the society and the environment. In this study, we investigate the feasibility of using network analysis as an innovative technique to explore these connections and identify influential drivers, with Australia serving as a case study. Australia was selected as an exemplar case due to its relatively complex yet stable food system. Utilizing longitudinal data from 1992 to 2021, we constructed a network model of the Australian food system using the Ts2net package. This model assesses how changes in food system elements have historically propagated across the network. The analysis examined stronger and weaker connections within the system and calculated the network measures such as density, transitivity, and centrality. The study also examined the clustering, robustness, and self-evolution characteristics of the food system, along with the impact of missing variables on the findings. The study provides evidence supporting well-established links between food system operations and economic and environmental outcomes. Findings also reveal that elements with weaker but more numerous connections may play a more pivotal role in the food system than those with stronger but fewer connections. Furthermore, this approach could improve our understanding of the dynamic nature of food systems, where connections and the influence of elements evolve. Network analysis also demonstrates the capability to assess the presence of subsystems within the complex system and the interactions among them. However, network analysis, which relies on correlations, should be considered more as an exploratory hypothesis-generating tool than a hypothesis-testing tool. Despite the technique's potential to reveal connections within the food system, its application is constrained by the availability of existing metrics and data. To address this, the study

proposes the development of a refined set of metrics that would enable a deeper understanding of the food system's connections, major drivers, and trajectories.

Engaging private sector partners in scaling up from demonstration level agrifood value chains: a case study from Pakistan

Rajendra Adhikari[1], Ali Iqbal[2], Burhan Ahmed[3], Mubashir Mehdi[4], sumaira Riaz[2], Tim Sun[1], Ray Collins[1]
[1]The University of Queensland, Gatton, Australia. [2]Concave Agriculture, Islamabad, Pakistan. [3]University of Agriculture, Faisalabad, Pakistan. [4]MNS University, Multan, Pakistan

Paper Abstract:

Scaling up from demonstration level value chain (VC) interventions so as to achieve wider impact is a primary objective of development projects that adopt a VC approach to agrifood industry development. At demonstration level it is common for projects to promote best VC practices and collaborative governance models to smallholder farmers and downstream agribusinesses by involving them in participatory learning and hands-on demonstrations of proof of concept. Successful demonstration VCs aim to apply experiential learning in fully commercial settings, but replicating success at wider scale raises new challenges. For smallholder farmers, peer-to-peer effects are considered the most important scaling out pathway, but for downstream private sector partners in VCs, the benefits remain limited to very few, and peer-to-peer models have limited relevance. For private sector participants involved in successful demonstration VCs, there is no incentive to share success stories with competitors, which would mean forfeiting first-mover advantage – commercial reality that acts as a barrier to achieving success at scale. Private sector businesses committed to demonstration scale partnerships could also be constrained to give access to other forward-thinking groups of farmers or to collaborate on new market opportunities if their market share does not rise accordingly. Transitioning VC leadership from farmers to downstream chain champions, or vice versa, is a possible approach, but there remains a significant knowledge gap in scaling up from farmer-based demonstration VCs to whole-of-chain initiatives at scale. This case study, based on learnings from an ACIAR funded project on pulses VCs in Pakistan, tells the story of agri-entrepreneurs' scaling up, who participated in demonstration value chains to improve chain performance through greater value to consumers and chain partners.

The effect of grape variety concentration and climate variability on grape prices: Evidence from Australian wine regions

Oanh Nguyen, James Fogarty, Michael Burton, Amin Mugera, German Puga
The University of Western Australia, Perth, Australia

Paper Abstract:

Old-World wine regions, such as those in Europe, benefit from legal protections for grape variety-location combinations through systems like the European Union's Protected Designation of Origin (PDO), which upholds traditional practices and regional characteristics, also known as "terroir", but can restrict innovation. In contrast to the old-world, the Australian wine industry operates within a flexible and dynamic regulatory system. This regulatory difference has led to an ongoing debate about the relative advantages and disadvantages of variety specialisation versus diversification. While the influence of climatic conditions on grape prices is well-established, the role of grape variety specialisation within a region on prices, in the context of a changing climate remains less explored. The objective of this study is to investigate how grape variety concentration within a region impacts prices and to explore whether regions with more diversified or specialised grape varieties are better positioned to adapt to climate change. Data from Wine Australia's Vintage Surveys and the Bureau of Meteorology for the period 2015-2024, covering 62 regions across 23 wine zones, are used in the analysis, and the data accounts for over 90 percent of the national annual wine grape crush. Panel data regression models are used to estimate the relationship between grape prices and grape variety concentration, and the models incorporate climate variables such as temperature and rainfall during the growing season. Results indicate that higher grape variety concentration in a region is generally associated with increased grape prices, though this effect is not uniform across all regions. It is also found that climate variability exacerbates price fluctuations, which highlights the complex interplay between variety concentration within a region and climatic conditions. Other factors, such as market orientation, sector inventory levels, export volume, and wine region size may also mediate the relationship between grape variety concentration, climate change, and grape prices. These insights have implications for both wine producers and policymakers, offering guidance on how to adapt to climate challenges and enhance resilience of the wine industry.

Food price inflation and local price formation

Tomoaki Murakami, Nobuhiro Ito, Yusuke Fushiki
Policy research institute, Tokyo, Japan

Paper Abstract:

In recent years, global events such as the COVID-19 pandemic and Russia's invasion of Ukraine have significantly disrupted international food supply chains, leading to a surge in food prices worldwide. Especially in Japan, a country largely depending on food-importing, has been particularly susceptible to these global price fluctuations, resulting in noticeable increases in domestic food prices.

However, the degree to which rising raw material costs translate into higher consumer prices depends largely on retail pricing strategies, which are shaped by competitive dynamics among retailers. This is particularly concerning in rural areas, where additional transportation costs from import place may further inflate food prices. Combined with the spatial oligopoly often present in remote regions, this dynamic may exacerbate price increases beyond those observed in urban centers, potentially harming economic welfare.

Despite the pressing nature of this issue, comprehensive empirical studies on price competition and price transmission in this context remain scarce. Therefore, this study aims to contribute to the literature by classifying a time-series typology of price change patterns for wheat flour and edible oils, both of which experienced significant price increases during the period under review. Utilizing point-of-sale (POS) data

from approximately 80 supermarkets across seven prefectures in western Japan, this analysis spans a two-year period from July 2021 to June 2023. The study not only examines average price swings but also explores variations in discount rates between regular prices and promotional sales prices.

The key findings of the analysis are as follows: First, the average purchase price of wheat flour was consistently lower in more urbanized retail outlets, while the opposite trend was observed for edible oils, where prices were higher in urban stores. A time-series clustering analysis of wheat flour's regular selling prices revealed that approximately 30% of outlets maintained stable prices, despite a general 30% increase in official retail price statistics for the same period. In contrast, for edible oils, all clusters showed significant price shifts, with some outlets reducing prices substantially during the summer of 2022. This reduction was primarily driven by a decrease in the availability of larger, discounted products, with around 25% of shops reducing the frequency of special offers at the onset of the price hike.

In the case of wheat flour, about 40% of the outlets were classified into clusters that significantly reduced discounts during promotional sales, with many of these outlets located in highly urbanized areas. Conversely, in the edible oils clusters, representing 60% of outlets, the price gap between regular and promotional prices had largely disappeared by the latter half of 2022, suggesting that price shifts were largely implemented by narrowing the range of discount prices rather than adjusting regular prices.

The clustering patterns of price changes often involved geographically proximate outlets falling into the same cluster, indicating that strategic pricing behavior among neighboring retailers may play a significant role in price formation.

Strengthening small-scale exports through agritourism: An experimental auction study

Robin E Roberts[1], Alec Zuo[2], Di Zeng[3]
[1]Griffith University, South Bank, Australia. [2]Flinders University, Adelaide, Australia. [3]The University of Adelaide, Adelaide, Australia

Paper Abstract:

Agritourism has been found to support rural economies as a diversification strategy for agribusinesses (Ammirato et al., 2020; Adom et al., 2021). For small-scale premium food exporters, an agritourism experience on site may offer consumers invaluable first-hand experiences relating to cultivation of the product, manufacturing and processing practices, understanding health benefits, and environmental friendliness. Studying this opportunity for exporting premium foods from Australia to the lucrative market of China is worthy of investigation.

This study explored consumer's willingness to pay (WTP) for Australian premium foods. An experiment simulating an agritourism experience was undertaken. A contingent valuation method using a fourth price auction using video presentation with tasting as the technique to elicit the WTP attitudes was employed. The experimental auction was implemented with 120 Chinese consumers where two rounds of auctions before and after video watching and tasting was studied.

To further reveal respondents' willingness to pay for coffee products, Gaussian kernel density estimate curves were plotted with auction price ranges before and after the tasting. In both cases (before and after video viewing), tasting increased WTP for respective products. In three of the six sessions, the clearing auction price was higher for both blends in the aftertaste round than in the before tasting round. The average clearing auction price is also higher in the aftertaste round than in the before-taste round, by approximately 2%. The results speak to the importance of video-generated virtual agritourism experiences and actual tasting.

Several important findings further emerge through backstage regression analyses. The level of importance that consumers place on sustainable production methods, coffee extraction methods, and aroma is significantly positively correlated with WTP in the before tasting round. Additionally, better evaluation of coffee aroma and bitterness can increase WTP in the after tasting round. Last, taste evaluations of coffee richness, sourness and aftertaste do not seem to affect WTP in the after tasting round.

Overall, the findings can be summarised as follows. First, Chinese consumers are familiar with agritourism and are interested in agritourism in Australia. Second, the experiment simulating an agritourism experience suggests they can effectively increase Chinese consumers' WTP for the tested agricultural product. Third, video presentation and tasting overall, increased the auction clearing price by a small margin. Notably, favourable evaluations of aroma and bitterness contributed to increased auction prices. Finally, further research needs to assess the effectiveness of agritourism participation by international visitors on brand awareness, export volume, and repurchasing in overseas markets.

Parallel 1E - Carbon & Nature Markets

Location Chancellor 5, LVL 0

Time: 10:30 - 12:10

Chair: Bernardo Cantone

Exploring the Payoff Structure of REDD+ Call Options: A Tropical Country Perspective

Hyunsung Cho, Yohan Lee
Seoul National University, Seoul, Republic of Korea

Keywords: 7. Carbon and Nature Markets; 8. Climate Change

Paper Abstract:

Carbon market risks discourage private investment in REDD+ and reduce incentives for forest conservation in tropical countries. Call options for REDD+ can help mitigate uncertainties and future price risks, thereby boosting private investment and improving cash flows in these countries. While the call option has been seen as a win-win mechanism for both corporations and tropical countries, we question whether it truly benefits tropical nations. We analyze the payoffs of REDD+ call option contracts from the perspective of tropical countries. Using the Black-Scholes model, we identify strike prices that compensate for the cost of REDD+ under various scenarios. We then estimate payoff diagrams for both corporations and tropical countries, based on price forecasts from geometric Brownian motion simulations. Our analysis reveals an inverted V-shaped payoff diagram for tropical countries, indicating that they benefit only when the market remains stable. Given the high volatility of the REDD+ market, we argue that the REDD+ call option is an unfair contract for tropical countries, though it represents a rational investment strategy for corporations. Additionally, we show that complementary measures, such as option strategies, are necessary for REDD+ call options to offer a viable solution for tropical countries. In conclusion, we highlight the importance of validating innovative financial tools for forest conservation and ensuring they align with the interests of developing nations.

Stuck In the Middle with You: The Impact of Intermediaries In Carbon Offset Markets

Ian MacKenzie, Lana Friesen, Peiyao Shen
UQ, Brisbane, Australia

Keywords: 7. Carbon and Nature Markets

Paper Abstract:

This article investigates the impact of market intermediaries in credit-based environmental markets, such as carbon credit markets. We develop a model in which firms can participate in the markets either directly or via an intermediary. We focus on a market with uncertain demand and evaluate two common form of contracts between individuals and the intermediary: a fixed price contract and a share contract, which provides each firm with a share of the equilibrium price. The introduction of the intermediary, under either contract type, is shown to increase the overall supply of offsets and to increase total social welfare. We test these predictions in a laboratory experiment. The results are largely consistent with the theory and confirm that aggregation can significantly increase both the total market supply of carbon offsets and aggregate social welfare. The gains arise as the aggregator contracts encourage low-cost suppliers to enter the market but at the expense of the singleton suppliers. Fixed contracts are somewhat more effective at increasing supply than share contracts. The results hold over a range of parameter values that reflect varying demand and supply conditions.

Towards Sustainable Agriculture: Implementing a Market for Payments for Environmental Services in Agri-Food Systems

Serge Garcia[1], Arnaud Dragicevic[2,3], Jean-Christophe Pereau[4]
[1]INRAE, Nancy, France. [2]Chulalongkorn University, Bangkok, Thailand. [3]CIRANO, Montreal, Canada. [4]Bordeaux School of Economics, Bordeaux, France

Paper Abstract:

This study evaluates the impact of a Payments for Environmental Services (PES) market on the sustainability of an agri-food supply chain. It employs a variational inequality approach within a multi-criteria decision-making framework. The theoretical findings are validated through numerical simulations using a neural network-based machine learning algorithm. They conclusively demonstrate the potential to not only achieve but also surpass objectives related to carbon and biodiversity neutrality targets. This study underscores the effectiveness of combining market valorisation of environmental services with government subsidies for ecological transitions as a powerful strategy to significantly reduce the global ecological footprint. It also demonstrates the absence of crowding-out effects between public and private agents. It shows that actors within the supply chain are inclined to intensify their offsets towards achieving environmental neutrality if they are initially compensated for their efforts to mitigate their environmental impacts.

Analyzing Pioneering Carbon Farming Schemes: Insights from Australia and Kenya

Regina Birner[1], Vida Mantey[1], Esther Ogbole[1], Jock R. Anderson[2,3]
[1]University of Hohenheim, Stuttgart, Germany. [2]UNE, Armidale, Australia. [3]Rutgers University, New Brunswick, USA

Paper Abstract:

Carbon farming schemes can play an important role in meeting the challenges of transition to a sustainable future as they aim (i) to reduce emissions from agricultural activities and (ii) promote agricultural activities that increase carbon sequestration.

The paper analyzes the institutional arrangements of carbon farming schemes in two countries that have played a pioneering role in promoting carbon farming: Australia and Kenya. By introducing the Carbon Farming Initiative in 2011, Australia was among the first of industrialized countries to enable the creation of carbon credits from agricultural activities. Among developing countries, Kenya has been an earlier leader in linking smallholder farmers to voluntary carbon markets by establishing the Kenya Agricultural Carbon Project in 2009.

An inductive research approach is applied in the paper to analyze the institutional arrangements of carbon farming schemes in these two countries. In the first step, empirical information on the institutional arrangements and the governance challenges of carbon farming schemes in each country was collected. In the second step, concepts of the New Institutional Economics (NIE), were applied to analyze the underlying reasons for the governance challenges observed and to identify possible solutions.

In Australia, where an extensive empirical literature on carbon farming exists, information on institutional arrangements and governance challenges was identified through a literature review. In Kenya, the paper draws on the literature and on empirical data collected in three carbon farming schemes: (1) the mentioned KAPC; (2) the "Livelihood Mt. Elgon Project"; and (3) the "Northern Kenya Rangelands Carbon Project". As major empirical data collection method, the participatory mapping tool Net-Map was applied in focus group discussions and expert interviews.

The empirical information gathered for Australia and Kenya shows that the institutional structure of carbon farming schemes is rather complex and governance challenges, such as high transaction costs and concerns about a fair sharing of costs and benefits are common. Applying the NIE concepts, the analysis showed that it is useful to conceptualize the institutional structure of carbon farming schemes as comprising two components: (a) the institutional structure required to promote the agricultural practices that reduce emissions and/or increase carbon sequestration, which typically involves the provision of agricultural advisory services; and (b) the institutional structure required to create carbon credits, which involves monitoring, reporting and verification (MRV) activities as well as the marketing of carbon credits.

The analysis led to the following insights: (1) information asymmetry is one of the major challenges in carbon farming projects; (2) consequently, the creation of carbon credits involves considerable transaction costs, especially for MRV activities, which can significantly reduce the financial incentives; and (3) digital tools have an untapped potential to reduce transaction costs. The empirical findings also reveal that the types of institutional challenges involved in SACPs are largely influenced by the type of agricultural practices that differ in important characteristics that matter for institutional design, such as observability and need for collective action. Based on the theoretical and empirical analysis, the paper draws conclusions for the institutional design of carbon farming schemes.

Increasing biodiversity on farms: are current tax arrangements nature positive compatible?

Sally Harvey[1], Cordelia Buntsma[1], Joanne Chong[2], Phil Heaphy[1]
[1]Productivity Commission, Melbourne, Australia. [2]Productivity Commission, Adelaide, Australia

Paper Abstract:

Achieving the Australian Government's commitment to protect and conserve 30% of Australia's landmass by 2030 will require areas of private freehold land to enter formal protection arrangements. In particular, ensuring a comprehensive, adequate and representative national reserve in currently under-represented bioregions will require greater participation from farmers. Over the past decade there have been increasing opportunities for farmers to earn income from land dedicated to protecting nature, however, income tax arrangements have remained largely unchanged. With a national nature repair market under development and a global shift to accounting for the impacts of value chains on nature, it is timely to review Australia's tax arrangements with respect to the incentives they provide for conserving land for nature and biodiversity. This paper reviews tax arrangements at the Commonwealth, State and Local Government levels and considers the effect they might be having on farmers' decision-making.

Employment implications of the Australian carbon market

Bernardo Cantone[1], David Evans[2], Andrew Reeson[3], David Fleming[4]
[1]CSIRO, Cairns, Australia. [2]CSIRO, Brisbane, Australia. [3]CSIRO, Canberra, Australia. [4]LaTrobe, Melbourne, Australia

Paper Abstract:

The Emission Reduction Fund (ERF) is an Australian government program designed to encourage entities to reduce or sequester carbon emissions while allowing business as usual. However, little evaluation has been conducted regarding the efficiency of outcomes and co-benefits or the social costs generated by these carbon mitigation projects. As the demand for carbon offsets grows globally, evaluating and addressing the social implications of public schemes such as the ERF is vital for fostering trust and motivating future actions. This study represents the first empirical analysis of the impact of the ERF on local employment in regional Australia, using statistical analysis of publicly available data. The results show that agricultural-related employment decline is associated with the total volume of registered carbon projects in regions. Although carbon farming provides potential social co-benefits, such as alternative income streams for farmers, it can also curb employment in traditional agricultural practices. Our findings indicate that regions with a large volume of ACCUs experienced a significant contraction in agriculture, fishing, and forestry, as well as in beef, sheep, and grain cattle farming. Evidence also suggests that other local industries are also negatively impacted by the total volume of ACCUs in these regions, suggesting a ripple effect throughout the local community.

Parallel 1F - Value Chain, Analysis & Marketing

Location Chancellor 6, LVL 0

Time: 10:30 - 12:10

Chair: Jack Dorries

Understanding export supply chain efficiency through consumers' lens: A study of Asian consumers

Sabrina Haque, Delwar Akbar, Susan Kinnear, Azad Rahman
Central Queensland University, Rockhampton, Australia

Paper Abstract:

The complexities associated with exporting perishable horticultural products contribute to inefficiencies in export supply chains (ESC). In the Australian-Asian context, high procurement costs, distance, transportation and quarantine time, and lack of collaboration between suppliers and importers can contribute to an inefficient ESC. In addition, Australian producers, industry and exporters may not have an adequate understanding of Asian consumers' needs, or their satisfaction levels for Australian fruits. This study explored the perceptions of Asian consumers about the efficiency of Australian mango and avocado export supply chains.

Following a comprehensive literature review to identify the variables related directly or indirectly to consumer satisfaction, a conceptual model has been proposed. The identified variables were grouped under five different constructs such as ESC efficiency, responsiveness of the SC, time efficiency of the SC, perceived product quality and price (PPQP) and consumer satisfaction. The model was then validated using data collected from 1,226 respondents across Hong Kong, Singapore, Malaysia, and South Korea. To pinpoint motivating factors, a Principal Component Analysis (PCA) was performed in SPSS 29, followed by Structural equation modelling (SEM) using SPSS Amos 29 to examine the interrelationships between the model's indicators. The model fit indices were subsequently assessed. The results indicated that ESC efficiency (ESCE) is influenced by responsiveness and consumers' perceptions of product quality and pricing (PPQP); whereas this was not the case for time efficiency. Rather, responsiveness and product quality and price had the most significant impact on ESC efficiency. Next, mediation analysis was performed through the bootstrap technique using 10,000 bootstrap samples, with 95% confidence intervals. Time efficiency had a significant, positive indirect effect on ESCE whereas the direct effect of time efficiency was not significant. This may reflect poor awareness of time efficiencies by consumers, despite its strong relationship with export supply chain efficiency. The moderation analysis also assessed whether age, gender, and income influenced the hypothesized relationships in the SEM. While gender showed no significant impact, certain age (35-45, 45+) and income groups (USD 81,395 and above) moderated some of the hypothesized relationships determined in this study. Therefore, Australian exporters should prioritize improvements in ESC efficiency to maintain competitive pricing and quality.

Although consumers may not directly recognize time efficiency, this indirectly influences their perceptions of product quality and pricing. Overall, this research enhances our understanding of Asian consumer perceptions of Australian horticultural produce and ESC performance, which is useful for a range of stakeholders such as researchers, industry bodies, growers, distributors, processors, exporters, retailers, and policymakers in developing efficient export supply chains for Australian perishable horticultural products.

Effects of Participatory Value Chain Methods on Value Chain Development: A Case Study of Pulses in Pakistan

Burhan Ahmad[1], M. Amjed Iqbal[1], Mubashir Mehdi[2], Haseeb Raza[3], M. Tayab Tahir[1], Rajendra Adhikari[4]
[1]University of Agriculture, Faisalabad, Faisalabad, Pakistan. [2]MNS University of Agriculture Multan, Faisalabad, Pakistan. [3]MNS University of Agriculture Multan, Multan, Pakistan. [4]University of Queensland, Queensland, Australia

Paper Abstract:

Consumers are the main driver of value chains as they determine the quality parameter and value while farmers are the main source of the supply and creator of value. However, both of these critical actors of the value chains are not directly connected in the exchanges of agricultural commodities. One of the main reasons is farmers usually do not involve in value adding activities that they would perform more efficiently and effectively compared to the local dealers or other intermediaries who perform these roles for farmers. Gaps in the flow of information from markets and lack of capacity and confidence among farmers to deal with market actors can be attributed to the weak level of connectivity between farmers and consumers. A case study, conducted as a part of an international research for development project, funded by Australian Center for International Research (ACIAR), Australia demonstrates that participatory value chain methods such as walking the chain, workshop, farmer field training can be instrumental to instigate behavioral changes among farmers, including basic value additions in their primary produce. Furthermore, findings suggest their enhanced capacity and knowledge of market requirements and expectations would prepare themselves for partnerships with market actors such as processors, wholesalers and retailers. Such partnerships not only benefit farmers through enhanced profit and investment in technology but also create value to consumers, creating win-win benefits for the two critical actors of the value chains. However, magnitude of profitability depends on the level of quality, for instance, in case higher damages and low number of large and uniform sized grains and higher moisture reduce the profitability.

Mapping the value chain of honey for sustainable and inclusive development: Findings from Assam, India

Dwiti Baruah Thapa, Kishor Goswami
Indian Institute of Technology Kharagpur, West Bengal, India

Paper Abstract:

The rural non-farm sector is one of the most crucial sectors for poverty reduction in developing economies, offering opportunities for employment and income generation. Beekeeping, or apiculture, is a significant micro-enterprise supporting livelihoods in many countries, including India. This sector has gained popularity, especially in developing countries, contributing to economic growth. Honey, the principal product in focus, is a high-value agricultural product requiring special handling and processing. Beyond honey, various value-added products such as beeswax, pollen, bee venom, and propolis can be obtained through beekeeping. When properly processed, these products not only contribute to higher prices and substantial earnings for producers, but also leads to rural development. Establishing links between farmers and markets is crucial for boosting local demand and promoting economic activities like agro-processing. As per APEDA (2024), the North Eastern region of India is a major hub for natural honey production. However, the potential of this sector remains underutilized, especially for small producers who face challenges in upgrading their products and processes. Unorganized small producers often lack awareness of potential markets and customer specifications. In this context, the present study aims to explore changes in the sustainability of the honey value chain, focusing on smallholders and their participation in market-linking activities in Assam. This study explores changes in the honey value chain, focusing on smallholders in North East India, using cross-sectional data from 350 beekeepers in Assam's North Lakhimpur, Golaghat, and Goalpara districts. The study revealed that Apis cerana is the major bee species in Assam for honey production. On average, beekeepers owned five hives, producing about 2.10 kgs of honey per colony, and 42 kgs of honey annually. Employing Porter's value-chain approach, the study identifies five emerging channels in Assam's honey market, involving actors such as input suppliers, beekeepers, local markets, wholesalers, retailers, cooperatives, and consumers. The average wholesale rate at the farm gate was INR 350 (USD 4.21) per kg, while retail prices varied from INR 400 to 800 (USD 4.81 to 9.62) per kg. Beekeeping was predominantly practiced as a subsidiary source of income, with only a few beekeepers engaging in it commercially. However, there was a lack of grading, processing, sorting, labelling or certification at the producer's point in Assam, and small beekeepers had a minimal role. Results also reveal that 89 percent of beekeepers had awareness about certification and wanted FSSAI certification, whereas, the other 11 percent didn't want to, which speaks about the need of sustainability in this sector. Various challenges exist at different levels of production, extraction, and marketing. Stakeholders like governmental, non-governmental, and developmental organizations need to intervene to enhance collaboration and coordination among value-chain players like establishing Farmers' Producer Organizations (FPOs) to increase smallholders' participation in the value chain, and also to innovate, streamline operations, and adapt to market conditions to include smallholders in the honey value chain for sustainable and inclusive growth in the sector.

Why did not interventions for improving pulses value chain meet the expected outcomes? An evidence based on the repeated trials from Pakistani Punjab

Khuda Bakhsh[1], Muhammad Hassan Akhtar[2]
[1]Department of Economics, COMSATS University Islamabad, Vehari Campus, Vehari, Pakistan. [2]Department of Economics, COMSATS University Islamabad, Vehair, Pakistan

Paper Abstract:

Pulses in Pakistan are facing various challenges and the daunting challenges are linked to transitioning to a sustainable value chain. These challenges cause a decline in profitability of pulses compared to other competing crops thereby resulting in vulnerability of future sustainable production of pulses in the country. Identifying pathways towards ensuring food security and affordability through improving pulses value chain can benefits all value chain actors. This paper explores the challenges of transition to improving value chain in production of pulses. ACIAR-funded project interventions were implemented for improving value chain of mung beans and chickpeas in arid zone of Punjab where pulses are commonly grown. Interventions included selling the produce directly to the processor (factory) after mechanical cleaning and grading of pulses at the farms, experimenting the improved storage materials (anaji drum and hermetic bags) for preventing damage to the stored pulses, providing machine for cleaning and grading of pulses on cost sharing basis to the lead farmer and online sale of pulses. These interventions aimed at the lead farmers and we expected that the outcomes would reach the fellow farmers. Some interventions reinforce, redistribute or create new sources of success. Although storage experiment provided promising outcomes, the farmers did not adopt the improved materials for protecting the stored pulses except the lead farmer. Selling pulses through online platform was totally neglected by the farmers. Repeated consignments of cleaned and graded mung beans along with uncleaned mung beans were processed with and without the involvement of the farmers. However, the fellow farmers were not interested in selling mung beans directly to the processor. Demonstration of mechanical cleaning and grading of mung beans created interests among the participating farmers to use the machine in the future. Interventions namely mechanical cleaning and grading of mung beans produced the better results as the fellow farmers in the surrounding of the lead farmer started using the machine on the basis of the running cost only. Mechanisms driving non-adoption of the interventions include shallow understandings of the interventions, inadequate and or inequitable participation of value chain actors (especially farmers) in the design and implementation of the interventions, a retrofitting of interventions into existing practices and a lack of critical engagement with how the intervention success is defined. An important lesson learnt from the interventions is that instead of designing interventions to change the practices of value chain actors including farmers, learning process with the value chain actors especially farmers should be at the center place of designing and implementing interventions. This will lead to scaling of project interventions to a larger value chain actors.

A Design Approach Study on Blockchain-Enabled Provenance and Supply Chain Data Governance for Indigenous Foods and Botanicals

Mokaddes Ahmed Dipu[1,2], Warwick Powell[3,4], Yasmina Sultanbawa[5], Madonna Thomson[6], Dharini Sivakumar[5], Luke Williams[5], Charles Turner-Morris[4]

[1]School of Agriculture and Food Sustainability, The University of Queensland, Brisbane, Australia. [2]Department of Agricultural Economics and Social Sciences, Chattogram Veterinary and Animal Sciences University, Chittagong, Bangladesh. [3]School of Design, Creative Industries Faculty, Queensland University of Technology, Brisbane, Australia. [4]Smart Trade Networks, Brisbane, Australia. [5]Centre for Nutrition and Food Sciences, Queensland Alliance for Agriculture and Food Innovation, The University of Queensland,

Brisbane, Australia. [6]Bushtukka and Botanicals Indigenous Enterprise Cooperative Limited, Brisbane, Australia

Paper Abstract:

Capturing provenance value from native foods and botanicals is essential for economic, community, and ecological sustainability in Indigenous communities. Utilising blockchain technology to support validated provenance claims throughout supply chain processes could be an effective intervention towards achieving this goal. This study presents the preliminary findings of a blockchain-enabled traceability project to validate provenance claims across the supply chain of native foods and botanicals in Australia. It focuses on value-based growth, sustainability, and provenance within a collaborative governance framework aligned with Indigenous community practices. The study explores how technology design and application development have been shaped by cooperative governance. This approach enables ecosystem participants to share responsibility for system development, operations, and benefits. The paper introduces a comprehensive provenance claims model built upon the Resources, Events, and Agents (REA) framework, which serves as the foundation for tracking and validating supply chain processes. This model is exemplified through the development and deployment of a digital application designed to actively engage a user community, particularly Indigenous producers, processors, and stakeholders. The application provides a real-time platform for verifying provenance claims, ensuring transparency and traceability throughout the supply chain. Moreover, preliminary user feedback is discussed, offering insights into the app's functionality, usability, and areas for future improvement, with implications for enhancing provenance and supply chain governance on a larger scale.

A decision-support tool to facilitate engineered coconut wood product manufacturing decisions in Fiji

Jack Dorries[1], Tyron Venn[1], Robbie McGavin[2], Sefanaia Tawake[3]
[1]University of Queensland, St Lucia, Australia. [2]Queensland Department of Agriculture and Fisheries, Salisbury, Australia. [3]The Pacific Community, Suva, Fiji

Paper Abstract:

Coconuts are fundamental to the national identity of many Asia-Pacific countries whilst also providing direct income to eight million households throughout the region. Nevertheless, many of the region's coconut farms are characterised by low-productive senile palms over the age of 60. These palms represent large opportunity costs of foregone income and employment, food production and foreign exchange earnings.

Governments and international aid agencies have implemented various programs to encourage the replacement of senile palms; however, many of these have been ineffective at reducing their high population due to a lack of funding and long-term incentives, as well as poor infrastructure and logistics. An alternative approach to encourage the replacement of senile coconut palms is to generate private sector demand for the palms which minimises costs to taxpayers and international aid agencies, whilst also addressing shortcomings of previously trialled programs. The wood processing industry could

potentially generate large demand for senile palms, where the palms would be purchased by log processing facilities to provide supplementary feedstock for the manufacture of veneer and engineered wood products. The utilisation of senile palms in the manufacture of EWPs can also assist wood processing industries in meeting the growing global demand for low-embodied energy materials, whilst offsetting their reliance on traditional native forest sawlogs, which are becoming increasingly harder and more expensive to procure.

Of all the countries in the Asia-Pacific region, Fiji is perhaps most likely to benefit from the creation of a senile coconut palm value chain. Approximately 60% of the country's coconut palms are classified as senile, whilst Fijian wood processing mills are considerably under capacity due to difficulty securing existing log resources.

A coconut wood value chain will rely on the potential for utilisation of coconut logs to enhance the profitability of EWP manufacturers. Since private sector decision-making is driven by optimising returns on investment, a spatial operations research (OR) model was developed to support strategic and tactical decision-making decisions The results of this paper help to evaluate the potential for a coconut wood value chain to reduce widespread coconut senility as an alternative to largescale government-led intervention programs under a range of upfront capital budgets. Although the model is demonstrated in Fiji, the method and several model parameter levels are likely to be adaptable to other wood processing decision-making environments.

A preliminary model was presented at the 2024 AARES conference which maximised the gross margins of dry veneer manufacture under a range of pre-defined veneering locations and log processing scales by optimising a mill's log procurement. The model has been considerably improved to now maximise net present value by optimising log procurement, facility location, the purchase of processing equipment, log processing scale, and final product selection.

Egg-Timer Presentations Parallel 1

Location Chancellor 3/4, LVL 0

Time: 10:30 - 12:10

Local vs. Distant Off-farm Work in Promoting Clean Energy Adoption among Rural Chinese Households

Lu Jia[1], Xiaoshi Zhou[2]
[1]Sichuan Agricultural University, Chengdu, China. [2]China Agricultural University, Beijing, China

Paper Abstract:

This study investigates how the location of household heads' off-farm work influences clean energy adoption in rural Chinese households, addressing a critical gap in understanding the relationship between labor mobility and energy transitions. Using data from the 2018-2020 China Family Panel Studies (CFPS), we employ a Multivalued Treatment Effects (MVTE) model to mitigate selection bias and analyze the differential impacts of local (within-town) and distant (out-of-town) off-farm work. Our findings reveal that while both local and distant off-farm work significantly promote clean energy adoption, local off-farm work has a larger positive effect. Specifically, households with heads engaged in local off-farm work demonstrate a 20.1 percentage point higher probability of adopting clean energy compared to those without off-farm working heads, while households with heads in distant off-farm work show an 18.1 percentage point increase. This 2 percentage point difference highlights the local advantage in facilitating clean energy transitions. Our mechanism analysis reveals that off-farm work generally enhances income, employment stability, and entrepreneurship opportunities. However, these effects are more pronounced for local off-farm work, potentially explaining its stronger impact on clean energy adoption. Local off-farm workers likely benefit from lower transaction costs, stronger social networks, and better information flows, leading to more effective household decision-making regarding energy choices. The study also uncovers significant heterogeneity across gender and geographic regions, with female household heads' local off-farm work exerting a stronger influence on clean energy adoption, and the local advantage being most pronounced in western rural households. These findings have important policy implications, suggesting that promoting local off-farm work opportunities, especially for women, could more effectively accelerate clean energy adoption in rural China. By elucidating the nuanced relationship between labor market geography and household energy choices, this research contributes to the literature on rural development, energy policy, and labor mobility, emphasizing the need for policymakers to consider spatial economic factors when designing strategies to promote clean energy transitions in rural areas.

Improving Rural Livelihoods in Pakistan: A Knowledge, Attitude, and Practice Analysis of Pulse Production

Saima Rani[1], Israr Hussain[1], Shahid Riaz Malik[1], Ata ur Rehman[2], Gavin Ramsay[2], Abdul Manan[3], Niaz Hussain[4]

[1]Pakistan Agricultural Research Council, Islamabad, Pakistan. [2]Charles Sturt University, Wagga Wagga, Australia. [3][5]University of New England,, Armidale, Australia. [4]Arid Zone Agriculture Research Institute,, Bhakkar, Pakistan

Paper Abstract:

Pulses are an important crop and a significant source of proteins and essential micronutrients in human nutrition worldwide, especially in South Asia. However, compared to significant and substitute crops in Pakistan, pulses have been subjected to years of neglect in research, development, and extension services. Consequently, pulse productivity has decreased over the years, whereas demand has continuously increased due to population growth, causing increased imports and thus a rise in import costs. Therefore, Australian Centre for International Agricultural Research (ACIAR) has funded this work under the project "Increasing Productivity and Profitability of Pulses Production in Cereal-based Cropping Systems in Pakistan (CIM/2015/041)" to identify the pulses situation in Pakistan for future interventions survey. The research highlights the constraints and opportunities in the production of chickpeas and lentils in Pakistan. Primary data were collected from six project sites representing pulse-specific districts in four provinces and based on each province's contribution to pulse production in Pakistan. The data were analysed using SPSS and Excel. The results indicate that production-related issues, low prices obtained by the farmers, neglect in overall agriculture research, low-yielding varieties, a lack of farmer access to good quality seed, low adoption of modern production technologies, poor crop management, labor shortage, poor harvesting mechanization, vulnerability to climatic stress, insect and pest attack, and water shortage are the major constraints in the study area. The outcome of the situational analysis was the implementation of several interventions to resolve these multifaceted issues, using farmer-led participatory approaches. The aim was to provide improved pulse varieties, certified seed production systems, crop production technologies, crop management, improved irrigation, and farm-level value addition.

Sustainable Food Behaviours: Understanding the Drivers of Household Leftover Food Waste

Nimeshika Aloysius[1], Jayanath Ananda[1], Ann Mitsis[1], David Pearson[2,3]

[1]Central Queensland University, Melbourne, Australia. [2]Central Queensland University, Sydney, Australia. [3]End Food Waste Australia, Adelaide, Australia

Paper Abstract:

Food waste is a significant global environmental, economic, and social issue, with implications for sustainable food systems and the well-being of communities. Food leftovers are a major contributor to household food waste. However, the drivers of household leftover food management practices are less understood. This study analyses the leftover food management behaviour using the Motivation-Opportunity-Ability framework. The analysis draws on data collected from an online survey of 1007 Australian households. As the first step, a confirmatory factor analysis (CFA) was carried out to inspect factor loadings, and fit indices to test the reliability and validity of the measurement scales. The latent constructs, motivation, opportunity, ability, competing goals, leftover food management and leftover food waste were measured with 47 manifest variables and the model fit indices were examined using the 'robust maximum likelihood' (MLM) estimation method. The final measurement model included 34 manifest variables measuring these six latent constructs. A Structural Equation Modelling (SEM) analysis was used to empirically test the postulated relationships between motivation, opportunity, ability, competing goals and self-reported leftover food management practices of Australian consumers. The results show consumers' motivation is strongly associated with leftover food management practices. Particularly, consumers are motivated not to waste food because of negative feelings towards wasting food and understanding the consequences of leftover food waste. Consumer abilities in meal planning, efficient cooking, food inventory management, interpreting expiry dates, and food storage also significantly affected leftover food management in the home. The availability of time, information technology and lifestyle showed a relatively weaker impact on leftover food management. Competing goals of eating healthy, safe, and tasty food and having enough food, lower the interest in leftover food management in the home. Understanding the drivers of leftover food management can guide designing interventions to promote behaviour change in preventing leftover waste. Smartphone applications that determine the exact amounts of ingredients required to cook a certain number of servings of a planned dish, along with an option to create a shopping list based on meal plans, can nudge consumers toward precise grocery shopping and cooking. Implementing public campaigns to raise awareness about proper storage of leftover food and creative ways to reuse food leftovers can help consumers make more informed decisions and reduce food waste at home. By examining the complexities of leftover management in Australian households, this study seeks to contribute to the broader discourse on food waste reduction and United Nation's Sustainable Development Goal 12.3.

Do petrol prices affect inflation perceptions? Evidence from New Zealand

Puneet Vatsa[1], Gabriel Pino[2], Alan Renwick[1]
[1]Lincoln University, Lincoln, New Zealand. [2]Diego Portales University, Santiago, Chile

Paper Abstract:

This study investigates the dynamic impact of petrol price shocks on inflation perceptions in New Zealand using Bayesian methods to estimate partially identified structural vector autoregression (SVAR) models. Results show that the initial effects of nominal petrol price shocks on inflation perceptions were negligible. Nevertheless, the effects were persistent, lasting more than three years and accounting for about 40% of the variation in inflation perceptions. The results point to the importance of petrol prices in shaping people's perceptions of inflation.

Comparative Analysis of Economic Viability and Adoption Drivers for Black Soldier Fly Larvae as Broiler Feed in Bangladesh

Jasim Uddin Ahmed[1], Joy Kumar Roy[1], Arifa Jannat[2], Md. Monirul Islam[2,3]
[1]Sylhet Agricultural University, Sylhet, Bangladesh. [2]Bangladesh Agricultural University, Mymensingh, Bangladesh. [3]University of Adelaide (CSIRO), Adelaide, Australia

Paper Abstract:

Despite Bangladesh's strong economic growth, the country continues to face significant malnutrition challenges, costing over US$1 billion each year. The broiler industry plays an essential role in addressing nutritional needs by supplying protein through meat and eggs. However, small and medium enterprises (SMEs) in this sector face high feed costs, which negatively impact their profitability and growth. Black Soldier Fly Larvae (BSFL) offer a sustainable and cost-effective alternative to conventional poultry feed, helping to reduce costs and environmental impacts. This study examined the use of BSFL as broiler feed and explored farmers' perceptions of it in selected areas of the Sylhet region, Bangladesh. Using purposive sampling, 60 respondents were selected from three upazilas in the Sylhet district. Data were analyzed with descriptive statistics, discriminative power value, a binary logistic regression model, and a profitability equation. The results showed that 70% of respondents (42) had a favorable attitude toward BSFL, while 30% (18) had a highly favorable attitude. Of the eight socioeconomic factors analyzed for their influence on the likelihood of adopting BSFL as broiler feed, average income ($p < 0.01$), years of schooling ($p < 0.05$), and years of broiler farming experience ($p < 0.01$) were found to be significant. Farms that used a 50% mix of BSFL and traditional feed had a net return of BDT 35,045.67 (USD 419.71), higher than those using only traditional feed, which had a net return of BDT 29,670.67 (USD 355.38). Additionally, farms using the 50% BSFL mix achieved a benefit-cost ratio (BCR) of 1.16, compared to a BCR of 1.11 for farms using only traditional feed. The study also identified several barriers to the adoption of BSFL in the region, including a lack of training programs, extension services, uncertain input supply, and limited financial support. To promote adoption, the study recommends raising awareness of the profitability of BSFL as broiler feed, providing training at the grassroots level, and ensuring that inputs are readily available to farmers.

Gender-Disaggregated Rural Advisory Services and Household Food Security: A Causal Decomposition Approach

Kwabena Addai, Md Sayed Iftekhar, Nicholas Rohde
Griffith University, Brisbane, Australia

Paper Abstract:

The United Nations' Sustainable Development Goals aim to reduce gender inequality and food insecurity, which are interconnected. Understanding gender roles, resource access, and constraints, is crucial for ensuring food security for women, who often have less access to agricultural services than men. Agricultural extension and advisory services are important for agricultural innovation and productivity,

and household food security but their impact can vary by gender. This paper examines how gender-specific access to rural advisory services affects household food security, using data from the World Bank's Integrated Household Panel Survey in Malawi. We employed the novel nonparametric causal decomposition approach by Yu and Elwert (2024). This approach enables a thorough assessment of access to rural advisory services within a potential outcome framework, highlighting both the overall significance of these services and the critical channels influencing household food security disparities, including prevalence (unequal exposure), effect (heterogeneous impact), and selection (within-group propensity for treatment). This is the first study to use detailed household-level data on rural advisory services' recipients to causally decompose household food security based on gender. The results show significant disparities in food security between male-headed and female-headed households due to unequal access to these services. These disparities are worsened by differences in resources and endowments (e.g., farm size, access to credit). The findings have important policy implications for addressing gender gaps in food security.

Developing a conceptual framework to evaluate factors affecting consumer's willingness to pay for Australian grown sesame seeds: Scoping review

Zillur Rahman, Delwar Akbar, Azad Rahman, Tieneke Trotter, Surya Bhattarai, Charissa Rixon
Central Queensland University, Rockhampton, Australia

Paper Abstract:

The global market for sesame seeds is currently valued at $3.4 billion and is expected to have an annual growth rate of 8%. This growth is primarily attributed to the high demand from Asian countries. However, sesame seeds are increasingly being used in Australia and other developed nations as value-added products. The widespread use of sesame seeds in various food items can be attributed to their desirable flavour and health benefits, such as rich protein content and abundance of vitamins and antioxidants. Additionally, sesame oil is a common cooking ingredient for many households. Global sesame production is projected to reach 9.26 million tonnes annually by 2040. Australia has been a net importer of sesame products since 1966. In 2020, Australia imported over 13,000 tonnes of whole sesame and sesame products, including oil and tahini, and this figure is expected to increase to 20,000 tonnes by 2025. There is a high demand for sesame seeds/products that are perceived as sustainably produced, and this is growing. Australian consumers consider environmental, social, and ethical factors when making purchasing decisions. As such, Australia's clean and green production system is more appealing to our domestic consumers than the lower priced imported products. Australian research trials are underway, focused on supporting producers of sesame, but production costs in Australia remain higher compared to many developing nations. A research gap exists in the literature regarding the role of credence attributes in influencing consumers' willingness to pay (WTP) more for sustainably produced Australian sesame seeds and sesame products. To address this gap, this paper develops a conceptual framework to evaluate the factors affecting willingness to pay for Australian-grown sesame seeds/sesame products and imported sesame seeds and products. This study uses the scoping review methodology to identify key concepts and the relationship between the credence factors and consumer WTP for locally grown products such as Sesame seeds in Australia. The Scopus and Google Scholar databases were searched for relevant articles

between 2000 and 2024, using consumer purchasing behaviour, environment, credence factor, sesame seeds and Australia. The PRISMA model was used to select appropriate literature for analysis, identifying 56 articles of relevance. This paper identified that the country of origin, environmental management practices, seed quality, and price significantly influence consumers' willingness to pay (WTP). However, their demographic and socio-economic conditions also affect their purchase decision. Policymakers and industry leaders can use these findings to understand the current evidence and review policy to support sesame seed production in Australia.

Trade-offs between profitability and greenhouse gas emissions in extensive-grazing systems in Australia versus intensive-feeding systems in Vietnam

My Pham-Kieu[1], Stephen Ives[1], Warwick Badgery[2], Matthew Harrison[1]
[1]University of Tasmania, Launceston, Australia. [2]New South Wales Department of Primary Industries, Orange Town, Australia

Paper Abstract:

Achieving sustainable beef production requires stacking multiple mitigation strategies at the farm level, with the best approach varying by livestock systems in each country. This study explores the trade-offs between farm profit and greenhouse gas (GHG) emissions in Australia's extensive grazing systems and Vietnam's intensive feeding systems.

In Australia, grazing management[1] and feed additives[2] were proposed; while in Vietnam, different dietary forage contents (all forage, 85% forage, 50% forage) combined with biochar were considered. Non-linear programming models were applied to identify the optimal combinations of interventions that would simultaneously maximise farm profit and minimise net GHG emissions.

The results indicate that the optimal combination of those interventions varied depending on farmer's objective was profit or emission reduction or both.

For Australia, if profit was key goal, a combination of ≥ 3 grazing treatments (favoring15 paddock-fast rotation-high stocking rate) with 0.2% Bovaer was adopted. For emission reduction, ≥ 2 grazing treatments (dominated by 15 paddock-slow rotation-low stocking rate) stacking with 0.2% Bovaer was preferred. A split between fast rotation-high stocking rate and slow rotation-low stocking rate systems or flexible grazing was recommended for balancing profit and emission- aims.

Regarding Vietnam, diets with 50% and 100% forage content were found to maximise profit. In contrast, 1% biochar stacking with these diets was used for emission reduction. A similar strategy was considered to achieve both profit- and emission- goals.

In both countries, herd size varied based on the farmer's objective. The maximum number of cattle was raised to maximise profit, while a smaller herd was preferred to minimise net emissions or to balance maximising profit with minimising net emissions.

Carbon price and cattle price were drivers of farmer's decisions regarding mitigation interventions. Farmer would favour interventions that minimise net emission in negative scenarios of cattle price. When cattle price decreased 50%, Australian farmer would implement 0.2% Bovaer and 0.5% biochar while expanding grazing area for flexible grazing. In Vietnam, proportion of using 1% biochar would increase under similar scenario. Impacts of carbon price on adoption decisions also varied between Australia and Vietnam. When carbon price reached $AU100/tonne of CO2-equivalent in Australia, farmer would reduce herd size and shift grazing area away from 15 paddock-fast rotation-high stocking rate towards 15 paddock-slow rotation-low stocking rate. In contrast, there was no change in farmer's mitigation adoption decisions in Vietnam under same carbon price. This highlights the need for policies and legislative measures in Vietnam to limit farm-level emission intensity.

Applying Global Lessons to Optimize Urban Food Production in Africa through AI, Machine Learning, and IoT

Comfort Onyaga[1], Precious .C. Ebere[2]
[1]Izanu Africa, Wales, Australia. [2]Cardiff University, Wales, United Kingdom

Paper Abstract:

Africa's rapid urbanization, coupled with climate change and inefficient traditional agricultural systems, has precipitated a growing food security crisis. As cities struggle to meet rising food demands with limited resources, vertical farming emerges as a potential solution for urban food production. This study explores how Africa can leverage artificial intelligence (AI), machine learning (ML), and Internet of Things (IoT) technologies to optimize vertical farming practices, drawing lessons from successful global models to address its unique food security challenges.

The primary goal of this research is to evaluate how AI, ML, and IoT technologies can be adapted from successful case studies in the U.S., Japan, and Australia to African urban contexts where food insecurity is prevalent. Specifically, the study will:

1. Analyze the effectiveness of AI and IoT in improving vertical farming practices in Africa's urban areas.

2. Investigate the economic and environmental implications of adopting these technologies within Africa's unique socio-economic conditions.

3. Provide scalable models and best practices for vertical farming tailored to African urban environments, focusing on smallholder farmers and sustainable resource use.

This study addresses a significant gap in the literature, as few studies explore the potential of AI-driven vertical farming within Africa, particularly in adapting advanced technological solutions to local contexts with limited infrastructure and predominantly smallholder farming.

A comparative analysis will be conducted on successful vertical farming operations such as AeroFarms (USA), Spread Co. (Japan), and Eden Towers (Australia). Data collection will involve field interviews and surveys with agricultural stakeholders in cities like Lagos, Nairobi, and Accra, alongside local pilot projects

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using IoT and AI-driven farming techniques. Qualitative interviews will explore scalability and adaptation to local environments, while data from AI-enabled sensors will assess resource optimization and scalability within African cities.

The significance of this research lies in its potential to develop sustainable solutions for Africa's urban food security challenges. It will provide actionable recommendations for policymakers, agricultural entrepreneurs, and smallholder farmers by localizing best practices from global vertical farming models. The findings could shape investment in AI and IoT technologies for African agriculture, potentially reducing urban food insecurity, minimizing resource wastage, and promoting resilience to climate change.

The study will highlight how innovations from successful global operations can be translated to African cities. AeroFarms' AI-managed water and nutrient delivery system will be examined for its applicability in water-scarce African nations. Spread Co.'s automation techniques will be evaluated for scalability within Africa's labor markets, while Eden Towers' model will serve as a case study for optimizing crop production in constrained urban spaces.

In conclusion, this research posits that AI-driven vertical farming has the potential to revolutionize African urban food production at scale to feed the projected 2.4 billion population by 2050. By integrating IoT and machine learning technologies, African cities could overcome space limitations, reduce dependence on unpredictable weather patterns, and create sustainable food systems resilient to climate change.

Special Session 2A – Queensland Government Sponsored Special Session: Climate and ESG Investment Supporting Sustainable Agriculture and Fisheries Transformation

Location Main Room 1 (ROMA), LVL1

Time: 13:10 - 14:10

Chair: Gillian Mayne

The session will provide the audience with understanding of the rapidly emerging area of climate and ESG investment and provoke thought into how this is and will shape agriculture and fisheries sector transformation. Moreover, it will unpack how economic analysis can support businesses as they look to alter their business models, gain additional income streams from climate and ESG investment or seek to maintain market access and social licence to operate.

Special Session 2B – Economics of Managing Water Resources

Location Main Room 2 (TERRACE), LVL1

Time: 13:10 - 14:10

Chair: John Rolfe

The Economics of Water Resources and Water Management have been major themes in AARES over the past half-century. Within this broad area, there has been substantial attention on areas such as water quality, governance, water markets and trading, and dealing with externalities and water resources. This mini-symposium continues this tradition, but with more focus on northern Australia and Great Barrier Reef contexts instead of the traditional focus on southern Australia and Murray Darling Basin issues. Topics addressed in the mini-symposium include a bibliometric analysis of publications on water issues in Australia, the economic tradeoffs involved in increased monitoring of water quality, the impacts of industry on water quality, and exploring the potential for co-benefits to provide additional levers for water quality management.

Parallel 2A - Development & Farming

Location Main Room 3 (WICKHAM), LVL 1

Time: 13:10 - 14:10

Chair: Ze Zhang

Can rural collective property rights reform promote household livelihood resilience? The evidence from rural China

Chen Chen
Southwest University of Science and Technology, Mianyang, China

Paper Abstract:

China's rural collective property rights reform (RCPRF) is another deepening reform of the rural collective economy after the reform of the rural household contract responsibility system. Since 2017, the Ministry of Agriculture and Rural Affairs has been actively advancing reforms targeting rural collective operating assets to boost farmers' property income and strengthen the collective economy. While existing studies have explored key issues, such as clarifying rural property rights ownership and examining the stock cooperative system's reform approaches, there is a lack of analysis on the process of RCPRF and corresponding empirical research on how these reforms impact farmers' livelihood resilience. This study investigates the impact of China's Rural Collective Property Rights Reform (RCPRF) on household livelihood resilience and explores whether farmers' land rent-in behaviour serves as a potential mechanism. The RCPRF is treated as a quasi-natural experiment, with livelihood resilience assessed across three dimensions: buffering ability, self-organizational ability, and learning ability. Utilizing data from the 2020 China Rural Revitalization Survey, the study applies the inverse probability weighting with regression adjustment (IPWRA) estimator to assess the effect of RCPRF on livelihood resilience. Multivalued treatment effects (MVTE) and propensity score matching (PSM) models are employed to check robustness. Additionally, the conditional mixed process (CMP) approach is used to analyze the mediation effect of farmers' land rent-in behaviour. The IPWRA estimation reveals that RCPRF significantly enhances rural household livelihood resilience, particularly buffer and self-organizational abilities. However, it negatively affects their learning ability. Both the MVTE and PSM analyses indicate that the positive impact of RCPRF on livelihood resilience primarily stems from improvements in households' buffer ability rather than their self-organizational or learning abilities. The CMP approach demonstrates that RCPRF significantly increases the likelihood of rural households renting land, reinforcing their livelihood resilience. Moreover, disaggregated analyses show that, compared to regions with high levels of digital financial inclusion (DFI), regions with low DFI that have completed RCPRF exhibit significantly stronger buffer, self-organizational, and learning abilities. Additionally, households in suburban villages experience higher livelihood resilience from RCPRF than those in non-suburban areas. Finally, the impact of RCPRF is strongest in villages with medium collective asset levels (25%–75% quantile) compared to those with low or high collective assets.

Impact of Off-farm Work Participation on Farm Labor Investments

Wenguang Zhang, Wanglin Ma
Lincoln University, Christchurch, New Zealand

Paper Abstract:

While off-farm work participation is widely recognized for its multifaceted benefits in enhancing farm production, economic security, and rural development, the labour shortages caused by the loss of agricultural labour can negatively impact farm performance, leading to reduced productivity. This study investigates how off-farm work participation influences farm labour investments from the perspective of household labour division. We employ the inverse probability-weighted estimator with regression adjustment (IPWAR) to analyze data collected from rice-producing households in China. The results show that households with heads participating in off-farm work have higher expenditures on hired labor than those with heads who did not. Specifically, off-farm work participation significantly increases household expenditures on land preparation, sowing, and harvesting. Although off-farm work participation does not significantly increase the total days of family labor used for rice production, it significantly raises the labor days allocated to fertilizer applications and irrigation. Overall, our findings indicate that households with heads participating in off-farm work tend to hire more labor and increase farm labor days in rice production to maintain or enhance farm productivity. We also find that off-farm work participation significantly increases expenditure on fertilizers, a productivity-enhancing input.

Gender roles and women's empowerment in dairy farming: A case from Indonesia

Vyta Hanifah, Alexandra Peralta, Rida Akzar
Centre for Global Food and Resources, School of Economics and Public Policy, University of Adelaide, Adelaide, Australia

Paper Abstract:

Gender equality and women's empowerment in agriculture are crucial for achieving multiple Sustainable Development Goals (SDGs), including gender equality (SDG5), zero hunger (SDG1) and poverty reduction (SDG2). Despite women's significant contributions to the agricultural sector, they remain underrepresented in many development efforts, which often target men as primary beneficiaries. Research on women's empowerment in agriculture has focused primarily on crop farming in Sub-Saharan Africa and South Asia, with some recent studies examining livestock systems. The dairy sector remains largely unexplored despite a significant number of households in developing countries relying on it as the primary source of income. Smallholder dairy farming is typically labour-intensive and dependent on family labour, in which women play a crucial role. However, there have been limited empirical studies that understand the roles of women in dairy farming and their levels of empowerment. This study aims to address this gap by investigating women's and men's roles in dairy farming households in Indonesia, a

developing country undergoing economic growth and structural transformation. Indonesia, the fourth-largest economy globally, ranks second in dairy production in Southeast Asia. Additionally, Indonesia is home to the largest Muslim population, accounting for nearly 13% of the global total. Thus, our study will offer unique insights into women's empowerment within a Muslim-majority nation. This study employed an expanded Abbreviated Women Empowerment in Agriculture Index (A-WEAI) questionnaire tailored to dairy farming activities. We compared our version with the A-WEAI and the Women Empowerment in Livestock Index (WELI). We suggested that our modifications help gain a better understanding of women's empowerment in dairy farming households. We used different cut-offs to estimate empowerment, assessing how this influence the modified A-WEAI. Data was collected through individual and separate interviews with 435 couples. All respondents operated dairy farming as their primary occupation, with fewer than 25% of households also engaging in cash crop farming. The findings suggest that women participated significantly less (p<0.01) than men in dairy farming activities. However, women's participation in dairy activities is economically significant, with almost 50% of women engaged. Moreover, women were more involved in on-farm dairy-related tasks (30-50%) than other farming activities (e.g., food crop farming 21%). When making decisions in the dairy business, most women perceived the decisions were made jointly with their spouses, while men tended to claim sole decision-making authority, consistent with existing literature on women's empowerment. Our estimation revealed that despite less participation, women were more empowered than men, with empowerment scores of 0.98 and 0.90, respectively. The levels of empowerment differ when we apply different cut-offs to estimating the index. When we lowered the threshold for empowerment, more women were classified as empowered, and vice versa. Women showed significantly higher levels of control over income, particularly from milk marketing, contrasting our results with studies in other parts of the world. Our findings highlight the complexity of gender dynamics in agricultural settings and the importance of context-specific research. The insights gained from Indonesia have potential implications for the strategic approach to measuring and interpreting women's empowerment in diverse contexts.

Seasonal Workers' Effect on Labor Market Outcomes: New Analysis on Monthly Longitudinal Data

Ze Zhang
University of California, at Davis, Davis, USA

Paper Abstract:

In agriculture, as domestic workers in rural areas find jobs outside elsewhere, farm owners are unable to attract enough workers to perform these tasks. Thus, the agriculture sector needs to recruit workers from overseas. Programs like the American H-2A visa facilitate temporary foreign agricultural laborers working in agriculture (Castillo, Martin, and Rutledge, 2022; U.S. Citizenship and Immigration Services, 2022). This paper analyzes a seasonal worker program that targets just the horticulture and viticulture industries, i.e., New Zealand's Recognised Seasonal Employer (RSE) scheme, on labor market outcomes of domestic and foreign workers. More specifically, this study answers the question of what the impact of industry or skill-specific immigrants has on wages and employment of domestic workers and foreign workers.

This study uses administrative datasets from Statistics New Zealand. In addition, I make some restrictions. (i) I only keep workers with age 15 or above and 65 or below, and divide age into five different groups: 15-

25, 26-35, 36-45, 46-55, and 56 to 65; (ii) I drop observations that declared they have five or more jobs in a month. This is likely to be an error; (iii) I group ethnicity into three groups: European, Māori-Pacific, and Other; (iv) Following Australian and New Zealand Standard Industrial Classification (ANZSIC), New Zealand firms belong to one of the nineteen industries (Australian Bureau of Statistics, 2022); (v) I use a random sample of 10% the population in the empirical analysis, due to computational constraints.

To causally identify the effects of the influx of RSE workers on employment and wages for other workers, I construct a Shift-Share Instrumental Variable based on the initial allocation of the RSE workers to the local farmers. In addition, I use two empirical strategies to separate different temporal effects. First, to analyze the contemporaneous effects of wage and employment, I use a two-way linear fixed effect model. To analyze the short- and long-run effects, I implement a cumulative long-difference approach.

Contemporaneously, the influx of seasonal workers has mostly no wage effects on domestic workers except for females and low-skilled ones. By contrast, Females, Middle-aged, Māori & Pacific, European, and low-skilled domestic workers have positive and significant employment effects. Second, the inflow of seasonal workers has differential impacts across industries. Accommodation & Food Service and Administrative & Support have the highest employment effects, while the wage effect of Education and Training is negative. Further, Agriculture, Forestry, and Fishing have positive and significant effects on both the wage and employment of domestic workers. Third, domestic workers can arbitrage the earnings and employment opportunities efficiently in the short- and long-run. Last, results show that foreign workers are disproportionately worse off and experience significant displacement when faced with an influx of foreign seasonal workers. The wage of foreign workers decreases without compensation by increasing employment. The results suggest that well-established skilled-based immigration programs in agriculture are beneficial to domestic workers.

Parallel 2B - Food, Health & Nutrition 1

Location Main Room 4 (LEICHARDT), LVL 1

Time: 13:10 - 14:10

Chair: Constantin Johnen

The impact and resilience of the 2024 flash flood on coastal households' food and nutrition insecurity in Bangladesh: the extent, severity and gender difference

Abdullah Al Mamun[1], Sonia AKTER[2], Pu HAO[1]
[1]Hong Kong Baptist University, Hong Kong, Hong Kong. [2]Australian National University, Canberra, Australia

Keywords: 8. Climate Change; 10. Development Economics

Paper Abstract:

There was a flash flood in Bangladesh in August 2024, which was one of the most devastating floods in the country's recent history. About a quarter of the country was inundated for over two weeks due to excessive rainfall in the upstream region of India. This flood caused extensive damage and loss of life in the southeastern districts of the country bordering India. The affected communities faced a severe shortage of basic necessities such as food, clean water, shelter, medical care, and supplies. These are crucial for survival. This study focuses on the impact of the flash flood on food security and flood preparedness. Previous research often overlooks the relationship between disaster resilience and its role in food security, particularly at the individual level, despite its critical importance. Differences in food insecurity between men and women after natural disasters are significant due to pre-existing gender inequities and discriminatory gender norms. Women are more likely to face food insecurity and health risks in the aftermath of a catastrophic climatic shock. The analysis was based on individual-level data collected two weeks after the flood. A face-to-face survey was conducted among 450 farming households, equally split between men and women engaged in agriculture and fisheries in three coastal districts, including flood-affected and unaffected areas. The survey revealed acute shortages of food, clean water, and medicine for both men and women. Due to a lack of effective flood forecasting and disaster response. Additionally, both government and non-government organizations provided inadequate support, especially in hard-to-reach areas. Women experienced significantly higher rates of food insecurity, worsened by limited access to emergency assistance in the flood-affected areas compared to the unaffected areas. The research also found that individuals continued to face food insecurity even after returning home once the floodwaters had subsided, particularly women from specific socio-economic backgrounds.

How do food literacy interventions empower individuals? A meta-analysis

Dasuni Dayananda[1], Shyama Ratnasiri[1], Pradeepa Korale-Gedara[2], Md Sayed Iftekhar[1]
[1]Griffith University, Brisbane, Australia. [2]University of Queensland, Brisbane, Australia

Paper Abstract:

Food literacy refers to an individual's ability to understand, develop a constructive relationship, and engage in the complexities of food systems. It enables individuals to make informed food choices throughout their lifetime. These informed choices not only lead to better health through a healthy diet and good nutrition but also strengthen economic management and contribute to a sustainable environment. Given the critical role of food literacy in shaping food choices, various interventions targeting different population cohorts have been implemented globally to promote healthier eating habits and enhance nutrition education. However, despite the large number of programs implemented, few program records are available, and a comprehensive analysis of these interventions has yet to be conducted. Therefore, this study aims to conduct a meta-analysis to examine the effects of food literacy interventions on empowering individuals toward food. This analysis will shed lights on the varying degree effects of different food literacy interventions on multiple outcomes related to food consumption. Furthermore, the study will enable to identify the effect of these interventions on different demographic subgroups, such as those defined by age, gender, socioeconomic status, or cultural background. Peer-reviewed research articles published since 2013 that have quantitatively assessed the impact of food literacy interventions were selected for the meta-analysis. The search for relevant studies was conducted using two major databases, Web of Science and Scopus, resulting in 515 articles after duplicate removal. Following the application of specific inclusion and exclusion criteria focused on food literacy interventions, 29 studies were deemed eligible for inclusion in the meta-analysis. These identified studies were reviewed in detail to extract details on the effects of the interventions on food literacy including effect sizes, demographic information, measure of food literacy intervention outcome, and characteristics of the interventions. A total of 359 observations were included in the meta-regression analysis, with mean differences considered as the effect size. Standardized effect sizes were considered to account for the heterogeneity in measurement outcomes. Our preliminary analysis results show that the majority of intervention outcomes were behavioural (173 observations), followed by knowledge (148 observations), skills (21 observations), and attitudes and beliefs (17 observations). Most interventions targeted school children, with the primary student group (ages 6-10) being the largest. This was followed by the middle-aged group (40-65), while none of the programs targeted seniors (above 65). A meta-regression was conducted to evaluate the impact of interventions on four distinct categories of outcomes: "knowledge," "skills," "behaviours," and "attitudes and beliefs." This study will provide crucial insights for policymakers and institutions, enabling them to design and implement more effective food literacy interventions tailored to diverse populations.

Can Online Food Shopping Narrow the Nutritional Gap for Rural Children?

Hongyun Zheng[1], Wanglin Ma[2]
[1]Huazhong Agricultural University, Wuhan, China. [2]Lincoln University, Christchurch, New Zealand

Paper Abstract:

Nutritional inequality among rural children remains a persistent challenge, particularly in developing regions with limited access to diverse, nutrient-rich food. Rural households often face structural barriers such as poor infrastructure, lower incomes, and restricted market access, all of which contribute to lower nutritional quality. As a result, rural children are more vulnerable to malnutrition, leading to adverse health and developmental outcomes. In recent years, digital technology and e-commerce platforms have gained attention as potential solutions to these challenges by offering rural households new channels for purchasing food, thereby increasing access to healthier food options.

Existing literature on rural nutrition and food access has predominantly focused on traditional interventions like government food aid programs and local agricultural improvements. While these efforts have yielded some success, they are often constrained by geographic and economic factors. Moreover, the role of online food shopping as an innovative solution for rural households remains underexplored. Most research examining the impact of e-commerce on food systems has concentrated on urban settings, where infrastructure and digital literacy are more developed. This leaves a research gap regarding whether online food shopping can effectively address rural children's nutritional inequalities, particularly in under-resourced regions.

This paper aims to investigate the impact of online food shopping on narrowing the nutritional inequality among rural children. Specifically, this study examines how rural households' adoption of online food shopping influences their nutritional outcomes. The study contributes to the literature in three key ways: first, it highlights the role of digital solutions in enhancing rural food systems; second, it addresses the specific challenges faced by rural households in accessing nutritious food; and third, it fills a research gap by evaluating the effectiveness of online food shopping in a rural context, which has been largely overlooked in previous studies.

Our findings suggest that rural households that use online platforms to purchase food demonstrate improved nutritional outcomes for children. This research holds significant implications for policymakers and stakeholders seeking to reduce nutritional inequality in rural areas. By facilitating access to healthier food options, online food shopping can serve as a viable tool for improving rural children's nutritional status, contributing to public health and economic development goals.

Food Security along the Rural-Urban Continuum: Empirical Evidence from a Decomposition Analysis in Kenya between 2012 and 2021

Constantin Johnen
University of Goettingen, Goettingen, Germany

Paper Abstract:

People who live in rural areas in the Global South are particularly vulnerable to suffer from food consumption shortfalls caused by covariate weather shocks. This is partially because people in rural areas often have less access to consumption smoothing instruments, such as buffer assets, mobile phones, or financial markets. It is further plausible to assume that the access to such consumption smoothing instruments decreases along the rural-urban continuum. That is, access to consumption smoothing

instruments, such as formal financial instruments, is likely to be lower in extremely rural areas compared to, say, peri-urban areas. However, little is known about the relationship between consumption smoothing instruments, food security, and the rural-urban continuum. Therefore, whether food insecurity is distributed similarly across rural areas remains unknown. Consequently, it is also unclear which consumption smoothing instruments are most relevant to explain an unequal distribution of food security along the rural-urban continuum. These are important gaps in the literature. To implement efficient policy measures that aim to decrease the rural-urban gap in food security, presupposes to understand which consumption smoothing instruments are most relevant to achieve that aim. The present study aims to fill these gaps.

This study is the first to estimate food-security along a rural-urban continuum using nationally representative data from Kenya collected in 2012 and 2021. To investigate rural-urban inequality I used a widely applied inequality measure, i.e. concentration indices (CI). A positive (negative) CI indicates a pro-urban (pro-rural) distribution of financial inclusion. This study is also the first to analyze which factors explain the inequality in food security along the rural-urban continuum. To do so, I decomposed the CIs to investigate the role of different consumption smoothing instruments, socio-economic, and -demographic variables in explaining pro-urban inequalities, while controlling for whether people have suffered from idiosyncratic or covariate shocks. The rural-urban continuum is a composite index that accounts for the population density of the county people live in and whether they live in a rural or urban area. To investigate the robustness of the rural-urban continuum, I used GIS locations of people to measure exact distances to urban centers and population density; this data was only available for 2015.

This study shows that food security is statistically significantly unequally distributed along the rural-urban continuum. However, the respective CIs of food insecurity decrease substantially between 2012 (CI = 0.241) and 2021 (CI = 0.145). The decomposition of the indices further reveals that inequality in asset ownership is the most important contributor to inequality in food security in both years (2012 and 2021), followed by mobile phone ownership. Other instruments such as bank account ownership, having an insurance, or participating in local savings associations were substantially less important in explaining inequality in food security. The results are robust against a different rural-urban continuum specification (using data from 2015). Overall this study strongly suggests that policy makers should aim to provide people in extremely rural areas with means to build up buffer assets and increase access to mobile phones.

Parallel 2C - Practice Change & Adoption 2

Location Chancellor 1, LVL0

Time: 13:10 - 14:10

Chair: Francesco Tacconi

Impacts of Mixed Crop-Livestock Systems on Fertilizer Practices: Reducing Chemical Inputs and Enhancing Bio-Fertilizer Use

Hongyun Zheng[1], Wanglin Ma[2]
[1]Huazhong Agricultural University, Wuhan, China. [2]Lincoln University, Christchurch, New Zealand

Paper Abstract:

In the Mixed Crop-Livestock Farming System (MCFS), rural households simultaneously engage in crop cultivation and livestock breeding, creating a small, self-sustaining cycle. This integrated approach minimizes waste, recycles by-products, and reduces dependence on external inputs such as synthetic fertilizers, promoting sustainability and mitigating environmental impacts. While existing literature has confirmed the positive effects of MCFS on sustainable development, most evidence derives from field experiments or predictive models, leaving uncertainty as to whether smallholder farmers' adoption of MCFS can effectively facilitate the transition to sustainability in real-world contexts.

This paper investigates the impact of MCFS adoption on smallholder farmers' fertilizer use, focusing on the expenditure and application frequency of chemical and bio-fertilizers. This study is novel in three key ways: First, it highlights a small yet impactful action within the sustainable development of smallholder farmers—MCFS. Smallholder farmers play a critical but often underappreciated role in sustainable development. Second, the research approaches the issue of fertilizer reduction from the perspective of agricultural production systems. Overusing chemical fertilizers has well-documented adverse effects on environmental and human health, making reducing chemical inputs an urgent global priority. Third, this study addresses the endogeneity of MCFS adoption by employing both the Probit-2SLS and Endogenous Treatment Effect (ETE) models.

The results reveal that MCFS adoption significantly increases the expenditure and application frequency of bio-fertilizers, aligning with the circular economy's goals of reusing agricultural waste. Notably, the reduction in chemical fertilizer use due to MCFS adoption is most prominent among younger farmers, indicating that age plays a critical role in determining how effectively MCFS reduces reliance on chemical inputs. Furthermore, MCFS adoption is associated with increased farm revenue, underscoring its potential to improve economic outcomes for farmers.

These findings suggest that MCFS adoption reduces chemical fertilizer use, increases bio-fertilizer utilization, and enhances farm productivity and revenue without compromising food security. As such, MCFS represents a viable pathway for smallholder farmers to contribute to the transition towards sustainable development, promoting both environmental sustainability and economic resilience.

The National Seed System of Timor-Leste: Evaluating the Legacy of the Seeds of Life (SoL) Program

Rio Maligalig[1], Alexandra Peralta[1], Adam Loch[1], Matias Tavares[2]
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Paper Abstract:

The Seeds of Life (SoL) program, implemented between 2001 and 2016 in Timor-Leste, was a major intervention to improve food security through increased productivity of major food crops. The program led to the establishment of the National Seed System (NSS) in 2013, which aimed to create a sustainable seed production and distribution network. However, with external funding ceasing in 2016, questions remain regarding the current state of the system and its alignment with the original vision. This study aims to evaluate the legacy of the SoL program and examine whether the NSS is still operational and effective in delivering its intended outcomes. The study is grounded in a Theory of Change (ToC) framework, that serves as a basis for evaluating the program's outcomes. The research employs Process Net-Mapping (PNM), a qualitative method used to analyse complex governance systems by mapping actors, relationships, influence levels, and challenges faced by the system. Data collection was conducted through a series of PNM workshops at national, municipal, and village levels between November 2023 and June 2024. These workshops involved stakeholders from the Ministry of Agriculture and Fisheries (MAF), Research Centres, and Commercial Seed Producers (CSPs), with a focus on understanding how the system has evolved post-SoL. The individual process net maps were aggregated to create four distinct maps representing each link: lines of command, information exchange, funding flow, and seed distribution. The content of the links was further analysed and grouped into common themes. The influence of each stakeholder on the outcome of the NSS to deliver high quality seeds was also assessed. The findings reveal a complex seed system involving 46 distinct actors, including government agencies, research institutions, international organizations, and local seed producers. MAF, the National Directorate of Research and Statistics (DNPE), and CSPs emerged as central actors with significant influence over the system, though their perceived influence varied across different levels of the seed system. Although NSS is still operational, various issues and challenges have emerged, which include the absence of a National Seed Policy. The absence of a formal legal framework has led to gaps in governance and coordination, making it hard to manage seed production, maintain quality, and set market standards. Without a National Seed Policy, there are no clear guidelines on stakeholder roles, resulting in uncoordinated efforts in seed production and distribution. This evaluation of the NSS in Timor-Leste provides valuable insights into the long-term sustainability of seed systems after donor funding ends. By comparing the current structure with the original vision, the findings inform recommendations for strengthening the system, particularly through improved governance, better coordination among local stakeholders, and enhanced support for

CSPs. These lessons offer guidance for future agricultural interventions in Timor-Leste and similar contexts, emphasizing the need for continued support and investment beyond the initial project period.

Drivers and constraints of voluntary sustainability standards in the Australian agri-food industry

Francesco Tacconi[1], Peggy Schrobback[1], Enayat Moallemi[2]
[1]CSIRO, St Lucia, QLD, Australia. [2]CSIRO, Black Mountain, ACT, Australia

Paper Abstract:

There is increasing consumer and market awareness regarding the environmental and social impact of agri-food production (e.g., GHG emissions, biodiversity loss and labour conditions). This raises questions about what tools or interventions can incentivise producers transitioning toward more sustainable practices and products.

Environmental and social sustainability constitute credence attributes of food products that typically cannot be directly verified by buyers along the value chain. Tools such as certified food product labels can be used to mitigate information asymmetry among value chain stakeholders. Voluntary sustainability standards, including certification and labels, aim at addressing this challenge. However, their rate of adoption by agri-food producers remains low compared to conventional practices, and there is still limited systematic understanding of societal drivers and constraints behind producers' adoption and what role these certification schemes can take in the transition process. Understanding and addressing producers' perspective about these drivers and constraints is crucial to inform strategies for supporting the transition of Australia's agri-food production sector towards more sustainable practices.

The aims of this study were to better understand: (1) producers' motivations for adopting or not adopting certified sustainability standards, (2) their perception of the drivers and barriers affecting adoption of certified sustainability standards in Australia, and (3) their perception of the risks associated with not adopting sustainability standards in the future.

We conducted interviews with 254 primary food producers across the Australian horticulture, red meat and seafood sectors. The data were analysed using a qualitative approach including exploratory and iterative thematic coding, and a comparative analysis across the three agricultural sectors.

Our results suggest that economic barriers and risks represent the main concerns for Australian producers regarding the adoption of voluntary sustainability standards. Additionally, the number, complexity and variability of these standards contribute to creating uncertainty and reducing trust in the adoption process. Conversely, those producers who adopted sustainability standards reported benefits such as enhanced reputation and market access. Key incentives for promoting the adoption of voluntary sustainability standards include simplification of standards and requirements, improved producer education, government support and better access to information. Notably, producers' approaches towards sustainability standards vary based on their capacity to invest in new practices, personal beliefs regarding sustainability, and trust in government and regulation. While many producers reported currently missing price premiums and low demand, the majority of respondents anticipated increasing

pressure from consumers and stakeholders to adopt sustainability standard, expecting their relevance to grow in the near future.

Considering the overall findings, voluntary sustainability standards should be viewed as one option for producers who seek to achieve higher environmental and social standards rather than a definitive solution for agricultural transition. Achieving meaningful change will require additional tools that incentivise practice change involving the different stakeholders along the agri-food supply chain and equitable interventions targeting specific producers and consumers cohorts.

Investigating Price Volatility and Wealth Generation in FPO-Traded Derivative Market using GARCH approach

Kripamay Baishnab, Piyush Kumar Singh
Indian Institute of Technology Kharagpur, Kharagpur, India

Paper Abstract:

Farmer Producer Organizations (FPOs) are increasingly participating in agricultural commodity derivatives trading in India, with a more than tenfold rise since their inception. However, their involvement still lags behind spot markets, likely due to unpredictable price volatility driven by external factors that impact farmers' wealth. This study examines the impact of external factors on the price volatility of spot and futures prices for agricultural commodities traded by FPOs in India, and its effects on farmers' wealth from derivative trading. Analyzing data from 2016 to 2024, we adopted a three-stage approach. First, we applied the GARCH-MIDAS model to assess long- and short-term price volatility, selecting the ten top volatile commodities. In the second stage, we used the TGARCH model to assess the influence of external factors, such as weather, climate change, global trade, government policies, and natural disasters on the volatility of these commodities. Finally, we explored the wealth generated by this volatility for FPOs. Key findings indicate significant volatility, particularly in the oil and oilseeds category, probably driven by global deserters like COVID-19. After 2022, declines in food grain and pulse prices are linked to geopolitical tensions and fluctuating fuel prices. The Guar complex emerges as the top wealth-generating category, followed by food grains, pulses, and spices, while fibers show the least potential. Insights from the study support better price management and wealth generation in derivative market compared to spot market, despite of external challenges. Therefore, farmers are encouraged to trade in the derivative market instead of the traditional chains. These findings will play a crucial role in shaping strategies that promote sustainable market practices, aligning with UN Sustainable Development Goals (SDGs) 8 and 12. By ensuring more stable and transparent pricing in agricultural commodity trading, farmers can not only navigate external market challenges but also enhance their wealth generation, echoing the broader goals of inclusive growth and sustainable economic development. To the best of our knowledge, this is the first attempt to explore wealth generated by FPO-traded farmers through price volatility driven by external factors.

Parallel 2D - Uncertainty & Risk 1

Location Chancellor 2, LVL 0

Time: 13:10 - 14:10

Chair: Alan de Brauw

Transformational agronomy by growing summer crops in winter: The cropping system and farm profits

Andrew Zull[1,2], DeVoil Peter[3], Joe Eyre[3], Daniel Rodriguez[3]
[1]Queensland Government Department of Agriculture and Fisheries, Toowoomba, Australia.
[2]University of Southern Queensland, Toowoomba, Australia. [3]University of Queensland, Gatton, Australia

Keywords: 18. Grains and Cropping Systems; 28. Uncertainty and Risk

Paper Abstract:

The idea that "Yield is King" fails to acknowledge that what matters most to farmers is farm profits and risk, rather than yield. This is because decisions made in one season will affect options and crop performance over the next few years. Therefore, quantifying the longer-term impacts of innovation adoption is important. We used the Agricultural Production Simulation model (APSIM) to simulate and investigate the implications of adopting rain-fed winter sown sorghum in the Australian northern grains region. Results indicate that within a crop rotation early-planted sorghum will tend to decrease median sorghum crop yields but increase the following winter crop yields. This appears to have a marginal economic effect in Breeza and Dalby but encouraging results in Emerald. The inclusion of chickpea within the rotation increased returns in the best seasons with little change to downside risks in poor seasons.

Estimating the costs of implementing managed aquifer recharge under uncertainty

Dennis Gonzalez
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Keywords: 14. Environmental Economics; 31. Water

Paper Abstract:

Managed Aquifer Recharge (MAR) is a proven method for increasing drought resilience however implementation is often limited by uncertainty regarding costs. The study developed a transferable financial cost assessment framework that incorporated time-varying costs, enabling the evaluation of MAR schemes across various operating scales and conditions and accounted for uncertainty. This

framework's transparency is enhanced by a disaggregated cost analysis, which breaks down capital and operating expenses into their constituent parts, providing insight into the key cost drivers. The incorporation of time-varying costs allows for a more accurate representation of the costs associated with MAR schemes. This is particularly important for MAR schemes, where costs can vary significantly depending on factors such as opportunity costs of source water, aquifer storage losses and operational rules. The study's probabilistic approach captured the uncertainty associated with input parameters, allowing for a more comprehensive understanding of the costs involved. Global sensitivity analyses highlighted the most critical factors contributing to uncertainty that varied with scheme scales and operating conditions, enabling targeted efforts to reduce it. The methodology was applied to conceptual surface water infiltration and well injection sites in Australia that demonstrated its practicality and provided insights into the factors influencing costs. Levelized costs of recovered water varied depended on the scheme's capacity, configuration and operating conditions. By capturing uncertainty, incorporating time-varying costs, and providing a transparent, disaggregated cost analysis, this study offers a robust foundation for evaluating MAR schemes. The approach can inform early planning and design stages, ensuring that potential storage losses and other critical factors are considered.

A comprehensive review of modelling and influencing factors of willingness to pay for weather index insurance

Qingxia (Jenny) Wang
University of Southern Queensland, Springfield Central, Australia

Paper Abstract:

Climate change significantly increases the risks of extreme weather events (e.g., drought, excess rainfall) and some strategies have been developed to manage these risks. Weather index insurance (WII) is increasingly becoming one of the strategic tools used to transfer risks, specifically in the agricultural sector. WII is an innovative financial product that is based on pre-defined thresholds and trigger points (i.e., index) of weather parameters (e.g., rainfall, temperature). Unlike traditional insurance, in which the indemnity is claimed when the actual loss occurs, the payout of WII is triggered if the weather parameter moves beyond the pre-specified threshold and trigger points, regardless of losses. As such, WII offers some advantages, including less adverse selection (information asymmetry) and moral hazard, greater transparency, and quicker settlement of claims. However, there are many challenges in promoting WII, and the uptake rate is low.

This study will systematically review the previous research work to identify the critical influencing factors of willingness to pay (WTP) for WII. Prior literature shows that farmers' socioeconomic and demographic factors (e.g., age, gender, education, farming experience, farm size, and income), risk perception and risk attitude, and basis risk are attributed to the low uptake of WII. However, the findings are inconclusive on how these factors impact WTP for WII. For example, some studies show that risk attitude increases farmers' willingness to purchase WII, but others find opposite results. This study further investigates what models (e.g., experimental methods) are adopted and how relevant factors (e.g., climate risk attitudes) are measured. These differences in models and measures might lead to inconclusive results. Finally, to keep the models and influencing factors comparable across different research work, this study focuses on

reviewing research for food crops, such as cereals (e.g., wheat, rice, barley, millet, and others) and seeds (e.g., nuts, legumes, and some spices).

This study contributes to the growing literature on innovative financial products for risk management. By collecting, analysing and summarising the recent research on WTP for WII, this study provides crucial insights to different stakeholders in mitigating the impact of climate change. For example, farmers may need to improve their financial literacy to understand innovative risk management products. The communities and insurance companies should provide relevant training programs, such as workshops and seminars. Insurance companies and other financial institutions can also improve their insurance design to enhance farmers' confidence and trust in weather index-related insurance products. The governments and regulators could develop risk management policies and set up a national framework or platform for climate service.

Cost Effectiveness of Providing Anticipatory Aid in Advance of Natural Disasters

Alan de Brauw, Jeff Bloem
International Food Policy Research Institute, Washington, USA

Paper Abstract:

Recent evidence generated by WFP, IRC, IFPRI and others suggests that anticipatory cash transfers before disasters occur can help households adjust their activities to prepare for negative shocks. The idea behind anticipatory action is that beneficiaries can use transfers to protect assets or otherwise diversify their activities in advance of a negative shock, so that they can better maintain their livelihoods after a shock occurs. Empirical evidence suggests that anticipatory actions can lead to lower incidence of food insecurity post shock (Pople et al. 2021) or to invest in productive assets and change pre-shock coping responses (Balana et al., 2023).

While there is evidence emerging that anticipatory action can help improve the resilience of beneficiary incomes, there are a number of questions about that can help decision makers understand when to use anticipatory action versus conventional approaches to humanitarian aid. These questions can all be considered in a cost effectiveness framework. A primary challenge in determining cost effectiveness of anticipatory aid is the inherent uncertainty about whether a negative shock will occur in most situations. If aid is distributed prior to a shock, it could be geographically mistargeted (or the negative shock might not occur). When predictive capacity is poor, the uncertainty around the negative shock is larger, which further muddles decision making and increases the expected cost of acting. Second, there is an opportunity cost; if anticipatory action is taken that could be mistargeted, assuming that the total budget for aid within a region/country is fixed, it could be reducing the aid available for others who could need it within a specific budgetary period.

This research has two components. First, we develop an economic theory model of the potential effects of anticipatory action versus conventional post-shock aid. The model can help illuminate the potential benefits of either type of aid, as well as helping us understand the difference in costs between anticipatory action and conventional aid. While the model is mathematical, it will be accompanied by a parallel

conceptual framework without math, and the model will be used to help identify variables that should be considered in making the decision to use anticipatory action.

Second, the model and variables suggested are used to simulate the cost effectiveness of using anticipatory action during the El Nino induced drought in southern Africa in 2024. We use data collected as part of the World Food Programme response in Madagascar, Mozambique, and Lesotho to inform our model and describe the benefits and costs to using anticipatory action in this context, and to explore how anticipatory action could or should be used in the future.

Parallel 2E - Water 1

Location Chancellor 5, LVL 0

Time: 13:10 - 14:10

Chair: Constantin Seidl

Bargaining power in the Australian water market

Alec Zuo, Sarah Wheeler, Wenzhu David Tang
Flinders University, Adelaide, Australia

Paper Abstract:

Although the MDB water markets have been continuously evolving and maturing – and are considered the most advanced water market system in the world (particularly in the Southern Basin) – information transparency (asymmetric information) amongst participants remains an unsolved issue, which prevents efficient markets and causes social harm.

Concentration in water ownership may result in market power, and consequently anti-competitive behaviours (imperfect competition) in the water markets. ACCC (2020) also alleged that investors used their market power to influence water market prices to their advantage. Large investors have multiple advantages that include analytical resources, financial market access and financial backing, and are not constrained by the need to apply water for agricultural production; therefore, it has been alleged that investors restrict market supply sufficiently to artificially raise allocation prices by a material amount and then supply allocations to the market at inflated prices at times of peak demand (ACCC 2020). Although this has not been shown quantitatively in the Australian market, overseas research has shown that barriers in Chile water markets caused by information asymmetry led to different prices for homogeneous water rights (Hadjigeorgalis & Lilywhite 2004) and that even small market power in a groundwater-dependent agriculture region in southern California led to sizeable distributional impacts (Bruno & Sexton 2020).

The specific research question is: how buyer and seller characteristics influence the bargaining power in MDB water markets?

To answer these questions, following Harding et al (2003), the effects of bargaining power can be estimated by a hedonic pricing model where the dependent variable is the observed water price of a transaction and the independent variables include a vector of characteristics of water trades, vectors of differences and sums of seller and buyer attributes. Given the assumption of symmetric bargaining power (if buyers and sellers are identical then neither will have an advantage) and symmetric demand (buyers and sellers with identical characteristics place equal value on the traded good); the estimated coefficients of the vector of differences of seller and buyer characteristics provide direct measures of seller and buyer bargaining power associated with the specific characteristics.

The data are from state water registers (NSW, VIC and SA). Specific to each trade, attributes of both sellers and buyers are available such as water ownership types, water availability, and climate conditions.

Preliminary findings suggest that drought conditions, temperature, rainfall and water allocation percentage differences between the regions of sellers and buyers are associated with bargaining power in the temporary and permanent water markets in the southern Murray-Darling Basin. Different types of water ownership are found to have bargaining power in the market. For example, in the NSW temporary market, financial investors have the highest bargaining power, followed by irrigators, irrigation districts, industrial users, and the environment water holder and urban user with the lowest bargaining power. In the NSW permanent market, urban users have the highest bargaining power, followed by financial investors, irrigation districts, and irrigators, industrial users and the environmental holder with the lowest bargaining power.

A scoping review of studies estimating the relative size of industries in the Murray–Darling Basin by economic value and water used.

Mark Stevenson
Murray-Darling Basin Authority, Canberra, Australia

Paper Abstract:

Knowing what the most important industries in the Murray–Darling Basin (MDB) are, in terms of their economic value and water used, builds the scientific evidence base to inform trade-offs and synergies in natural resource policy and decision-making, and also enables monitoring and planning for sustainable industry transition and community assistance to meet future climate challenges. However, the Australian Bureau of Statistics (ABS) stopped reporting detailed agricultural production and water use data in 2021-22, ceasing its underlying agricultural commodities surveys as it investigated better data collection methodologies. The purpose of this scoping review is to determine if any, particularly any recent, analyses have been published that go beyond just reporting ABS figures to calculate the sizes of industries in the MDB region, or that can be used to rank these industries by economic value and water used. Employing established scoping review methods, academic and grey literature was found through online databases, search engines and in consultation with the Murray–Darling Basin Authority's economics community of practice. Seventy citations were selected for relevance and systematically analysed for their data sources used, types of analysis conducted and reporting of industry sizes. Results of this investigation revealed that studies mainly reproduced standard outdated data, with no suitable measures published to enable calculation of industry sizes specific to the MDB region. Only one dataset was discovered that could be used to derive a contemporary economic value ($415 million) for the relatively small MDB winegrape crush. Instead, modelling was commonly used to estimate economic value or water use, with econometric models being most popular. Although this scan established that there were no useful data in the extant literature for ranking MDB industries (except for the wine industry), better datasets and analyses, such as for socio-economic drivers and water trading, were found to be forthcoming in future publications.

The impact of the imposition of water tariffs on household income and consumption expenditure pattern

Noorhaslinda Kulub Abdul Rashid
Universiti Malaysia Terengganu, Kuala Nerus, Malaysia

Paper Abstract:

Water plays an important role in solving various human problems, agriculture, industry and many more towards balancing nature. Water operators are responsible for overseeing the treatment and distribution of water to customers. While the household is responsible for managing the use of water prudently. The National Water Services Commission (SPAN) which is a national regulatory body for the water and sewerage industry for Peninsular Malaysia and the Federal Territory of Labuan has announced that home water tariffs in the Peninsular and Labuan will be adjusted beginning February 1st, with an average rise of MYR0.22 per cubic meter, with rates reviewed every three years thereafter. This study investigates water accessibility and affordability among the Malaysian households, based on their income and consumption expenditure. This study employed a stratified random sampling among 500 residential users in Terengganu and Johor by using multiple regression model. The questionnaire consists of water experience with a water operator, consumption patterns, a choice experiment for water security criteria with three levels on a choice set, and socioeconomic status. The data reveal that there is a considerable variation between the variables. The findings indicate that there is a large gap between water tariffs and household income and consumption expenditures pattern. These findings are useful for water operators and governments in determining the appropriate water price for users in order to accomplish long-term sustainability water security.

Tapping into groundwater markets: Unlocking the future of water trade in South Australia's Limestone Coast

Constantin Seidl, John Kandulu, Sarah Ann Wheeler
Flinders University, Bedford Park, Australia

Paper Abstract:

Groundwater resources in South Australia's Lower Limestone Coast are divided between an unconfined aquifer, replenished by rainfall, and a deeper, irreplenishable confined aquifer. Both aquifers are already over-allocated, and climate change is projected to significantly reduce future recharge, threatening water availability. The region supports over 3,000 water licences for various uses, governed by regional legislation that is currently under revision to better address climate impacts, protect groundwater dependent ecosystems and encourage groundwater market growth. Despite provisions for temporary and permanent water licence transfers, the region's groundwater market remains underdeveloped due to limited competitive pressure from surplus (unused) water and other barriers. This study applies Wheeler et al.'s (2017) water market readiness assessment framework to identify legislative and policy barriers,

comparing the region to the South Australian River Murray water market. Our analysis leverages water register, usage, and trade data to assess current groundwater market performance, examining trade volumes, prices, and flow patterns. We employ scenario optimisation modelling to quantify potential benefits of increased groundwater trade and removal of trade barriers. Finally, we conduct up to ten semi-structured personal interviews with key groundwater user representatives, utilising a vignette study to investigate trading behaviour, concerns and barriers. The findings of this study will guide legislative revisions and inform efforts to remove trade barriers, promoting future groundwater trade.

Parallel 2F - Value Chain, Analysis & Marketing 2

Location Chancellor 6 , LVL 0

Time: 13:10 - 14:10

Chair: Hemali Kanthilanka

Optimizing value chain linkages using online value chain solutions and implications for the rural growers of pulses in Pakistan

Mubashir Mehdi[1], Rajendra Adhikari[2], Burhan Ahmad[3]
[1]MNS University of Agriculture, Multan, Pakistan. [2]University of Queensland, Brisbane, Australia. [3]University of Agriculture, Faisalabad, Pakistan

Paper Abstract:

Developing competitive agrifood value chains by linking rural smallholder farmers with powerful market actors have remained a major challenge in developing countries, including Pakistan. Traditional value chain system involves multiple intermediaries along the chain, reducing the logistical efficiency of the whole chain. Moreover, power and information asymmetry between farmers and downstream actors often results in opportunism and lack of trust among the key actors when a coherent whole of chain effort is required to develop competitive value chains. As a result, neither the farmers and value chain actors nor the consumers are able to leverage the price advantage and quality benefits of efficient and effective value chains. The rapid emergence, and consumers' increasing adoption, of online marketing system is considered as a potential pathway to transform the traditional value chains to more efficient and effective modern value chains that allow selling the produce directly from farmers to the end consumers. However, due to the lack of market knowledge and online platform facility, the Pakistani pulses growers have been unable to capitalise the opportunities offered by the emerging online market solutions. These value chain issues were addressed in a research project funded by the Australian Center for International Agricultural Research, which aimed to develop competitive value chains of pulses. Using the cluster approach of famers capacity development and a value chain collaboration approach, the project brokered partnerships between the cluster of smallholder rural pulses growers and an agribusiness firm providing digital marketing platform. Twenty farmers organised in a cluster and an online service provider were engaged in a participatory value chain appraisal approach and trial shipments were conducted to monitor and evaluate the financial costs and benefits of consignments. This case study reports the findings of the research which involved a survey of 500 consumers, in-depth interviews of participating farmers and the online agribusiness. Results indicate that by engaging in short, efficient and responsive value chains, farmers could earn up to 30% more profit than the traditional system while ensuring benefits to both the online agribusiness service provider and the consumers. This study reports the process and pathway of brokering value chain partnerships among rural smallholder farmers and powerful market actors that not

only ensured consumer responsiveness, agility and adaptability – the key features of modern value chains, but also created and grew value to smallholder farmers, market actors and consumers as well as ensured equity and synergy in the value chain partnerships. We also report opportunities and constraints of utilizing the online pulses marketing system in Pakistan.

Value-chain analysis— Evidence to improve the Pakistan's chickpea value chain performance

Saroj Amgai, Adam M. Komarek, Rajendra P. Adhikari
The University of Queensland, Gatton, Australia

Paper Abstract:

Over time, the demand for pulses, particularly chickpeas, has significantly increased in Pakistan and places it 6th in terms of global chickpeas consumption. This surging domestic demand, coupled with a decline in cultivation area and production, has increased concern among the chain stakeholders and facilitators about the future of the chickpea value chain. The effort to improve the chickpea value chain performance in Pakistan still lacks evidence on value chain dimensions despite value chain analysis offering a robust methodological tool to do so. The study maps the current state of the chain by examining five dimensions: processing activities, product flow, information flow, relationships, and financial flow, along with improvement options, using both qualitative and quantitative data. The data was collected using Group Model Building and followed by semi-structured interviews with chickpea value chain stakeholders in the Punjab and Sindh provinces. Results showed that typical of many commodity chains, chickpea stakeholder interacts with their immediate suppliers and customers, lacking the knowledge of what is happening in other parts of the chain, making them vulnerable to unknown consumer preferences and constraints. Farmers and collectors, as well as wholesalers and retailers, maintain strong relationships; however, the flow of information among them remains unequal. The information flow between the chain stakeholders is either unequal or uni-direction, with intermediaries playing a crucial role in facilitating trade between stakeholders due to existing trust and commitment issues. Categorising farmers into small(<5 acres), medium (5-25 acres) and large (>25 acres) based on cultivation areas, large farmers incur 1.38 times higher production cost per hectare than small and medium farmers by investing particularly in irrigation, fertilisers, weeding, cleaning, sorting and grading. Stakeholders across the chain enjoy a positive return on investment, with retailers having the highest return, followed by wholesalers and collectors. Similarly, retailers capture the largest percentage of the marketing share of consumer value despite investing the least in marketing compared to collectors, wholesalers, and processors. Although farmers bear the highest risks and production costs, their profit is eight times less than that of retailers and the lowest among all the chain stakeholders. The chain represents improvement opportunities by prioritising value-adding activities—particularly for farmers and collectors—ranging from fair prices to packaging, branding, levelling, sorting, and grading. However, a fair distribution of consumer value and profits and the equal information flow that strengthens stakeholder relationships are inevitable to support farmers' and improve overall chain performance.

Impact of E-commerce Platform Certification on Rice Sales Growth

Xianhui Geng
Nanjing Agricultural Uniersity, Nanjing, China

Paper Abstract:

Addressing the challenge of adverse selection in e-commerce markets stemming from information asymmetry, online trading platforms have embraced reputation signals as a market-based governance mechanism. While the complexity of the market environment has led to the erosion of the positive effects of reputation mechanisms, which are frequently manipulated through practices such as "brushing orders" and malicious negative reviews. Using data from 1,860 rice transactions involving 958 gold-rated sellers, we examined the corrective effect of platform certification signals on the market failure of reputation signals and its mitigation of adverse selection. We find that platform certification, positive seller reputation, and product favorable reviews significantly boost sales growth. However, negative reviews exert a negative impact, with product evaluations having a greater influence than seller reputation. And there exists a synergy effect among consistent signals and a substitution effect among inconsistent signals. Our findings suggest that e-commerce platforms should deepen the standardization and construction of their platform certification signal systems and strengthen measures to enhance the credibility of online reputation signals, thereby preventing adverse effects that may arise from combinations of negative evaluations and other signals.

Market Opportunity Index: A Tool for Future Australian Grain Export Opportunity Analysis

Hemali Kanthilanka, Chris Carter, Peter White, Barry Cox
Australian Export Grains Innovation Centre (AEGIC), Perth, Australia

Paper Abstract:

Australian exporters, government, and other industry organisations can benefit from accurately identifying the most promising markets for grain export for their development activities. This study developed a tool to aid this process. It is called the Market Opportunity Index and ranks future potential export markets for Australian wheat. Methodically, the index aggregates relevant indicators to produce three key dimensions: size of the market, responsiveness of the market, and accessibility of the market. By utilising the index, the study evaluates future export opportunities. The size of the market measures the potential import demand for Australian wheat from the markets. The gravity model estimates the economic potential and demand for wheat in various international markets based on their economic characteristics and proximity. Market Responsiveness measures how quickly and favourably a market can adjust to changes in supply conditions or pricing. At the same time, Market Accessibility evaluates logistical and regulatory factors that impact ease of entry and trade. The findings reveal that Indonesia, China, and Vietnam are the most promising markets for Australian wheat. Indonesia, with its growing population and increasing demand for wheat products, represents a substantial market opportunity. The Market Opportunity Index results emphasise the importance of maintaining robust trade relationships

with these key markets. Given the competitive nature of the global wheat trade, Australian exporters, the government, and other industry organisations must prioritise engagement strategies and market development, such as market delegations, bilateral trade agreements, and tailored marketing approaches to sustain and enhance their market presence. By aligning strategies with the insights provided by the Market Opportunity Index, exporters can better navigate the complexities of international markets and capitalise on emerging trends. This strategic focus will not only strengthen Australia's position in the global wheat market but also contribute to sustained export growth and economic benefit.

Media Panel Session: Shaping the Narrative of Agriculture and Energy Transition

Location Main Room 1 (ROMA), LVL1

Time: 14:20 - 15:20

Chair: Monique Lewis

As Australia moves towards decarbonisation, regional communities—many reliant on mining and traditional industries—face significant change. How can the media help bridge the gap between policy and public perception, ensuring a smoother transition for agriculture and energy sectors? What challenges will need to be overcome? Chaired by Dr. Monique Lewis, this panel brings together award-winning rural journalists Cathie Schnitzerling, Rhianna Patrick, Kallee Buchanan and Liz Wells alongside Professor John Rolfe, a leading expert in Regional Development and Resource Economics. Together, they will explore the media's role in informing, engaging, and persuading diverse audiences, from policymakers to people on the ground.

The discussion will unpack how different regions—whether agricultural areas, mining towns, the Great Barrier Reef tourism industry, or areas with strong First Nations connections—experience the transition in unique ways. What narratives resonate most with regional communities? How can media help counter misinformation, highlight opportunities, and foster understanding in places where economic shifts create uncertainty? With Queensland at the heart of Australia's energy and agricultural sectors, this session will examine the media's power in shaping public discourse, influencing decision-makers, and ultimately helping communities navigate the path to a more sustainable future.

Monique Lewis

Dr. Monique Lewis is a Senior Lecturer in Media and Communication at Griffith University, Gold Coast, QLD, specialising in the intersection of media, health, and risk sociologies. Her research explores how news media frame health, medicine, and risk, with recent work focusing on COVID-19 communication, vaccine narratives, and government messaging. She co-edited "Communicating COVID-19: Interdisciplinary Perspectives" (Palgrave Macmillan, 2021) and its forthcoming sequel, bringing together global insights on pandemic communication. Monique has presented her research internationally to

scholars, health professionals, and policymakers. She is an active member of several academic associations and co-Vice Chair of the IAMCR Health Communication Working Group.

Cathie Schnitzerling

The picture can't be displayed.

Born and raised in outback Queensland, Cathie was ABC TV Landline's first presenter in 1991, fronting and reporting on the program for four years. She returned as the executive producer in 2019 after four years as the regional editor for Queensland. Cathie was the first female director of news for the Ten Network in Brisbane and Sydney. She's worked as a reporter, presenter and producer on television and radio, including the Queensland Country Hour. She presents regularly on ABC Radio Brisbane. An award-winning writer and producer, Cathie was recognised for her leadership and mentoring skills with a Queensland Clarion award for her Contribution to Journalism in 2014. She has tertiary qualifications in leadership coaching and mentoring and has attended the Women's Leadership Forum at Harvard Business School.

Rhianna Patrick

Rhianna Patrick is a freelance Torres Strait Islander journalist, broadcaster and audio content creator. She is currently a senior journalist with the National Indigenous Radio Service and has an extensive media career spanning more than 25 years. She's an experienced podcaster, newsreader, researcher and producer and has worked in radio, television and new media platforms. Rhianna has produced several podcast series, Black Nation and Blak Bias for Indigenous X and was commissioned by the State Library of

Queensland to host, write and produce a podcast series on Eddie Koiki Mabo. The latter podcast earned Gold at the 2022 Australian Podcast Awards. Rhianna began her media career with Triple A Murri Country and the National Indigenous Media Association before joining the ranks of the ABC as news cadet.

Kallee Buchanan

Kallee has worked as a journalist, presenter and producer at the ABC since 2009. In 2017 she won the radio and digital categories at the Queensland Rural Media Awards, and was named the Rural Journalist of the Year. She went on to win both the Australian and the International Star Prize for Digital Media. She has since won multiple awards for her rural and emergency broadcasting, and in 2021 was the first Australian to receive the IFAJ-Alltech International Award for Leadership in Agricultural Journalism. She is currently the presenter of the Queensland Country Hour, Australia's longest running radio program.

Liz Wells

Liz Wells is an experienced agricultural journalist with a career spanning more than three decades. She began her journey at The Land newspaper in 1989, covering rural NSW before becoming Knight-Ridder's Australian agricultural correspondent, reporting on grain, meat, fibre, and sugar industries. Her work has taken her across Australia and internationally, covering key market developments and industry events. Now based in Toowoomba, Liz is the editor of Grain Central. With a deep connection to agriculture, she brings a wealth of industry knowledge and storytelling expertise to her reporting.

Mark Phelps
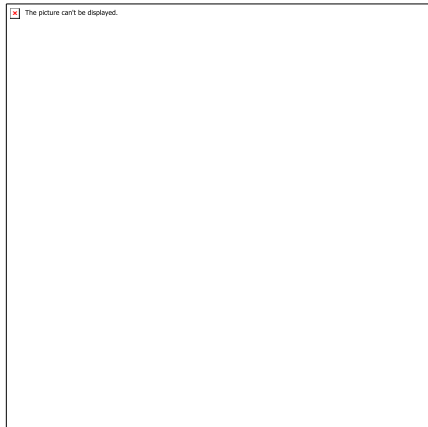
Mark is a long serving journalist and former editor of Queensland Country Life. His reports appear nationally across the Australian Community Media publications. His passion for agriculture has taken to all parts of Australia and many overseas locations during the past 30 years. Starting as a cadet journalist, he went to serve as the editor of QCL for some 12 years ensuring a reader driven focus and helping to pioneer the growth of digital technologies. He also worked as the communications manager at the United Graziers Association during the 1990s.

John Rolfe
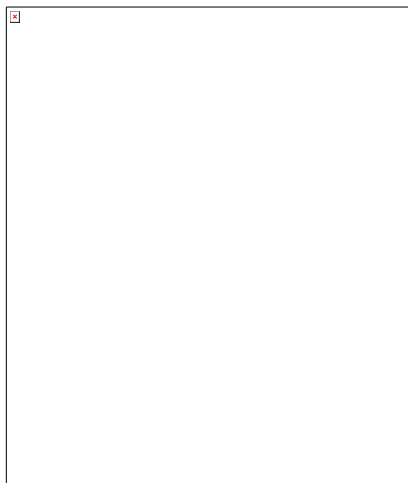
Professor John Rolfe is a distinguished resource economist at Central Queensland University, specialising in regional development, environmental, and agricultural economics. With extensive practical and policy experience in agricultural and environmental issues in northern Australia, he has operated a cattle property in Central Queensland for several decades. Since 1989, Professor Rolfe has held numerous academic and management roles at the university, contributing significantly to research in non-market valuation and economic impact assessments in rural areas. Professor Rolfe is also a past President of AARES (2019) and a Fellow of the Academy of the Social Sciences in Australia.

Special Session 3A - CGE modelling – Innovative tools in policy analysis

Location Main Room 3 (WICKHAM), LVL 1

Time: 14:20 - 15:20

Chair: Bill Malcolm

This session concentrates on adaptations to CGE models, including the TEEMS (Trade and Environmental Equilibrium Modeling System and GlobeTERM which combines GTAP regions with sub-national detail.

The session also includes a discussion of the Food and Agriculture Consequence of Adverse Events Tool (FACAET), a mimic tool built for a client concerned with the implications for the U.S. economy of disease outbreaks in agriculture and VURMTAX, a multi-regional CGE model of Australia.

Impacts on headline economic numbers, sectoral impacts and the fiscal implications of emissions mitigation policies will be discussed.

Session program:
14:20   Bill Malcolm (Uni. of Melbourne) (Chair): Introduction
14:22   Matthew Cantele (Uni. of Melbourne): TEEMS: An open and modular pipeline software platform for reproducible equilibrium model runs
14:40   Peter Dixon (Victoria Uni.): Mimicking CGE solutions for fast, secure turnaround: the case of agricultural diseases in the U.S.
15:00   Glyn Wittwer (Victoria Uni.): GlobeTERM, including sub-national detail in a multi-country model
15:18   Bill Malcolm (Uni. of Melbourne) (Chair): Closing remarks
15:20   Close

Special Session 3B - Urban Sustainability Transition in Australia

Location Main Room 4 (LEICHARDT), LVL 1

Time: 14:20 - 15:20

Chair: Sorada Tapsuwan

This special session is hosted by the Centre for Urban Transitions (CUT), Swinburne University of Technology.

The CUT undertakes research focusing on developing systemic, integrative and actionable knowledge on cities and how they transform.

The special session features the latest research from the CUT on housing, transport, circular economy, and environmental sustainability.

Session program:
14:20   Sorada Tapsuwan (Chair) (Swinburne Uni. Of Technology): Introduction
14:25   Andi Nygaard (Swinburne Uni. Of Technology): Wellbeing loss and gains from housing market spatial sorting and affordable housing
14:40   Olamide Shittu (Swinburne Uni. Of Technology): Navigating circular economy transitions in Victoria: A holistic analysis of multi-dimensional challenges
14:55   Magnus Moglia (Swinburne Uni. Of Technology): Willingness to pay for zero-emission freight trucks in Australia
15:10   All speakers: Q&A Discussion panel
15:20   Close

Presentation description:

Speaker 1 - Prof Andi Nygaard:
"In a context of worsening housing affordability, housing market spatial sorting exacerbates spatial inequalities in health, and access to green infrastructure and active public transport infrastructure. Affordable and social housing, in well-located areas, may reduce spatial inequality, but their financial and economic case are often poorly supported when compared to alternative public sector investments, or if valuation of access is income elastic and/or considered superior goods. This paper identifies willingness to pay for accessing green and active transport infrastructure, derived from choice experiments, for households in the two lowest income quintiles (low-income) in Australia. Our results identify positive WTP for access also for lower-income households, and that WTP varies across housing type (houses and apartments) as well as urban context (capital and regional cities, smaller regional towns). The quantification of WTP amongst low-income households provides evidence on the wellbeing loss, or gain, associated with housing market spatial sorting, or provision of well-serviced affordable housing."

Speaker 2 - Dr Olamide Shittu:

"The transition to a circular economy (CE) involves complex systemic changes across various scales. Despite a growing body of literature, there is a lack of empirical studies on the multi-dimensional challenges of CE transitions in regional contexts. To address this gap, the Circular Economy - Measurements, Assessments, and Pathways (CE-MAP) framework was introduced to explore the challenges of CE transitions in Victoria, Australia. The framework identifies three domains of change: Enabling Environment, Market Creation, and Organisational Change. Through case studies and interviews, the study revealed barriers such as organisational reluctance, inadequate investments for startups, and slow multi-sectoral collaboration. To overcome these challenges, the study recommends a comprehensive approach, including financial incentives, regulatory frameworks, collaboration, knowledge exchange between sectors, and sharing best practices for CE implementation. Aligning policy, practice, and research efforts can collectively address the multi-dimensional challenges of transitioning to a CE."

Speaker 3 - A/Prof Magnus Moglia:

"Here, we report on a choice experiment survey carried out in mid-2023 in Australia among decision-makers in road freight sectors. Results show overall relatively high willingness to pay in, but more so for HFCTs compared to BETs. Nonetheless, purchase price and ongoing costs remain the key drivers of preferences. Furthermore, we identify three clusters. The first group has a preference for diesel trucks. The second category prefer HFCTs but are not positive about BETs. A third group prefer anything but diesel trucks. We conclude that the transition to decarbonise the freight sector will require both financial and non-financial incentives."

Special Session 4A - CGE Modelling – Climate Change

Location Main Room 1 (ROMA), LVL1

Time: 15:50 - 17:30

Chair: Glyn Wittwer

The theme of this session is CGE modelling of climate change.

The session will include a discussion of the GTAP_INT 2.0 model, a GTAPv7 model variant, scalable in terms of both time (time horizon and step size) and space (number of regions and sectors).

An application of GTAP - INT 2.0 to improved country-level labour productivity loss assessment and its utilization will be presented.

The session will also include a presentation on a stochastic ensemble simulation of decarbonisation paths for Australia under policy uncertainty, introducing the concept of an expected policies baseline and discussion of a model covering 30 countries/regions and 31 sectors showing the Paris Agreement target and path in annual time steps to 2100 in terms of emissions reduction and the shift in energy mix.

Session program:
15:50   Glyn Wittwer (Victoria Uni.) (Chair): Introduction
15:52   Pham Van Ha (Uni. of Melbourne): GTAP_INT 2.0 – A forward looking CGE model for climate change and trade policy analysis
16:16   Sam Marginson (Victoria Uni.): VURMTAX-Green to analyse Australia's 2030 emissions reduction policies on the economy and government budgets
16:40   Vito Avakumović (Uni. of Melbourne): Improved country-level labour productivity loss assessment and its utilization in GTAP - INT 2.0
17:04   Tom Kompas (Uni. of Melbourne): The World Will Not Achieve Net Zero by 2050: The Challenge of Meeting Emissions Reductions Targets in a Global Energy and Trade Model
17:28   Glyn Wittwer (Victoria Uni.) (Chair): Closing remarks
17:30   Close

Special Session 4B - Building Climate Resilience in Pacific Horticulture: Policy, Practice, and Community Engagement

Location Main Room 2 (TERRACE), LVL1

Time: 15:50 - 17:30

Chair: Shabbir Ahmad

The Pacific horticultural sector has untapped potential to significantly contribute to the region's food security, nutrition, and rural livelihoods through high-value production, processing, and trade activities.

The horticulture sector could boost food and income security, playing a significant role in value addition and economic diversification in the Pacific.

Building community capacity for commercial value addition through improved production and value creation systems in horticulture could offer a pathway to significant improvement in rural economic activity leading to economic growth and social stability.

This session will bring together policymakers, rural development facilitators, and academics to discuss effective narratives to build sustainable, climate-adaptive horticultural farming enterprises that safeguard both food security and economic benefits through value-creation activities.

By bringing together diverse perspectives, the discussion will explore both practical solutions and the economic case for investing in resilience, contributing to sustainable development and food security in the face of climate threats.

Session program:
15:50   Shabbir Ahmad (UQ) (Chair): Introduction- Brief overview of the session's objectives and the significance of productivity climate resilience in Pacific horticulture/agriculture sector.
16:00   Ian Newton (QlD Govt, DAF): Economic Implications of Climate-Resilient Horticulture – Implementing climate adaptation measures to reduce climate change footprint in horticulture sector.
16:10   Deborah Hill (Uni. of Canberra): Community Engagement and Traditional Knowledge - The role of indigenous knowledge systems in climate resilience and horticultural adaptation with a particular focus on exploring agribusiness development opportunities in Solomon Island.
16:20   Sergie Bang (Dpt. of Agriculture & Livestock, PNG): Policy Frameworks for Climate Resilience – Discussion on national and regional policies on addressing climate impacts on horticulture. Some examples of from PNG.
16:30   Thilak Mallawaraachchi (UQ) (Moderator): Moderated discussion
17:15   All speakers / Shabbir Ahmad (UQ) (Chair): Q&A + Closing remarks
17:30   Close

Speakers:

100

Dr. Shabbir Ahmad is a Senior Research Fellow at Queensland Alliance for Agriculture and Food Innovation (QAAFI), University of Queensland (UQ).

Dr. Ian Newton is a Principal Entomologist at the Department of Agriculture and Fisheries, Queensland Government.

Dr. Deborah Hill is an Associate Professor at the Centre for Sustainable Communities, University of Canberra.

Dr. Sergie Bang is Secretary at the Department of Agriculture and Livestock, Papua New Guinea.

Dr. Thilak Mallawaraachchi is Honorary Associate Professor at the School of Economics, University of Queensland (UQ) and direct past-President of AARES.

Parallel 3A - Valuation 1

Location Main Room 3 (WICKHAM), LVL 1

Time: 15:50 - 17:30

Chair: Rodrigo Zilleruelo Estanol

Assessing dimensions of household water security: a choice experiment approach

Zuraini Anang, Mahirah Kamaludin, Roseliza Mat Alipiah, Noorhaslinda Kulub Abdul Rashid, Ahmad Hakimi Abdul Halim
University Malaysia Terengganu, Kuala Nerus, Malaysia

Paper Abstract:

Malaysia has abundant water resources. Overpopulation, urbanization, inadequate water management, and climate change all contribute to water stress in certain Malaysian states. Water insecurity, particularly in households' consumption, results from an imbalance between demand and supply. Household water security is measured in five dimensions, namely pipe burst, water amount, water pressure, water reliability or resilience, and price. This study aims to investigate the current state of household water security dimensions and measure willingness to pay in order to improve the household water security frameworks. The choice experiment will be used to determine a willingness to pay for simulating the water security framework. The questionnaire includes water experience with water operator, consumption patterns, a choice experiment for water security parameters with three levels on a choice set, and socioeconomic characteristics. The sample includes 500 residential customers. These findings will help to develop a comprehensive household water security framework to meet the Energy Transition and Water Transformation Ministry goal of achieving an estimated 180 litres per person per day by 2025, as well as the United Nations' Sustainable Development Goals (SDGs) 2030 target of ensuring access to clean water and sanitation for all and long-term water security.

Valuing Coastal Wetland Restoration in Australia with Discrete Choice Experiments

John Rolfe[1], Sabiha Marine[2], Kym Whiteoak[3], Paul Carnell[4], Melissa Wartman[2]
[1]CQUniversity, Rockhampton, Australia. [2]Deakin University, Melbourne, Australia. [3]Canopy Economics, Melbourne, Australia. [4]RMIT, Melbourne, Australia

Paper Abstract:

Coastal wetlands are critical ecosystems that provide numerous ecological benefits, including habitat for wildlife, water filtration, coastal protection and carbon sequestration. This study reports a discrete choice experiment used to value potential restoration of coastal wetland ecosystems in Australia. Three wetland types were described to respondents: mangroves, tidal marshes and seagrasses. From a policy perspective, these ecosystems are of particular interest because of their extent and distribution around the Australian coastline, and their potential for delivering a range of co-benefits. A particular focus of the study was to design the choice experiment at a national level, in contrast to most studies that focus on smaller scale and more easily definable tradeoffs. A random sample of Australians were asked to choose between different restoration options for each ecosystem over 10-year scenarios involving annual payments. The annual willingness to pay for 10 years per 1,000ha of restoration is estimated to be $12.56 per household for mangroves, $9.55 for tidal marshes, and $5.59 for seagrass. We identified diminishing marginal values with increasing expenditure and used non-linear cost functions to improve model fits. Under this treatment the annual willingness to pay per 1,000ha was lower at $3.41 for Mangroves, $2.52 for Tidal Marshes and $1.46 for Seagrass. We found significant heterogeneity in preferences across the population, with only 21.1% of Australian households interested or very interested in paying to protect these ecosystems, with the potential for carbon sequestration being one of the main factors that underpinned this support. The results of this study add to the small pool of primary valuation studies to value improvements to coastal ecosystems, providing one of the first economic analyses of this issue in Australia.

Quantifying Recreational Losses from Harmful Algal Blooms

Olesya Savchenko[1], Abhishek Rajan[1], George Parsons[2], Christa Court[1]
[1]University of Florida, Gainesville, USA. [2]University of Delaware, Newark, USA

Paper Abstract:

Most coastal regions in the world are affected by harmful algal blooms. Climate change and human activities alter the marine environment, causing harmful algal blooms to grow bigger and more frequent. HABs have emerged as a significant concern for marine ecosystems globally, causing serious damage to marine resources and the coastal economies. In the U.S., more than 800 HAB events were recorded between 2000 and 2019. HABs severely impact the environment and coastal communities, creating dead zones in marine water, killing fish and marine animals, and reducing recreational activity. The average economic impact from a single major HAB event in the U.S. is estimated to be around $100 million.

This paper is the first to estimate the loss in the recreational use values of beach visitors due to HABs in the U.S., using the case of HABs along Florida's Gulf of Mexico coast. We use a single-site Travel Cost Method to estimate the lost recreational use values and economic impacts due to HABs along Florida's Gulf Coast between 2017-2022. Our model combines revealed preference survey data on actual recreational trips taken in Florida's Gulf Coast and data on cancelled trips. We construct a pseudo panel of trips taken during the time of HAB occurrences and a counterfactual time period without HABs. We utilize this pseudo panel data to estimate the change in consumer surplus which represents the loss in recreational value due to the HABs.

We find that HABs have a significant negative impacts on the trips to Florida's Gulf Coast, reducing the average number of trips per household by 3% a year. Our welfare estimates show that the HABs in Florida's Gulf Coast lead to an average reduction in consumer surplus of $53 per visiting household per year. The aggregate damages due to HABs in just one county in Florida are estimated to about $4.3 million per month.

The paper makes several contributions to the literature on the economic impacts of HABs. First, this study is among the first to estimate the recreational losses due to HABs, demonstrating that HAB events significantly lower beachgoers' welfare and trip frequency. While previous studies have examined the recreational and tourism losses due to red tide events in Florida, to our knowledge, no study has evaluated the reduction in beach visitations and welfare losses experienced by beach visitors to the Gulf of Mexico due to HABs. Second, this paper contributes to the broader literature on recreational damages due to HABs which is largely unexplored. Third, our study makes a methodological contribution by using TCM for estimating recreational losses from HABs. Finally, the results of our research provide meaningful information to policymakers. Our estimates of welfare losses due to HABs can inform policy decisions to design programs aimed at reducing the severity and frequency of HABs.

Exploring alternative systems for comprehensive natural capital valuation

Jeremy De Valck[1,2], John Rolfe[3,2]

[1]Centre for Regional Economies and Supply Chains (CRESC), Central Queensland University, Brisbane, Australia. [2]Coastal Marine Ecosystems Research Centre (CMERC), Central Queensland University, Gladstone, Australia. [3]Centre for Regional Economies and Supply Chains (CRESC), Central Queensland University, Rockhampton, Australia

Paper Abstract:

There has been growing concern over the mismatch between anthropocentric nature valuation systems, non-economic values important to certain stakeholder groups—especially First Nations People (FNP)—and the intrinsic value of ecosystems outside human uses.

Positivist methods are proposing increasingly advanced systems to identify, measure and estimate the many benefits and values obtained from natural ecosystems. From the early days of environmental economics to its most recent advance, concepts like environmental functions and ecosystem services have been refined, harmonised, integrated into accounting systems and expended to embrace non-economic value dimensions and the diverse perspectives of multiple types of stakeholders. These different systems and concepts have been essential in expanding our understanding of human-ecosystem interactions and their many socio-economic implications.

However, it is becoming apparent that these systems show important limitations the moment one ventures into the realm of non-use, intangible values like the ones related to social, cultural or spiritual importance. Key challenges include:

1. Limits of nature commodification: Reducing nature's many contributions to society to economic values is likely a gross simplification. Not all of nature's contributions can be easily transactional. The economy is only a fraction of human society, itself bounded by the limits of the natural ecosystem we live in (i.e., Earth).

2. Holistic vs Atomistic views: Current systems typically break nature into discrete components for valuation (TEV) but tend to miss holistic perspectives. FNPs, for example, view nature as interconnected and emphasise relational values that cannot be captured by atomistic measures. Synergies in their value system suggest that ecosystem value is greater than the sum of its parts.
3. Western vs Alternative views: Positivist, objective measurement systems often don't align with alternative cultural perspectives, like FNP knowledge, which leans towards idealist and interpretivist views that clash with Western worldviews. These views highlight the importance of context, individual interpretation, and cultural heritage, which can't always be objectively measured.

This is a longstanding issue, illustrating the divide between physical and metaphysical worldviews and how they shape reality. The reliance on monetary metrics appears central to the problem. While non-monetary alternatives exist, they typically lack the simplicity and universality of money, making them harder to apply in decision-making.

To address these challenges, we propose three main ideas to reconcile differing perspectives. First, we suggest using time as an alternative to money in nature valuation. As time is finite, it becomes humanity's ultimate currency, shaping both individual and ecosystem value over thousands of years, giving ecosystems a time-based value far exceeding purely monetary assessments. Second, we argue for valuing community benefits over private ones. Community-based valuation reflects relational values, equity, cultural heritage, and accessibility rights, making it a more just and inclusive approach. Finally, we propose that valuation systems focus on ecosystem resilience. By prioritising adaptive capacity, we can enhance stewardship and ensure ecosystems continue to support human well-being long into the future.

The rest of the paper explores the practical implications of this shift to time-based valuation, community benefits, and resilience, and how these new approaches could aid in decision-making.

The potential impact of tidal marsh ecosystem restoration on the recreational value of birdwatching: The case of the Adelaide International Bird Sanctuary National Park

Vandana Subroy, Bethany Cooper, Joanne Tingey-Holyoak, Jeffery Connor

University of South Australia, Adelaide, Australia

Paper Abstract:

Around the world, degraded coastal ecosystems are starting to be restored, resulting in restored natural tidal flows, 'blue carbon' capture and storage, and new habitat for migratory birds, fish and other marine life. Among the expected recreational benefits of tidal restoration projects, birdwatching has been identified as being important to quantify given its personal, societal and conservation benefits. We conduct a travel cost survey of birdwatchers across Australia to estimate the recreational value of birdwatching at the Adelaide International Bird Sanctuary (AIBS) in the upper Gulf St Vincent for a South Australian Blue Carbon Ecosystem Restoration project. Located at the southern end of the East Asian-Australasian Flyway, the Bird Sanctuary is a crucial feeding and roosting site for over 5 million migratory

birds annually, some flying from as far as Siberia and Alaska. It is also home to 263 unique fauna and flora species. The travel cost survey estimates the recreational value of birdwatching pre-restoration, assesses birdwatching experience and interest and measures hypothetical post-restoration (future) behaviour as a change in visitation for different restoration scenarios including, no change from current conditions, increase in infrastructure at the site, a 30% increase in native vegetation, and a 30% increase in bird numbers and number of species that can be sighted on a visit for both resident and migratory birds. Given the likelihood for the spread of the H5N1 bird flu strain in Australia in the near future, we also explore on the potential change in future visitation if bird flu were to spread to the population at the AIBS. The recreational benefits calculated from our travel cost survey will feed into a useable Environmental Economic Accounting framework to quantify the restoration impacts and develop project level accounts at the restoration site. There are limited primary studies in Australia that measure the recreational values of birdwatching, despite the substantial economic contribution of birdwatching to tourism and recreation in the country ($46 million spent on day trips and $237 million on overnight trips in total in 2019). Therefore, our study provides an important contribution to the global travel cost literature measuring the recreational values of birdwatching.

Valuing improvements to ecosystems across conserve, restore and create options in the Great Barrier Reef in Australia: insights from Discrete Choice Experiments

Rodrigo Zilleruelo[1], John Rolfe[1], Jeremy De Valck[2], Gordon Dwane[3]
[1]Central Queensland University (CQU), Rockhampton, Australia. [2]Central Queensland University (CQU), Brisbane, Australia. [3]Gladstone Port Corporation, Gladstone, Australia

Paper Abstract:

Marine and coastal ecosystems face human-induced and natural pressures, leading to the degradation of some of these ecosystems. It is increasingly recognised that the extent of this degradation has made conservation alone insufficient as a response; more active approaches like restoration and the creation of ecosystems are required to halt and reverse these trends. Whereas conservation refers to actions to protect ecosystems currently in good ecological condition, restoration can be applied to repair ecosystems that are in poor condition, while creation can be used to establish ecosystems where they are absent or have been lost. There are many areas in which these three approaches (i.e., I. Conservation, II. Restoration, III. Creation) are being applied simultaneously. However, information about how they should be prioritised is scant, particularly regarding their economic benefits, resulting in a challenge for decision-makers.

To address this gap, our research uses environmental valuation to assess the economic values of these approaches. Specifically, we designed a group of Discrete Choice Experiments (DCE) to estimate values for quantities of ecosystems in good ecological condition across these three types of management response. The Great Barrier Reef in Australia (GBR) serves us as our case study. The GBR is a complex socio-ecological entity with significant spatial extent and outstanding universal value; in the GBR multiple ecosystems, stakeholders, and contested values coexist. We focus on three ecosystems (I. mangrove forests, II. seagrass meadows, and III. coral reefs) which are in different ecological conditions in the GBR. A split-sample approach per ecosystem (n=300x3=900) is employed to reduce task complexity.

Our general objective is to compare respondents' preferences for the conservation, restoration and creation of these three ecosystems, where we expect increasing marginal values across the management levels. We also assess the effects of bundling, where respondents are presented with individual or packaged DCE alternatives, and the influence of contested values (i.e., intrinsic, instrumental and relational values) on respondents' preferences. Our mixed logit models further explore the complexities tied to baseline conditions and ecosystem types, where we expect stronger preferences for improving ecosystems currently in poor conditions.

This study makes several contributions. On conceptual and methodological grounds, as far as we know, no other study has applied DCE to analyse respondents' preferences and the economic benefits of these three management approaches simultaneously. Further, only a few studies have explored relational values and bundling effects in environmental management using DCE. On practical grounds, information about preferences for conservation, restoration and creation actions is crucial for decision-makers who often face the challenge of budget allocation under uncertainty. Further, managing the GBR is complex because values are contested; every socio-ecological conflict is ultimately a value conflict. Therefore, disentangling the complexities of people's preferences and values for these ecosystems and management approaches is essential to enable an effective and widely accepted management of the GBR. This study showcases the implications of valuation in contributing to meeting a transition to a sustainable future.

Parallel 3B - Agricultural Production

Location Main Room 4 (LEICHARDT), LVL 1

Time: 15:50 - 17:30

Chair: Christophe d'Abbadie

Examining the Value Realization of Ecological Agricultural Products in China: A Tripartite Evolutionary Game Analysis

Jinpeng Dong[1], Jinlan Chen[2], Yuanyuan Zhang[2], Lei Cong[3], David Dean[3], Qiang Wu[2]
[1]Huazhong Agricultural University, Wuhan, China. [2]Shandong Agricultural University, Taian, China. [3]Lincoln University, Lincoln, New Zealand

Keywords: 3. Agricultural Production; 23. Market Design and Policy

Paper Abstract:

Agricultural products are essential for nutrition and food security, particularly in China where agricultural production capacity is growing steadily. Despite the benefits of Ecological Agricultural (EA) products, including environmental protection and enhanced consumer utility, their widespread adoption and maximization of value are impeded by various factors. This study explores the intricate tripartite relationship – government, agribusiness, and consumer, in the value realization of EA products in China by establishing an evolutionary game model. The purpose is to illuminate the evolution of system equilibrium strategies across various scenarios and examine how significant external factors influence these strategies, thereby summarizing the evolutionary process of EA products' value realization and providing guidance for stakeholders' decision-making processes. The results indicate that with increased government regulatory efforts, technological advancements and scale expansion in agricultural enterprises, as well as the refinement of market mechanisms, the production cost of EA products decreases, leading to a steady rise in EA product prices and economic benefits for consumers purchasing them. Ultimately, the value of EA products was primarily realized through market forces. Simulation analysis using Matlab further validated the model's effectiveness and precision, highlighting the influence of government regulatory measures, consumer green sensitivity and preferences, and product base value on system equilibrium strategies. These conclusions provide insights for policymakers to facilitate the realization of EA product value and promote green and low-carbon agricultural development.

Trend and factors affecting production and consumption of fertilizers in Australia: The moderating role of Agri GDP and R&D expenditure

Khairul Alom[1], Delwar Akbar[1], Chengyuan Xu[2], Tham Dhong[3]
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Paper Abstract:

This paper aims to investigate the trend and factors affecting the production and consumption of fertilizers in Australia in the framework of moderating effects of agri GDP and R&D expenditure. Quarterly data from 2000 to 2023 has been collected to examine underlying propositions among the variables of fertilizers consumptions, crop production, arable land, employment in agri, agri value added, agri export to import ratio, agri R&D expenditure. The ARDL bound tests, Granger Causality, and FM-OLS econometric models were employed to look at the relationship dynamics among the variables affecting fertilizer production and consumption in the Australian economy. The findings confirm a significant long-run relationship exists among the variables of agri value added, corp production, arable land, agri export-import ratio, agri R&D expenditure, and the moderating effects of agri value-added and agri R&D expenditure with fertilizers consumption. However, agriculture employment has no long-run relationship with fertilizer consumption. In the short run, the error correction mechanism shows that all the variables quickly return to equilibrium except for the arable land. The Granger causality test results show that bi-directional causality exists among the variables of agri value added to fertilizer consumption, arable land to fertilizer consumption, employment to fertilizer consumption, and export-import ratio to fertilizer consumption. Moreover, uni-directional causality exists among the variable of crop production to fertilizer consumption, agri R&D expenditure to fertilizer consumption, agri value added to crop production, agri value added to arable land, agri export-import ratio to agri value added, arable land to crop production, employment to agri export-import ratio, and corp production to agri R&D expenditure. Robustness checks further confirm that all the variables have a fully modified co-integrating relationship with fertilizer consumption except the employment variables in Australia. The impulse response function shows an accumulated response of one standard deviation innovation. All the variables have positive reactions to fertilizer consumption except employment. The accumulated response function of employment is negative with fertilizer consumption. Thus, policymakers are advised to prioritize investing more in agri R&D to promote sustainable fertilizer production, consumption, and overall sectoral contribution to the Australian economy.

Multi-criteria evaluation of cropping system designs: Targeting profitability, drought resilience, and resource use efficiency in broadacre agriculture across Eastern Australia

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Paper Abstract:

The variable production environments across Eastern Australia require agricultural producers to engage in highly opportunistic cropping strategies. Instead of following largely predetermined crop rotation patterns and cultivation practices, rainfed broadacre farmers across Queensland and New South Wales frequently switch between (i) summer- and winter-dominant cropping strategies, (ii) double cropping and long fallow systems, (iii) cereal- and legume-dominated systems, and (iv) high- and low-input production practices. Observed soil moisture conditions, seasonal rainfall forecasts, and price incentives from input

and output markets are predominant decision drivers. Farmers are confronted with the complex management task of selecting a cropping strategy that performs well across typical seasonal climate conditions while optimising their short- and long-term system performance across multiple criteria, involving profitability, resource use-efficiency, and on-farm environmental resources.

Our analysis investigates which cropping strategies across rainfed broadacre systems in Queensland and New South Wales are most suitable to deliver multiple farm-level production objectives in a resilient manner. Specifically, we quantify the performance of cropping systems in terms of gross margins, downside risk, crop failure frequency, crop water uptake, soil organic carbon, and water loss.

Our analysis combines a comprehensive bio-physical modelling analysis with gross margin accounting. We systematically analyse more than 80 crop rotation options across 24 production locations, considering different fertiliser intensities and sowing rules for their average annual performance across 60 years of seasonal climate records. We simulate agronomic and further bio-physical outcomes using the cropping systems model Agricultural Production Systems sIMulator (APSIM). We calculate the financial performance of cropping strategies based on input costs and output prices reported in the AgMargins database.

We found strong differences in the performance of cropping systems among multiple dimensions. First, when farmers choose to consistently apply a specific sowing rule (e.g., predetermined soil moisture threshold) to determine if to cultivate or to fallow, the largest gross margins are achieved by strongly different cropping systems as when farmers switch between variable sowing rules. Second, while some financial and environmental indicators can consistently be achieved in synergy by carefully designed cropping systems, a smaller number of performance indicators can seldom be achieved in synergy and necessitate trade-off decisions by farm managers. Further, we quantify and visualise spatial differences in cropping systems performance across agro-environmentally diverse production locations.

Our analysis provides new quantitative evidence of how the agro-environmental variability of broadacre production systems in Eastern Australia generates complex farm optimisation problems for farm managers. We identify (i) core cropping system decisions that predetermine long-term average system performance and performance stability and (ii) highlight achievable synergies and persistent trade-offs between financial and environmental on-farm outcomes.

The Economic Value of Natural Enemies in Agricultural Production

Zhenzhen Liu[1], Xianhui Geng[1], Jingqiu Zhang[2]
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Paper Abstract:

Natural resources, such as natural enemies, are becoming increasingly important in agricultural production. By optimizing their combination with socio-economic inputs like pesticides, land productivity can be significantly enhanced. The utilization of natural enemy-prey relationships within ecosystems provides notable ecological benefits for pest control. However, the economic value of natural enemies at the farmer level remains unclear. It is an urgent issue to evaluate this economic value at the

individual farmer level and apply it to agricultural production. This study treats natural enemies as a natural input in agricultural production. We theoretically analyze their relationship with other production inputs and crop yields, construct a damage control production function model, assess the marginal impact of natural enemies on crop yields, evaluate the direct influence of natural enemies on agricultural production, and make a quantitative evaluation of the economic value of natural enemies. Our findings indicate that natural enemies, like pesticides, play a crucial role in controlling pests and reducing crop losses. Both comprehensive measures of predator populations and specific indicators, such as the density of ladybird beetles (the most important predatory natural enemy), show that an increase in predator numbers significantly enhances crop yields. In pear orchards, for instance, an increase of one predator per board leads to an average increase of 1.635 CNY in pear fruit value, demonstrating natural enemies as a vital natural force in pest control. Compared with the increase of the number of natural enemies in the later stage, it is of more economic significance to establish predator populations from scratch in the early stages of production.

Existing research on agricultural production input and output has primarily focused on social factors of production, with limited consideration of natural factors. It often overlooks natural resources beyond land or treats them as homogeneous, which does not align with the current realities of agricultural production and may omit important explanatory variables. This study thoroughly examines the role of natural enemies in agricultural production by incorporating them as a pest control factor into the production function. It integrates this with a damage control function to analyze productivity from the perspective of pesticide use efficiency. This approach refines both the theoretical model of pesticide productivity and the conventional Cobb-Douglas (C-D) production function, addressing the discrepancies between previous empirical results and the "profit maximization theory." Most existing studies have evaluated the economic value of natural enemies using simulation methods at the regional or project level, lacking empirical data from the micro-level of individual farmers. This study, however, approaches the issue from individual farmers' perspective, incorporating field observation data of natural enemies for both theoretical and empirical analysis. It provides pioneering empirical evidence of the economic value of natural enemies at the individual farmer level, thus filling a critical gap in this research area.

Optimal Corn Planting Density and Flexible Estimation Methods

Lulu Pi, Zheng Li, Xiaoyong Zheng, Roderick Rejesus
North Carolina State University, Raleigh, USA

Paper Abstract:

Introduction: United States (US) corn yields had increased approximately seven-fold from 21.4 bu/acre in 1935 to 171.9 bu/acre in 2022, which implies an annual growth rate of roughly 1.7 bu/acre. Evidence shows that the increases in planting density is one of the major reasons for the impressive yield gains observed in the US.

The purpose of this paper is to estimate the optimal planting density that (a) maximizes mean corn yields, and (b) minimizes production risk. We use flexible econometric estimation methods based mainly on semi-parametric procedures, and then compare estimates with less flexible traditional parametric approaches. That is, we estimate the impact of planting density on mean corn yields and production risk using flexible

and non-flexible approaches, and then determine optimal planting densities under these different scenarios.

Our paper contributes to the literature in several ways. First, previous studies examining the impact of planting density on corn yields and production risk mainly employed less flexible parametric regression methods, which are susceptible to misspecification issues. In cases where the model is misspecified, the estimated parameters become inconsistent, leading to potentially misleading statistical inferences. Second, past literature has have employed various non-parametric methods to analyze production risk, but they did not estimate optimal planting densities or investigate how these optimal densities evolve over time. Hence, our study offers valuable insights into the dynamic nature of deriving optimal planting densities.

Data and Methods: We apply flexible semi-parametric econometric methods and traditional parametric approaches on a US county-level panel data set with information on corn yields and planting densities that spans the period 1995-2014. In particular, we rely on flexible cubic spline functions to be able to ascertain the best model specification for the data (without ex ante imposing a parametric structure that may not fit the data well, and lead to misspecification errors).

Preliminary Results: We have three major findings. First, the optimal planting density that maximizes conditional mean yield increases over time, but the growth rate for this optimal planting density level also gradually decreases. Second, the estimated cost of yield risk (or production risk) ranges from 2% to 7% of the mean yields and the optimal planting densities that minimize the cost of yield risk are smaller than the corresponding optimal planting densities that maximize the conditional mean yield. This has important implications for farmers choosing their optimal planting density (e.g., it depends on whether they want to maximize yields or minimize risk). Finally, results from our flexible framework are quite different from those of the traditional parametric approach, which implies that relying solely on the traditional parametric approach could lead to potentially misleading recommendations for optimal planting densities.

In view of the foregoing discussion , we believe that this paper will generate good discussions at the AARES meetings. We envision that agricultural economists interested in applied production economics, specifically those studying production risk and using related econometric estimation methods, would have meaningful dialogue that encourages future studies on the topic.

Is there something fishy about rangelands livestock?

Christophe d'Abbadie[1], Ross Kingwell[1,2], Brad Plunkett[1]
[1]Department of Primary Industries and Regional Development, WA, Perth, Australia. [2]School of Agriculture & Environment, University of Western Australia, Perth, Australia

Paper Abstract:

Globally, many fisheries suffer from stock depletion and over-fishing. How best to manage and regulate fisheries is often an applied focus of fisheries economics. To aid the sustainability of fisheries, fisheries economics often draws on complex bioeconomic models that capture the interplay of aquatic biology,

marine environments, regulation and the overlay of fishing technology, fishing effort and the associated costs and returns.

Rangeland livestock management faces some similar issues that confront fisheries. Rangelands globally face the widespread problem of overgrazing (similar to over-fishing). The challenge of responding to climate change is an issue affecting fisheries and rangeland management. While ecosystem functions in fisheries are well understood and reflected in models, understanding, monitoring, and managing ecosystems in rangelands remains a significant challenge. In fisheries, the stock of fish is managed through harvest controls (e.g., restrictions on the number of boats, number of pots, geographic controls on fishing effort). In rangelands, the resource to be conserved is the grass and shrub ecosystem (i.e., land condition), with livestock and other native and feral graziers acting as the ecosystem harvesters. Therefore, controlling total grazing pressure from all animals and the geography of grazing are keys to improving land condition—akin to controlling the harvest in fisheries to sustain fish stocks.

This paper explores the parallels between fisheries economics and rangeland livestock management economics, focusing on the potential beneficial implications of applying fisheries frameworks and fisheries modelling perspectives to rangeland environments and the business of rangeland livestock production.

Parallel 3C - Uncertainty & Risk 2

Location Chancellor 1, LVL0

Time: 15:50 - 17:30

Chair: Patrick Ward

Cropping intensity drives risk efficiency and GHG intensity of crop sequences in Australia's subtropical cropping zone.

Lindsay Bell[1], Jeremy Whish[2], Dean Schrieke[1,3], Brook Burrett[1], Andrew Erbacher[4], Darren Aisthorpe[5], Jayne Gentry[6], Jon Baird[7]

[1]CSIRO, Toowoomba, Australia. [2]CSIRO, Brisbane, Australia. [3]University of Melbourne, Melbourne, Australia. [4]Department of Agriculture and Fisheries, Queensland, Goondiwindi, Australia. [5]Department of Agriculture and Fisheries, Queensland, Emerald, Australia. [6]Department of Agriculture and Fisheries, Queensland, Toowoomba, Australia. [7]NSWDPI, Narrabri, Australia

Paper Abstract:

Australian cropping systems are facing range of threats to their long-term profitability and sustainability. Farming systems need to evolve to be more resilient to changing climatic conditions with increasing rainfall variability, increasing price and input cost volatility and respond to societal demands like mitigating GHG emissions.

Cropping sequences in Australia's subtropics vary greatly in their diversity of crops grown due to the opportunity to grow a range of crops during summer (e.g. sorghum, cotton, mungbean, maize) and winter (e.g. wheat, barley, chickpeas, canola). Similarly, there is potential to grow up to two crops per year, but as these environments are water-limited and rainfall is too variable and insufficient to support two crops being grown in most years. Fallow periods in the farming systems are a common risk management practice whereby soil water is accumulated which provides a buffer crops against periods of low or inconsistent rainfall. However, fallows are inherently inefficient, with much of the water evaporated and only a small proportion is retained to be used by crops. Hence, there are questions about the balance of time in crop versus fallow (i.e. the crop intensity) to optimise the conversion of rainfall into economic output and the implications this has for downside risk and greenhouse gas footprint of the farming system.

The northern farming systems initiative has undertaken a combination of simulation modelling and long-term field experiments at seven locations over the past 10 years to understand the implications of different crop systems varying in their diversity and intensity. Using this data we have computed the gross margins and green-house gas emissions over both the experimental period and predicted over the long-term (e.g. 60 years) amongst the different crop sequences. We found that changing the mix of crops had relatively small impacts on overall system profitability, risk and greenhouse gas emissions.

On the other hand, we find that systems with higher crop intensity are more effective at capturing and using rainfall, but this doesn't always translate into higher returns for farmers because of higher production costs. These systems also have a higher down-side risk, generating lower returns in the drier years than lower intensity systems with a higher proportion of time in fallow. However, in more favourable conditions a higher intensity system generated a much greater 'up-side' benefit. Hence, there is a strong influence of crop intensity on the risk efficiency of the farming system (i.e. the balance of expected or average returns relative to the returns in the worst set of seasons).

Our research also shows that there is a two-fold difference in estimated GHG emissions and a four-fold difference in emissions intensity between systems employing higher versus lower crop intensities. Despite higher inputs, higher intensity cropping systems generated lower total emissions due to drier soils and reduced time in fallow limited N_2O losses, and increased biomass inputs which improved the soil C balance compared to other systems. In contrast, Low intensity systems showed higher total emissions because of a predicted negative soil C balance.

How Australian Grain Growers Approach Decision Making Under Risk & Uncertainty

Masood Azeem[1], Brendan Brown[1], Michael Burton[2], Rick Llewellyn[1]
[1]CSIRO, Adelaide, Australia. [2]UWA, Perth, Australia

Paper Abstract:

Farming is inherently risky, with decisions usually made under imperfect knowledge and Australian grain growers face particularly high levels of production and price volatility. Farmers' decision-making processes can significantly affect the risks they take and the reward they achieve. Recognising the importance of the combination of risk and uncertainty, alongside highly heterogenous personalities, biases, and preferences is important when considering research, development and extensions strategy aimed at shifting farm management decisions.

This research explores and characterises Australian grain grower decision-making processes under risk and uncertainty in the context of the System 1 ('fast', less analytical) and System 2 ('slow', more analytical) approaches described by Kahneman. Using primary survey data from more than 300 grain growers on their approach and steps used for particular on-farm decisions (with a focus on nitrogen fertiliser decisions), we apply a 3-step Latent Class Analysis (LCA-3) - a probabilistic clustering method estimated via Maximum Likelihood Estimation (MLE). In the first step, growers are divided into decision-process groups, with the optimal number of latent classes determined by comparing models with one to five classes. LCA predicts the probability of class membership for each grower based on their responses to various decision-process elements. This classification is fuzzy, as probabilities do not assign growers to a specific class with certainty. In the second step, growers are assigned to the class where their posterior probability is highest. The third step examines how the resulting class membership relates to independent variables such as risk-aversion, comfort with current decision-making process, farm size, and location.

The analysis identifies three distinct classes for the included decision types: More-analytical (29% of respondents), Advisor-oriented (47%), and Less-analytical (24%). More-analytical growers align most

strongly with use of Kahneman's System 2 ('slow thinking'), with greater use of calculations, spreadsheets, and consideration of probabilities. Advisor-oriented growers depend more heavily on advisors with less direct use of calculation, though they are more likely to review decisions. Less-analytical growers rely primarily on intuition, using few tools or spreadsheets and are less likely to make decisions with profit analysis.

Class membership is associated with factors including farm size and comfort with current decision-making process, both of which increase the likelihood of belonging to the More-analytical class. Being in the More-analytical class is associated with lower levels of (self-reported) risk aversion. The findings highlight the importance of recognising that only a minority of growers are likely to directly engage in more analytical decision-making steps, and the role of advisors in the decision process, as well as reminding the research and extension cohort of the need to consider existing approaches when tailoring messaging to stakeholders.

Impacts of complimentary technological and financial solutions for managing production risk

Patrick Ward[1], Yingchen Xu[1], David Spielman[2]
[1]University of Florida, Gainesville, FL, USA. [2]International Food Policy Research Institute, Washington, DC, USA

Paper Abstract:

Climate change is widely expected to increase the intensity of India's summer monsoon, but also make monsoon rains less predictable. Reliance on the vagaries of the summer monsoon is an omnipresent risk for rainfed agricultural production in India. Delayed arrival and early cessation of the monsoon, prolonged dry spells during the season, below average overall volumes of rainfall, or excessive rainfall resulting in floods can have both ex-ante and ex-post effects on smallholder welfare. While the occurrence of drought could have immediate and direct ex-post production effects such as crop damage and loss that cause hunger, food insecurity, illness, and fluctuation of food prices, the ex-ante threat of drought or flood imposes an equally heavy burden on smallholder farmers, driving them towards asset liquidation, conservative farming practices, underinvestment in the use of modern inputs, low-return livelihood and long-term poverty traps. Among the various production risks faced by farmers practicing rainfed agriculture in India, droughts pose perhaps the greatest threat, accounting for more than 70 percent of crop losses between 1985 to 2002. Stress-tolerant cultivars and crop insurance are common solutions to agricultural risk management, but neither is a perfect solution to the challenge of drought risk: the relative yield benefits of stress-tolerant varieties start to decline as drought becomes severe, while crop insurance is often expensive and faces low demand among farmers in developing countries. Bundling the technological and financial risk management products could yield complimentary benefits and provide farmers with a complete risk management solution. We use a two-year randomized controlled trial to study the effect of providing smallholder rice farmers in drought-prone Odisha, India with (a) drought-tolerant seed and (b) a bundled product consisting of drought-tolerant seed and a weather index-based insurance on ex-ante production decisions and ex-post production and productivity outcomes and farmer welfare. We find that the providing farmers with drought-tolerant seed not only had no yield penalty under no drought but also brought yield benefits under both moderate and severe drought stresses.

However, the complementary weather index-based insurance in the bundle negatively impacted crop yield under no drought and canceled out the yield benefits of drought-tolerant seed under drought, potentially due to farmers' underinvestment in agricultural inputs. We hypothesize that this might be due to farmers' incomplete understanding of the insurance product, leading them to mistakenly believe it would compensate for any crop loss, which could have resulted in moral hazard characterized by underinvestment in risk-reducing inputs. We recognize the challenge of introducing novel and complex financial solutions to rural farmers with low financial literacy and highlight the necessity of ensuring that farmers fully understand the insurance contract in order to guarantee the success of the insurance product.

What does it take to build resilience investment capabilities in Australia – reflections and lessons from the Enabling Resilience Investment initiative

Russell Wise[1,2], Paul Box[1], Russell Gorddard[1], Stefanos Xenarios[1], Peter Heinmiller[3], Nic Mesic[3], John Marinopoulos[3], Seona Meharg[1]

[1]CSIRO, Canberra, Australia. [2]Swinburne University, Melbourne, Australia. [3]Value Advisory Partrners, Melbourne, Australia

Paper Abstract:

Effectively responding to climate risks requires urgent coordinated actions and investments into net zero transitions, climate adaptation and resilience. Due to the sheer scope and scale of these changes – spanning all sectors of the economy and regions of Australia – the funding of these cannot be met by Governments alone. Both public and private sector actors will need to allocate substantial and growing amounts of capital to major projects (hard, soft and green) that deliver both public benefits (community and economic productivity and resilience) and financial returns to investors. Yet there remains a massive shortfall in both public and private investment and a dearth of fundable projects developed to reduce risks and build resilience in place. Efforts to do so in Australia have revealed limitations in the prevailing systems of values, rules, and knowledge (vrk) which are constraining the creation, evaluation, and delivery of projects that meet investor requirements AND deliver benefits across community, governments, and private groups. The Enabling Resilience Investment (ERI) approach was initiated in 2019 – building on a decade of resilience and adaptation R&D – to contribute to systematically addressing these fundamental challenges and catalyse scalable place-based investments in adaptation and resilience. The ERI approach provides the planning and analytical capabilities – comprising concepts, guidance, and participatory assessment processes, tools and methods – and the strategic agenda to support the shifts in thinking, policies and practices required to generate novel options and build resilience investment cases that create new value, enhance community benefits, and mitigate climate and disaster risks. Since 2019, the ERI approach has been applied in urban, peri-urban and rural contexts to support disaster recovery for long-term resilience, landscape scale natural resource management, disaster resilient micro-energy grid development, and regional land-use planning for the delivery of safe and affordable housing. This talk will briefly introduce the ERI approach and case studies before describing and reflecting on the progress made and lessons learned. These reflections will cover: the feedback from project participants, the progress made in addressing data issues and building the authoritative tools and processes, and the ongoing challenges and opportunities to catalysing the funding required to build disaster resilient communities and regions

Impacts of an innovative credit-insurance bundle for landless farmers: Evidence from a cluster randomized trial in Odisha, India

Patrick Ward[1,2], Berber Kramer[3], Subhransu Pattnaik[4,5], Yingchen Xu[1]
[1]University of Florida, Gainesville, FL, USA. [2]International Food Policy Research Institute, Washington, DC, USA. [3]International Food Policy Research Institute, Nairobi, Kenya. [4]University of Gottingen, Gottingen, Germany. [5]International Food Policy Research Institute, New Delhi, India

Paper Abstract:

In developing countries, financial inclusion and risk management are critical to fostering investments to improve agricultural productivity and enhance rural livelihoods. Amid traditional barriers like limited access to credit and vulnerability to agricultural risks, smallholder farmers often lack the wherewithal to expand their operations or invest in profitable technologies and inputs. For smallholders with limited land holdings, formal financial services like credit and insurance are often considered cost-prohibitive due to high transaction and monitoring costs, along with limited available data on these farmers to identify the risks of insuring or lending to these farmers. For instance, smallholder farmers often lack documented land rights or other collateral for formal loans, and consequently potential borrowers are involuntarily limited in their borrowing. Even when individuals may have access to formal credit, credit markets can be in a disequilibrium in which lenders restrict potential borrowers' access to their desired level of borrowed funds to finance agricultural investments. In other cases, risk averse borrowers may voluntarily withdraw from the credit market, often because they are afraid of losing their collateral if there is an adverse calamity and they are unable to repay the loan. Such "risk rationing" occurs in any situation in which the lender shifts so much contract risk onto the borrower (in the form of excessive collateral requirements, high interest rates, unfavorable repayment terms, etc.) that the borrower voluntarily opts out of the credit market, even when otherwise qualifying for loans of a desired size. Innovations in financial markets and financial products can potentially overcome both types of credit rationing and expand investments in agriculture. Recent financial innovations have led to packaging credit and insurance together in a bundled financial product, though empirical evaluations of such product bundles have shown mixed results. We implemented a randomized evaluation of KhetScore, an innovative credit scoring methodology that uses remote sensing and machine learning to unlock credit and insurance for smallholders who might otherwise be excluded from formal financial markets. In our treatment group, where we offered credit + insurance (where loans were sanctioned on the basis of farmers' KhetScores), we find increased reliance on formal sourcing and less reliance on informal sourcing, with a net effect of crowding-in female borrowers. Despite increased borrowing, treated households reported facing considerably less difficulty in repaying loans, suggesting that insured KhetScore loans transferred risk and eased the burden of repayment. Moreover, the treatment enhanced agricultural profitability by increasing revenues during the monsoon season and reducing costs in the dry season. Positive and significant effects are found among both farmers with unconstrained baseline credit access, and quantity rationed farmers, suggesting that KhetScore helps address supply-side credit constraints. Finally, the treatment significantly enhanced women's empowerment and mental health, with some beneficial impacts observed even among women who were not direct recipients of KhetScore lending, suggesting the potential for positive intrahousehold spillovers. In conclusion, we find compelling evidence that innovative financial products leveraging

emergent technologies can substantially improve marginalized farmers' access to agricultural credit, risk management, resilience, and well-being.

To adopt or not to adopt: Risk management and attitudes among agricultural producers in slopeland area

Shuay-Tsyr Ho
National Taiwan University, Taipei, Taiwan

Paper Abstract:

Farmers in slopeland area face more and higher degree of risks in agricultural production, mainly due to the vulnerability of terrain and land overuse. The saturation of flatland utilization pushes producers to look for economic opportunities in slopeland or mountainous area. The consequential land-use/cover change induces environmental externalities, such as soil erosion, landslides, and debris flows, which worsen the sustainability of crop production and livelihood of farmers and residents in this type of topography. Existing research focuses on investigating the impact of weather shocks or government program on soil fertility, land vulnerability, or tourism in slopeland region using GIS or topographical data. There is scant literature on adaptation strategies used by farmers facing adverse weather events such as typhoon, drought, or excessive rainfalls, particularly for agricultural management across different terrains. The purpose of this study is to examine whether farmers have different attitudes towards adopting risk management strategies and soil and water conservation practices that can be used to mitigate the magnitude of production losses from climatic risks in slopeland versus flatland region. Furthermore, the differences in strategy adoption in different types of terrain are evaluated along the spectrum of farmers' risk attitudes. This research aims at bridging the literature gap by investigating various approaches that farmers use to preserve land productivity and manage site-specific production risk in the long run in areas susceptible to extreme weather events. I conduct an online survey distributed to farmers in Nantou county in Taiwan, where the co-existence of flatland and slopeland areas provides suitable target for this research. This survey includes comprehensive set of crops grown, certification of environmental-friendly practices, adoption of soil and water conservation practices and market-based and non-market-based risk management strategies as precautionary approaches, and risk attitudes derived from a hypothetical subsidized insurance design. This study uses multinomial logit model to examine how risk attitudes affect the differences in risk-managing and risk-mitigating behaviors among farmers in different terrains. Also, Heckman selection model is used to first identify the factors determining the choice of production in slopeland region and then examine the influence of risk attitudes on the adoption of risk management strategies and conservation practices. Preliminary results show that farmers in slopeland area are more likely to adopt soil conservation practices and non-market risk management instruments, while the results show heterogeneity across different crops and varying levels of farmers' resources. Under some conditions, farmers in flatland areas could outperform in effectively managing production risks. Also, risk-averse attitude could be the barrier that dissuades farmers from adopting some precautionary strategies in response to threats under climate change. The implication of this study is two-fold. First, it disentangles the complexity of agricultural management behavior by differentiating the producers across different terrains where some areas are more prone to natural disasters. Second, it sheds light on the role of risk management and mitigation policies and strategies in slopeland agriculture development where the crop

insurance program, extension support, and farmer education should vary by the risk exposure and resilience of the agricultural landscape.

Parallel 3D - Land & NRM 1

Location Chancellor 2 , LVL 0

Time: 15:50 - 17:30

Chair Md Sayed Iftekhar

Analyzing the Effectiveness and Efficiency of Farmland Preservation Policies

Andrew Stevens
University of Wisconsin–Madison, Madison, USA

Paper Abstract:

In recent years, the United States has steadily lost productive farmland. Between 2001 and 2016, 11 million acres of farmland and ranchland were converted to urban or residential land use (Freedgood et al., 2020). This loss of agricultural land constitutes an effectively irreversible reduction in the United States' capacity to produce food and other agricultural products in the coming decades. In response, state and local governments have instituted farmland preservation policies to maintain productive agricultural landscapes (Daniels, 2020).

I analyze multiple aspects of the state of Wisconsin's farmland preservation program and determine how different policies causally affect farmland transition. Wisconsin's farmland preservation program consists of several overlapping policies that give rise to innovative identification strategies using regression discontinuity approaches. In particular, Wisconsin's Agricultural Enterprise Area (AEA) program is a politically popular, community-led approach to farmland preservation that interacts with rural zoning policies, individual farmland preservation agreements, and farmland preservation tax credit policy.

I estimate the causal effects of establishing an AEA on land use and farmland transition. To overcome the endogeneity problem that AEAs are not randomly placed on the agricultural landscape, I employ a spatial regression discontinuity (RD) approach (Holmes, 1998) to estimate local average treatment effects of AEAs on the outcomes of interest. First, I leverage the fact that an AEA can only be designated on land that has already been included in a farmland preservation plan area. Now, consider a farm outside a farmland preservation area but adjacent to the AEA: such a farm is likely similar in many ways to a farm just within the AEA, but the excluded farm could not have been included in the AEA even if its landowner (or a state policymaker) had wanted it to be.

The preceding discussion hints at a solution: I use the farmland preservation plan boundary as a source of plausibly exogenous variation in the probability of a parcel being included in an AEA. The probability of a parcel outside a farmland preservation plan area being part of an AEA is zero, while the probability of a parcel inside a preservation plan area being part of an AEA is positive. Since this probability jumps discontinuously at the plan boundary, I use distance-to-plan-boundary as an instrumental variable in a

sharp RD design to estimate local average treatment effects of AEAs on land use, farmland transition, and farm size.

This research will advance the discourse around farmland preservation policies and shine a spotlight on spatial RD methods in land use analysis. Consequently, I believe it will spark meaningful interaction and discussion at the 2025 AARES Conference.

Socio-economic Disadvantage and Wildfire Recurrence, Duration and Extent: A Longitudinal Study in Australia, 2010–2022

Sonia Akter, Quentin Grafton
Australian National University, Canberra, Australia

Paper Abstract:

This research examines the relationship between socioeconomic disadvantages in Australia and exposure to wildfires using data spanning over a decade. The study makes three main contributions to the literature. Firstly, it investigates the connection between socioeconomic disadvantage and wildfire exposure using longitudinal wildfire exposure data. Previous studies have only used cross-sectional data from the Black Summer fires to study a similar relationship. Secondly, this study is the first to measure wildfire exposure in terms of frequency, which refers to the number of times a geographical area was affected by wildfires within a 12-year period. Finally, this is the first study in the literature to use wildfire duration data and examine its link with socio-economic disadvantage. Duration represents the average number of days between fire detection and suppression. Notably, wildfire duration data is scarce, and very few studies have used wildfire duration data on a national scale and over a long-term time horizon. For this study, we utilized data from two government sources. Wildfire data was collected from the Historical Bushfire Boundaries data published by GeoScience Australia in collaboration with the Australian Research Data Commons (ARDC) and the Emergency Management Spatial Information Network. This dataset represents a single nationally consistent and harmonized historical bushfire boundary data, derived from the authoritative state and territory agencies. In addition to the burned area and fire perimeter, this dataset includes fire duration which presents a valuable opportunity to study the nature and drivers of wildfire duration in Australia's landscape. The historical wildfire data was combined with 2011, 2016 and 2021 Socio-Economic Indexes for Areas (SEIFA) datasets published by the Australian Bureau of Statistics. SEIFA assigns scores and classifies each SA1 based on the collective socio-economic advantage and disadvantage of its population. The unit of analysis was SA1 (the second-smallest geographical unit of the Australian Statistical Geography Standard). The analysis sample includes all SA1s that experienced a wildfire incident during the 2010–2022 fire seasons and for which SEIFA data are available. The analysis sample excludes observations from the Northern Territory and northern areas of Western Australia, South Australia, and Northern Queensland, as burned areas in northern Australia represent prescribed fires that are part of the natural landscape management dynamics. Using Ordinary Least Square regression models, including time and SA4 fixed effects and involving over 8,000 data points, our results reveal a strong and significant positive correlation between all indices of socio-economic disadvantage and wildfire exposure during the study period. In addition to fire extent, which was used in previous studies as an indicator of wildfire exposure, we find a significant positive correlation between socioeconomic disadvantage and wildfire

frequency and duration in an SA1. Our results remained robust when the indices of economic resources and education and occupation were used as a proxy for socio-economic disadvantage.

Valuing food system externalities: a systematic literature review of true cost accounting studies

Fentahun Abebe[1], Cecile Godde[1], Peggy Schrobback[1], Maartje Sevenster[2], Murray Hall[3], Joshua Aboah[1]

[1]CSIRO, Brisbane, Australia. [2]CSIRO, Canberra, Australia. [3]CSIRO, Sydney, Australia

Paper Abstract:

The food system is essential to humanity and the broader economy, providing a diverse range of products and services. However, it generates many externalities—both positive and negative— that are often unaccounted for and missed in popular conventional economic measures. This oversight leads to sub-optimal decisions and undermines the system's long-term sustainability and ability to deliver nutritious, environmentally sustainable, economically viable, and equitable food to current and coming generations. Identifying and estimating externalities (the cost imposed on, or the benefit received by, another party not directly engaged in an economic activity) in the food system represents a necessary first step in addressing externalities. True cost accounting (TCA) has been suggested as a promising approach to quantify externalities and help drive tangible change in the food system. UNEP et al. (2021) described TCA as "an evolving holistic and systemic approach to measure and value the positive and negative environmental, social, health and economic costs and benefits to facilitate business, consumer, investor and/or policy decisions". Research efforts to evaluate food system externalities monetarily have been expanding in recent years. We undertook a systematic literature review to synthesise this fast-growing body of knowledge, explore its breadth of methods and applications and guide future research priorities. The analysis of over 100 studies showed that the number of studies exploring the monetary values of the food system externalities steadily increased over time. There was a variation in the type and number of externalities investigated across studies, with greenhouse gas emissions being the most frequently examined. Life cycle assessment was the dominant method to quantify impact (e.g., tCO_2/yr.). Most studies focused on assessing externalities at the product level (e.g., apples, meat) or farming system level (e.g., organic farming), and fewer considered the food system as a whole. Overall, the results emphasised a variety of methodologies that differed across scientific fields and units of analyses (e.g., food system component, geographical extent). The wider variations across TCA initiatives and the absence of a common standardised framework causes a critical hurdle to the further advancement of TCA research, broader adoption of TCA, and comparability of TCA estimates. This is a critical gap that this study helps to narrow and one that future research should aim to fully address.

Trends analysis of global research (2000-2024) in adoption factors of land management practices: A bibliometric analysis

Praseed Thapa, John Rolfe
CQUniversity, Rockhampton, Australia

Paper Abstract:

Globally, land management practices (LMPs) in agriculture have received extensive attention for enhancing food security and productivity, and more recently, on reducing the consequences of environmental degradation. While some LMPs to reduce environmental degradation have been adopted widely by landholders, the adoption levels, in other cases, are modest. Many scholarly studies have significantly expanded to understand the underlying drivers of LMP adoption to address environmental issues. However, research trends on knowledge and intellectual connections of LMPs adoption studies are lacking. Within this framework, this paper conducted a bibliometric mapping using the Web of Science database on 6 September 2024 to search, filter and extract 1,549 publications published between 2000 and 2024. An in-depth network analysis of the scientific landscape of publications (co-authorship, co-occurrence, citation, bibliographic coupling, and co-citation) was generated and visually presented using the VOSviewer software (Version 1.6.20). The findings in this study showed that the top three authors were Rahut, Tey, and Abdullah and the USA, Germany, and England were the top three countries of focus. Co-occurrence analysis revealed that "Adoption", "Climate change", and "Agriculture" were the top three keywords used in the adoption of LMPs study. The citation analysis identified that the most cited country and author were the USA and Kassie respectively whereas the bibliographic coupling technique for authors and countries identified Rahut and the USA at the top. This paper should be an important contribution to the literature providing an understanding of scientific knowledge of articles related to the adoption determinants of LMPs at a global scale.

Tribal Forest Rights and Firm Behaviour

Raahil Madhok[1], Sabyasachi Das[2]
[1]University of Minnesota, St. Paul, USA. [2]Ahmedabad University, Ahmedabad, India

Paper Abstract:

This paper asks how tribal land policy affects firm behavior. Tribal land titling is intended to promote conservation and protect tribal land from commercial interests. Yet their effectiveness for deterring firm activity, and the overall economic impact on tribal areas, remains unclear. Quantifying how firms react to tribal land policy is critical for designing sustainable development strategies that balance economic development, resource conservation, and tribal livelihoods.

We set the stage with a simple model that adds transaction costs to firms' start-up costs, representing approvals from tribal landowners and tribal councils. The model yields two predictions: first, aggregate land demand declines, characterized by less economic activity on tribal land. Second, however, firm composition changes toward larger and less productive firms. Intuitively, the policy cost is a small proportion of total costs for larger firms, leading to their survival compared to smaller firms.

Our empirical setting is India, a country home to 200 million forest-dependent tribal people who have lived without formal land titles for centuries. In 2008, the Forest Rights Act granted tribes formal forest management rights and, importantly, the right to contest industrial projects that encroach on their

forestland. The policy exclusively applies to tribes, enabling construction of clean treatment (tribal areas) and control (non-tribal areas) groups for identification.

We use a difference-in-difference design to estimate the effect of tribal land rights on firm behavior using a firm-level manufacturing panel from 2001-2021. The data describe landholdings, capital, output, and a variety of balance sheet data. District tribal population data are from the 2001 Census. Since the Act grants forest management rights in particular, the treatment is measured as district tribal population share living within 1 km of forests.

We find three results. First, aggregate firm landholdings in tribal areas decline after the policy. Capital, labor, and output also decline, pointing to policy success in deterring overall firm activity from tribal land. Second, aggregate TFP and land productivity (output per unit of land) increase, suggesting exit of smaller, less productive firms. Lastly, large firms are less affected by the policy. Heterogeneity by firm size shows that large firms increase land acquisition relative to small firms. Surviving firms are also less productive. All three results are consistent with the model.

We next study conservation implications by digitizing the universe of deforestation permits awarded to developers during the study period. The data describe project type (mining, transportation, etc.), location, and forest area earmarked for logging. We find less forest encroachment by industrial projects following the policy. We find weaker evidence that larger projects encroach further into forestland, in line with the firm-level results.

Overall, we reveal an important tradeoff about tribal land policy: it can indeed protect tribal forestland from commercial activity in aggregate, yet surviving firms are larger, less productive, and more ecologically harmful. This highlights the need for complementary policies on surviving firms, such as afforestation requirements, revenue-sharing, and other initiatives to balance economic development, forest conservation, and environmental justice for tribal communities.

Landholders' preference for conservation covenant when climate change risks are made salient

Md Sayed Iftekhar[1], Nanda Kaji Budhathoki[1], Kelly Fielding[2], Jonathan Rhodes[3]
[1]Griffith University, Brisbane, Australia. [2]UQ, Brisbane, Australia. [3]QUT, Brisbane, Australia

Paper Abstract:

Many studies have explored the role of social, economic and environmental factors that motivate private landholders to engage in conservation covenant agreements. These studies often focused on various features of conservation programs, such as level of payment, agreement length, and intensity of conservation activities, and their impacts on landholder acceptance. However, there is limited information on how private landholders' preferences for different covenant features are changed when their exposure and risk to extreme weather events are made salient. To address this knowledge gap, we have conducted a choice experiment survey of private landholders from an ecologically important area of New South Wales, Australia. We used a between subject design, with 179 respondents participating in a 'treatment' survey and 170 in a 'control' survey. The surveys were identical, except for one key difference: in the treatment survey, respondents were asked about their experience and perception of extreme weather

events before making their choices, while in the control survey these questions were asked afterwards. Additionally, in the treatment survey included the potential impact of extreme weather events on local biodiversity and livelihoods. Initial results indicate that when the extreme weather information is made salient, respondents are more likely to adopt longer conservation covenant. Further analysis is on-going to test the robustness of these findings. This information will be valuable for future design and communication of conservation covenant to attract targeted group of landholders.

Parallel 3E - Development, Wellbeing & Community

Location Chancellor 5, LVL 0

Time: 15:50 - 17:30

Chair: Krishanthan Gnanapragasam

Does Participation in Fishing Tourism Improve the Well-Being of Smallholder Fishermen? Insights from Indonesia

Moh Shadiqur Rahman, Tri Wahyu Nugroho, Nuhfil Hanani
Brawijaya University, Malang, Indonesia

Paper Abstract:

Fishing tourism has become an alternative source of livelihood for small-scale fishermen in Indonesia. Instead of catching fish themselves, many fishermen are choosing to work as guides for anglers. This study aims to investigate how fishermen's participation in fishing tourism as guides impacts their well-being. Specifically, it explores both economic and subjective well-being to provide a comprehensive view of the fishermen's condition. The study uses survey data collected from 400 small-scale fishermen in Indonesia and employs a conditional mixed-process model to address issues of endogeneity. The findings reveal that fishermen's decision to participate in fishing tourism is positively influenced by factors such as education level, family size, and the number of fishing locations available. However, age negatively affects this decision. The key results of the study show that fishing tourism significantly improves fishermen's income, happiness, and overall satisfaction. These results suggest that fishing tourism can play a significant role in enhancing the well-being of fishing communities. Therefore, it is recommended that efforts be made to further develop and promote fishing tourism as a viable livelihood option for fishermen. Improving fishing tourism infrastructure and providing training for fishermen could help to maximize the benefits of this sector, ultimately contributing to poverty reduction and enhancing the well-being of coastal communities. The study highlights the importance of creating supportive policies that encourage the sustainable development of fishing tourism in Indonesia's fishing communities.

Women's Empowerment in Bangladesh's Seed Sector: A Contract Farming Perspective

Bisakha Dewan
University of Queensland, Brisbane, Australia

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Paper Abstract:

Contract farming has emerged as a prominent market governance model in Bangladesh, offering opportunities for both male and female smallholder farmers. However, ensuring equitable participation and empowerment for women within this system requires careful navigation of gender dynamics and addressing structural challenges. A significant barrier to progress in this area has been the lack of suitable measures to assess women's empowerment levels in the contract farming context. To address this gap, this study surveyed 260 female and male contract farmers in Bangladesh's vegetable seed sector. This study adapted the Women's Empowerment in Agricultural Index for Contract Farming (WEAI4CF), an adaptation of the IFPRI's Women's Empowerment in Agriculture Index (WEAI). The WEAI4CF measures empowerment across five dimensions: rights over assets, involvement and autonomy within contractual agreements, access and autonomy in contractual and individual opportunities, autonomy in livelihood, time, and participation in group activities, and overall empowerment. The findings reveal that both male and female farmers exhibit high levels of empowerment (give reference level is 0.80) in areas such as rights over assets, involvement in contractual agreements, and access to opportunities. However, significant gender disparities persist in autonomy in livelihood, time, and participation in group activities. These disparities highlight women's enduring challenges in achieving equitable empowerment within the contract system. Despite the potential of contract farming to empower women, obstacles such as unequal access to resources, limited agency, workload, and restricted opportunities for leadership and group membership continue to hinder progress. To create fair and inclusive agricultural value chains that acknowledge and reward women's contributions, key stakeholders, including the government, NGOs, seed companies, and farming communities, must enhance their concerted efforts to address these areas of disempowerment. This study provides valuable insights into the factors influencing women's empowerment in contract farming and offers recommendations for policy interventions and programs aimed at promoting gender equality and enhancing the livelihoods of women farmers in Bangladesh.

Unleashing rural potential: how gender roles, policy, institutions and investments drive transformation

Rika Reviza Rachmawati
National Research and Innovation Agency, Jakarta, Indonesia

Paper Abstract:

This study explores the dynamics of rural transformation in Indonesia, emphasizing the interplay between institutions, policies, investments (IPIs), and gender roles. The research specifically addresses three critical areas: (a) the factors influencing the transition from agricultural to non-agricultural villages, (b) the drivers and barriers to converting traditional food crops into high-value commodities (HVCs), and (c) the role of gender in these processes. A mixed-methods approach was employed, utilizing data from the National Labor Force Survey and Village Potential Statistics (PODES) for the years 2018 and 2020. The data being analysed is village-level balanced panel data. A binary logistic regression model is utilised to address the objective. The study's findings reveal that access to credit, infrastructure, and a higher proportion of women in the non-agricultural workforce significantly promote the shift to non-agricultural villages. In contrast, factors such as greater distance from urban centers, efficient irrigation systems, and the

substantial involvement of women in agriculture inhibit the transformation from food crops to high value commodity. Regarding the shift to High value commodity, proximity to urban areas, the presence of water sources, and changes in women's labor hours towards agriculture were found to encourage this transition. Conversely, food security concerns, access to irrigation, and a high female agricultural workforce pose significant challenges. The study underscores the critical role of IPIs in facilitating rural transformation while highlighting the complex influence of gender roles in agricultural practices. These findings suggest that sustainable rural development requires a multi-faceted approach, including targeted infrastructure investments, expanded access to credit, and the empowerment of women through skill development and cooperative support. The study concludes with recommendations for policy interventions aimed at promoting gender equality and economic diversification in rural areas, thus ensuring that both agricultural and non-agricultural sectors contribute to sustainable and inclusive rural transformation.

Changes in gender issues in Viet Nam since the outbreak of Russia-Ukraine conflict

Trang Truong
Institute of Policy and Strategy for Agriculture and Rural Development, Hanoi, Vietnam

Paper Abstract:

Since the COVID pandemic, and especially after the Russia-Ukraine conflict outbreak, urban households in Viet Nam exhibit a twofold income difference between husbands and wives, while in the rural areas this gap is three times larger. Income earned by husbands significantly surpasses that of wives. Wives bear the primary responsibility for housework and childcare, constituting 60-80% of these tasks. The income gap between male-headed and female-headed rural households has expanded from -6% in 2018 to 37% in June 2023. Female-headed urban households experienced a higher average monthly spending reduction compared to male-headed households. 59% of rural female-headed households could only sustain household spending for 3 months if their main income source was lost, contrasting with 44% of male-headed households facing this risk. These findings are based on a survey of 1278 households (664 rural households across six provinces: Son La, Bac Kan, Ha Tinh, Ninh Thuan, Dak Lak, and Tra Vinh and 614 urban households in Ha Noi and Ho Chi Minh City), conducted by the Institute of Policy and Strategy for Agriculture and Rural Development in 2023. The data collected was compared with the Vietnam Household Living Standard Survey (VHLSS) data from 2018, 2020, and 2022 provided by the General Statistics Office, facilitated an in-depth analysis of the evolution of a range of household-based indicators over the years.

Can Women Drive Sustainability in Fisheries? Evidence from a Choice Experiment

Krishanthan Gnanapragasam, Christopher Fleming, Shyama Ratnasiri
Griffith University, Brisbane, Australia

Paper Abstract:

While research on gender in small-scale fisheries is growing, the role of fishermen's wives in management decision-making is often neglected. Most studies focus only on fishermen, who are expected to represent their households. This study addresses this gap by exploring how fishermen's wives influence sustainable management decisions. Our choice experiment revealed significant differences in preferences between the two groups. Although both preferred sustainable fishing practices, wives demonstrated a stronger commitment to sustainability. Fishermen's preferences were influenced by their experience and income, while wives' preferences were shaped by their education and family size. Additionally, wives tended to be more risk-taking and showed greater trust in their communities. Joint decision-making revealed collaborative participation from fishermen and their wives, influenced by their socioeconomic backgrounds. Households with more experienced husbands and risk-averse couples were less willing to adopt new sustainable practices. This study highlights the significant role of fishermen's wives in decision-making. To foster sustainability, we recommend that researchers ensure the participation of both fishermen and their wives in fisheries management studies.

Parallel 3F - Fisheries, Marine Systems & Aquaculture

Location Chancellor 6, LVL 0

Time: 15:50 - 17:30

Chair: Andrew Buckwell

Factors influencing crab farmers' climate smart aquaculture technology adoption in coastal Bangladesh

Md. Hayder Khan Sujan[1,2], Md. Abdur Rouf Sarker[3,4], Monira Sultana[2], Md. Ali Akber[1], Ammar Abdul Aziz[1]

[1]The University of Queensland, Gatton, Australia. [2]Sher-e-Bangla Agricultural University, Dhaka, Bangladesh. [3]Zhongnan University of Economics and Law, Wuhan, China. [4]Bangladesh Rice Research Institute, Gazipur, Bangladesh

Keywords: 3. Agricultural Production; 4. Agricultural Technology and Innovation; 15. Farm Management and Farmer Behaviour; 16. Fisheries, Marine Systems and Aquaculture; 26. Practice Change and Adoption

Paper Abstract:

Context: Climate change has significantly impacted agricultural practices in coastal regions worldwide, with salinity intrusion posing a critical challenge along the Bangladesh coast. As a response, coastal communities are increasingly adopting diversified agricultural practices including 'saline-tolerant technology-crab farming', which can survive and even thrive in saline water. However, the adoption of climate-smart aquaculture (CSAq) practice is vital for long-term agricultural sustainability.

Objective: This study explores crab farmers' perceptions on CSAq practices, and identifies the drivers influencing different levels of CSAq adoption in coastal Bangladesh for the first time.

Method: Primary data were collected through a survey of 150 randomly selected crab farmers from Khulna and Satkhira districts in August 2023. Using a structured questionnaire, farmers' perceptions were evaluated through a perception index based on their responses to 12 Likert-scale statements, while the adoption of eight specific CSAq practices was assessed. An ordered logit model was employed to analyse the factors driving varying levels of CSAq adoption.

Key results: The perception index revealed that farmers possessed adequate knowledge of CSAq practices, underscoring the importance of knowledge-dissemination programs. The eight CSAq practices adopted by the crab farmers were "using natural feeds", "adapting with increased salinity", "using cost-effective production practices", "(crab-fish, crab-rice based) integrated/mixed farming practices", "using harvested rainwater", "farming in a mixed-water pond", "installing artificial shaded area", and "using paddle wheeler/aerator". Approximately half of the farmers had adopted less than or equal to three CSAq

practices, while 41% adopted four to five practices. The ordered logit model analysis showed that factors such as education and household size and pond ownership positively influenced higher CSAq adoption levels, whereas age, high crab-let cost and fluctuating crab prices hindered adoption.

Practical implications: To encourage higher levels of CSAq adoption and support the sustainability of coastal ecosystems, it would be beneficial for the Government of Bangladesh to consider implementing programs that raise knowledge and awareness. Engaging youth in agricultural entrepreneurship and exploring ways to make crablets more affordable, possibly through hatchery development, could also contribute to more sustainable, climate-resilient aquaculture practices.

Production of pathogen-free polychaete worms in Australia: an evaluation of demand for prawn feed and bait

Trevor Hutton[1], Tung Hoang[1], Peggy Schrobback[1], Ha Truong[1], Gavin Clydesdale[2]
[1]CSIRO, Brisbane, Australia. [2]CSIRO, Hobart, Australia

Paper Abstract:

The farming of prawn broodstock (mature adults for breeding) constitutes a foundational pillar in the cultivation of prawns. The ability to reliably produce healthy broodstock is crucial for consistent and reliable supply of larvae, which in turn supports the broader prawn farming sector. However, feed for broodstock is often sourced from wild catch sources, e.g., fish, squid, clams/mussels, worms, which contribute to negative environmental impacts of the aquaculture sector. Aquaculture feed products such as polychaete worms that are reared in a cultured environment can overcome these environmental impacts and could also improve reliability of feed supply, limit pathogen transmission through feed, increase the nutritional value of feed and subsequent stock productivity.

This study aimed to assess the economic viability of cultured polychaete worms as a potential feed source for broodstock husbandry. Polychaete worms which are high in protein and essential fats have been shown to improve the fecundity and the health of prawn broodstock, such that demand for this product has increased. Currently, frozen polychaetes are imported to feed the local prawn broodstock and there is the opportunity to produce aquaculture pathogen-free polychaetes domestically. Estimates for demand in Australia are in excess of 6 t/year whereas demand globally is estimated be in the region of 2500 t/year which creates opportunities for export, as the global prawn industry has been relying heavily on wild-caught marine polychaetes which is often not pathogen free. Both of these estimates are expected to grow given the expected increase in aquaculture production nationally and internationally (e.g. South-east Asia, South America, USA). Transitioning away from the use of wild sourced polychaetes which are high risk in terms of introducing virulent pathogens into farms would promote sustainability of both production and reduce the impact on the environment.

We present preliminary cost estimates and modelling from trials on the domestic production of pathogen-free polychaete worm as a baseline to estimate the economic viability in up-scaling the production of this type of aquaculture feed. Opportunities potentially exists to substitute for imported (less sustainable) feed products. The demand for the product is also considered for the highly valuable recreational fishing sector as bait, taking into account an exploration of diversifying the market for this product.

TRADE-OFFS BETWEEN EMPLOYMENT AND FLEET PROFITABILIY IN SRI LANKAN COASTAL FISHERIES

Nipuni Abeysiriwardena[1], Louisa Coglan[1], Sean Pascoe[2]
[1]Queensland University of Technology, Brisbane, Australia. [2]CSIRO, Brisbane, Australia

Paper Abstract:

Marine fisheries contribute to a nation's food security and economic growth. At a regional level, fisheries are a source of food, livelihood, employment, and income to coastal communities, where alternative employment opportunities are often lacking. Effective use of these resources requires the balancing of objectives from the exploitation of the fish resource (social and economic) with the sustainability of the stock and its ecosystem (environment). Whilst some of these objectives are complementary, others will require trade-offs. In the absence of multi-objective bioeconomic models to formally assess these trade-offs, simpler approaches are required. We use estimates of capacity utilization to assess how the fleet size (and hence employment) can be reduced while maintaining catch (food security) and the implications of different reductions on fleet profitability. From this, we can develop a trade-off curve relating to economic and social objectives. These estimates will be derived using an output-orientated Data Envelopment Analysis (DEA) model with costs and earnings data collected from a survey of the outboard engine fiberglass (OFRP) vessel owners who operate in a coastal (inshore) small-scale multispecies fishery in the West fishing region in Sri Lanka.

The significance of this study lies in its contribution to effective fisheries management strategies, particularly in developing countries. This study will use primary data; therefore, it will be a novel study which will contribute to the knowledge about Sri Lankan coastal fisheries management. It will also provide a framework for other developing countries as an assessment of the economic performance and long-term economic viability.

Enhancing Safe Fish Production and Trade: Assessing the Know-how of Value Chain Actors in Bangladesh

Md. Saidur Rahman[1], Madan M. Dey[2], Md. Farid Dewan[1], Md. Akhtaruzzaman Khan[1], Pratheesh O. Sudhakaran[2]
[1]Bangladesh Agricultural University, Mymensingh, Bangladesh. [2]Texas State University, San Marcos, USA

Paper Abstract:

Despite being the world's fifth-largest aquaculture producer, Bangladesh faces a critical challenge in enhancing fish quality and ensuring food safety. Widespread use of antibiotics in fish production and unhygienic practices have led to contamination with heavy metals and pathogenic microorganisms. Fish traders adopt illegal trade practices like using formalin and artificial dye to preserve fish and poor handling

practices. These issues affect consumers' health and compromise food safety throughout the value chain, requiring immediate action.

Considering these health hazard issues, a comprehensive study was carried out in Bangladesh aimed to assess the knowledge, attitudes, and practices (KAP) related to food safety among the actors in the fish value chain, develop awareness tools to enhance their knowledge and share the findings with the relevant government authorities to create and implement effective food safety policies.

A total of 1140 individuals took part in the KAP survey, including 240 fish producers, 300 individuals involved in fish trading, and 600 fish consumers. The survey used a five-point Likert scale to formulate the KAP questions and collected demographic information from the participants. The respondents' scores were totaled to determine the KAP index, and they were categorized as having low, medium, or high KAP levels based on this index. The relationship between KAP and independent variables was assessed using the Chi-square ($\chi2$) test of independence. A truncated regression model was also used to identify the demographic factors that significantly influenced the actors' KAP. The study also employed partial least squares structural equation modeling (PLS-SEM) to estimate latent variables and understand the causal relationship between KAPs.

More than 71% of producers, 80% of fish traders, and 69% of consumers were found to have poor knowledge of good aquaculture practices (GAP). However, over 90% of the value chain actors displayed moderate to good attitudes towards safe fish production, trading, and consumption. Surprisingly, only 20% of producers, 1.3% of consumers, and no traders followed GAP. The chi-square test revealed a positive and significant association between education, income, and training with the KAP of value chain actors. The regression results further confirmed the influence of education and training on the actors' food safety KAP. The PLS-SEM estimates established a direct and significant link between the knowledge and attitudes of value chain actors and their food safety practices.

Therefore, targeted educational and communication strategies such as regular community-level training and workshops are crucial to raise awareness and motivate value chain actors to adopt good aquaculture practices. Based on the KAP findings, the research team developed training modules and trained over 30 fish producers, more than 90 hotel and restaurant owners, and cooking staff on safe fish production, cooking, and storage practices within the project period. To ensure food safety and security for the population of Bangladesh, an integrated nationwide approach involving the government, NGOs, and voluntary organizations is essential. In such cases, our research findings and developed modules would serve as a key reference, guiding the formulation and implementation of effective food safety policies and practices.

Classifying livelihood patterns in Pacific Islands highly threatened by climate change: focusing on fishery activity

Shoichi Kiyama
Kyoto University, Kyoto, Japan

Paper Abstract:

People's livelihoods in the Pacific region with remote islands highly depend on local natural resources. Reef fishes inhibiting corals are essential as daily foods as well as income sources while most threatened by climate change. Planning a livelihood policy coping with climate change needs an assessment of the relationship between the level of climate change and socio-economic activities undertaken for living, in the local, country, or international level of interest. Previous knowledge characterizes them separately, together with inconsistent information. This study uses the secondary data of population and housing Census in Melanesia and Micronesia, between 2009 and 2021. Target counties are where coral bleaching warnings or alerts were issued by NOAA. This study attempts data processing with GIS to build a dataset with consistency at the island level. The created dataset, consisting of a variety of bleaching alert levels, was descriptively summarized in the island level. The result was reviewed in the light of the patterns between the coral-bleaching level and regional structure of socio-economic activities, including the dependence on reef fishing, fishing in general, and agriculture, and occupational description.

The social licence of salmon aquaculture in Tasmania: Fulfilling the social bargain

Andrew Buckwell, Syezlin Hasan, Alana Knight, Christopher Fleming, Jeremy Harte, Jim Smart
Griffith University, Brisbane, Australia

Paper Abstract:

Salmon aquaculture is one of a number of economy sectors in Tasmania that can benefit from new technologies that can reduce the local ecological and community amenity impacts of its coastal operations. This may assist the sector in retaining its social licence to operate (SLO), which is currently in question, so that it can continue generating benefits for local livelihoods. We used Q-methodology to gain empirical insight into stakeholder perspectives on or attitudes towards salmon aquaculture's SLO. Results revealed four factors, all of which saw genuine engagement with strategies to retain SLO as being fundamental to the sector's future. Whilst three factors saw the economic and employment benefits as playing an important part in this—as part of a bargain with the community—all four factors believed that the continued legitimacy of the sector requires broader civil society consent. One factor considered the sector as being under pressure, but nevertheless felt a SLO could be achieved if the sector followed steps to secure it. Our research demonstrates that the salmon aquaculture sector would do well to continue to actively seek SLO, achievement of which will maximise total net social benefit and point to pathways that begin to incorporate the nature positive and people positive agendas. It should consider engagement with both communities of place and communities of practice as it explores opportunities in the blue economy and recognise that disclosure and transparency will assist in demonstrating procedural fairness.

Egg-Timer Presentations Parallel 2

Location Chancellor 3/4, LVL 0

Time: 15:50 - 17:30

Negotiating Multifunctional Forest Management in a Bioeconomic Supply Chain

Jean-Christophe Pereau[1], <u>Arnaud Dragicevic</u>[2,3], Serge Garcia[4]
[1]Bordeaux School of Economics, Bordeaux, France. [2]Chulalongkorn University, Bangkok, Thailand. [3]CIRANO, Montreal, Canada. [4]INRAE, Nancy, France

Keywords: 5. Biodiversity; 14. Mathematical Programming

Paper Abstract:

This research explores the negotiation over multifunctionality in forest management, examining strategic interactions between foresters and first-transformation agents within the forest-based supply chain. Central to the study is a novel Nash-type bargaining model that provides a structured framework for these negotiations, focusing on both economic viability and ecological sustainability. The model incorporates a variational inequality approach wit1hin a multi-criteria decision-making framework. Insights are validated through numerical simulations using a neural network-based deep learning algorithm. The simulations reveal that an equitable distribution of bargaining power among stakeholders promotes the coexistence of conventional and multifunctional forestry, leading to an economic decoupling between sustainable timber and wood production and its environmental impacts on biodiversity. Additionally, the findings indicate that the success of multifunctional forestry heavily relies on state aid, provided through Payments for Environmental Services, underscoring that environmental awareness alone is insufficient to significantly reduce biodiversity loss within the forest-based supply chain.

Does Rural Tourism Development Generate Agricultural Green Spillover Effects? Evidence from China's Organic Fertilizer Adoption

Ziyang Zhang, Xiaoshi Zhou
China Agricultural University, Beijing, China

Keywords: 3. Agricultural Production; 11. Ecological Economics; 15. Farm Management and Farmer Behaviour; 26. Practice Change and Adoption

Paper Abstract:

This study examines the potential agricultural green spillover effects of rural tourism development, focusing on its impact on farmers' adoption of organic fertilizers within the context of China's rural revitalization strategy. While existing literature has extensively explored rural tourism and agricultural

production separately, the potential environmental benefits in agricultural practices arising from industry integration remain understudied.

Using data from the 2020 China Rural Revitalization Survey (CRRS), we employ an endogenous switching probit model to account for selection bias arising from both observed and unobserved factors. Our findings indicate that the development of rural tourism significantly increases the probability of organic fertilizer use in agricultural production. The average treatment effect on the treated (ATT) shows a 15.1 percentage point increase in organic fertilizer adoption among households in rural tourism villages.

Heterogeneity analysis reveals varying impacts across different demographic and geographic segments. Notably, rural tourism development is associated with a 9.3 percentage point decrease in organic fertilizer use among female-headed households, contrasting with a 15.9 percentage point increase for male-headed households. The positive effect is more pronounced for households with elderly heads (aged 65 and above), those producing grain for self-consumption, and farmers in western regions of China.

To ensure robustness, we conduct various sensitivity analyses, including clustering standard errors at the county level, employing a seemingly unrelated bivariate probit model, and using alternative measures of rural tourism development. These tests corroborate our main findings.

Our results suggest that industry integration, as exemplified by rural tourism development, can play a significant role in promoting the green transformation of agricultural production. These findings have important implications for policymakers seeking to balance rural economic development with sustainable agricultural practices in the context of China's rural revitalization efforts.

Future prospectus and Constraints of Entrepreneurship ; A Policy Implication for Sustainable Agribusiness Growth in Smallholder Farmers in Pakistan

Saima Rani[1], Rajendra Adhikari[2], Nadeem Akmal[1]
[1]Pakistan Agricultural Research, Islamabad, Pakistan. [2]university of Queensland, Brisbane, Australia

Paper Abstract:

More than one billion people in developing countries live in poverty. The main source of income and livelihood for many poor people in rural areas comes from agricultural activities in these countries. The literature indicate that agricultural sector is one of the most important sectors in developing countries in need of sustainable entrepreneurship improve the livelihood. Therefore, the small research activity research carried out to identify agribusiness potential and constraints for sustainable agribusiness growth and policy implication in smallholder farmers in Pakistan . Furthermore, the ACIAR pulses production project (CIM/2015/041)" with the support of NRSP and ACIAR pulses value chain Project develops the small-scale seed bank and linkup the grower with the high end market. Therefore, the research is designed to identify the constraints and opportunities of farm entrepreneur. The primary data was collected through the focus group discussion and key informant interviews conducted from the farmers and seed

bank owners in Chakwal. The results indicate that, the livelihood of the farming community depends 50 percent on agriculture (Crop and livestock) and 30 percent on off farm income. During the focus group discussion, it identified that, mainly farmers are in pre-establishment stage of entrepreneurship, however, there are few farmers are working on establishment stage in project sites where farmers have basic skills to negotiate with middlemen and other value chain actors to get better price. Furthermore, the seed bank owners have on the early growth stage where farmer decides to take his new enterprise beyond survival, and they want to grow and establish the seed companies and develop linkages with the processes and high-end market. The poor infrastructure, unsupportive laws and regulations, lack of financial support, social and cultural barriers, Lack of support and training especially for youth and uncertainly in the market are the major constraints face by the farmers in the village. The effective and adequate entrepreneurship policies and programmes like promoting the entrepreneurship education should be developed for young farmers for growth and development in the area.

The impact of live streaming on demand for eco-labelled food products in China

Yue Chen, Chunbo Ma, Michael Burton
The University of Western Australia, Perth, Australia

Paper Abstract:

Information asymmetry between sellers and consumers has long affected the market for eco-labelled food products. As a rapidly growing new digital marketing channel, live streaming has the potential to alleviate this asymmetry by providing more information, thereby improving sales performance. However, there is limited evidence of the effect of live streaming on consumption. This study analyzes daily live streaming platform data as well as individual session data from TikTok, between July 5, 2023, and July 4, 2024, to examine the impact of live streaming on sales of eco-labelled rice products in China. The results reveal that live streaming has a stronger boosting effect on platform sales of labelled rice products than un-labelled products. Session-level analysis also shows that information proxies such as the number of streamer followers, the duration of promotional product demonstration during a live streaming session, and the expertise of streamers are positively associated with the sales of labelled rice products compared to unlabelled products. These findings provide new insights into the impact of live streaming on marketing eco-labelled products in which information plays a critical role.

A meta-analysis of yield responses to crop diversification practices

Christine Li
Centre of Excellence for Biosecurity Risk Analysis, The University of Melbourne, Melbourne, Australia

Paper Abstract:

Crop diversification has been proposed as one possible sustainable intensification strategy to achieve the aims of meeting rising food demand using finite resources while limiting environmental pollution. This project aims to synthesise evidence from the last thirty years on the effects of such diversification practices across a range of growing conditions, to gain insight into the differences in production between diversified and simplified systems.

I conducted a systematic review and meta-analysis of the yield responses for staple grains (i.e., maize, wheat, rice, soybeans) observed in matched-pair trials of crop diversification practices, defined as intercropping, crop rotation, conservation agriculture, agroforestry, incorporation of semi-natural habitat vegetation and the use of organic inputs. Following the PRISMA protocol, I identified over 70 relevant papers and extracted data to form a dataset of over 900 observations. I extracted information from the papers related to yields, inputs, and their resource use efficiency, to estimate effect sizes in terms of the yield response ratios (i.e. the ratio of mean treatment yields and mean control yields).

This presentation will report on the yield response ratios across crops and diversification practices and aim to explain the quantified heterogeneity across studies. I will also discuss meta-research practices and topics such as publication bias and how to deal with cases of complex dependency commonly found in agricultural experimental data.

Impact of Multidimensional Energy Poverty on Household Expenditure Patterns in Rural China

Bowen Shen, Wanglin Ma
Lincoln University, Christchurch, New Zealand

Paper Abstract:

Energy poverty affects a household's quality of life and significantly influences their economic decisions, particularly the structure of household expenditures. This study examines the impact of multidimensional energy poverty (MEP) on various categories of household expenditures, including total household expenditure, education expenditure, food expenditure, and gift expenditure. The MEP is a comprehensive indicator that captures households' energy access, reliability, and affordability limitations. The conditional mixed process model is employed to address the endogeneity of the MEP and estimate the MEP and household expenditure equations simultaneously. We estimate data from 1,485 rice farmers from Jiangsu, Hubei, and Yunnan provinces of China. The findings show that rural households being MEP are associated with lower education, food, and gift expenditures. The expenditure effects of MEP are heterogeneous between male and female-headed rural households. Specifically, being MEP significantly reduces education, food, and gift expenditures in male-headed households, while the same only significantly decreases education and gift expenditures in female-headed households. Our findings highlight that policymakers can promote more equitable resource allocation within households by addressing multidimensional energy poverty, improving economic stability and overall well-being, particularly for those most vulnerable to energy poverty.

Investing in Natural Capital Production Landscapes: An exploratory analysis of investors and WA growers' perspectives [please note that this submission is for speed presentation]

Ram Pandit[1,2], Tom Picton-Warlow[3], Jon Marx Sarmiento[1], Fiona Dempster[1], Lizzy Lowe[4], Ana Manero Ruiz[1]

[1]The University of Western Australia, Perth, Australia. [2]The Western Australian Biodiversity Science Institute, Perth, Australia. [3]MobileGlobal Pty Ltd, Perth, Australia. [4]Edith Cowan University, Perth, Australia

Paper Abstract:

Natural capital is one of the key form of capitals contributing to human-wellbeing. Its degradation has resulted into biodiversity loss and decline/shortages of ecosystem services – e.g., water, pollination, productive soil, and bio-geo-chemical cycles – affecting households and businesses. There is growing realisation and interest across businesses that their dependency and impact on nature needs to be considered and included in financial models. There is also a growing interest among investors to invest in nature for environmental, social and governance requirements, among others. Considering agricultural systems and surrounding natural environment as a holistic system in the form of 'production landscape' and developing natural asset companies to monetize the value of natural capital within the landscape is one of the ways to engage investors and growers to improve cultural, social, environmental, and economic outcomes for agricultural producers and the broader society.

This research aims to examine how Natural Asset Companies in production landscapes can enable sustainable benefits from natural resources while creating positive and long-term benefits for both people and nature. To achieve this aim, we start with two specific objectives: a) to understand WA growers' perspectives in managing natural resources in agricultural systems and attitudes towards listing Nature as an Asset Class; and b) to understand investor interest in Natural Capital within regional-scale agricultural production systems.

We conducted exploratory research with various investors and growers through workshops and targeted interviews. To explore perspectives of investors (demand side) and growers/landowners (supply side), we followed an iterative process. Initially, we interacted with investors to learn their perspectives, followed by workshops with growers (farmers, pastoralists, Aboriginal indigenous, and natural resource management groups). In parallel, we conducted two set of surveys with investors and growers. Preliminary analysis of the survey revealed that: a) diversifying farming profit to make growers more resilient should be the target for natural capital production landscape (NPLC) approach; b) investors' primary concerns when investing in NCPLs include lack of tangible and profitable natural capital project examples, lack of liquidity, and regulatory issues; c) NCPL instruments, in their own right, will only become attractive liquid assets with appropriate legislation and regulation; and d) among the aspects of natural capital that can be implemented in the farm as part of a collaborative group, many of the farmers preferred rehabilitation of water systems and tacking salinity – reducing runoff, erosion, and pollution. Investors also identified water systems rehabilitation together with biodiversity corridors, which enhances ecosystem health by promoting native species and natural processes like pollination, pest control, and soil health.

We believe that policy environment for natural capital approach to look at agricultural system is gaining momentum in Australia through the systemic risk that the continued decline of natural systems presents to investor portfolios and the need for growers to reduce emissions, maintain and improve access to markets and build resilience to drought and heat.

Effects of Weather Events on Hospitalization Rates and Medical Expenditure in New Zealand

Sazia Ahmed
University of Waikato, Hamilton, New Zealand

Paper Abstract:

Across the globe, there has been a noticeable increase in weather phenomena such as heatwaves, storms, and intense rains, primarily attributed to changes in climatic patterns. Along with the global scenario, New Zealand's weather patterns are changing, with extreme events occurring more frequently and with greater intensity. New Zealand is affected by a range of weather phenomena, such as tropical cyclones, heavy rainfall, floods, droughts, snowstorms, heatwaves, earthquakes, tsunamis, and the excessive occurrence of El Nino and La Nina. This study explores to investigate the effect of weather events on hospitalization discharge rates heath expenditure of New Zealand.

Author have utilized secondary weather data accumulated from National Institute of Water and Atmospheric Research (NIWA), as well as hospital discharge rates by ethnic groups and medical expenditure data obtained from Health New Zealand. It has used panel data from 8 major regions which have DHB and NIWA weather stations in all over New Zealand and (2014-2019) have been considered to assess the impact of meteorological occurrences on the health sector. Panel data regression models (fixed effect and random effect) have been implemented to investigate the association between health variables and meteorological events.

The findings indicate that while the average temperature has an effect on the rate of hospital release, rainfall is inversely correlated with hospitalization. The analysis indicates that both the average temperature (1% significance level) and minimum temperature (5% significance level) have had a significant positive impact on the discharge rate.

Both panel regression models (fixed and random) demonstrate that the average temperature has a significant impact on increasing medical cost in New Zealand. It is intended to indicate that individuals are becoming ailing and experiencing a variety of diseases as the average temperature begins to rise. At the end of the day, they are required to undergo medical monitoring. As a result, the authority ought to allocate additional funds to the healthcare sector. In the same way, the total rainfall has a positive association with the medical expense on health care across the nation. The rainfall coefficient has significant impact on medical expenditure in random effect model. According to Hausman test, the result of random effect model is more reliable than the fixed effect model for this study.

The rising costs of healthcare systems are being exacerbated by health issues resulting from extreme weather conditions, particularly in regions with low resources. Gaining insight into the impact of these

particular weather conditions on health facilitates the development of more effective health plans and policies. With the increasing frequency of severe weather events, healthcare systems must possess robustness and preparedness to effectively handle the situation. While we may not have a direct role in dealing with climate change and temperature rise, our study can assist health-policy authority in raising awareness among the public about the imminent concerns that climate change poses to the health sector.

Thursday, 13th February 2025

Keynote 2 - Dr Paul Graham - Energy transition

Special Session 5A - Leveraging Social Incentives to Enhance the Effectiveness of Initial Payouts for Landscape-Scale Environmental Outcomes

Special Session 5B - A Systems Thinking Approach to Advancing Food and Nutrition System Resilience

Special Session 6 – Transitioning Australia's Electricity Grid: Market Reform and Policy

Keynote 3 - Adam Fennessy PSM

Keynote 4 - Prof. Ross Kingwell - Agriculture

AJARE Session

Keynote 5 - Prof. Wendy Umberger: Challenges facing food and agricultural systems

Keynote 6 - Prof. Natalie Stoeckl: Valuing reciprocity for a sustainable future

Presidential Address - Dr Sorada Tapsuwan

Special Session 7A – From Fields to Shelves: Climate, Policy, and Firm Behaviour in Agricultural Markets

Special Session 7B - EAST ASIA BRANCH SPECIAL SESSION: ASSESSING ECONOMIC IMPACT OF NON-TARIFF MEASURES ON GLOBAL GRAIN TRADE AND ITS IMPLICATIONS FOR RURAL TRANSFORMATION

Special Session 7C – Land Use Modelling

Parallel 4A - Choice modelling

Parallel 4B - Water 2

Parallel 4C - Energy & Utilities

Parallel 4D - Agricultural Technology & Innovation

Parallel 4E – Biosecurity

Egg Timer Presentations Parallel 3

Keynote 2 - Dr Paul Graham [Energy transition]

Location Main Room 1 (ROMA), LVL1

Time: 08:30 - 10:10

Special Session 5A - Leveraging Social Incentives to Enhance the Effectiveness of Initial Payouts for Landscape-Scale Environmental Outcomes

Location Main Room 3 (WICKHAM), LVL 1

Time: 08:30 - 10:10

Chair Steven Schilizzi

Land degradation, biodiversity loss and other environmental impacts from agricultural activities have been typically understood in terms of a mismatch between private landholders producing public benefits but shouldering private costs. Policy responses have then been to financially compensate landholders for participating in environmental conservation programs. However, landholders' participation rates have remained far lower than anticipated and when participating their conservation actions have tended to stop as soon as payments ended, suggesting that financial payments in and of themselves are not enough to address conservation needs. This special session proposes to explore these aspects by presenting work on the dynamics of adoption and disadoption of conservation practices; the effect of social norms on farmers' decisions to adopt and sustain sustainable farming practices beyond the duration of conservation programs; the capacity of social sanctions to prevent free-riding and encourage cooperation in public good projects; and the extent to which coordination incentives can promote the positive co-evolution of social and ecological processes that support sustainable land use by landholders.

Special Session 5B - A Systems Thinking Approach to Advancing Food and Nutrition System Resilience

Location Chancellor 1, LVL0

Time: 08:30 - 10:10

Chair: Risti Permani

The challenges facing our food systems are vast. Nearly a billion people worldwide are hungry or undernourished, while 1.5 billion are overweight or obese. In developing countries, many households spend over half their income on food, leaving them vulnerable to sudden price changes that can deepen poverty. On the production side, food systems struggle with climate change, soil degradation, and labour shortages. Building resilience in these systems is essential to withstand shocks and ensure continued function during disruptions. However, gaps remain in understanding resilience root causes, potential strategies, measuring and monitoring resilience, and addressing gender, disability, and social inclusion (GEDSI) perspectives. This session is intended for participants involved in agrifood systems and agricultural research for development (R4D), including researchers, research project managers, scientists, economists, and policymakers whose work consists in understanding the complexity of issues in the food systems. The participation of early career researchers (including higher-degree research students) is strongly encouraged.

Special Session 6 – Transitioning Australia's Electricity Grid: Market Reform and Policy

Location Main Room 1 (ROMA), LVL1

Time: 10:40 - 12:10

Chair: Frank Jotzo

Electricity is undergoing a profound shift in Australia. Eectricity generation is shifting rapidly from a system supported by a relatively few large electricity generation facilities, dominated by coal fired power stations, to a system dominated by renewables generated by thousands of producers ranging from household roof-top solar to larger scale wind and solar farms, supported by gas fired plants and a diverse range of of stored energy. Wholesale market prices are low or negative when renewables dominate, and there is uncertainty about revenues in the energy-only market. Generation investments are now underwritten by governments. This session takes stock of the changes and challenges. It asks whether government underwriting might need to be continued, and whether national electricity market reform is needed.

Keynote 3 - Adam Fennessy PSM

Location Main Room 3 (WICKHAM), LVL 1

Time: 10:40 - 12:10

Chair: Kym Anderson

Adam Fennessy PSM is the Secretary of the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF). The session will be chaired by Kym Anderson, a member of the Crawford Fund Board.

Keynote 4 - Prof. Ross Kingwell [Agriculture]

Location Chancellor 1, LVL0

Time: 10:40 - 12:10

AJARE Session

Time: 12:10 - 13:10

Keynote 5 - Prof. Wendy Umberger: Challenges facing food and agricultural systems

Location Main Room 1 (ROMA), LVL1

Time: 13:10 - 14:10

Chair David Shearer

Keynote 6 - Prof. Natalie Stoeckl: Valuing reciprocity for a sustainable future

Location Chancellor 1, LVL0

Time: 13:10 - 14:10

Presidential Address - Dr Sorada Tapsuwan

Location Main Room 1 (ROMA), LVL1

Time: 14:20 - 15:00

Special Session 7A – From Fields to Shelves: Climate, Policy, and Firm Behaviour in Agricultural Markets

Location Main Room 1 (ROMA), LVL1

Time: 15:30 - 17:10

Chair: Alexandra Hill

The session features a panel of economists, diverse in their career stages and areas of expertise. The session will address factors influencing the volume and pricing of agricultural products as they move from fields to shelves. The session will open with two talks "in the field" addressing climate change, transition to retail procurement markets addressing food loss due to firm behaviour, move to retailer consumer markets addressing how government policies influence pricing, and will conclude with a broad-scope study of the implications of conflict for price transmission.

Special Session 7B - East Asia branch special session: assessing economic impact of non-tariff measures on global grain trade and its implications for rural transformation

Location Main Room 2 (TERRACE), LVL1

Time: 15:30 - 17:10

Chair: Yu Sheng

With average tariffs falling since the Uruguay Round in 1994, NTMs have gradually become the most essential obstacle to global agricultural commodity trade. The rapid increase in NTMs, particularly in the

realm of agricultural trade, have erode the gains obtained from the success made by global trade negotiators in tariff cutting over the post-war period, presenting emerging challenges to global trade liberalization, and thus threaten global food security and the achievement of Millennium Sustainable Development Goal by 20230 (UN, 2021).

To cope with these challenges, trade negotiators need better understanding of the existing NTMs and their impacts on agricultural trade and determine what NTMs and products to prioritize in bilateral and multilateral negotiations. This special session will offer insights into the economic impact of major Non-Tariff Measures (NTMs) on global grain trade and the Australian grains industry. Discussions will also cover trade policies and rural transformations in Australia. By offering comprehensive empirical evidence and a robust, evidence-based modeling tool, we aim to empower policymakers and industry stakeholders with actionable insights. This special session is organised with the support of Grains Australia.

Session Program:

15:30   Prof. Yu Sheng (Crawford School of Public Policy, ANU) (Chair): Introduction
15:35   Dr. Wanlu Dong (Institute of Agricultural Economics, Chinese Academy of Social Sciences)/Yu Sheng: Measure of NTMs for Grains Products Globally and Australia
15:45   Christian Creed (Trade and Global Change, ABARES): Assessing Trade Impact of NTMs on Grain Products: Assessing trade impact of NTMs: the structural Gravity model I
15:55   A/Prof. Sizhong Sun (College of Business, Law and Governance, JCU): Assessing Trade Impact of NTMs on Grain Products: Assessing trade impact of NTMs: the structural Gravity model II
16:05   Liangyue Cao (Trade and Global Change ABARES): CGE Model: Analysing economic impact of NTMs through the value-chain
16:15   A/Prof. Qi Cui (School of Economics, China Petroleum University): CGE Model: Prioritizing policy tools for managing NTMs effects
16:25   Dr. Xianneng Ai (School of Advanced Agricultural Sciences, Peking University): Economic Development and Rural Transformation in Mongolia: Mongolia vs. Inner Mongolia
16:40   Dr. Moyu Chen (School of Advanced Agricultural Sciences, Peking University): Institutions, Policies, and Investments: Contextual Drivers of Agricultural Labor Productivity Across Stages of Rural Transformation
16:55   All speakers Q&A Panel
17:10   Close

Special Session 7C – Land Use Modelling

Location Main Room 3 (WICKHAM), LVL 1

Time: 15:30 - 17:10

Chair: Ian Bateman

Policies to improve environmental outcomes and livelihoods of smallholders in upland areas: an agent-based optimisation approach

Oscar Cacho, Daniel Hill, Jonathan Moss
University of New England, Armidale, Australia

Paper Abstract:

Upland landscapes in tropical countries are critical for smallholder livelihoods. They provide land for agriculture, grazing, and forest products. Many farmers in these areas benefit from high-value cash crops, such as coffee, rubber, cocoa and palm oil. However, uplands are particularly vulnerable to environmental degradation, including soil erosion and landslides due to their steep slopes. This situation worsens when land is cleared to plant annual crops. Additionally, upland areas contain a significant portion of remaining virgin forests, which are vital for biodiversity conservation, carbon sequestration, and regulating climate. This creates a conflict between the need for land for agriculture and the preservation of these ecosystems.

There is good coverage in the literature of these problems and potential solutions, such as establishment of agroforestry to replace annual crops, or ecotourism to help protect forests. Policies that provide incentives for farmers to select lands uses that benefit the environment (or avoid damage), need to be targeted to key areas on the landscape to provide the best value for money. This means that some local knowledge is required to decide which segments of the farmer population to target to improve environmental outcomes. Agent-based modelling and marginal abatement cost (MAC) curves are useful tools to assist with this targeting.

In this study we develop an optimization model at the farm-household level and apply it to a population of farms on a catchment. The case study we present is in West Java, Indonesia, and was developed under a project funded by ACIAR. At the centre of the model is a set of heterogeneous farm households, each with an initial endowment of land (A), labour (L) and capital (K). Crucially, the land managed by a household is divided into one or more plots, which vary in terms of area, slope, land use, and position in space. Other variables considered include household size, education level and use of conservation practices. A population of over 42,000 farmer households was modelled, managing 103,735 smallholder plots covering 26,099 ha, out of 197,778 ha in the full map, which included settlements and water. The aggregate land-use decisions of households have impacts on household welfare but also on environmental outcomes such as soil erosion, water quality and biodiversity. These outcomes are modelled by overlaying farm plots on a set of maps representing slope, rainfall, land cover, carbon stocks and other variables.

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In the model, alternative policies are represented as experimental treatments. By modifying incentives and constraints faced by households, and allowing households to optimize their behaviour, we are able to derive MAC curves, which allow us to estimate the potential reduction in soil erosion and costs associated with each policy. As an example, we estimate that restricting planting of seasonal crops on steep plots can reduce soil loss by 100,000 tonnes per year at a cost of ~AUD 1,140 per tonne for the marginal farmer. The same approach can be applied to carbon and biodiversity using the model.

Challenges and opportunities in offset tool design: Insights from Australian experts

Claire Doll[1], David Pannell[1], Diane Jarvis[2], Ram Pandit[1]
[1]The University of Western Australia, Perth, Australia. [2]James Cook University, Townsville, Australia

Paper Abstract:

The Department of Climate Change, Energy, the Environment and Water Offsets Calculator (the Offsets Assessment Guide) is an important tool used by officers to assess the suitability of offset proposals. Since 2012, when the tool was originally developed, it has been used to assess a wide variety of proposed developments impacting Matters of National Environmental Significance. Recently, the effectiveness of these offsets in realising ecological gains has been called into question. After over ten years of use, the Department has called for a revised version of the tool. Our team has worked to understand limitations of the existing tool and assess opportunities for improvement. We conducted interviews with wide range of experts engaged in offsets including: consultants that regularly engage with the tool on behalf of developers, assessment officers from the Department, the original developers of the tool, specialists responsible for state-level offsetting systems, and other biodiversity experts. This project aims to understand the key drivers that influence the success or failure of environmental offset systems, and assess how this knowledge can inform the design of a more effective system of offset and restoration tools. In this paper, we highlight key insights from a series of interviews with offsets experts. We provide an overview of how these insights were used to design a new calculator tool (the Updated Offsets Calculator), and discuss how these revisions can translate to proposed Environmental and Biodiversity Conservation Act reforms.

Carbon and financial performance of native forest silvopastoral systems in Queensland

Tyron Venn, Mengyou Sour, Martin Timperley
University of Queensland, Brisbane, Australia

Paper Abstract:

Globally, the livestock industry is a major contributor to the climate crisis, and in Australia, the red meat sector is responsible for 10% of national greenhouse gas (GHG) emissions. Meat and Livestock Australia (MLA) aim to shift the nation's red meat sector towards carbon neutrality. There is considerable global research effort to develop feed supplements that reduce enteric fermentation emissions; however, commercial-scale production is not yet a reality. Silvopastoral systems (SPS) are land management practices that integrate trees, pasture and livestock on the same unit of land, and can substantially reduce the net carbon emissions of livestock production. However, there is limited information in international and Australian literature about the carbon and financial performance of these systems. Planting and nurturing young trees within pasture is a high-cost undertaking, but fortunately, in southern and central Queensland there are 1.6 M ha of regrowth native forests on Category X grazing lands with commercially important timber species. Typical management involves periodic re-clearing. Alternatively, this regrowth could be managed as a productive SPS. Relative to feed supplements, SPSs have the added benefits of increasing the diversification, drought resilience and aggregate level of farm income through timber and livestock production, improving animal welfare through creation of a more favourable microclimate, improving biodiversity conservation outcomes on private land and reducing Australia's international ecological and carbon footprint in forests of developing countries by increasing domestic timber supply.

The paper presents a carbon and financial evaluation of SPS in native forest regrowth in southern and central Queensland. A native forest growth model and the Queensland Government grass production model (GRASP) have been integrated within a discounted cash flow decision support tool (DST) to simulate farm management scenarios over 100 years. The DST tracks over time the trade-offs between timber, pasture and livestock production, the net farm carbon balance, net annual farm income and land expectation value (LEV).

The research will be finalised in 2024 and preliminary analysis has revealed that future cash flows are maximised by adopting SPS, although improved open pastures generate the greatest farm LEV. Properties can be net carbon sinks for at least 50 years when a fraction of the farm is managed as a SPS. However, the potential for native forest regrowth SPSs to provide significant carbon and financial benefits will be severely constrained unless the following policy recommendations are implemented. First, sovereign risk in Queensland must be addressed by providing long-term (30+ years) harvest rights to landholders, which will encourage the retention of regrowth forest. Second, Australian Carbon Credit Unit (ACCU) methods that permit native forest timber harvesting are required so that landholders can be credited for carbon stored. Given that carbon neutrality is an MLA goal, SPSs are unlikely to generate substantial carbon credit income, as the sequestered carbon will be necessary to offset enteric fermentation from livestock grazed under the trees, as well as in remaining open pastures. Thus, carbon markets on their own may not completely overcome the long payback period barrier to silvopastoral systems.

Integrating science with economics to deliver interconnected climate, biodiversity and food objectives: Assessing policy alternatives

Ian Bateman
University of Exeter, Exeter, United Kingdom

Paper Abstract:

Land use change is crucial to addressing the existential threats of climate change and biodiversity loss while enhancing food security. However, the interconnected and spatially varying nature of the impacts of land use change means that these challenges must be addressed simultaneously. Despite this, governments around the world commonly focus on single issues, incentivizing land use change via 'Flat-Rate' subsidies offering constant per hectare payments, uptake of which is determined by the economic circumstances of landowners rather than the integrated environmental outcomes that will be delivered. Here we compare this common approach to allocating subsidies to two increasingly popular alternatives: 'Land Use Scenario' allocation of subsidies through consultation across stakeholders and interested parties; and a 'Natural Capital' approach which targets subsidies according to expected ecosystem service response. A comparison of outcomes across the three approaches is achieved by developing a novel and comprehensive decision support system, integrating new and existing natural, physical and economic science models to quantify environmental, agricultural and economic outcomes. Applying this system to the UK net zero commitment to increase carbon storage via afforestation, we show that the three approaches result in significantly different outcomes in terms of where planting occurs, their environmental consequences, and economic costs and benefits. Analysis reveals that the dominant Flat-Rate approach actually increases net carbon emissions while Land Use Scenario allocation of subsidies yield poor economic outcomes. In contrast, the Natural Capital targeted approach outperforms both of these alternatives, providing the highest possible social values while satisfying net zero commitments.

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Parallel 4A - Choice modelling

Location Main Room 4 (LEICHARDT), LVL 1

Time: 15:30 - 17:10

Chair: Kynda Curtis

Do perceived food values drive consumer behavior in food waste management? A comparative analysis between Vietnam and Switzerland

Minh Hai Ngo[1], Thanh Mai Ha[2,1], Mathilde Delley[3], Franziska Götze[3], Thi Lam Bui[1], Nhu Thinh Le[4], Evelyn Markoni[3], Anh Duc Nguyen[1], Bárbara Franco Lucas[3], Bao Duong Pham[5], Thomas A. Brunner[3]

[1]Vietnam National University of Agriculture, Hanoi, Vietnam. [2]Swedish University of Agriculture, Ultuna, Uppsala, Sweden. [3]Bern University of Applied Sciences, Bern, Switzerland. [4]Fruit and Vegetable Research Institute, Hanoi, Vietnam. [5]Bacgiang Agriculture and Forestry University, Bacgiang, Vietnam

Keywords: 9. Consumer Choice; 17. Food, Health and Nutrition

Paper Abstract:

Consumers' perceptions of food values may play a critical role in shaping their food waste management practices. Although understanding this relationship could help improve communication strategies aimed at reducing food waste, research in this area remains scarce. Moreover, there is a lack of comparative studies between developed and developing countries, leaving a gap in how food waste reduction measures can be adapted to different cultural and economic contexts. This study seeks to address this gap by investigating how perceived food values impact food waste management behaviors in Vietnam and Switzerland. Data were collected from an online survey, yielding 643 valid responses from Switzerland and 616 from Vietnam. A four-scenario experiment was designed to elicit food values and consumer behavior (discard or use food). Four scenarios include reference scenario (food bought from supermarkets), responsibility (leftover food received from a party host), traceability (foods bought from a known farmer), and traceability combined with responsibility. The study focused on vegetables and pork, which were presented as still edible but degraded due to being neglected.

The results revealed significant differences in consumer behavior between the two countries, particularly in handling meat. On average, 70% of Vietnamese respondents discarded forgotten meat, compared to just 8% of Swiss respondents. In contrast, 92% of Swiss participants chose to save the meat through actions such as cooking, freezing, or refrigerating it, whereas only 30% of Vietnamese respondents did the same. A similar pattern, though less extreme, was observed for vegetables, with 37% of Vietnamese respondents discarding forgotten vegetables, compared to just 2% of Swiss respondents. These findings suggest that Swiss consumers are generally more responsible in their food waste management, which may be linked to a stronger focus on sustainability in Switzerland or a greater availability and affordability

of fresh food in Vietnam, which forms a low perceived opportunity cost of wasting, thereby encouraging wasting behavior.

The study also found that the influence of traceability, responsibility, and their combination on food waste behavior was more pronounced in Vietnam than in Switzerland. In Vietnam, the responsibility scenario was most effective in reducing food waste for forgotten vegetables, with only 27% of respondents discarding them. Regarding forgotten meat, the traceability scenario had the largest effect, with 62% of respondents choosing to discard the meat, compared to 74% in the reference scenario. In Switzerland, no significant differences were found in the proportion of consumers discarding meat across the scenarios. For vegetables, the only notable difference was a higher percentage of respondents choosing to make salad in the traceability and responsibility scenarios compared to the reference scenario. Overall, this study suggests that, depending on the type of food, either perceived traceability or responsibility values can influence food waste management behaviors in Vietnam. Given the lower awareness of sustainability in Vietnam, there is significant potential to reduce food waste through better communication of food values to Vietnamese consumers.

Animal versus consumer welfare: is there a trade-off? The case of eggs in New Zealand.

Harold Mayaba
Lincoln, Christchurch, New Zealand

Paper Abstract:

As animal welfare concerns have increased in many countries, there has been a shift in consumers' attitudes and awareness towards the treatment of farmed animals. These concerns have led to increased public scrutiny of animal welfare issues, focusing on improving welfare outcomes in many production systems. New Zealand is one of the countries that responded to this shift in public awareness by formally recognising the sentience of animals in legislation and banning the use of conventional cages in the egg industry. However, more needs to be discovered about consumer preferences towards egg production in New Zealand and which animal welfare-enhancing attributes they perceive as particularly valuable. Phasing out cages resulted in farmers switching to other, higher-cost production systems, triggering price increases that imply a trade-off between hen welfare and consumer welfare. At a time when food prices are increasing at an unprecedented rate, there is a need to understand the economic impact that animal welfare legislation has on consumers as they switch to other types of eggs from different production systems.

Our study investigated consumer preferences for eggs, focusing on attributes related to hen housing. housing systems. The objectives were to examine underlying consumer preferences towards egg attributes related to hen housing, estimate the (consumer) welfare impact of a ban on conventional, and predict future consumer welfare when colony cages are also banned in New Zealand.

Data from a nationwide survey were analysed, using a random parameter logit model (RPL). The survey used three different randomized blocks: a control group (Treatment 1), where no additional information

was provided; Treatment 2, which included positive information about the commonly used housing system; and Treatment 3, which provided negative information about each housing system.

The results indicate a clear preference for free-range eggs and show that information, especially negative information, significantly influences consumers' preferences. Parameter estimates from the RPL model suggest that the total annual national welfare loss from phasing out conventional cages is $238.46 million. The predicted annual welfare loss from phasing out colony cages is estimated at $297.46 million, largely driven by the price increase associated with non-cage production.

How Can Animal Welfare Knowledge Influence Consumer Willingness to Pay for Eggs in Traditional Market?

Shang-Ho Yang[1], Shuay-Tsyr Ho[2]
[1]National Chung Hsing University, Taichung City, Taiwan. [2]National Taiwan University, Taipei city, Taiwan

Paper Abstract:

Animal welfare is an increasingly significant issue nowadays. The importance of animal welfare extends beyond its intrinsic value and ethical considerations to encompass broader implications for society, environment, and economy (Keeling et al., 2019; Lagerkvist & Hess, 2011; Neto et al., 2022; Ostojic-Andric et al., 2018; Zanoli et al., 2013). Consumer knowledge plays a significant role in purchase behavior for food products. Thus, there has been a growing recognition of the link between animal welfare and market trends, showing that individuals are increasingly seeking products and services that align with their values (Alonso et al., 2020; Lusk, 2011; McClung et al., 2022; Washio & Ohashi, 2019; Winkel et al., 2020).

Consumers in Taiwan usually go to traditional markets, supermarkets, and local grocery stores to buy chicken eggs. When markets face higher demand for animal-welfare eggs, not all markets can meet up the potential demand for the animal welfare concept due to the inconsistency in packaging system. Chicken eggs sold in traditional markets and local grocery stores are self-service, so consumers can pick up the eggs they like and put into their plastic bag. Consumer trust issue lies in whether the eggs sold in traditional markets and local grocery stores follow the animal welfare standard or not. All eggs look alike. Without a certified process or product traceability information, it would be hard to tell. Our research question is on whether there is market potential to sell animal-welfare eggs in traditional markets. Furthermore, we also examine whether the consumer knowledge of animal welfare influences the purchase intention.

We conduct a web-based survey and collected 1, 093 valid responses with paid rewards. The Random Utility Theory model is used in this study and assumes that consumers are maximizing their utility based on his/her preferences (Cascetta, 2001). Results show that the willingness to pay (WTP) for animal welfare eggs would be higher if consumers have stronger knowledge about the psychological need of the hens, such as having objects to peck, having litter to scratch, and sand shower provided. In addition, the experience of purchasing animal-welfare egg before would contribute to a higher degree of knowledge understanding on animal welfare issues, while those who never bought before actually have a lower degree of knowledge on animal welfare. An animal-friendly certificate for the rearing process would also

enhance consumer knowledge about animal welfare. It implies that egg farmers and marketers should apply for and be approved for the animal-friendly rearing certificate in marketing their eggs. Lastly, consumers in traditional market show greater willingness to pay when they understand that the concept of animal welfare is more of "free to flap or stretch" and "free to go outdoor". For industrial implication, traditional markets should consider imposing a stringent and suitable regulation to promote the knowledge diffusion among consumers interested in understanding the animal-friendly certification system.

Assessing Preferences and Willingness to Pay for Vegetable and Fruit Box among Nepalese Consumers

Pramila Dhakal, Shang-Ho Yang
National Chung Hsing University, Taichung City, Taiwan

Paper Abstract:

The current food system involves numerous market intermediaries so that farmers make less profit while consumers pay more without knowing the origins and safety of their food. Therefore, transitioning the system to one that supports and fosters shorter supply chains can improve farmer well-being, help consumers save money, and protect the environment. Various shorter supply chains, such as farmers' markets, specialty shops, vegetable and fruit box programs, community-supported agriculture etc., have been practiced throughout the world. The Vegetable and Fruit Box (VFB) scheme delivers fresh, organic fruits and vegetables directly from the farm to the consumer's doors in a hassle-free way and eliminates intermediaries. In Nepal, the agricultural marketing system is moving towards shorter supply chains with the rise of online marketing. Some online retailers have begun offering vegetable and fruit boxes online, which is a fantastic way to link farmers and consumers. Consumers may act differently when buying fruits and vegetables online than when using a traditional market channel. Thus, it's critical to investigate how they behave when making purchases online. A total of 603 Nepalese consumers participated in an online survey based on a Discrete Choice Experiment (DEC) and the Random Utility Model was used to evaluate the consumers' preferences and willingness to pay for VFB. Preliminary results revealed that, despite the prevalence of home delivery services and the proliferation of online retailers, consumers still frequently visit their neighborhood stores to purchase fruits and vegetables. Furthermore, over 65% of respondents have never made an online fruit and vegetable purchase and may lack trust in online transactions. In contrast, products from farmers' markets are perceived as more trustworthy and safer, which signals farmers' markets opportunity to engage in online marketing. Social media platforms like Facebook and TikTok are essential for spreading knowledge about the online sale of agricultural products and digital wallets are the preferred payment method for online purchases. Although 56% of participants are unfamiliar with VFBs, the 95% of among them are interested in ordering, with an average willingness to spend NPR 1,162 (USD $8.67) per box, which is comprised of highly preferred vegetables namely; cauliflower, broccoli, cucumber, carrot, and potato. Majority of consumers are willing to pay an additional NPR 25 (USD $0.19) for VFBs that contain certified organic products with a weekly subscription. Among the attributes considered consumers valued all—organic certification, payment timing, packaging materials, and price, with packaging materials being particularly important whereas price is the least priority. The VFB packaged in paper boxes with an organic guarantee rating are much favored over inorganic goods contained in plastic bags which demonstrates the green behavior of consumers.

Additionally, due to concerns about pre-payment risks, consumers preferred to pay after the products were delivered. This study laid the foundation for e-commerce retailers selling agricultural products to tailor their offerings to consumer needs to leg up their competition. Online VFB may also be the next promising business for farmer markets as consumers are becoming more confident in the products they buy.

Understanding Public Preferences for Green Transition: An Urban Perspective

Shouyu Zhang, Quanbiao Zhang, Junming Zhu
Tsinghua University, Beijing, China

Paper Abstract:

Cities, where 70% of the world's population resides, are major contributors to greenhouse gas emissions (Lu et al., 2024). Transitioning to sustainable cities could not only lead to a significant reduction in carbon emissions but also enhance overall economic and social sustainability. For instance, transitioning to a low-carbon city can effectively reduce PM2.5 concentrations in the air, thereby improving health of citizens (Panji et al., 2023). Moreover, urban green transitions reduce environmental pollution and promote job creation and economic growth through initiatives such as promoting renewable energy, increasing energy efficiency, and advancing electric vehicle adoption (Lu et al., 2024).

However, the green transition is a complex process of socio-technical change involving interactions at multiple levels, including institutional and cultural shifts at the macro level and individual behavior and choices at the micro level (Geels, 2011). The need for a green urban transition is not confined to the macro level; micro-level perspectives should also be considered. While some studies have discussed the ecological value of green spaces, inner-city lighting, and noise pollution as perceived by urban residents (Bronnmann et al., 2023; Buxton et al., 2021; Sanders et al., 2020; Svechkina et al., 2020), most focus on preferences for individual ecological services, lacking a comprehensive examination of the multidimensional ecological well-being that can be achieved through an integrated green transition. This limitation makes it difficult for policymakers to fully understand the diverse needs and preferences of urban residents when designing and implementing green policies, thus affecting their effectiveness (Bateman et al., 2006).

Therefore, we are conducting a nationwide discrete choice experiment to explore urban residents' willingness to pay for green transition, which is expected to be accomplished by December 2024. The sample are citizens from over 50 cities in China. Respondents will be asked to provide demographic information and approximate location of residence within the city. The context of cities, including environmental and economic indicators, are also collected for further heterogeneity analysis. In the context of the UN's 2030 SDG goals, we focus on clean energy consumption, air quality improvement, extreme weather response, ecological values, and health benefits as the core aspects of the green transition process. The experimental design includes several attributes, such as the proportion of residents consuming green electricity, air quality, frequency of extreme weather events, amount of green space, and health co-benefits under the transition. Our study aims to contribute to the literature by offering insights into public opinion on climate change mitigation from a novel urban perspective, and

providing guidance for building sustainable cities, with a focus on urban residents' demand for green transitions in varying environmental contexts.

Are sustainability certifications important to US fresh cut flower buyers?

Kynda Curtis, Melanie Stock
Utah State University, Logan, USA

Paper Abstract:

The objective of this study is to assess consumer preferences and willingness to pay for fresh cut flowers with sustainability certifications. Sub objectives include assessing consumer knowledge, attitudes, and importance of sustainable labeling certifications and the impact of improving their understanding of certification programs on their preferences and WTP.

Americans purchase 10 million cut flowers daily, spending close to $7 billion annually. The majority (80%) of the flowers sold in the U.S. are grown internationally in climate-optimal countries, such as Ecuador, Columbia, and Kenya. Unfortunately, the industry is riddled with issues such as use the of toxic chemicals, low wages, and suboptimal working conditions. The industry also has a large environmental impact due to shipping requirements and production systems, including an enormous CO_2 footprint, high fuel usage, and water and air contamination. While regulating conditions overseas is difficult or even impossible, sustainable labeling programs do exist, including but not limited to the Rainforest Alliance and Fairtrade International.

Data were collected through an online Qualtrics survey of US consumers in the Intermountain West (Nevada, Utah, Idaho, Wyoming, Colorado, and Montana). A total of 607 responses were collected. Quotes were set such that sample demographics reflect those of the region. The survey included questions regarding socio-demographics, floral shopping/purchasing habits, familiarity with specialty labelling programs, and cut flower variety and color preferences. Additionally, respondents completed a choice experiment and auction to estimate their willingness to pay for the certified organic, locally grown, and Rainforest Alliance certification labels on cut flower bouquets.

Survey results show that cut flower price, freshness, appearance and quality were the most important factors in their purchasing decisions. Respondents were most family with the locally grown and GMO-free labelling programs, and least familiar with the Fairtrade International and Rainforest Alliance certification programs. For all purchases (flowers, food products, etc.), locally grown, pesticide-free, natural, organic, and sustainable/eco-friendly were the five highest ranked specialty labels. Although 34% had never purchased cut flowers with sustainability labeling.

Close to half of the respondents, 44%, purchased fresh cut flowers several times a year, while 8% never purchased cut flowers. Flowers were purchased primarily at florist shops followed by grocery stores, and most often purchased for Valentine's Day, Mother's Day, and as a show of affection. Respondents spent $57 on average per purchase and roses, tulips, and lilies were the most preferred flower varieties.

Auction results show that respondent willingness to pay was highest for the 18-22 stem wrapped bouquet featuring locally grown and rainforest alliance certification at $25.57 followed by a bouquet featuring a

locally grown and organic certification at $25.45. Respondent WTP was the lowest for the non-labelled bouquet at $18.27.

The choice experiment analysis isn't complete, but resulting WTP values will be compared to the auction results. Also, labelling information was provided to half of the respondents before the choice experiment and auction. Results will be evaluated for the Information and No Information groups to assess the impact of providing labeling information.

Parallel 4B - Water 2

Location Chancellor 1, LVL0

Time: 15:30 - 17:10

Chair: Joey Blumberg

Measuring the GDP of the Murray-Darling Basin: An income-based approach to GDP modelling

Liuyuan Tang
Murray-Darling Basin Authority, Canberra, Australia

Keywords: 12. Econometric Modelling; 31. Water

Paper Abstract:

The Murray-Darling Basin (MDB) is the largest river system in Australia, covering 1 million square kilometres in south-eastern Australia and straddling across four states and one territory. An iconic part of Australia and a key agricultural region, the MDB is home to 2.4 million people, who live in the Basin's urban centres and rural communities, and who work in diverse industry sectors.

The GDP is a common measure for the size of an economy. In Australia, the official GDP statistics are limited to national and state levels as provided by the Australian Bureau of Statistics (ABS). This paper proposes a methodology for estimating the GDP of the MDB, Gross Basin Product (GBP), using a compensation of employee (CoE) model aligned with national account concepts. The GBP, along with other indicators, will support the Murray-Darling Basin Authority's work in collecting best available data to inform the adaptive management of the Murray-Darling Basin Plan, which aims to best balance between water users, communities and the environment.

The GDP can be derived by summing up all the income in the economy (consisting of employee income and business income), plus taxes less subsidies on production and imports. This research proposes to use employee income in the MDB to build a panel regression for the GBP, leveraging the confidentalised income tax data that is available through the ABS' Integrated Data Asset. The GDP-CoE model seeks to establish statistical relationships between the national GDP and employee income in various industries over time. The model will then be scaled down to the MDB, using the MDB-specific employment data.

This research presents the modelling methodology for discussion. The aim is to contribute to discussions on the potential applications of the ABS Integrated Data Assets in economic exploratory modelling and the available tools, ultimately supporting informed policy-making.

Market concentration in the access to water: a case study at Chile.

Luis Mateo-Peinado
Department of Economics, Universidad Católica del Norte, Antofagasta, Chile

Paper Abstract:

Freshwater scarcity can constrain directly or indirectly all the Sustainable Development Goals (Vanham et al., 2018). Rising living standards, population growth, or increased competition across productive sectors (i.e., economic factors), as well as climate change or heterogenous endowments of water across space (i.e., natural factors) lie behind this problem (Aghakouchak et al., 2015; Greve, 2018; IPCC, 2018; Mehran et al., 2015). Water markets are intended to allocate water efficiently among competitive uses and can contribute to alleviate this problem. Australia, Mexico, Chile or The United States of America implemented market mechanisms to deal with water scarcity (Wheeler et al., 2017). Yet, concentration resulting from market accessed water can produce social conflicts and bear negative consequences for regional economic development (Loch et al., 2021; Mateo-Peinado, 2022; Woodhouse and Muller, 2017).

Thus, our main research objective is to investigate how natural and social dimensions contribute to explaining market concentration in the access to freshwater at the subnational level. Socio-hydrological research approaches the interdisciplinarity among the natural and the social spheres, considering a positivist paradigm together with a quantitative research methodology (Wesselink, 2017). Research gaps in this field consider institutional reforms for management problems as well as a better understanding of competitive freshwater uses (Ross and Chang, 2020; Vogel et al., 2015). Accordingly, the first specific research objective is to analyze levels of equity in the access to water at different spatial levels. The second specific research objective is to relate economic and hydrologic dimensions to explain these equity levels. We use the case of Chile to complement our research design.

Chile privatized access to water through the enactment of the 1981 Water Code, part of a neoliberal program developed under Pinochet's dictatorship. It contributed to the development of a system that gives control of national water supplies to companies that export natural resources to the international market (Budds, 2013). Bauer (2010) described the 1981 Water Code as the most laissez-faire water market regulation in the world. Water rights markets in Chile tend to perform under uncompetitive economic standards (World Bank, 2011) and there have been an increasing number of conflicts related to water access (Bauer, 2015; Herrera et al., 2019; Rivera et al., 2016). These conflicts stem mainly from asymmetric relations between indigenous communities and some of the largest companies (Woodhouse and Muller, 2017).

Preliminary results show considerable levels of regional concentration in the access to water in Chile. Progress in this research will help understanding how concentration in the access to water is determined through economic and hydrological factors at the regional level. This knowledge can contribute to transition to a more sustainable future for countries that already use market systems (such as Australia) as well as for those transiting towards water rights market institutions.

How does more extreme weather affect prices in the Australian Water Markets?

Patrick Campbell
The University of Sydney, Sydney, Australia

Paper Abstract:

This thesis investigates the impact that extreme weather events have on the price of allocations and entitlements in Australia's southern Murray-Darling Basin water markets. Historical rainfall and dam storage data is used to explain how prices respond to structural changes of the water availability distribution. The findings suggest that allocation prices are only linked to changes in the rainfall distribution, verifying that irrigators use the short-term allocation market to manage fluctuations in water demand during an extreme weather event. An inconclusive relationship between allocation prices and statistical moments of the dam storage distribution provides further evidence for the use of the allocation market as a short-term demand management tool. The empirical results in this paper also find that entitlement prices are affected by long-term changes in the expectation of water supply and demand, concluding that the overall use of statistical moments to better capture how the changing shape, spread and central tendency of the water availability distribution does explain short and long-term fluctuations in water prices. With the knowledge that climate change will increase water scarcity and volatility, I present possible market and policy implications to promote discussion about how irrigators and government can respond to the associated changes in price to effectively manage risk and uncertainty in the face of worsening water scarcity.

Investigating water market outcomes in the presence of non-landholder ownership in the Murray-Darling Basin, Australia

Alec Zuo, Sarah Wheeler
Flinders University, Adelaide, Australia

Paper Abstract:

Water markets play a critical role in helping Australia's food bowl survive periods of severe drought. The value of trade in both temporary and permanent water rights in MDB averages about $1.5 billion per year.

As part of the commitment to the National Water Initiative agreed in 2004 by the Council of Australian Governments, states began to separate the bundled components of the right to access a share of the water resource from the land. The unbundling of irrigation water from land allowed water to be more efficiently traded among irrigators and the government to hold water for the environment, known as environmental water. Owning and trading water by non-landholders has resulted in the belief by some farmers and commentators that market speculation is on the rise and water prices have increased as a result. Although investment in water entitlements by corporate non-landowners is still relatively small – estimated at around 16% in some areas in 2018 – corporate involvement in water markets is increasing and it is unknown how their presence has impacted the water market outcomes. Hence, given that non-landholder water ownership and speculative trading is increasing every year in the MDB, it is critical to assess the actual impacts of non-landholder participation in MDB water markets.

This study aims to evaluate the impact of non-land holders of water shares and water share concentration on temporary and permanent water markets in the most active trading zone –Greater Goulburn in the Murray-Darling Basin, such as price and price volatilities; and what market conditions are more conducive to higher prices and higher volatilities due to non-landholder participation. We use a unique dataset covering a monthly series of water shares regarding their volume, land association and environmental water ownership from Jan 2010 to June 2024, supplied by the Victorian Department of Energy, Environment and Climate Action. Monthly water market trading volumes and prices are collected from the Victorian Water Register.

Time-series econometric modelling is employed, and a multivariate GARCH model, known as the VARX-BEKK-GARCH model, is estimated. The BEKK-GARCH framework can directly measure volatility spillovers between price and trading volume, including the size and direction. The empirical strategy seeks to examine the impact of water ownership structure on both temporary and permanent water market prices and their volatility and whether the impact is conditional on market conditions such as water availability, liquidity, market size, and early versus late season. We will present preliminary findings in the 2025 AARES conference in Brisbane.

A Comparative Analysis of Water Allocation Institutions and Economic Efficiency

Joey Blumberg
US Forest Service, Fort Collins, USA

Paper Abstract:

Water demand is estimated to soon surpass average supplies in many arid climates, which has implications for the institutional efficiency of water administration and governance. This is particularly relevant for the western United States, where new and competing interests for water continue to emerge and surface water shortages are expected to worsen due to increasing frequency and severity of droughts induced by climate change (Gutzler and Robbins, 2011). Although technological innovations have led to marked improvements in water use efficiency, institutional changes in the governance of water are occurring at a slower pace (Libecap, 2011). Achieving outcomes close to a social optimum through technological improvement alone is unlikely if the mechanism governing water use inherently introduces inefficiencies. The present research compares the efficiency of different water allocation institutions and evaluates the implications of return flows, heterogeneous users, and user locations (i.e., upstream or downstream) on allocative performance and market efficiency. I focus on comparing prior appropriation and alternative, share-based mechanisms—all with and without water markets.

While it is well established in the economics literature that a system of prior appropriation creates inefficiencies due to asymmetry in risk across water users (Burness and Quirk, 1979, 1980), less attention has been given to how the initial allocation of water rights can exacerbate or alleviate these inefficiencies. The Coase Theorem (Coase, 1960), a cornerstone in the field of environmental economics, posits that if property rights are clearly defined and transaction costs are negligible, the allocation of resources will be efficient regardless of the initial distribution of these rights. However, the application of Coasean bargaining to water rights governed by a doctrine of prior appropriation is not clear cut, as contemporary

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water trading is typically associated with high transaction costs. Additionally, when high priority water rights are located downstream, the ability of upstream junior users to divert water and generate return flows can be stifled, potentially distorting the total amount of water that can be reallocated through a market.

I develop a series of optimization models that emulate different institutions that exist throughout the world and use Monte Carlo simulations of water supply to examine their sensitivity to randomly generated physical characteristics of a river basin. I find that system-wide value generation under prior appropriation is particularly sensitive to the location of priority along a stream during times of shortage, even in the presence of a perfectly competitive leasing market. For simulations in which there is no water shortage, markets unsurprisingly and unambiguously generate the most value. Ideal conditions for priority-based mechanisms include relatively senior upstream water users that either generate high value or high return flows. However, as the number of water users in the model increases, these ideal conditions become less likely, and share-based mechanisms can generate more value than a market under certain conditions. By examining the physical factors that impact institutional efficiency, this study provides valuable insights for policymakers and stakeholders in the development and implementation of effective and efficient water allocation strategies.

Parallel 4C - Energy & Utilities

Location Chancellor 2, LVL 0

Time: 15:30 - 17:10

Chair Kudzai Zvenyika

General Equilibrium Analysis of Supply-side Climate Policy

Mi Lim Kim
Australian National University, Canberra, Australia

Paper Abstract:

This paper analyzes the environmental effectiveness and the economy-wide impacts of supply-side climate policy. It is an alternative approach to reducing carbon emissions by taxing or restricting the production or export of fossil fuels such as coal rather than taxing or regulating the emission of greenhouse gases as implemented in many countries. Discussion on an export tax on coal started in, and is very relevant to, Australia, one of the major coal exporters.

A previous study employing an energy optimization model finds that coal taxes can contribute to global emission reduction and economic benefit of the major coal exporters. I analyze the impacts of coal taxes by using a global computable general equilibrium model with detailed energy technologies.

General equilibrium analysis can contribute to the discussion. First, coal is closely linked to the other markets so that a change in the price of coal from coal taxes is likely to change prices of other commodity markets. Also, because coal is a capital-intensive industry and associated with the factor market, coal taxes would result in distributional impacts through changes in factor prices. Hence, a partial equilibrium analysis holding prices and quantities of other markets constant could mislead the analysis result. This study can show emission reductions, distributional impacts between coal exporters and importers and household income changes with interaction impacts of coal taxes with other markets and distortion in the global economy.

The results show that even if a coalition of coal exporters adopted a supply-side tax policy it would be quite ineffective and costly because of leakages from domestic production in major coal consumers, exports of competitors and other fossil fuels. High substitutability of coal mainly drives them. It causes far larger economic losses to tax-setters than those to non-tax-setters. On the contrary, the global coal production tax decreases the leakage significantly so that distributional impacts turn to be favorable to Australia and unfavorable to China.

The household income of Australia increases in most scenarios because the increase in its indirect tax receipts outweigh the decline of factor income mainly due to the decrease in returns on capital. Owing to perfect mobility of capital, the negative shock on capital is spread to all industries. However, the global

coal production tax decreases the leakage significantly, and the returns on capital turn to be positive. As both factor income and indirect tax receipt increase, her household income increases far more.

This result implies that all coal producers including China would need to adopt the policy to have significant effects at reasonable cost. However, considering the distributional impacts, China would hardly participate in the coalition. Additionally, the opposing interests of Australian producers and consumers imply that domestic politics would place a barrier in the way of implementing the supply-side climate tax policies in Australia. Thus, this paper affirms that supply-side climate policy would be faced with the identical challenges of demand-side climate policy, domestic and international political constraints. Moreover, it implies that a cost-efficient climate policy would need to target all fossil fuels.

Analysing workforce requirements of renewable energy projects in regional Queensland.

Kalpana Pudasainni, John Rolfe
CQUniversity, Rockhampton, Australia

Paper Abstract:

The Queensland Government aims to achieve 80% renewable energy by 2035 to meet the state's net zero target by 2050. Current projections are that the energy transformations may create 100,000 direct and indirect new jobs by 2040 with high demand for electrical trades, engineering, construction workers and technicians. Most of the jobs growth are expected to be in regional Queensland in the solar and wind energy sectors. However, there are gaps in knowledge about the employment impacts at regional levels, which make it difficult to predict the net effects of transition activities. The aim of this research is to assemble and analyse workforce estimates for renewable energy projects in Queensland, drawing on assessment documents for projects from planning through to approval stages.

This project involves a desktop review and analysis of the employment involved in renewable energy projects in Queensland to identify all the solar farm and wind farm projects in the state, including those that are in operation, completed, under construction or being planned. The construction and operational workforce requirements for the projects are being assembled from the available planning and approval documents, as well as other data such as the projected multiplier impacts on regional economies. A formal meta-analysis will be carried out on the full data set, and regression analysis will be used to identify the relationship between the generating capacity of each project and the construction and operational workforce requirements, together with other factors.

The result will show the extent of heterogeneity around workforce requirements, the differences between solar and wind sectors, whether requirements are changing over time, and whether there appear to be differences in workforce requirements between broad regional areas. This finding will help to identify the need of existing and future workforce in renewable energy sector in each region of Queensland, across the construction, operation and maintenance phases.

Keywords: Renewable energy projects; workforce; Queensland; regional areas

Cost benefit analysis of highway upgrades in the Orana Region in a alternative energy development phase

Rod McInnes
Resource Economics Consultancy, Eastwood, Australia

Paper Abstract:

A Cost Benefit Analysis was completed to assess the merit of investing in the Golden Highway in Orana Region NSW, between Dubbo and the Port of Newcastle. The region has an impending economic transformation with regard to its contribution to decarbonising the Australian economy through wind and solar energy and mining industry transformation from coal exports to minerals for electronic manufacturing input. Transportation efficiency will play an important role in facilitating these investments whilst maintaining existing services to residents in light of congestion costs. The study looked at benefits including, improve freight efficiency through proposed improvements to the Golden Highway which aimed to improve traffic flow and reduce congestion, upgrading the load capability of the Golden Highway for PBS2B standard trucks along the length of the Golden Highway, reducing traffic delays through proposed improvements to the Golden Highway which benefit traffic flow and reduce congestion, improving the likelihood of timely construction of projects in the Far West-Orana Renewable Energy Zone. Non-market benefits evaluated included mproving road safety through improved traffic flow and reduce congestion, improved health and entertainment services, reduced carbon emissions of freight vehicles, reduced chemical and other road related pollution to waterways. The options to deliver these benefits included significant road and bridge upgrades, overtaking lanes, rest zones, level crossings and other options at different levels of intervention. The study found significant net benefits.

Can Electric Vehicles Aid the Renewable Transition? Evidence From A Field Experiment Incentivising Midday Charging

Andrea La Nauze[1], Lana Friesen[2], Kai Li Lim[2], Flavio Menezes[2], Lionel Page[2], Thara Philip[2], Jake Whitehead[2]
[1]Deakin University, Melbourne, Australia. [2]University of Queensland, Brisbane, Australia

Paper Abstract:

In a field experiment tracking 390 electric vehicles minute-by-minute, we show that incentives reduce charging by 17%–-27% during peak times and increase it by 34% during midday when solar generation is highest. Peak charging decreases at home, while midday charging rises out of the home. Participants shift and reduce charging, drive less, and run batteries lower. We find heterogeneity based on rooftop solar ownership, commuting, and having a fast home charger. These findings suggest electric vehicles can support the shift from fossil fuels to renewable energy and highlight the enabling role of charging infrastructure.

Energy poverty and household work: evidence from rural China

Yiyi Zhao, Sonia Akter, Jane Golley
Australian National University, Canberra, Australia

Paper Abstract:

The majority of the world's energy-poor population is concentrated in Asia and the Pacific, where over 350 million people have limited access to electricity and 150 million people lack access entirely. Rural households that rely on agriculture for their livelihoods are particularly affected by energy poverty compared to urban residents. Previous studies have shown that energy poverty in rural areas adversely affected agricultural productivity, water use efficiency, and farmers' health. However, the link between energy poverty and the unpaid work of male and female farmers has not been previously studied. This study is the first to investigate this link using an individual-level four-year panel dataset for the period of 2014-2020 from China.

By using multiple indicators of energy poverty and incorporating both county-year and individual fixed effects, the results of our analysis revealed a significant positive correlation between energy poverty and the amount of time spent doing unpaid household work by farmers in rural China. Specifically, energy poverty is associated with an additional 5.4 to 8.4 minutes/day of unpaid household work for individuals engaged in agricultural work. Our findings show that increased household work has a greater impact on female farmers compared to male farmers. There is a statistically significant positive correlation between energy poverty and housework for female farmers, resulting in an increase of 11.1 to 16.5 minutes per day on workdays and 14 minutes per day on days off. No such effect is observed for male farmers. Additionally, the impact of energy poverty on household work varies based on household composition. The time burden only increases in households with at least one child under 6 years old, with no effect on other household compositions. Further analysis suggests that this increased time burden primarily affects mothers, who experience an additional 34 to 49 minutes of daily household work in households with preschool-aged children—the largest increase observed in this study—while fathers do not experience any significant impact as caregivers. The study identifies higher reliance on self-consumed agricultural products, lack of household appliances, and inadequate agricultural machinery as crucial factors that increase household work in agricultural households.

This study contributes to the broader understanding of energy poverty's impact on farm workers by addressing the research gap on its overall impact on household work, particularly through a gender-specific analysis. It also highlights the need for targeted interventions to alleviate the disproportionate burden on women, particularly those in agricultural households with young children, thus advancing the goals of SDG 7 and SDG 5.

A Crop Specific Effective Tariff Approach for Farm Irrigation Energy Use: Impact on Gross Margin and Policy Formation

Kudzai Zvenyika
Griffith University, Brisbane, Australia

Paper Abstract:

The Australian agricultural industry is one of the world's most productive, however as competition for resources increase it faces a multitude of challenges. These include the rising costs of fuel, large fluctuations in the prices of energy, water, fertilisers, and severe weather. In addition, the impacts of environmental policies seeking to mitigate the effects of climate change, and the increasing constraints on the shared essential resources of water and energy are causing further strain on the industry. Internationally, whilst the individual areas of agricultural productivity, energy, water, and policies that relate to them are abundant, literature reveals a gap in research that looks at them together in a systematic way.

This thesis builds on the model proposed by Monjardino et al., (2022) and develops a context-specific proof-of-concept model that integrates tariffs, technology choice, irrigation related energy consumption, water use, and cropping systems. To the best of my knowledge, this is the first time that a hybrid quantitative approach to calculate crop specific effective electricity prices based on NSW tariffs has been trialled. The model has been applied to a specific case study to answer the following four objectives: firstly to examine the effect of electricity price; secondly, to identify which type of tariff structure is most profitable for a single irrigation technology; third, to understand the joint impact of tariff structure, irrigation technologies, water price, and agronomic systems on productivity, water use and gross margin product; and finally to assess the impact of a government tariff subsidy on gross margin product, and inform evidence-based energy policy decision making.

The research findings based on 164 scenarios showed that for the Riverina case study, across four different irrigation methods, tariffs, and agronomic systems, despite relatively less flexibility to adjust irrigation to shoulder and off-peak watering, a time of use tariff under the current structure was still more economical than a flat tariff. In addition, it was found that adjusting the agronomic system, and the efficiency of irrigation technologies had more effect on gross margin product than changes to tariffs. The results showcased the potential utility of adding energy modules to agricultural systems research and simulations to provide greater clarity for on farm decision making, as well as the potential to inform evidence-based energy related policy decisions for Australian lawmakers.

Parallel 4D - Agricultural Technology & Innovation

Location Chancellor 5, LVL 0

Time: 15:30 - 17:10

Chair: Marta Monjardino

The disparity in willingness to pay for wage labor between agricultural corporations and family farms

Qi Dong
University of Niigata Prefecture, Niigata, Japan

Paper Abstract:

Many studies have explored how family farms decide between using family labor or hiring outside workers, but few have investigated how emerging agricultural corporations differ from traditional family farms in their decision-making. Agricultural corporations, due to their market position, may either hire more workers at lower wages or employ higher-skilled workers at comparable pay. Moreover, these corporations typically have easier access to capital and lower borrowing costs compared to family farms, which may incentivize them to offer higher wages in order to optimize the balance between labor and capital. However, there is limited research comparing the labor decisions of agricultural corporations and family farms. This study aims to examine whether significant differences exist in the willingness of agricultural corporations and family farms to pay for wage labor, as well as to analyze the decision-making processes and mechanisms behind their labor choices.

The study employs a two-stage approach. In the first stage, it assesses wage disparities between agricultural corporations and family farms and estimates labor supply and demand models for each. This step helps determine whether there is a difference in willingness to pay for wage labor between the two. In the second stage, the marginal costs of agricultural corporations and family farms are estimated and compared with their respective wages to identify whether agricultural corporations exert greater market power in hiring wage labor. This stage explores the differences in decision-making and labor-hiring mechanisms between the two types.

This study uses survey data from Japan's family farms and agricultural corporations, both of which derive over 80% of their agricultural sales from rice. The dataset includes information on rice production costs for 2021 and 2022, covering 805 family farms and 125 agricultural corporations annually. The research subjects are categorized by land management scale: small-scale farms (less than 5 hectares), medium-scale farms (5-20 hectares), and large-scale farms (over 20 hectares).

The key findings are: (i) at the same scale, there is little difference in the proportion of family labor hours to total labor hours between family farms and agricultural corporations, but agricultural corporations pay significantly lower wages in the labor market; (ii) simulation results show that family farms have higher elasticity in demand for family labor, whereas agricultural corporations exhibit higher elasticity in demand for hired labor. When market wages increase, family farms are more inclined to rely on family labor compared to agricultural corporations; (iii) differences in capital equipment levels and employment duration explain the variation in preferences for family versus wage labor between agricultural corporations and family farms.

Characterising Agricultural Mechanisation Business Models in Indonesian Agri-Food Systems: A Participatory Net-Map Approach

Kodad Winarno, Risti Permani
The University of Queensland, Gatton, Australia

Paper Abstract:

The global population is growing exponentially, and by 2050, the world will need to produce 70% more food to feed a projected 9.15 billion people, primarily in Asia and Africa. Agricultural mechanisation has emerged as a critical strategy for achieving food security within the transformation of agri-food systems in the Global South. Ensuring inclusive access to mechanisation for smallholder farmers is crucial to unlocking its potential for food security. Across the Global South, innovative business models have emerged to provide mechanisation services for farmers, ranging from land management to processing and transportation. These models typically emerge as either part of public-led and private-led initiatives. Many public-led initiatives tend to push mechanisation artificially through subsidies, focusing less on the demand for mechanisation. In contrast, strong market demand promotes the emergence of private-led models. While previous studies have shown the development of these models in silos, there remains a lack of research examining their distinct characteristics and the dynamic interplay between these models. Understanding the business models' characteristics and interactions is critical to ensure smallholder farmers' inclusive access to agricultural mechanisation.

While public initiatives have primarily driven the development of mechanisation business models to support the Indonesian agri-food systems, the extent of private sector investment remains unclear. Therefore, Indonesia is a fitting case study for this research. Focusing on the rice value chain, which heavily relies on agricultural mechanisation, the study aims to characterise existing business models, identify challenges, and explore opportunities for machinery service providers. A participatory appraisal method called Net-Map is used to understand how the mechanisation business models operate, the relationship between actors, how they are linked, their goals and the influence involved in these models. East Java and South Sulawesi provinces were selected as the study locations based on their significant rice production, diverse agroecological zones, and varying population densities. Two regencies within each province (Malang and Pasuruan in East Java and Gowa and Bone in South Sulawesi) were chosen to identify existing business models and critical actors at the district level. In each regency, fifteen interviews from diverse actors (governments, private sectors, universities, and farmers) and one focus group were conducted and visualised to capture the multi-stakeholder's governance networks and their challenges.

This study highlights the characteristics of business models based on aspects including ownership, technical, and business operations. The business models offer diverse services, including land preparation, harvest, post-harvest, and transportation services, with some distinct characteristics. Local contexts, such as agroecological conditions and socioeconomic factors, influence the business models' emergence. However, governance challenges, knowledge gaps, and limited supporting facilities hinder the models' development. This study suggests favourable conditions for growing mechanisation business models require more engagement from multi-stakeholders. In addition, this study highlights that understanding farmers' preferences toward business models is critical to ensure the provision of inclusive and sustainable access to agricultural mechanisation for farmers. The findings of this study offer valuable insights for effectively allocating public support while simultaneously fostering the growth of the private sector's contributions to the sustainable development of agricultural mechanisation.

Impact of Unmanned Aerial Vehicle Adoption on Pesticide Expenditure and Rice Yields

Bowen Shen, Wanglin Ma
Lincoln University, Christchurch, New Zealand

Paper Abstract:

Unmanned Aerial Vehicles (UAVs) have become essential tools in modern agriculture, allowing farmers to optimize resource allocation, reduce waste, enhance production efficiency, and improve crop yields and environmental sustainability. For example, UAVs are expected to help minimize environmental impact by reducing the over-application of chemicals and promoting more sustainable farming practices. Despite the potential benefits, the adoption rates of UAVs among farmers remain relatively low in developing countries due to a lack of technical skills, limited awareness and knowledge, and unclear return on investment. Some farmers even could not achieve the expected benefits. This study evaluates the impact of UAV adoption on pesticide expenditure and crop yields using data collected from three rice-producing provinces (Jiangsu, Hubei, and Yunnan) in China. The endogenous treatment regression model addresses potential selection bias due to observed and unobserved factors in UAV adoption. The findings reveal that adopting UAVs significantly decreases rice farmers' pesticide expenditure but does not significantly affect rice yields. We also find that the impacts of UAV adoption on pesticide expenditure and crop yields are heterogeneous across the survey provinces, farm sizes, and educational levels of household heads. Our findings suggest that policymakers should focus on providing region- and context-specific guidance for UAV use to ensure that farmers maximize the benefits of this technology.

Mechanization and Labor Market Transformations: Evaluating Machine-Harvestable Chickpea Adoption in India"

Nedumaran Swamikannu[1], Aprajit Mahajan[2], Sayanthan Mitra[2]
[1]International Crops Research Insititute for the Semi-Arid Tropics, Hyderabad, India.
[2]University of California, Berkeley, USA

Paper Abstract:

Chickpea, the third most important pulse crop globally, is a crucial and affordable source of protein. It is cultivated on approximately 11M Ha, accounting for 16% of the global pulse area, with South Asia comprising about 80% and India alone covering two-thirds of the global area. Chickpea is predominantly a rabi (post-rainy season) crop, and its traditionally short plant architecture has required manual harvesting and threshing, tasks primarily undertaken by women. Rising labor costs and increased competition for hired labor have pressured production costs and farm profitability. In response, ICRISAT, in collaboration with NARES partners, developed machine-harvestable chickpea (MHCP) varieties with erect and taller plants, positioning the first pod at least 25 cm above the ground to facilitate easier mechanized harvesting.

This study addresses the constraints to adopting machine-harvestable chickpea (MHCP) varieties and evaluates their cost-effectiveness in real-world settings. It also examines whether a one-time intervention—through a randomized controlled trial (RCT)—resulted in sustained changes in planting and harvesting patterns by monitoring farmers over multiple seasons. In addition, the study investigates the broader effects of MHCP on local labor markets, focusing particularly on women's economic agency and labor supply dynamics. After a pilot in 2021-22 that tested the research design and implementation plan, a full RCT was conducted in the Kurnool, Kadapa, and Prakasam districts of Andhra Pradesh (India) in 2022-23. The RCT provided treatment group farmers with free MHC seeds for one acre, assessing the technology's adoption and its labor market implications.

Key findings include:

1. Increased Mechanization: Harvester usage was 10% higher among treatment group farmers than control group farmers. This result, statistically significant at the 10% level, underscores the potential of MHCP to drive mechanization, reducing reliance on manual labor during harvest.
2. Improved Yields: Farmers who adopted MHCP varieties saw yields increase by 85 kg/ha (a 6% improvement) compared to those growing traditional varieties. Notably, farmers who used the specific MHCP variety NBeG-776 experienced an even more significant yield increase of 119 kg/ha (a 19% increase), highlighting the potential productivity gains from adopting optimized chickpea varieties.
3. Lower Costs: Treatment group farmers who used combine harvesters reported a significant reduction in costs, with expenses per hectare 40.5% lower compared to those of control group farmers who continued manual harvesting.
4. Labor Market Effects: A substantial reduction in labor demand was observed in treatment villages, with harvesting labor days declining by 1.5% and threshing labor days dropping by 25% between the 2021-22 and 2022-23 agricultural seasons.

These findings highlight the transformative potential of machine-harvestable chickpea in enhancing farm productivity, reducing costs, and promoting the mechanization of labor-intensive processes. At the same time, the shift toward mechanized harvesting is reshaping labor market dynamics, particularly in regions where women's participation in agriculture is high. By reducing the demand for manual labor, MHCP technology can improve the profitability and sustainability of chickpea farming in India while necessitating broader discussions around labor reallocation, gender equity, and rural livelihoods.

Use of Digital Platforms in the Agricultural Industry: A systematic literature review

Sauda Afrin Anny[1,2], Dr. Ammar Abdul Aziz[1], Dr. Rajendra Adhikari[1]

[1]School of Agriculture and Food Sustainability, University of Queensland, Brisbane, Australia. [2]Sher-e-Bangla Agricultural University, Dhaka, Bangladesh

Paper Abstract:

Humanity views the agriculture industry as the most crucial sector for ensuring food security, and it serves as the largest employment generator for the global population. Maximizing this industry's potential necessitates enhanced and sustained production, as well as efficient distribution and marketing. With ever increasing climate uncertainties and continuous technology innovation, the sector is exposed to unprecedent challenges and opportunities at the same time. An integration of advanced digital technologies, such as digital platforms, into the agricultural industry is considered as creating numerous opportunities to enhance efficiency throughout various stages of the agricultural value chains. The growing realisation of the benefits of integrating digital platforms into agricultural sector is parallelled by a plethora of research but how and in what conditions the farmers' welfare could be enhanced is not fully understood yet. To fully understand and leverage the potential benefits of digital platforms to farmers and other chain actors, it is essential to comprehend their application within the agricultural industry and their contribution to agricultural value chain activities. Therefore, this study aims to investigate the applications of digital platforms across different stages of agricultural value chains and assess their roles in facilitating enhanced integration among the chain stakeholders. We conducted a systematic literature review, adapting the Protocol of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), to examine the current understanding on the topic. Our focus was on research outputs that involve at least one digital platform utilised in one or more value chain activities within developing countries. After implementing the protocol, we identified 102 papers to examine the extent of digital platform adoption in agricultural value chain activities, focusing on the types of digital platforms, value chain functions, stakeholder benefits from digital platform uses, and challenges faced when utilising various digital platforms. The findings suggest that in developing countries, digital platforms primarily serve as transactional platforms, rather than serving as innovation platforms. Although the digital platforms enabled value chain service providers to create complementary products, services, or technologies, benefits to farmers were not substantive. Nevertheless, value chain participants, including farmers, could extensively utilise digital platforms for communication and collaboration, sharing market data, weather updates, advisory information, and trading, thereby generating value through reduced transaction costs. Finally, we identified and categorised the barriers to digital platforms utilisation by actors in the agricultural value chains, across technical and socio-economic dimensions. This comprehensive review offers valuable insights into the present state of conditions, applications, and benefits of digital platforms to agricultural value chain actors and suggests future research directions.

Evaluating climate-smart agriculture for profitable and resilient smallholder agrifood systems in the Indo-Pacific

Marta Monjardino[1], Dio Antille[2], Mohammed Mainuddin[2], Rupak Goswami[3], Sukamal Sarkar[3], Kalyan Roy[3], Sarah Fulton[4], Sharma Ami[5]

[1]CSIRO, Adelaide, Australia. [2]CSIRO, Canberra, Australia. [3]RKMVU, Kolkata, India. [4]University of Tasmania, Hobart, Australia. [5]Fiji Ministry of Agriculture, Suva, Fiji

Paper Abstract:

Traditional smallholder agrifood systems in the Indo-Pacific region face severe agroecological and socioeconomic challenges. These include increasingly unpredictable weather patterns, new pests and diseases, limited water quality and availability, soil salinity, food and nutrition insecurity, gender inequality, labour shortages, and restricted market access. To address these issues, climate-smart agriculture— such as reduced tillage, permanent soil cover, diversification of crop species, and precision irrigation— has been promoted by R&D agencies. These practices aim to sustainably intensify agricultural systems, improve food security, boost incomes and livelihoods, and adapt to the impacts of global climate change. However, evaluating the full impact of these adaptations is highly complex due to the context-specific and multidimensional nature of both the agricultural practices and technologies themselves and the systems in which farmers operate. Integrated systems analysis enables us to combine various models, providing deeper insights into how farmers can benefit from adopting climate-smart agricultural practices over time.

The Value-Ag analytical framework was used to assess how profit-risk trade-offs and adoption drivers influence climate-smart agricultural practices for smallholder systems in the Indo-Pacific. We modelled two baseline rice-based systems in the Ganges Delta (Bangladesh and West Bengal, India) and two taro-based systems in the Pacific Islands (Fiji and Samoa). The model was parameterised to simulate whole-farm resource flow over 10 years for each baseline scenario. Using experimental field data and crop yield simulation, we incorporated new crops and practices, including zero-tillage (ZT), into the rice-fallow and taro-fallow systems. The new adaptation systems were Rice-ZT Sunflower in Bangladesh, Rice-ZT Potato in India, Taro-Cowpea in Fiji and, Taro-Maize/Soybean intercropping in Samoa. Additionally, we simulated crops responses to projected climate scenarios under low and high emissions and reflecting changes in temperature and rainfall based on historical weather data.

For all case studies, the climate-smart agriculture scenarios increased economic benefits, reduced farm risk, and improved food and nutrition security through boosted energy and protein production. Some of these benefits were relatively higher in the projected climate scenarios. Adoption rates were predicted to reach between 77% in 15 years for Taro-Maize/Soybean in Samoa and 96% over 7 years for Rice-ZT Potato in India. The key drivers for adoption included improved soil security, through the maintenance of soil fertility and to some extent soil carbon, with potential flow-on effects to income and food security. Barriers like a non-commercial grower mindset, financial constraints, and limited technical knowledge were found to hinder adoption of intercropping in Samoa, for example. Understanding the impacts of these practices on farm productivity and profitability could accelerate their uptake in the region. Our research highlights the need for employing a range of methods and tools that include a combination of biophysical and socioeconomic modelling platforms to understand the relative value of agricultural innovations for a unique farming population and context. Overall, integrated systems analysis, such as that used in these case-studies, can be applied to a range of innovations and contexts to inform farming

systems design, extension programs, research gaps, investment priorities, and policy decisions for the agricultural sector.

Parallel 4E – Biosecurity

Location Chancellor 6, LVL 0

Time: 15:30 - 17:10

Chair: Richard Bradhurst

The methodology of biosecurity system evaluation – the New Zealand case study

Julia Polak, Christine Li, John Baumgartner, Andrew Robinson, Tom Kompas
Centre of Excellence for Biosecurity Risk Analysis (CEBRA), School of BioSciences, University of Melbourne, Melbourne, Australia

Paper Abstract:

New Zealand operates a comprehensive biosecurity system to protect its extensive natural and agricultural resources, along with cultural assets. Substantial research efforts have been made to evaluate specific biosecurity measures and the damages incurred from particular biosecurity threats. However, no comprehensive attempt has yet been made to evaluate the entire system. The value of the entire biosecurity system and its components is of a great interest to government, Treaty partners and the public, and is crucial for ensuring appropriate resource allocation for the maintenance and optimization of the biosecurity system. Evaluating the whole biosecurity system requires a novel methodology. Such a methodology was recently developed and applied to Australia's biosecurity system. It is now being adjusted for New Zealand's biosecurity system. We are developing a comprehensive, dynamic and large-dimensional simulation model to estimate the economic value of New Zealand's biosecurity system. Starting with detailed asset layers and potential damage functions from invasive pests, the model will simulate the arrival, spread, and impact of biosecurity hazards (in terms of asset yield or value reduction) under different biosecurity operational scenarios. It will also estimate the economic value of biosecurity interventions.

This talk will present the methodology for estimating the tangible value of New Zealand's biosecurity system, as a whole, in terms of its impact in safeguarding New Zealand's natural, cultural and economic assets. This is a large and ambitious project, in which we estimate the value of seventeen NZ assets (e.g. agriculture, fishery, flood control, gene pool, tourism and marine non-market services) and how they may be damaged by exotic invaders (pests and pathogens) over time. We are considering 48 biosecurity hazards that may affect New Zealand's vegetation, agriculture, animals, aquaculture and marine ecosystems, and cultural assets.

Damages to environmental and ecosystem services: The large missing piece in the economics of biosecurity

Lu-Yi Wang[1,2], John Baumgartner[2], Anca Hanea[1,2], Nicholas Moran[1,2], Andrew Robinson[2], Tom Kompas[1,2]

[1]The Centre for Environmental and Economic Research, The University of Melbourne, Melbourne, Australia. [2]The Centre of Excellence for Biosecurity Risk Analysis, The University of Melbourne, Melbourne, Australia

Paper Abstract:

Environmental and ecosystem services are intergenerational treasures provided by nature, yet susceptible to significant damage from invasive pests. To understand the impact of invasive species, quantification in monetary values is a useful approach to compare different sectors and types of damages. However, most of the reports to date focus on damages to agriculture, industry, and public health, whilst the losses on environmental and ecosystem services are largely under-reported if at all. This in turn leads to an illusion that the costs of environmental damages are negligible. To capture more comprehensive impacts, particularly environmental damages, we further modified the standard Value of Biosecurity Model (VBM) developed by the Centre of Excellence for Biosecurity Risk Analysis (CEBRA), which, to its credit, can estimate both market and non-market value losses in monetary units for sixteen different assets vulnerable to biosecurity hazards. Using the red imported fire ant (RIFA), one of the most notorious invasive pests in Australia, as an example, we show that after accounting for the losses from environmental damages more correctly, over a broader range of environmental assets, the cost of RIFA in New South Wales increases by at least 2 times larger over 30 years compared to the VBM, and by many multiples over existing standard results including that contained in the InvaCost database. Our refined model is a promising tool to fill the gap in quantifying losses to environmental and ecosystem services from invasive pests. The outcomes of the model can also serve as important reference points for improving biosecurity budget allocation across both portfolio and environmental assets.

The costs of invasive species to agriculture, the environment, and the community in New South Wales

Nicholas Moran[1,2], Lu-Yi Wang[1,2], Anca Hanea[1,2], Tom Kompas[1,2]

[1]The Centre for Environmental and Economic Research, The University of Melbourne, Melbourne, Australia. [2]The Centre of Excellence for Biosecurity Risk Analysis, The University of Melbourne, Melbourne, Australia

Paper Abstract:

Estimating the costs of invasive species is important for biosecurity decision making and resource allocation. As part of a broad, state-level invasive species cost assessment for NSW, an expedited systematic review ("rapid review") was conducted to compile cost estimates from published and grey literature, using the InvaCost database (v4.1) as the starting point. This major global database has been

the foundation of global, regional, and national studies to estimate the current and cumulative costs of invasive species, including for the USA, North America, Central and South America, Europe, and Australia. InvaCost data was supplemented by an independent systematic literature search focused on NSW, to produce a comprehensive database of cost estimates either within or including NSW. Spatial modelling tools via the Biosecurity Commons platform were then used to partition and apply non-NSW specific estimates (e.g., national estimates) to NSW.

Our findings show that invasive species costs within NSW are in the scale of billions of dollars annually and increasing. Furthermore, the majority of reported costs are attributed to agricultural/industry sectors, for example lost productivity and control costs. In contrast, costs associated with environmental assets or ecosystem services appears to be underreported in the literature. This work highlights the ongoing costs that continue to be incurred due to invasive species in Australia, particularly for agriculture, and emphasises the importance of also considering environmental costs. Additionally, this work highlights the value of open resources (e.g., Biosecurity Commons and InvaCost) to support biosecurity research and decision making.

A tool to diagnose and fix incentive problems in biosecurity risk management policies

Susie Hester[1,2], Arthur Campbell[3], Gary Stoneham[4]
[1]University of New England, Armidale, Australia. [2]CEBRA, University of Melbourne, Melbourne, Australia. [3]Department of Economics, Monash University, Melbourne, Australia. [4]Centre for Market Design, University of Melbourne, Melbourne, Australia

Paper Abstract:

Biosecurity agencies manage biosecurity risks via interventions—broadly defined as policies, rules, regulations, inspection regimes—aimed at influencing the behaviour of stakeholders whose actions impact on biosecurity outcomes. Without such interventions, it is unlikely that relevant stakeholders would automatically 'do the right thing'—ie. act in the national interest. Importantly, since every intervention carries with it incentives for humans to behave a particular way, it is extremely important to carefully consider whether these incentives will lead to the desired behaviours. Focusing on the incentive properties of interventions is an important, and often neglected, part of their design. When the incentive properties aren't given proper attention, well-intentioned biosecurity interventions can cause counterproductive consequences for the environmental, economic, and societal assets they are aiming to project; human behaviour may actually be the opposite of what was intended by imposing the intervention.

An 'incentive diagnostic tool' has recently been developed to assist biosecurity agencies design and implement incentive-compatible biosecurity interventions. The tool is based on a well-established set of ideas from the economics discipline. It has been tested on several import pathways, and if implemented, offers an opportunity for significant improvements in the efficiency of biosecurity systems.

Spatial and Economic Impacts of Biosecurity and Quarantine Systems: The Case of Live Cattle Trade between South East Asia and China

Dominic Smith[1], Rodd Dyer[2], Nga Le[2], Thansamay Vorlaphim[3], Aloun Phonvisay[4]
[1]Griffith University, Brisbane, Australia. [2]Focus Group Go, Hanoi, Vietnam. [3]DLF, Vientiane, Lao, People's Democratic Republic. [4]Focus Group Go, Vientiane, Lao, People's Democratic Republic

Paper Abstract:

Since 2018, hundreds of millions of dollars of investments in developing infrastructure for formalised cattle trade systems in Lao PDR and Southern China have been made by the public and private sectors. In support of these investments, the governments of China and Lao PDR have developed detailed protocols governing biosecurity, quarantine and animal health and issued policy directives to support the development of formalised cattle trade.

These investments and policies have had four main objectives:

1. Provide a source of live cattle (up to 500,000 per year) to meet increasing demands for protein in Southern China;
2. Support the smallholder based cattle industry in Lao PDR to supply into the Chinese market;
3. Develop local economy in border areas of Mengla (China) and Luang Namtha (Lao PDR); and
4. Reduce the risk of transboundary animal disease incursion from South East Asia into China.

This study explores the impact of the current biosecurity, quarantine and animal health protocols on the achievement of these objectives and analyses the impact of the cost of complying with the protocols on the overall economic viability of formal cattle exports to China from South East Asia. Using an application of service areas and network analysis under ArcGIS Pro to estimate catchment areas, the impact on the spatial area where collecting cattle for the trade is feasible is also examined. The analysis is based on extensive qualitative and quantitative information gathering from a wide range of value chain actors and other stakeholders in Central and Northern Lao PDR.

The results of the study indicate that the current biosecurity, quarantine and animal health protocols result in very high levels of costs, which significantly hampers the economic viability of the formal trade system. The high costs reduce the feasible collection area to almost zero and reduce the number of cattle that could profitably enter the system from more than 500,000 to practically zero. Under these conditions there is a strong incentive for traders to continue to attempt to export through informal channels, maintaining the current high level of risk of transboundary animal disease incursion from South East Asia into China. We propose a number of modifications to the biosecurity, quarantine and animal health protocols that could lead to increased numbers of cattle flowing through formalised channels and lower the risk of disease incursion.

Development of a decision support tool to assess the cost effectiveness of early detection surveillance systems for khapra beetle arriving via shipping containers

Richard Bradhurst[1], James Camac[1], Tracey Hollings[1], Callum Fletcher[2], Ken Young[2]
[1]The University of Melbourne, Melbourne, Australia. [2]Grains Research and Development Corporation, Canberra, Australia

Paper Abstract:

Khapra beetle (Trogoderma granarium) are a globally significant pest that has the potential to threaten global food security, disrupt international trade, and cause severe economic losses for infected countries. They are voracious feeders of stored grain products, affecting both the quality and quantity of infected products, and posing a risk to human health from larval cast skins and hairs. Though primarily a pest of grains and stored grain products, khapra beetle can infest and reproduce on an array of different commodities, including animal origin and non-grain plant materials such as dried fruit, nuts, spices, and cow's milk power. More than 100 different commodities have been recorded hosting khapra beetle populations. It is estimated that establishment of khapra beetle could cost the Australian economy $17 billion over 20 years. This includes significant losses from damaged grain and trade embargos by non-khapra beetle countries.

Spatiotemporal models can assist in the formation of plant health policy for priority pests, especially where field studies are not possible or practical. We describe the development of a decision support tool to assist policy makers explore the potential spread, detection and control of khapra beetle in Australia.

The Australian Plant Pest & Disease model (APPDIS) (www.aadis.org) was extended with:

- a khapra beetle habitat suitability layer based on ALUMC land use categories
- a population growth sub-model that considers the influence of ambient climatic conditions
- a stochastic spread pathway that represents hitchhiking spread of khapra beetle via infested shipping containers discharged at Australian ports and then dispatched to distribution centres
- a stochastic spread pathway that represents secondary spread of khapra beetle from distribution centres to wholesale, retail and consumer locations
- detection of khapra beetle via general surveillance and early detection trapping systems
- response to khapra beetle detections with delimiting surveillance, treatment, and post-treatment surveillance

Khapra beetle incursions were simulated at 13 Australian ports which are responsible for 99.9% of arriving containers. The effectiveness of candidate early detection trapping systems was assessed against a range of incursion scenarios. The distribution of the simulated outbreaks was consistent with previous risk mapping work on khapra beetle. The developed model provides a useful decision support tool for assessing the cost effectiveness of early detection surveillance strategies and the benefits/consequences of early/late detection. The developed methodology provides a framework for future work on other priority pests that may hitchhike into Australia via shipping containers. The presentation will include a demonstration of the APPDIS model running example scenarios of khapra beetle incursion, spread, detection, and control.

Egg Timer Presentations Parallel 3

Location Chancellor 3/4, LVL 0

Time: 15:30 - 17:10

'Should I use FinTech?': Understanding factors influencing smallholder farmers' willingness to use Agri-FinTech

Joko Sustiyo, Risti Permani
the University of Queensland, Brisbane, Australia

Keywords: 1. Agribusiness; 2. Agricultural Finance

Paper Abstract:

The financial technology (FinTech) market at the global level is increasing with an estimated US$169.32 billion by 2023 and is predicted to reach US$1.5 trillion by 2030. However, the level of FinTech utilisation in the agriculture sector (Agri-FinTech) is minimal as evidenced by the Tracxn report which shows there are only 219 Agri-FinTech companies in the world in 2023 out of a total of 126,488 FinTech companies. In Indonesia, despite FinTech being one of the potential financing solutions as it does not require debt collateral, the level of FinTech usage by farmers compared to the number of potential farmers is very low. The level of FinTech utilisation by Indonesian smallholder farmers is around 3.44% of total lending by FinTech companies in 2023. Despite farmers' increasing interest in FinTech usage, limited research analysed financial service attributes according to farmers' perceptions to encourage them to be more willing to use Agri-FinTech. Using a Discrete Choice Experiment (DCE), this study analyses farmers' preferences for the attributes of financial services by FinTech companies in Indonesia to provide potential increases in the use and sustainability of these services. A total of 1000 on-farm farmer respondents above 18 years of age from four provinces in Indonesia (namely West Java, East Java, South Kalimantan, and South Sulawesi) were selected using a convenience sampling method and participated in this study. Data were analysed using conditional logit through the support of CE package in R software. From the DCE attributes consisting of payment time, payment term, annual interest rate, approval duration, online insurance service, and FinTech type, the study results show that farmers attach importance to payment term and yearly interest rate. In addition, conditional logit analysis shows various relationships between farmer characteristics (such as age and education) along with the level of Agri-FinTech attributes. The results of this study inform factors according to farmers' preferences for FinTech service attributes that could increase their level of utilisation and policy recommendations to support the development of Agri-FinTech at sectoral, regional, and national levels.

An Economic Analysis of Shifting to Sustainable Rice Production Strategies in Lao PDR: A Farm-level Case Study on Lowland Wet Season Rice Farming

Chinthani Rathnayake[1], Alexandria Sinnett[1], Chitpasong Kousonsavath[2], Fue Yang[2], Lytoua Chialue[2], Margaret Ayre[1], Garry Griffith[1], Bill Malcolm[1], John Mullen[3]

[1]School of Agriculture, Food and Ecosystem Sciences, Faculty of Science, University of Melbourne, Melbourne, Australia. [2]Department of Rural Economics and Food Technology, Faculty of Agriculture, National University of Laos, Vientiane, Lao, People's Democratic Republic. [3]Private Consultant, Orange, Australia

Paper Abstract:

Sustainable development is a global goal. Agriculture is one of the sectors that is increasingly prioritised in achieving sustainability goals. As a country heavily dependent on agriculture, Lao PDR has endorsed and prioritised such goals in their policy frameworks such as National Green Growth Strategy and Green and Sustainable Agriculture Framework till 2030 to encourage sustainable agricultural farming systems. Consequently, the expectation on the agriculture sector is a shift towards low-input and organic production. In Lao PDR, rice is the main crop grown, covering about 60 per cent of the arable land (Food and Agriculture Organisation, 2023). Rice is the staple food; rice provides almost 80 per cent of the daily calorie and 50 per cent of the protein intake of the rural population in Lao PDR (Lao Statistics Bureau, 2012). Food security in Lao PDR means 'rice security'. There are many ways to grow rice in Lao PDR and many issues facing rice growers (Sinnett et al. 2024a). Sustainability has economic, social and environmental dimensions spatially and temporally. Hence, judgments about sustainability are complex and uncertain. Of particular interest to the government when implementing policies affecting rice production are the consequences for farm families, the rice industry and the economy of technologies that use purchased inputs such as inorganic fertilisers, pesticides and herbicides in different proportions. These technologies range from organic production using no purchased inputs to those technologies recommending rates of these inputs that maximise production. Most rice producing farm families grow rice primarily for home consumption, which can be considered a constraint to how they choose between technologies. To investigate these issues, ACIAR funded a project titled 'Assessing the Social and Economic Implications of Changing to Low-input and Organic Rice Production in Lao PDR.'[1]. This project focuses on the largest sector of the Lao rice industry – lowland rice production during the wet season. One important component of the project has been to estimate, from the viewpoint of a rice producing farm family, the opportunity costs associated with alternative rice growing technologies. The focus of this paper is to present the method for the farm-level analysis, the assumptions about the representative farm business, and to report some initial results. The theoretical framework of the analysis is farm management economics, which follows the approach outlined by McConnell and Dillon (1997), Dillon and Hardaker (1993), Makeham and Malcolm (1986) and Abbott and Makeham (1991). The representative lowland wet season rice producing farm household system has been defined using the literature, farm interviews and published secondary data. This representative whole-farm budget model is used to evaluate the welfare effects on farm households/businesses that change to low-input or organic rice production technologies from conventional farm practices.

Value chain interventions for women at farm level: Pathways to empowerment

Rakhshanda Kousar[1], Khuda Bakhsh[2], Hassan Akhtar[2]

[1]University of Agriculture Faisalabad, Faisalabad, Palestine. [2]COMSATS University Islamabad, Vehari Camus-Pakistan, Vehari, Pakistan

Paper Abstract:

The agricultural production systems are important in terms of food security, value addition, employment opportunities and industrial development in sustainable manners. Pulses are important in terms of profitability as well as resource efficiency and sustainable farm production. However, the marketing facilities and value chain are not well developed that hinder the growth of these alternative crops. Problems in the chickpea chains are not limited to production practices only, rather extends to whole chain level. There are also post-production problems too, such as logistical inefficiency, post-harvest losses, lack of value addition and wastage and losses during transportation and marketing. Gender could play important role to improve the farm livelihood in pulses value chains. There is need of development initiatives for empowering women through their participation in pulses value chains or marketing of value-added products as small-scale entrepreneurs and through stronger market linkages. Keeping in view the important role of women in the value chain of chickpea, two interventions were conducted at Mankera Bhakkar, Pakistan. The aim of these research activities was to encourage and support women to utilize their potential at all level of value chain.

The first intervention included the storage and post-harvest management of chickpea. This was the first women training and engagement at this site which sensitized females about their role in pulses value chain. The interaction with women at farm started a process of co-development and co- learning. The second intervention was to develop linkages of women farmers with local and supermarket retailers. It is intended to get a point of sale for value added chickpea produce from stakeholder farmers which will have positive impact on household income. Without being linked into markets they are condemned to produce only for subsistence — better markets can lift them out of poverty. It also ensured the secured and easily accessible marketing outlet for chickpea byproducts and reduction in the transaction costs by limiting the role of intermediaries.

The Governance and Impact of Ecological Fiscal Transfer at the Regional Level in Indonesia

Fitri Nurfatriani[1], Mimi Salminah[1], Tugas Suprianto[2], Alam Surya Putra[2]
[1]National Research and Innovation Agency, Jakarta, Indonesia. [2]The Asia Foundation, Jakarta, Indonesia

Paper Abstract:

The Intergovernmental Fiscal Transfer (IFT) aims to provide funding sources for regions to carry out public services that fall under their authority due to the decentralization of Government. Improving the existing IFT scheme by adding ecological indicators can enhance local Government preferences for conducting natural resource protection activities, known as the Ecological Fiscal Transfer (EFT) mechanism. EFTs are useful tools to mitigate the potential trade-off between economic costs and environmental conservation. If managed properly, they will reward regions for investing in conservation and incentivize the expansion
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of ecological areas. Local governments in Indonesia are initiating EFT, both at the provincial level through budget transfers from the provincial Government to the regencies (Provincial EFT) and at the regency level through budget transfers from the regency Government to the villages (Regency EFT). Since 2019, local governments have implemented regional EFT, necessitating an evaluation to understand its benefits, obstacles, and impacts on environmental development. This paper aims to study the governance, fund utilization mechanisms, impacts, and women's involvement in local governments' implementation of regional EFT. The analysis method employs a descriptive qualitative approach to provide a comprehensive overview of the research situation, the Impact Value Chain Model, and the Theory of Impact Change to assess the impact of regional EFT implementation. The results show that while regional EFT implementation in various regions shares similarities, each region tailors its application to its unique characteristics. Several factors influence the implementation of EFT, including the area's geographical and biophysical conditions, the local government's commitment to environmental preservation, the socio-economic conditions of the community, the history of environmental degradation in the area, and the vision and mission of the relevant region. The regional EFT scheme comprises village fund allocations and special financial assistance transfers. The implementation of regional EFT has been institutionalized through various regulations at the regional level, including both governor and regent regulations. The regional EFT funds across all study areas serve as performance-based incentives in ecology and community economics. The funding utilization scheme in each region has yet to find an ideal standardized form and requires refinement tailored to each area's characteristics and conditions. The regional EFT policy positively impacts environmental development and the advancement of a green economy, which positively affects the improvement of the budget allocation system in regencies/villages for ecological purposes. The regional EFT incentives also serve as a stimulus for regencies and villages to obtain other incentives, such as rewards for environmental performances. Implementing the regional EFT policy has generally accommodated women's roles in planning and policy implementation. This paper provides policy recommendations, including the need for improvements in governance, such as enhancing transparency mechanisms in the performance assessment of regional EFT, flexibility in the use of funds to boost regional creativity and innovation in environmental protection activities, and the regional EFT implementation should be considered as one of the indicators for granting incentives from the central Government.

Food system transformation in developing countries: A systematic review

Kanchana Wickramasinghe
Deloitte, Brisbane, Australia

Paper Abstract:

Food system transformation is increasingly recognized as essential for achieving sustainable development, addressing climate change, and ensuring food security. This need is especially urgent for developing countries, where food systems are often characterized by inefficiencies, vulnerabilities to climate change, and disparities in access to nutritious food. In many developing regions, food systems are unable to meet the nutritional needs of the population, and they face significant environmental challenges such as land degradation, water scarcity, and loss of biodiversity. Moreover, these systems must adapt to rapid urbanization, population growth, and changing dietary preferences, making transformation critical for fostering resilience and long-term sustainability.

The challenges and constraints faced by developing countries in transforming their food systems are distinct and often more pronounced than those experienced by developed countries. Limited access to finance, technology, infrastructure, and institutional support hinders efforts to implement necessary changes. In addition, smallholder farmers, who form the backbone of agriculture in many developing nations, often lack the resources, training, and market access needed to adapt to new practices. These challenges are exacerbated by political instability, inadequate policies, and climate vulnerabilities. In contrast, developed countries generally have better access to technology, infrastructure, and policy support, allowing them to address food system challenges more effectively.

This paper undertakes a comprehensive systematic review of articles published in peer-reviewed journals, focusing on food system transformation in developing countries. The review is grounded in the food systems conceptual framework outlined by the High-Level Panel of Experts on Food Security and Nutrition (HLPE) of the Committee on World Food Security. This framework provides a comprehensive understanding of the complex interactions between different elements of food systems, including production, distribution, consumption, and environmental sustainability.

The objectives of this paper are multifaceted. First, it seeks to understand the current status of food system transformation efforts in developing countries, examining the extent to which these countries have made progress in addressing food security and sustainability challenges. Second, it identifies the major specific challenges and constraints that hinder transformation. Third, the study explores cases of success, where developing countries have managed to implement innovative practices or policies that have led to significant improvements in food system sustainability and resilience. Furthermore, this review identifies critical research gaps in the existing literature, highlighting areas that require further investigation and offering valuable insights into how food systems can be transformed to promote more sustainable and equitable outcomes. These insights have important implications for academia, policymakers, development practitioners, and other stakeholders engaged in food system transformation in developing countries.

Assessment of Consumers' Preferences, Perceptions and Willingness to Pay for Pulses & Pulses Products in Pakistan

Muhammad Qasim, Saima Rani, Arshed Bashir, Rashed Saeed
Pakistan Agricultural Research Council, Islamabad, Pakistan

Paper Abstract:

Despite the significance of pulses to both agricultural systems and diets in Pakistan, domestic production has declined over recent decades and three major pulse crops i.e lentils, chickpeas and mash bean fall well short of demand. At the same time, domestic prices have been continuously increasing for the last two decades. Improving the performance of the pulses production, marketing and processing, therefore, represents an important sustainable food supply, nutritional security, poverty reduction, and economic growth strategy. Keeping in view the low area and production of pulses to fulfil the domestic demand of pluses in Pakistan, they have to be imported. In the pulses, demand-supply gap scenario, the present consumer study was designed to identify the domestic pulses consumer segments, explore the consumer perceptions, preference about major pulses and value-added products, and their willingness to pay. The

main aim of the study is to explore the consumption pattern and preferences of pulses consumers in major urban markets of Pakistan. Moreover the study provides overall consumers' feedback for developing inclusive, and competitive pulses value chains through identifying consumers' groups, and willingness to pay for quality traits of pulses and value added products for ensuring sustainability in pulses production.

Market survey was conducted in four major urban markets of Pakistan i.e Islamabad, Lahore, Faisalabad and Karachi. Overall sample of more than 400 consumers was selected through stratified random sampling techniques comprising 100 consumers from each major urban market.   The analysis were complemented by consumer and market research in major pulses markets of Punjab and Sindh. Consumer preferences about pulses products, prices, and other market characteristics were analyzed. The results of the study indicate that pulses price, taste, grading, convenience, cleanliness, size of grain and type of market were the much important factors for consumers than brand reputation, packaging, size of packet, distance to market, color, nutritional contents, and retailers reputation. For the good taste and proper grading of the pulses products, majority of consumers were willing to pay 5 to 10 percent extra. In comparison white chick peas are more popular than black while in case of whole and split chick peas both were almost equally popular. Large chick peas were slightly more liked than small sized one. For mash/urd bean split were more popular than whole one. For lentils split and small ones were more like than whole and large sized lentil. For majority of consumers pulses are the necessity food commodities as they don't change their level of consumption when pulses prices increase. Improving the grading and cleanness of pulses products and reduction in pulses prices were main suggestions by consumers. Female respondents suggested introducing more pulses recipes in combination with meat and vegetables and availability of the ready-to-cook processed pulses products.

Effect of value chain participation activities on smallholder's food security: A case study of Pulses farmers in Pakistan

Muhammad Haseeb Raza[1], Mubashir Mehdi[1], Burhan Ahmad[2], Amjed Iqbal[2], Iqra Ejaz[1]
[1]MNS University of Agriculture Multan, Pakistan, Multan, Pakistan. [2]University of Agriculture Faisalabad, Pakistan, Faisalabad, Pakistan

Paper Abstract:

Participation of smallholders in agricultural value chains activities play vital role in the poverty alleviation and positively contributing to food security of the developing countries. In countries like Pakistan, there has been growing importance on the value chain development of all food commodities where smallholders will bet benefit from participation in agricultural value chains. Smallholder farmers are however still faced with constraints that negatively influence their participation decisions and the level of participation in agricultural value chain development activities. Still, smallholders faced constraints that hinders their participation decisions and the level of participation in agricultural value chains activities. This research explored impact of pulses smallholder farmers' participation in activities along the pulses value chain, implications for their household food security in of Punjab Pakistan. For this purpose, data collected from smallholder farmers participated in pulses value chain project activities funded by Australian Center for International Research (ACIAR), Australia. Primarily, resulted revealed that participation in the pulses value chain activities has a positive impact on the food security by household food consumption in kilocalorie. Furthermore, findings suggest that a pathway will be designed to make

feasible more and more smallholders participate in the pulses value chain activities. The capacity building and machinery support required for pluses farmers will be, a robust policy which can help in improving household food security in pulses areas of Punjab Pakistan.

Time series modeling for forecasting production and area of lentils in pakistan

Rashed Saeed, Arshed Bashir
Pakistan Agricultural Research Council, Faisalabad, Pakistan

Paper Abstract:

For better resource planning of the country, forecasting is the main tool for predicting future value of the commodity based on past behavior of the commodity. Forecasting technique are equally important in agriculture like other sectors of the economy. By using forecasting technique, future behaviour of the production and area under lentils from 2021 to 2030 were predicted. Descriptive results reveal that average production of lentils based on past 50 years data is 24.25 thousand tons per year and average area under lentils is 53.77 thousand hectares in Pakistan. Average estimates of first 5-year study period (1970-75) relating to production and area of lentils are 4.22 thousand tons and 15.58 thousand hectare respectively. Average estimates of production and area of lentil has gone down significantly in last 5-years of study period (2016-2020) to 1.2 thousand tons and 2.08 thousand hectare respectively. Based on Vector Error Correction model, both time series of lentils i.e., production and area are cointegrated series showing long-run equilibrium relationship. Moreover, forecasting estimates depict gradual declining behavior of production and area over the next decade under the assumption that no irregular movement or variation occurs in due course of time. This implies that imports may increase in future to fulfil the deficient needs of consumers in the country. Hence, the declining trends of production and acreage of lentils can be stopped further by sowing improved cultivars and applying better cultural practices of lentils as well as bringing more area under lentils even through cultivating barren lands. In this regard, government should choose a mix policy approach both for lentils and competing crops such as wheat in order to increase area under lentils that would directly increase production of lentils in the future.

Friday, 14th February 2025

Special Session 8A (CSIRO SPONSORED): SOCIAL IMPACT, SUSTAINABILITY, AND FOOD SYSTEMS IN TRANSITION

Special Session 8B - ECONOMIC IMPLICATIONS OF TRANSITION PATHWAYS TOWARDS NET ZERO EMISSIONS

Parallel 5A – Biodiversity

Parallel 5E - Grains

Parallel 5C - Productivity & Efficiency

Parallel 5D - International Trade & Tariffs

Parallel 5B - Land & NRM 2

Parallel 5F - Ecosystem Accounting

Parallel 5G - Agricultural Finance

Keynote 7: Prof. Nick Hanley: Markets for biodiversity credits

Special Session 9A - RECOE SPONSORED SPECIAL SESSION: THE RESILIENT FARM: LESSONS LEARNED FROM SOUTHERN QUEENSLAND

Special Session 9B - ON THE ECONOMICS OF PATHWAYS TO SUSTAINABLE AGRICULTURAL AND LAND SYSTEMS.

Parallel 6A - Valuation 2

Parallel 6B - Consumer choice

Parallel 6C - Farm Management & Farmer Behaviour

Parallel 6D - Climate Change 2

Parallel 6E - Food, Health & Nutrition 2

Parallel 6F - Circular Economy & Waste

Parallel 6G - Practice Change & Adoption 3

Awards and Closing Session

Special Session 8A (CSIRO sponsored): Social impact, sustainability, and food systems in transition

Location Main Room 1 (ROMA), LVL1

Time: 08:30 - 10:10

Chair: Peggy Schrobback

Our food system faces a range of challenges stemming from complex problems like climate change, geopolitical stress, ecosystem collapse, and inequality.

Many agricultural producers are working hard to respond to a new biophysical reality while also tackling disruptions in factor markets, including agricultural labour markets.

Meanwhile, consumers and buyers are putting pressure on food supply chains to address, mitigate, or otherwise more transparently manage social risks and labour liabilities.

In this session we explore emerging economic work around this topic, including: how do we value agricultural work and what employment measures matter for a transitioning agriculture sector?

What role might consumer preferences play for delivering socially sustainable products? What are the risks/opportunities around ensuring socially sustainable jobs accrue in the agriculture sector?

After the presentations there will be a 35-min panel discussion or Q&A.

Session program:

08:30AM   Peggy Schrobback (CSIRO) (Chair): Introduction
08:35AM   Katie Ricketts (CSIRO): Valuing social impacts and designing a quality jobs measure for tracking agricultural transformation
08:50AM   Sarah Whitnall (UC Davis): The nexus between agricultural labour, climate change, profitability and productivity
09:05AM   Margaret Jodlowski (Ohio State Uni.): What underlies agricultural visa workers' job satisfaction? Evidence from qualitative and survey data
09:20AM   Alexandra Hill (UC Davis): Farm labour supply in the US and Mexico: Future projections and implications for modelling
09:35AM   Peggy Schrobback (CSIRO) (Chair) & All speakers   Q&A + Panel discussion (35 min)
10:10AM   Close

Presentation description:

Katie Ricketts (CSIRO A&F):

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"Valuing social impacts and designing a quality jobs measure for tracking agricultural transformation" Like other aspects of sustainability, labour relations may be enforced, enabled or disabled by a range of institutions and governance mechanisms. In the case of agriculture, we provide examples for how the institutions mediating sustainability appear to fundamentally shifting the nature of agricultural work, often with little or no input from affected rural or indigenous communities. Katie will discuss a case study from Queensland that consider how agricultural work is changing, what community values are/aren't reflected in typical co-benefit measures, and the usefulness of measuring quality employment. (15 minutes)

Sarah Whitnall (UC Davis):

"The nexus between agricultural labour, climate change, profitability and productivity" This study reviewed literature about the nexus between agricultural labour, climate change, and farm-level profitability and productivity. Focus was put on potential vulnerabilities and adaptation responses relevant to the Australian agricultural context. (15 minutes)

Margaret Jodlowski (Ohio State University):

"What underlies agricultural visa workers' job satisfaction? Evidence from qualitative and survey data" This study presents new insights from a unique and novel data source based on a survey of agricultural workers with temporary visas in the USA that was conducted using interviews about their impressions of their positions. We examined factors that influence workers overall work experience, including network effects, climate measures, particularly temperature, at the time of interview, and perceptions of their managers. These insights reveal important dynamics in the way in which workers' characteristics influence both the kinds of jobs they accept and their perceptions of their work and working conditions. (15 minutes)

Alexandra Hill (UC Berkeley):

"Farm labour supply in the US and Mexico: Future projections and implications for modelling" This project studied the evolution of the US and Mexico farm labor markets and documents how labor markets mediate agriculture's response to environmental stressors, with implications for agricultural production, wage rates, and the relocation of firms. This project developed the SIMPLEG-LABOR model, a version of the partial equilibrium gridded model of US agriculture that incorporates characteristics of modern farm labor markets, provides a validation of the model's performance using historical data, and develops future projections given predictions of changes in farm labor supply. (15 minutes)

Special Session 8B - Economic implications of transition pathways towards net zero emissions

Location Main Room 2 (TERRACE), LVL1

Time: 08:30 - 10:10

Chair: George Verikios

This session will focus on the economic consequences of achieving net zero emissions in Australia. The objectives of the session include: (1) Explore the multi-sectoral implications of achieving net zero emissions, (2) Explore the sectoral challenges of industrial transformation (e.g., energy, transport and agriculture) as driven by decarbonisation efforts, and (3) Explore the effects on regional economies of delivering net zero for the country. The session is relevant to participants from the private sector, the government, or academe who are interested in understanding the scale and implications of the net zero transition for Australia. Attendees will have the opportunity to hear a diverse set of perspectives from the presenters and the audience, learn state-of-the-art tools in assessing the economic impacts of net zero transition, and understand the practical and policy challenges across the economy of achieving net zero emissions in Australia. It is our hope that participants will leave better informed to consider and contribute to urgent debates around the speed of transition, including the next Nationally Determined Contribution target for 2035, and the sectoral pathways in development by the Australian Government.

Session program:

08:30AM   George Verikios (CSIRO) (Chair): Introduction
08:35AM   Yingying Lu (CSIRO): Towards the transition to a net-zero-emissions and circular economy: Global and domestic modelling applications
08:50AM   Duy Nong (CSIRO): Effects of Australia's pathway to net zero emissions on agriculture-food systems in Australia and other countries.
09:05AM   Manfred Lenzen (Uni. of Sydney): Investigating the consequences for energy demand and emissions of transitioning towards net zero as well as global equity.
09:20AM   Philip Adams (Victoria Uni.): Multi-sector economic modelling and the transition to net zero emissions.
09:35AM   George Verikios (CSIRO) (Chair): Modelling potential technology transition and emissions pathways in six Australian sectors – electricity and energy, industry and resources, transport, land and agriculture, waste, and the built environment.
09:50AM   All speakers: Q&A
10:10AM   Close

Parallel 5A - Biodiversity

Location Main Room 3 (WICKHAM), LVL 1

Time: 08:30 - 10:10

Chair: Gabriela Scheufele

Agrobiodiversity on the farmers' field and its shadow price —Farmers-Farmers' rice variety choice in Chitwan district, Nepal-

Rin Akitaya[1], Yoko Saito[1], Ram Pandit[2]
[1]Hokkaido University, Sapporo, Japan. [2]The University of Western Australia, Perth, Australia

Paper Abstract:

The purpose of this paper is to investigate the farmers' variety choice behaviors and estimate the shadow price of producing traditional rice varieties. Although traditional varieties are less productive compared to modern varieties, they have the potential to provide genetic resources (e.g., breeding materials) for the future. As the impacts of climate change are expected to be severe, these traditional varieties or genetic diversity become important and considered as global public goods since they are beneficial to global society. Given the public-good nature, and the tradeoff between modern varieties and traditional varieties in the farmers' field, price of traditional varieties can be estimated as the opportunity cost of producing modern varieties. This paper focuses on the traditional rice variety called Anadi in the Chitwan district of Nepal. Anadi is often used for cultural purpose in certain ethnicity, and medicinal benefits are also reported locally. This variety is generally produced and supplied for domestic use. We estimate the relative opportunity cost of Anadi compared to modern varieties using an output distance function. Subsequently, the characteristics of farmers that influence this shadow price are identified through a two-stage estimation, production choice equation (probit) and shadow price equation. We conducted household survey in October 2023 in two different regions in the study area, and data from 280 household surveys were employed in the estimation. Among the sample households, only 28 households produce Anadi. The shadow price of Anadi was found to be 8.6 times higher than that of modern varieties, indicating that Anadi producers highly value this traditional variety. Particularly, in regions with marginal production environments or where farmers have limited access to input markets, the probability of choosing traditional varieties remains high, and the shadow price of traditional varieties increases. Traditional varieties are more efficient in those unfavorable area than modern varieties since those traditional varieties can be environmentally suitable in such areas. In addition, communities where traditional varieties are part of culture, the shadow price also increases. Cultural use of crop varieties can function as conservation tool to maintain genetic diversity. On the other hands, if the traditional variety is widely adopted in certain area, its shadow price decreases because it is sufficiently available in the area, i.e., demand for such variety would be limited. If farmers are well educated with agricultural land and production facilities, the production efficiency of modern varieties increases higher than that of traditional varieties. For those who are knowledgeable about agriculture, or highly equipped, production of modern

varieties is more efficient than traditional varieties. We found that shadow price differs by the farmers' production environment and characteristics. Agrobiodiversity conservation in the farmers' fields is considered effective through income transfers such as direct payments to farmers, but choosing the target farmers is challenging because of the heterogeneity among farmers. One of the policy implications of this study is that shadow price can serve as a guideline for this selection. These selected farmers are generally poor, thus, this conservation service payments can also contribute to poverty alleviation.

Local economic contributions of protected areas and conservation spending in Aotearoa New Zealand

David Worden, Tsegaye Gatiso, Suzie Greenhalgh
Manaaki Whenua - Landcare Research, Auckland, New Zealand

Paper Abstract:

In the past year, the Department of Conservation (DOC) in Aotearoa New Zealand (A-NZ) has experienced substantial budget cuts, impacting its ability to manage and maintain public conservation lands and protected areas (PAs).[1],[2] This study explores the effects of proximity to PAs, DOC budgetary allocations, and the presence of regional DOC offices on local economic activity. Three key indicators—employment, sales, and the number of firms—are used to assess economic development at a fine spatial resolution.

Our results reveal that closer proximity to PAs has a positive impact on local economic growth, though this influence weakens with increasing distance from these areas. Higher budget allocations and closer proximity to DOC regional offices help mitigate this diminishing effect, indicating that continued government support plays a role in sustaining local economies.

The study employs meshblock-level (the smallest spatial unit maintained by Statistics NZ) data from 2015 to 2023, covering the entirety of A-NZ.[3] At the meshblock-level we utilise firm-level microdata from Statistics NZ's longitudinal business survey. Using multilevel (mixed-effects) models, our analysis estimates the influence of distance to PAs, DOC budget, and regional office proximity across various sectors. The results are consistent across all sectors, as well as when looking at individual sectors associated with recreation and tourism, such as food and accommodation, retail, and wholesale sectors.

While PAs restrict typical land-use activities, they foster tourism and recreation, which can drive local economic development. We add to the growing body of literature suggesting that PAs strengthen local economic outcomes in developed countries. This study highlights the importance of maintaining budgetary support for conservation efforts to ensure the continued economic contribution of these protected areas to surrounding communities in Aotearoa New Zealand.

What decision makers want: a reflection on how research into the human dimensions of the Great Barrier Reef currently informs management decision making, and how it could be improved

Coggan Anthea[1], Schultz Tracy[2], Clemence Belgnaoui[1], Robyn Gulliver[2]
[1]CSIRO, Brisbane, Australia. [2]University of Queensland, Brisbane, Australia

Paper Abstract:

In the summer of 2023/2024, the Great Barrier Reef (GBR) suffered its fifth recorded mass bleaching event. With more summers with record breaking temperatures forecasted to come, it is time to rethink how people are considered within the socio-ecological system of the GBR and therefore how research about the human dimensions of the GBR is designed, conducted and applied. Following semi-structured interviews with key decision makers in GBR management at the Federal, State and regional/catchment levels of governance, we reflect on how research into the human dimensions of the Reef can be improved for greater impact. We present three key findings from these interviews. First, how the role and practice of embedded research can assist in research impact (and how to do this). Second, how the communication of human dimension research findings can be refined for better inclusion into decision making. Thirdly, that there is a need for better management of the growing body of human dimensions data for use by decision makers (and how this is happening). Whilst people remain a key pressure on the GBR, and the management of this a continued key priority of GBR decision makers, a changing Reef in the context of a changing climate is generating demand for embedded, futures-focussed human dimensions research with a view to sustainable transitions, which the research community needs to step up to deliver.

Assessing knowledge gaps in biodiversity economics and finance

Ram Pandit[1,2], Dinesh Thapa Magar[2]
[1]The University of Western Australia, Perth, Australia. [2]The Western Australian Biodiversity Science Institute, Perth, Australia

Paper Abstract:

Biodiversity loss is one of the major environmental challenges faced by today's society. There is an increased recognition that it is a major risk to economic and financial systems for both public and private sectors, and urgent actions are needed to halt and reverse the biodiversity loss. Mainstreaming biodiversity into economic and financial decisions, and increasing finance to biodiversity conservation are important targets of the Kunming-Montreal Global Biodiversity Framework (KMGBF) that are to be fulfill by 2030 in order to achieve a vision of living in harmony with nature by 2050. To materialise this, we need to identify and address the existing knowledge gaps on biodiversity economics and finance. Biodiversity economics and finance relates to understanding, measuring, and valuing biodiversity, and finding innovative ways to finance its conservation.

In this context, we aim to identify existing knowledge gaps in biodiversity economics and finance to make progress in mainstreaming biodiversity in private and public decision-making. We reviewed peer-review and grey literature to identify the knowledge gaps. Based on the review, we found that peer-reviewed literature is more focused on biodiversity economics, and grey literature on biodiversity finance. Literature on biodiversity finance has been emerging rapidly in the last few years.

There is greater realisation across all sectors that biodiversity loss is a material and financial risk to the economic system and to existing business models. As a result, there is a growing interest among industry to assess impacts, dependencies, risks, and opportunities in relation to nature and biodiversity. Given the context-specificity of biodiversity, several widely applicable and scalable measurement approaches, tools, and frameworks are in the early stages of development and application.

Peer-reviewed and grey literature highlight a range of biodiversity economics and finance related knowledge gaps. Key knowledge gaps related to biodiversity economics include a) conceptualisation and understanding of biodiversity values, b) biodiversity data, valuation methods, and tools, c) policy uptake of valuation results and leveraging transformation, and d) effect of biodiversity on ecosystem functioning, and biodiversity conservation and management. Similarly, key knowledge gaps related to biodiversity finance include a) policies, regulations, institutions, and their impacts, b) biodiversity-related financials risks and costs, c) biodiversity metrics and measurement techniques, d) financing options, mechanisms, financial flows, their impacts and scaling pathways, and e) reporting of corporate nature-related impacts, dependencies, risks, and opportunities.

These findings imply that whole of government and inclusive corporate approaches would be needed to mainstream biodiversity in government and business decisions by identifying nature or biodiversity related impacts, dependencies, risks, and opportunities; and implementing and assessing plans to address them. Similarly, to achieve vision, goals and targets set by the KMGBF, a transformational shift in the way markets value nature, nature-based assets, and natural capital along with alignment of private and public financial flows is essential. With the increasing emphasis on natural capital accounting by both corporate and public sectors; measuring, valuing, and financing biodiversity by addressing identified knowledge gaps are critical for nature positive future.

Across time and space: the spread of verge gardens in suburban Perth

Michael Burton, Claire Doll, Curtis Rollins, Sharon Koitu
University of Western Australia, Perth, Australia

Paper Abstract:

The verges that lie between suburban houses and roads exist in an interesting space: formally owned by local councils but often managed (with or without approval) by local residents, they provide private benefits (e.g. parking) and potentially public benefits (from aesthetics or ecological values) or nuisances (if left to become unkempt). If managed intensively for lawns, they may also have high water costs. Given their location, they are a very public statement of personal preferences. Local councils in Perth have a range of different policies that both restrict what can be done on verges, and which incentivise certain types of use, such as native gardens.

This paper reports the results of an audit of verge gardens (both native and non-native plantings in the public verge) and household survey in 2 suburbs in Perth. The extent of gardens is much greater than would be assumed from the formal approvals information held by councils. We test the hypothesis that the decision to plant a verge garden is influenced in part by the existing extent of such planting in the neighbourhood due to social norm/demonstration effects, leading to both spatial and temporal

correlation in their spread. We consider the implications of these results for councils who wish to effectively promote verge gardens.

Economic assessment of Crown-of-Thorns Starfish control strategies on the Great Barrier Reef

Gabriela Scheufele[1], Christina Skinner[2], Cameron Fletcher[1]
[1]CSIRO, Brisbane, Australia. [2]UQ, Brisbane, Australia

Paper Abstract:

The paper presents the results of an economic assessment of alternative manual Crown-of-Thorns Starfish (COTS) strategies to reduce the loss of hard coral on the Great Barrier Reef (GBR). COTS outbreaks contribute significantly to the loss of hard coral on the GBR. Controlling COTS through manual culling takes significant resources but in return generates benefits in terms of reduced COTS populations, coral protected, and overall reef resilience. When, where, and how COTS are culled changes the extent and distribution of these ecological benefits. While detailed GBR-scale ecological modelling can tell us how effectively different control strategies reduce COTS and protect coral, they do not account for the inputs used, costs incurred, and benefits generated. However, such information is required to ensure that public investments in COTS control maximise benefits at a fixed budget.

The economic assessment is based on ecological benefits estimated by a spatially explicit ecosystem model of the GBR under alternative COTS control strategies. The strategies examine the effect of spatial distribution of vessels, considering different regions, controlling protected versus fished reefs, treatment of effort sink reefs, and dynamic responses to COTS outbreak fronts. The assessment included 18 alternative strategies against four benefit metrics: (1) COTS Density Reduced: a metric counting the number of COTS culled per area, (2) Outbreaking Reefs Avoided: a metric related to suppressing or preventing outbreaks, (3) Coral Area Saved: a metric directly capturing the ability of a control strategy to protect coral, and (4) Economic Value of Benefit: a monetary metric capturing benefits enjoyed by the Australian population. Control costs were modelled based on data generated by the current GBR COTS Control Program.

The assessment identified cost-effectiveness and allocative efficiency gains compared to a counterfactual with no control across the 18 alternative strategies. The results suggest that COTS control has generally a positive impact, irrespective of the metric used. However, identifying the optimal COTS control strategy depends on the management objectives and thus the respective benefit metric of interest. These results highlight the importance of establishing clear objectives for management when selecting strategies.

Parallel 5B - Land & NRM 2

Time: 08:30 - 10:10

Location Chancellor 5, LVL 0

Chair: Tim Capon

Public Lands and Urban Quality of Life

Sherzod Akhundjanov, Paul Jakus
Utah State University, Logan, USA

Keywords: 21. Land and Natural Resource Management; 29. Valuation

Paper Abstract:

Federal and state-owned public lands occupy a significant proportion of many U.S. urban regions, contributing to two highly-valued, nontradable goods: viewscapes and outdoor recreational opportunities. Yet, public lands have not been adequately addressed in the urban quality-of-life (QOL) literature.

First, much of the public lands literature has focused on the effect of public lands within a tightly defined geographic region, such as a Metropolitan Statistical Area or a core urban region. Our study relies upon a larger geographic region, the Combined Statistical Area, which is explicitly defined to include connections to the geographically broader social and recreational resources upon which urban QOL depends.

Second, our study is further distinguished by assuring that our measures of public land ownership include 'generic' federal and state public lands. Past studies have often limited their analysis to lands that have special protective or management status as national, state, or local parks, as wilderness or recreation areas, or a similar designation. However, lands protected with special designations make up less than half of all publicly owned lands. Studies that focus only on protected lands ignore the contribution of adjacent and nearby generic public lands to viewsheds and in providing outdoor recreation opportunities that are not permitted on protected lands.

Third, the public lands literature has not often addressed the possibility of endogeneity between public lands and wages, housing prices, or economic growth measures. Recent public lands studies have used a variety of quasi-experimental methods to control for endogeneity, but the data used to empirically test our primary research question do not allow for such an approach. Instead, our analysis controls for endogeneity using the two largest 19th century "place land grant" policies of the United States---State Trust Lands and Land Grant Railroads---as possible instruments. Place grants are those in which parcels of land to be transferred to state and private control were designated in legislation with great specificity. The initial trust land allocation was distributed with near uniformity across a state; it follows that trust lands could vary widely in land quality. The initial uniform allocation is plausibly exogenous to QOL and is also believed to be correlated with current state and federal land ownership. Similarly, the every-other-section allocation of land within the place limits of land grant railroads resulted in an exogenous

"checkerboard" pattern of land ownership that is likely to be highly correlated with state and federal land ownership and independent of QOL.

Our analysis demonstrates that public land ownership is a significant factor contributing to regional quality of life, regardless of estimation method, model specification, alternative QOL indices, and geographic level of aggregation. Welfare calculations indicate that annual urban household willingness-to-pay estimate for a one percent increase in public land ranges between $80.58 and $130.29. The results of our analysis can be used to evaluate the welfare consequences of proposed land exchanges and other changes in land ownership or management.

Implication of Net Zero Emissions on Agroecological Zones (AEZ) Land Use in Australia: A Multi-Region General Equilibrium Modelling Assessment

Trang Tran, Duy Nong, George Verikios
Commonwealth Scientific and Industrial Research Organization (CSIRO), Brisbane, Australia

Paper Abstract:

Australia committed to reducing 43% of total greenhouse gas (GHG) emissions compared to 2005 levels by 2030 and targets to reach net zero emissions by 2050. Net zero emissions are a balance between greenhouse gas (GHG) emissions emitted and carbon sequestration and removals. Reaching net zero emissions requires not only GHG emissions mitigation measures from both supply- and demand-sides but also technology applications and measures to capture and remove carbon dioxide, such as BECCS, afforestation, and reforestation. Therefore, achieving net zero emissions requires all energy and land-use systems that contribute to emissions are decarbonized. Agriculture, forestry, and land use change (AFOLU) play an important role in reducing GHG emissions through decreases in deforestation, increases in afforestation, improvements in animal feeding, breeding, manure management, rice cultivation, reductions in food loss and waste, and diet changes. All of these measures will affect land use and land use change, including Agroecological Zones (AEZs) allocation. AEZs are classified by 18 AEZ land types from a combination of three climate zones (tropical, temperate, and boreal) and six periods of growing length. In this study, we develop and apply the Global Trade Environmental Model- AEZ (GTEM-AEZ) to evaluate the impact of net zero emissions achievement and changes in AEZs land in Australia. In the GTEM-AEZ model, the allocation of AEZ land use across sectors is constructed by a three-level nested CET functional form to solve the heterogeneity in land rent. AEZ land is transformed among forestland, cropland, and pastureland, depending on the value of elasticity transformation. The findings of this study could inform policymakers about land use change in reaching net zero emissions by 2050.

What about the critters? Natural Resource Adaptation Strategies in the U.S.

Valerie Seidel, Cortney Cortez
The Balmoral Group, Winter Park, USA

Paper Abstract:

Monroe County, Florida, home of the Florida Keys, has been addressing the need to identify natural resource adaptations and approaches to prepare for sea level rise and other climate conditions. To provide information on the cost-effectiveness of different natural resource-based strategies across the Keys, a spatial cost-benefit analysis (CBA) was conducted. Five natural resource adaptation strategies were selected based on the county's 2021 Vulnerability Assessment: rainwater harvesting, implementation of passive green infrastructure, land acquisition, living shorelines, and wetland restoration.

For each strategy, project candidate sites were identified using GIS software, and costs and benefits were applied to each site using decision rules based on various ecological and practical factors. Ecological factors for candidate sites included whether sea level rise data and Sea Level Affecting Marshes Model (SLAMM) results show the location is viable in 2040; hydrologic or other connectivity compatible with the strategy; and input from scientists studying Keys natural resource adaptation strategies. Practical considerations included restricting candidate sites to the management or ownership regimes appropriate for the strategy. Benefit estimates included public values for conservation lands, protection of threatened and endangered species, and avoided flood damages, among other published economic measures of public natural resource values. A 10-year planning horizon was used, and appropriate discount rates applied.

Results provide input that can be used in prioritisation of adaptation projects. Costs and benefits vary by strategy and location, and all strategies were cost-effective in most candidate sites. If all strategies were implemented in all locations where benefits exceeded costs, US$500 million in total benefits would be realised at a cost of US$211 million, for net benefits of US$289 million. Based on the results, recommendations included considering a rainwater harvesting incentive program due to its significance for preserving threatened and endangered species in light of rapid loss of access to fresh water. Findings also indicate that when choosing projects, local government must also carefully consider future shoreline conditions, future connectivity for habitat corridors, and geographic variability of implementation costs. Lastly, land acquisition may be more desirable in larger forested areas that provide greater benefits, than in non-forested areas.

"Three Rights Separation" in China's Grassland Property Right and Entity Behaviors: Evidence from an Evolutionary Game

Yunna Bao[1], Yubing Fan[2]
[1]Beijing University of Chinese Medicine, Beijing, China. [2]Lanzhou University, Lanzhou, China

Paper Abstract:

Abstract: The production efficiency of cropland is highly appreciated in increasing agricultural output. As an innovation of the Chinese cropland system, the "three rights separation" divides the grassland property right into three distinct rights, including ownership, contract right and management right, associated with three entities in the pastoral area, which aims to increase the cropland production efficiency by transferring the management right from herders to capital owners. However, the transference term is too

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short in many villages to achieve long-term cooperation among three entities, which has been a hindrance to achieving policy aims; thus, the purpose of this research is to explain why this "inconsistency dilemma" appears between policy aim and the situation in practice. Due to the bounded rationality of economic agents, we built a tripartite evolutionary game model, analyzed the payment matrix and obtained the expected returns of the three entity groups including village collectives, herders, and capital owners. We derived the replicator dynamic equations for the evolutionary game of three entities. With the game equilibrium analysis of the three entities, the evolutionary stable strategy of the six spaces can be obtained, but the game fails to converge to a stable equilibrium point. The result of the game is affected by the cost structure, income status, penalty, incentives, and other parameters of the three entities. Changes in parameters will directly lead to three economic entities' changes in their game behaviors, optimal strategy selection, and the equilibrium result.

With further numerical simulation, we found that apart from the cost-revenue structure, three entities' original rates of taking cooperation strategies and the parameters affect the final evolution result, which accounts for the inconsistency. Promoting the policy implement in the areas where three entities' original rates meet the specified conditions will lessen the inconsistency. Three entities' long-term cooperation is realized in three scenarios. First, three entities' original rates of taking cooperative strategies are not lower than 70%, which we regard as high rate. Second, the original rate of taking cooperative strategy in herder group is not lower than 80% which we regard as higher rate, with the other two entities' medium rate. Third, with the herders' medium original rate of taking cooperative strategy, the other two entities' original rates are not lower than 90%, which we regard as super high rate.

An effective mechanism for entities' cooperation where penalties for capital owners' short-term behavior and incentives for herders' transfer behavior are clearly defined and enhanced will also help to lessen the inconsistency.

Welfare implication of sugar self-sufficiency program in Indonesia: an optimization land- use reallocation model approach.

Zaura Fadhliani
The University of Adelaide, Adelaide, Australia

Paper Abstract:

Many countries have made ensuring a stable domestic food supply a priority in response to global challenges such as rising food prices and disruptions caused by the COVID-19 pandemic. Governments, including Indonesia, have sought to achieve food self-sufficiency through policies that promote land reallocation and provide incentives for increased agricultural production. However, reallocating limited land resources can lead to unintended welfare consequences, such as inefficiencies and inequities, particularly affecting smallholder farmers. In Indonesia, recent policies aim to achieve sugar production self-sufficiency by offering subsidies and land reallocation incentives targeting farms of different sizes. While these initiatives are critical to reaching the government's goal of producing 6.2 million metric tonnes of sugar annually by 2025, there is a lack of quantitative studies evaluating their welfare impacts. Existing research primarily relies on qualitative analyses, which do not fully capture the economic costs and

benefits associated with land reallocation. This study addresses this gap by applying an optimisation model to assess the welfare impacts of Indonesia's sugar self-sufficiency programme. The model evaluates how incentives, such as subsidised inputs and mechanisation, influence land reallocation decisions for small, group, and large-scale farmers and examines both the positive and negative externalities of these policies. The findings suggest that while the government's initiatives may help increase sugar production, they could also impose substantial welfare costs, particularly on small farmers. These costs stem from an unequal distribution of resources and operational burdens across different farm sizes. This study provides critical insights for policymakers aiming to balance national food security goals with broader welfare outcomes. It also offers lessons for other countries seeking to implement self-sufficiency policies in agriculture.

Analysing the contribution of trees to the resilience of sheep grazing systems using stochastic processes and real options analysis

Tim Capon[1], Helena Clayton[2], Greg Hertzler[1], Greg Bekker[3], Philip Graham[4], David Lindenmayer[2], Daniel Mendham[1], Todd Sanderson[5], Sorada Tapsuwan[6], Sally Thompson[7]
[1]CSIRO, Canberra, Australia. [2]ANU, Canberra, Australia. [3]Agriculture Victoria, Maffra, Australia. [4]Graham Advisory, Yass, Australia. [5]ACIAR, Canberra, Australia. [6]Swinburne University of Technology, Melbourne, Australia. [7]UWA, Perth, Australia

Paper Abstract:

We summarize the results from two case studies analysing the benefits of trees on farms and their contribution to the resilience of sheep grazing systems.

(1) The first case study examines the potential of windbreaks to reduce evaporation from farm dams and improve drought preparedness. A bioeconomic model integrating flock management with a dam water balance model accounts for the dynamic interactions between water availability and livestock management decisions. Outcomes are modelled as stochastic processes to compare the probabilities and estimated times of reaching the minimum water levels necessary to sustain sheep flocks. Results demonstrate the potential for trees on farms to increase water availability and delay destocking decisions.

(2) The second case study models the adoption of shelter belts that reduce evapotranspiration from pasture and lower feed costs. This analysis employs real options analysis alongside stochastic processes to estimate decision thresholds, considering both the value of flexibility and the uncertainty of outcomes. The resilience of the agricultural system is evaluated based on the estimated times to decision thresholds for destocking or exiting the farming system. Comparing the times estimated for scenarios with and without shelter belts illustrates the contribution of trees to the resilience of agricultural and economic outcomes.

These two case studies highlight how estimating times and probabilities to biophysical and decision thresholds can provide valuable insights into the resilience of farming systems.

Parallel 5C - Productivity & Efficiency

Location Chancellor 1, LVL0

Time: 08:30 - 10:10

Chair: Ella Dewilde

Balancing the Ledger: Accounting for Bad Outputs in Measures of Agricultural Productivity Change

Chris O'Donnell
University of Queensland, Brisbane, Australia

Keywords: 14. Environmental Economics; 27. Productivity and Efficiency

Paper Abstract:

Sustainable production refers to the creation of goods and services using processes and systems that are non-polluting. This paper discusses measures of agricultural productivity change that reflect well on firms that adopt sustainable production practices. It computes so-called sustainable productivity index numbers for 143 countries over 61 years. The paper finds the sustainable productivity performance of the Australian agricultural sector to have been relatively poor. To explain this finding, the paper uses econometric methods to estimate the economic drivers of productivity change.

Do Probiotics Enhance Productivity and Technical Efficiency in Freshwater Prawn Farming? Empirical Insights from Bangladesh

Md Akhtaruzzaman Khan[1], Mohammad Sabbir Hossain[2], Rasmus Nielsen[3], Md Badiuzzaman[2]
[1]Bangladesh Agricultural University, Mymensingh, Bangladesh. [2]Patuakhali Science and Technology University, Patuakhali, Bangladesh. [3]University of Copenhagen, Copenhagen, Denmark

Keywords: 27. Productivity and Efficiency

Paper Abstract:

Prawns (*Penaeus monodon*), a globally farmed freshwater species, are typically raised in ponds and estuaries. However, as prawn farming intensifies, bacterial diseases have emerged as a significant challenge, threatening both productivity and farm profitability. In response, eco-friendly probiotic technologies have been developed, offering a sustainable solution to reduce disease-related losses while improving overall farm performance. In Bangladesh, small and medium-scale prawn farmers have embraced these imported probiotics, hoping to better manage diseases and enhance the growth of their

stock. This study explores the impact of probiotic use on the productivity, profitability, and technical efficiency of freshwater prawn farms, shedding light on whether this innovative approach lives up to its promise. Surveying 318 prawn farms across Bangladesh, the study split participants into two groups: 146 farmers who used probiotics and 172 who did not. To ensure a fair comparison, Propensity Score Matching (PSM) was employed. The analysis relied on a stochastic frontier model, with a Cobb-Douglas functional form (selected after several statistical tests), to estimate the technical efficiency of the farms. The results found that probiotic users experienced significantly higher productivity and profitability than their counterparts. Not only did probiotics improve yields, but they also reduced costs—farmers using probiotics spent less on feed and fingerlings, leading to a lower per-hectare cost of production. On average, farms scored 0.56 in technical efficiency, meaning that farm could boost production by as much as 44% with the same level of inputs if they operated as efficiently as the top performers. The data also revealed that probiotic users were far more efficient, with an average efficiency score of 0.78, compared to just 0.36 for non-users. These findings highlight the potential of probiotics to transform prawn farming. By improving disease resilience and boosting technical efficiency, probiotics offer a powerful tool for small and medium-scale farmers looking to enhance their productivity and profitability.

Impact of Land Fragmentation on Ecological Efficiency of Wheat Production

Ziqi Wang, Wanglin Ma
Lincoln University, Christchurch City, New Zealand

Paper Abstract:

Wheat is one of the most important staple food crops globally and a primary food source for many of the world's population. Its nutritional and economic value makes wheat the foundation of global agriculture. China is the world's largest producer and consumer of wheat, making it a crucial crop in the country and a key component of its commercial grain production. Despite its significant output, China's wheat production still needs to improve its sustainable development. Eco-efficiency is a significant challenge in wheat cultivation in China, where the excessive use of chemical fertilizers and pesticides raises production costs, contributes to environmental pollution, and accelerates soil degradation. This study examines the effects of land fragmentation on the eco-efficiency of wheat production using data collected from rural households in Shandong, Henan, and Hebei provinces of China. Estimating a fractional regression model, we find that land fragmentation negatively affects the eco-efficiency of wheat production. We also find that the effects of land fragmentation on eco-efficiency are heterogeneous across the survey regions, farm sizes, and mechanization levels. Therefore, the study's findings suggest that promoting land consolidation can significantly improve the eco-efficiency of wheat cultivation.

Can socialized services for manure and sewage resource utilization enhance green total factor productivity in livestock farming? Evidence from 412 large-scale dairy farms in China

Xiaoxia Dong

Chinese Academy of Agricultural Sciences, Beijing, China

Paper Abstract:

Promoting social services in dairy farming is pivotal to modernizing China's livestock industry, yet farms remain skeptical about their economic viability for manure and sewage management, hindering the development of specialized organization. This study applies a total factor productivity analysis framework, drawing on survey data from 412 large-scale dairy farms across 23 provinces in China. By employing a stochastic frontier model and an enhanced hierarchical analysis method, we empirically compare the green total factor productivity of farms that manage manure and sewage resources through social services versus those using self-treatment and propose pathways for improvement. The findings reveal an inverted "U" relationship between the adoption intensity of manure and sewage utilization technology and the production frontier in large-scale dairy farms. Farms that adopt the technology independently can reduce technical efficiency losses through improved employee training and accumulated farming experience. Additionally, both the first-order and second-order terms of the land input-output elasticity coefficient are positive for independently adopting farms. These farms often have less supporting land compared to those using social services, leading to excessive manure and sewage application to fields and higher unintended output levels. Farms that utilize manure and sewage resources through social services achieve 8.7% higher green total factor productivity compared to those managing it independently. Capital cooperation with social service organizations is identified as the key driver of this efficiency gain. It is recommended that farms adjust their scale to match their capacities and engage in capital cooperation with social service organizations. This approach, coupled with enhanced mechanization, can effectively unlock the full potential of green total factor productivity.

Assessing the impacts of climate-induced labour productivity losses on agriculture and overall economy: The case of small developing agricultural economies

Sumali Dissanayake[1], Dayani Gunathilaka[2], Jeevika Weerahewa[1], Athula Senaratne[3], Sheu Salau[4]
[1]University of Peradeniya, Peradeniya, Sri Lanka. [2]Griffith University, Brisbane, Australia. [3]World Bank, Colombo, Sri Lanka. [4]World Bank, Washington DC, USA

Paper Abstract:

This study uses Sri Lanka as a case to empirically assess the economy-wide impacts of climate-induced labour productivity losses in small developing agricultural economies in Asia. Agriculture contributes around 7-8% of the country's GDP and employs approximately 25-30% of the workforce. The rising temperatures and extreme weather events have led to significant losses in labour productivity due to heat stress, particularly in the agricultural sector. Sri Lanka's geographical location close to the equator and the dominance of outdoor agricultural work, makes it highly vulnerable to the climate-induced effects.

We employed a computable general equilibrium model to estimate the effects of declining agricultural labour productivity due to heat stress, particularly in the grains and crop sectors, which are vital for the country's economy. The analysis considers five projected temperature rise scenarios (+1°C to +5°C) and their impacts on Sri Lanka's GDP, welfare, trade, and input markets. Our results revealed that with a temperature rise from 1°C to 5°C, the country's GDP will shrink ranging from 0.27% to 1.43%. This corresponds to an economic loss of $237 million to $1,253 million. The associated welfare loss, measured in terms of equivalent variation, range from $188 million to $1,045 million. As agricultural labour productivity declines, agricultural output, particularly in the grains and crops sector, may also drop ranging 3% to 15%. Consequently, the sector will experience increased prices for key commodities, with grain and crop prices rising by 2.5% to 14%. This would also contribute to food shortages and increased dependence on imports. Labour productivity losses will exacerbate rural poverty and increase the demand for agricultural labour by 4% to 22%, as more labour is required to maintain certain level of output to fulfil the demand.

Despite increased labour demand, wages are projected to increase by 1% to 7%, widening income gap in rural regions. Moreover, land rents for agricultural use are expected to fall by 6% to 32%, as the reduced profitability of farming diminishes the value of agricultural land. These changes may lead to land abandonment and a labour reallocation towards the other sectors, such as textiles and apparels, which would experience modest output growth due to labour shifts. The study also emphasizes the broader economic impacts caused by labour productivity losses, with a notable reduction in agricultural exports (7% to 38%) and a subsequent rise in imports (2% to 13%) to offset domestic production losses. This shift will worsen the country's trade balance, adding further strain to the economy with long continued trade deficit. Given the multifaceted and extensive impacts on agriculture and the economy, the study highlights the urgent need for adaptive strategies i.e., labour-saving machinery and use of digital agriculture applications, and supportive policies. These policies should focus on mainstream adaptation strategies to lessen the agricultural labour productivity losses, safeguarding food security, and promoting sustainable economic development. The findings are critical for policymakers aiming to build climate resilience in small developing agricultural economies and address the potential long-term economic challenges caused by rising global temperatures.

Data Challenges and Unintended Consequences in Farm-Scale Sustainability Reporting for Australia's Beef Industry

Ella Dewilde, Elaine Mitchell, David Tucker, Louisa Coglan, David Rowlings
Queensland University of Technology, Brisbane, Australia

Paper Abstract:

Public concern about the global climate has led to increasing demands for agricultural production to demonstrate sustainability initiatives. As a result, organisations at all levels of Australia's beef supply chain are under pressure to measure and report on sustainability themes to maintain the beef industry's social license to operate. Reporting of environmental sustainability at the farm level is the focus of the industry, as this production segment has the largest environmental impact and is the most tangible to consumers. Our research investigated what challenges industry stakeholders perceived in measuring farm-level sustainability and explored potential consequences of these data challenges not being addressed. 24

semi-structured interviews with industry and expert stakeholders were conducted and analysed using discursive thematic analysis. Our research found that poor data quality and low interpretability of public datasets were the dominant challenges where secondary data is used for sustainability reporting. Firms collecting new data on farm-level sustainability stated the major challenges are cost, practicality and low economic return of measuring sustainability performance. Throughout the interviews we also identified systematic barriers that reinforce these data challenges and may cause perverse outcomes for sustainability reporting in the beef industry. The politicisation of the sustainability of beef, and the lack of standardisation in how sustainability is defined and measured has made measuring sustainability a communication problem instead of a data problem. Sustainability language ambiguity enables competitive advantage and product differentiation between firms further reinforcing barriers to standardisation in sustainability measuring and reporting. This alongside barriers to farm-level data collection and interpretation can result in unintended consequences like cherry-picking data to create a misleading narrative of sustainable performance. We posit that perceived challenges relating to poor data quality and interpretability of existing farm-level data can be addressed by exploring the potential of alternative data sources like national science infrastructure networks. But without acknowledging systematic, industry-level challenges, the level of change needed to prevent unintended consequences in environmental sustainability reporting is unlikely to occur.

Parallel 5D - International Trade & Tariffs

Location Chancellor 2, LVL 0

Time: 08:30 - 10:10

Chair: Rosa Mar Dominguez-Martinez

Understanding the determinants of participation in agri-food global value chains

Attila Jámbor[1], Áron Török[1], Zalán Márk Maró[1], Sándor Kovács[2]
[1]Corvinus University of Budapest, Budapest, Hungary. [2]University of Debrecen, Debrecen, Hungary

Paper Abstract:

Since the WWII, the role of global value chains (GVCs) has been continuously increasing as the main driver of global agrifood production and trade patterns. This paper provides an empirical analysis of the determinants of agri-food GVC participation of countries standing at different levels of economic development, especially focusing on developing countries. Including eleven variables selected based on the literature, the factors affecting backward and forward GVC participation are identified between 2013 and 2023.

Our findings make it clear what the key determinants are of GVC participation by analysing simple correlation statistics; by running econometric models for all countries and by identifying determinants by performance. Overall, our results suggest that structural characteristics of the countries are the key determinants of GVC participation and that market and trade policy-related determinants drive engagement in forward and backward GVC participation. The most important determinants are as follows.

Trade openness proved to be one of the most important factors in GVC participation in all models and by all means (backward and forward types as well). Opening borders and actively trading with other countries should be a key policy for countries aiming to increase their GVC participation levels.

As expected, the general level of economic development definitely plays a role in enhancing GVC participation at all levels and especially for backward participation. Developed countries are most active in GVCs than developing ones. Economic policies aimed to improving economic development is also beneficial for better GVC integration.

The quality and speed of logistics activities appear to be major determinants of GVC participation, especially for forward participation. Economic policies should focus on investing in logistics infrastructure.

The ease of doing business was proven to be another key factor in all terms of GVC participation – governments should focus on providing a conducive business environment.

Being part of a common market with a common currency definitely fosters GVC participation, especially backward participation.

Market size per se does not seem to play a major role in boosting GVC participation – countries with smaller markets can also be important beneficiaries of global economic integration.

Liberal trade interventions play some role in enhancing GVC participation, though this does not seem to be the most important factor. Trade intervention policies seem to play a limited role in GVC participation growth.

On the whole, it seems that market-related factors are more important than trade policy-related factors in pursuing GVC participation, at least in agri-food markets. Future policies in pursuing higher GVC participation should take these results into account.

Economic consequences of a US initiated tariff war

David Vanzetti
UWA, Perth, Australia

Paper Abstract:

In July 2018 the Trump Administration initiated a tariff war by imposing additional duties of 25 percentage points on selected imports from China. As promised, China responded with bilateral tariffs of its own. As a result, both countries are worse off. The Biden Administration retained Trump's tariffs and added more of its own. Prior to the 2024 election, presidential candidate Trump has proposed a ten per cent tariff on all imports and possibly a 60 per cent tariff on imports from China. Assuming Trump has a chance of becoming the next President and implementing these policies, we analyse the potential trade and welfare impacts on the US, China and third countries using a global computable general equilibrium model.

Our results suggest that while the US may gain from a harmonised ten per cent tariff, it would be worse off from a large tariff on imports from China, even in the absence of retaliation. However, countries such as Vietnam, the United Kingdom, the European Union, Indonesia, Bangladesh and Brazil are likely beneficiaries, as these exporters replace China in supplying the US market. Notwithstanding that China can export to countries other than the US, its losses amount to $146 billion annually. Australia is also a net loser, with annual welfare losses estimated at $844 million.

If all countries retaliated to a ten per cent tariff with similar tariffs of their own, most, but not all, countries would be worse off. Australia and Japan are two countries that may gain.

Effects of Non-Tariff Trade Barriers in Grain Markets: The Case of Rice Export Ban Imposed by India.

Walter Ac-Pangan, Nathan Hendricks
Kansas State University, Manhattan, USA

Paper Abstract:

India is the world's largest rice exporter, accounting for roughly 40 percent of global rice trade in 2022. In July 2023, the Indian government banned the export of non-basmati white rice; this represents a large shrinking in rice supply in global markets (USDA-FAS, 2023a). The export ban is expected to have a large impact on the international rice markets and potentially other grain markets. Previously, the Indian government implemented an export ban and tariffs on various types of rice. In September 2022, they banned exports of broken rice and imposed a 20% tariff on paddy rice and brown rice (GTA, 2024). As a major rice exporter, any trade barriers enacted by India are expected to influence the international grain markets (IFPRI, 2024).

Since 1980, the use of Non-Tariff Barriers (NTBs) as international trade instruments has increased (Coughlin 1989), while the tariffs have decreased between 1997 and 2015 (Niu et al. 2017). A study by Kinzius et al. (2019) showed that between 2009 and 2014, the implementation of NTBs reduced the imports of products by 12%; this trade-dampening effect is thus comparable to other trade defense instruments. On average, NTBs can have similar trade restrictions effects as tariffs (Kee et al. 2009; Head and Ries 2008; Hoekman and Nicita 2011; Bratt 2017).

Our study aims to investigate the effects of the export ban on rice imposed by India on global rice grain markets. With this objective, this study seeks to assess how the trade flows (imports or exports) change among major country rice exporters and major rice importers. The key contributions of our study to the available literature are as follows: i) This study assesses the effect of a non-tariff barrier, which is less common in the international trade literature published since most of the studies assess tariff barriers; and ii) As of August 2024, no study has been published assessing the effects of these non-trade barriers (export bans) imposed by India on the rice market.

We empirically assess how exports of rice change on average (across countries and at the country level) when an export ban is implemented. We will exploit differences in trade flows (exports and/or balances) in the grain markets between targeted products and non-targeted products in the major grain exporting/importing countries.

We expect that the adjustment of the rice supply chain among countries will vary depending on each country's infrastructure, policy, and technology. Also, it will depend largely on the ability of the major rice importers to find another source of rice and the ability of the major exporting rice countries to increase supply to gain market share. We expect the substitution effect among different types of rice and the substitution effect across grain markets due to the rice price increase in the global market.

Our results will contribute to the literature strand on identifying and measuring the effect of NTBs that have influenced all trading partners equally. Providing essential insights to understand the impacts of trade policies on the stability of the global economy.

Impacts of free trade agreements on agri-food trade: Evidence from Japan

Yuko Akune
Nihon University, Fujisawa, Japan

Paper Abstract:

Numerous scholars have empirically shown trade creation and diversion as impacts of free trade agreements (FTAs). Additionally, many studies of agricultural trade have found different influences on commodities. This study empirically examines the impact of FTAs on Japan's agri-food trade.

Japan, a major agricultural importing country, has enforced trade and domestic policies to protect its farmers. Following the Economic Partnership Agreement with Singapore in 2002, Japan formed FTAs with nations that posed fewer significant threats to their domestic agricultural sectors, such as Mexico in 2005, Malaysia in 2006, and Chile in 2007.

However, it signed the Trans-Pacific Partnership (TPP) in 2016, which included major agricultural exporters worldwide, such as Australia and the United States, competing with domestic agricultural products, such as beef and rice. Therefore, Japan's agri-food trade policy was reversed in 2016, to encourage exports. This policy shift is also explained by the expectation that the domestic market will shrink owing to a decrease in population. The CPTPP enfored in 2018, after the United States withdrew from the TPP in 2017, provides a twofold challenge for Japanese farmers, who must not only open the domestic market more than previously signed FTAs, but also seize opportunities to access overseas markets. Later, Japan entered into economic partnership agreements with the EU and the United States at the same level as the CPTPP.

Japanese agri-food exports have grown steadily since 2010s. This expansion for several commodities is evident not only in the volume of exports, but also in the diversification of export destinations. A notable example is the significant increase in the number of countries importing Japanese beef from 2016 to 2017, with the number of destinations increasing from 45 to 171. The exports of strawberries and mixed liquid seasonings showed similar trends.

This study focuses on the trade creation and diversion effects on the exports of aggregated agri-food commodities and 28 strategic export commodities in Japan, including beef, strawberries, scallops, processed foodstuffs, and beverages. A total of 47 countries and regions were examined for the estimated period of 2002–2023, including 18 FTAs. Preliminary analysis showed that the implementation of many trade agreements significantly affected the trade of livestock products and mixed liquid seasonings. Overall, the trade creation effect was more significant than the trade diversion effect.

Globalization and national commodity cycles:The case of wine in Australia

Kym Anderson
University of Adelaide, Adelaide, Australia. ANU, Canberra, Australia

Paper Abstract:

Globalization may have reduced but certainly has not eliminated differences in national commodity cycles. This article examines the case of Australia's wine industry. Over the past four decades, all annual indicators of that industry's international competitiveness have traced a steep inverted V. This paper

draws on recently compiled data to first summarize such indicators and contrast them with those of other key wine-exporting countries. It then offers a series of partial explanations for the industry's sharp rise and then equally steep fall in its international competitiveness (and its several bumps along the way). The New Zealand and Californian wine industry's prolonged expansions in particular are contrasted with Australia's. Despite the current downturn in the industry's fortunes, and notwithstanding the likelihood of further boom-slump cycles in the decades ahead, the paper concludes that a return to profitability is possible if vignerons and wine exporters were to raise their current rates of investments in R&D, quality improvements and promotion, and if the AUD remains relatively weak.

Changes in the international trade of sharks, rays and chimaeras before and after the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

Rosa Mar Dominguez-Martinez[1], Carissa Klein[1], Leslie Roberson[1], Chris Wilcox[2], Peggy Schrobback[3], Jessica Gephart[4]
[1]University of Queensland, Brisbane, Australia. [2]University of Tasmania, Hobart, Australia. [3]CSIRO, Brisbane, Australia. [4]University of Washington, Seattle, USA

Paper Abstract:

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is a voluntary multilateral agreement among 183 governments aimed to protect threatened species and regulating their trade. Listings under CITES Appendices do not necessarily ban trade but require that trade transactions are regulated and reported. Early CITES listings of marine species predominantly involved charismatic shark species that constitute a relatively small proportion of global elasmobranch (sharks and rays) trade. However, more recent listings include species caught in large volumes, widely targeted by various fisheries globally for meat, fins, and other uses. As the international elasmobranch meat market expands, CITES now mandates regulation for the trade of 146 shark and ray taxa. Despite this, the impact of these listings on trade dynamics remains unclear. Using the newly developed Aquatic Resources Trade in Species (ARTIS) database, we evaluate changes in international trade for elasmobranch meat as additional species are added to CITES listings. Additionally, we analyse whether these trade shifts are reflected in changes in production volumes and price fluctuations, providing a more comprehensive understanding of the market response to CITES regulations and their effect on the shark and ray meat industry.

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Parallel 5E – Grains

Location Main Room 4 (LEICHARDT), LVL 1

Time: 08:30 - 10:10

Chair: Emanuel Gomez

Cost of weeds in Australian grain and cotton cropping systems

Jackie Ouzman[1], Rick Llewellyn[1], Masood Azeem[1], John Broster[2]
[1]CSIRO, Adelaide, Australia. [2]Charles Sturt University, Wagga Wagga, Australia

Paper Abstract:

Weeds threaten agricultural productivity by competing for resources and as such they are one of the largest costs to producers. Given the wide range of weeds and impacts on production and management across diverse agro-ecological zones it is not simple to identify where the largest costs are incurred and in what form (e.g. yield loss; management; in-crop vs. fallow; weed type; crop type). To inform R&D investment priorities and industry, this Grains Research and Development Corporation (GRDC) and Cotton Research and Development Corporation (CRDC) funded study estimates the cost of weeds to the grain and cotton production in Australia. Costs are based on; 1) revenue losses due to the presence of weeds including yield losses due to in-crop and fallow weeds and grain contamination, and 2) expenditure costs associated with managing weeds including herbicide and non-herbicide practices. This includes opportunity costs associated with changes in crop choice due to weed management considerations. The model draws upon a variety of new datasets including regional advisory groups, GRDC Farm Practice Survey, Australian Bureau of Agricultural and Resource Economics (ABARE) and Australian Bureau of Statistics (ABS) production data, National Variety Trial data, national weed species survey data, local and industry-based gross margin guides, and herbicide use data collected from 2021-2023. Expenditure costs have increased since the last major study on Australian cropping systems (Llewellyn et al 2016), although weeds continue to be generally well-controlled despite the need to adapt to increasing levels of weed resistance. Nationally the cost of weeds to Australian grain and cotton growers is estimated at $4.4 billion annually, which equates to over $206 per hectare in expenditure and losses. Revenue losses due to yield loss and contamination are a minority (13%) of the overall cost, far exceeded by expenditure costs (87%). The results imply growers' increasing willingness to invest in fallow weed control for soil water conservation and relatively new pre-emergence herbicide options for modern cropping systems that have evolved to maximise water use efficiency and minimise soil degradation. More generally, to increase marginal benefits of additional weed control, the results point to the relative importance of innovation towards lower cost control methods.

Factors Underlying Crop Variety Choice by Australian Grain growers: Assessing the Importance of Wheat-rust Resistance

Abebayehu Geffersa, Susie Sprague, Luke Barrett
CSIRO Agriculture and Food, Canberra, Australia

Paper Abstract:

Disease-resistance is an important trait targeted by crop breeders globally. Resistant crop varieties can play a crucial role in managing crop diseases and promoting sustainable agricultural practices by reducing the need for chemical inputs and enhancing long-term resilience in farming systems. Despite the availability of resistant cultivars in Australian crops, susceptible varieties are widely grown in many grain-growing regions of Australia, leading to an overreliance on fungicides for crop protection. This paper examines factors that influence crop variety selection among Australian grain growers, with a particular focus on barriers to the wider adoption of wheat-rust resistant cultivars. We draw on empirical data from a 2021 national survey of 1,200 grain growers, conducted across diverse Australian cropping systems by the Grains Research and Development Corporation (GRDC). This nationally representative survey provides quantitative data on crop and farm management practices, including the adoption of farming systems and the key varietal attributes grain growers consider when selecting new crop varieties. Leveraging additional empirical data from over 5,000 observations of wheat varieties with varying rust-resistance ratings from the 2021 cropping season, we employ alternative econometric models to identify gaps in the adoption of wheat cultivars and analyse the socio-economic and environmental factors influencing these adoption patterns. Our analysis, based on a binary choice model, highlights several key factors driving crop variety selection, including market prices, historical rainfall, farmers' perceptions of yield potential and disease resistance, and recommendations from agronomists or peers. Among these factors, the highest marginal effects were observed for traits such as flowering time, grain and milling quality, yield gains, and agronomist or peer recommendations. Interestingly, while disease resistance remains a significant factor, its marginal effect is the least influential in variety selection. By identifying these key factors, we emphasise the importance of strong institutional support to promote the widespread adoption of disease-resistant cultivars, ensuring a more sustainable and resilient agricultural future.

The Economics of Including Grain-Related Biogenic CO2 in Climate Accounting

Richard Gray
University of Saskatchewan, Saskatoon, Canada

Paper Abstract:

The current international climate accounting system considers the large quantities of CO_2 removed from the atmosphere and stored in harvested grains, and the large quantities CO_2 emissions that occur when grain is consumed as, ephemeral, zero-emission activities. Despite being described as a "critical flaw in climate accounting" leading to increased food insecurity and GHG intensive land-use changes, all parties

United Nations Framework Convention on Climate Change, continue to treat these large fluxes as zero-emission activities.

Using a simple trade model we show that in absence of measuring CO_2 in grain, there is an incentive for parties committed to reducing emissions under the Paris Agreement to develop policies to use CO_2 "emission free" grains to produce biofuels, with no offsetting policy incentive to produce grains required to meet this additional demand.

A straightforward solution to mitigate these disastrous outcomes is to treat grain CO_2 the same as fossil fuel CO_2 and expand National GHG Inventory accounts to include the biogenic CO_2 sequestered in harvested grains, and the CO_2 emissions that occur when grain is consumed. We show that these additional two lines in National GHG Inventories would incentivize parties in the Paris agreement to increase net grain exports, thereby reducing world grain prices and enhancing food security, while reducing the market incentives for carbon intensive land use conversion in non-compliant countries.

We apply the more comprehensive accounting system to Australian agricultural emissions over the past decade to demonstrate its simplicity, the large impact on net emissions, and the profound impact on policy incentives.

When reactive resistance management can lead to pro-active benefits: a data-driven study of herbicide and weed management in Australia

Md. Monirul Islam[1,2], Rick Llewellyn[1], Marta Monjardino[1]
[1]CSIRO Agriculture and Food, Adelaide, Australia. [2]Bangladesh Agricultural University, Mymensingh, Bangladesh

Paper Abstract:

Herbicide resistance (HR) is a significant factor contributing to the rising cost of weeds in Australian grain production, now exceeding $4 billion annually. In response, Australian growers have gradually adopted integrated weed management (IWM) practices, which include chemical and non-chemical methods to control resistant weed populations. However, a largely unexplored area in the socioeconomics of HR management is whether the "reactive" adoption of IWM in response to initial HR offers 'preventative', or at least delaying, effects on further forms of HR. Furthermore, most existing research primarily focuses on the epidemiology of HR evolution, often overlooking the relative impact of various other factors at different scales. In this study, we review examples where resistance development has been slower than what was initially expected and investigate the potential roles of agroecological, socioeconomic, and managerial factors, including IWM practices, in shaping the development and management of HR in Australian cropping regions.

We analyzed data from 602 broadacre grain growers across 13 agroecological zones (AEZs) in Australia to determine whether the initial reactive adoption of IWM is associated with lower rates of resistance development to additional herbicides and in other weed species at the farm level. Data were analysed using different econometric models, including ordered logit models capturing the diversity of practice use (including harvest weed seed control, HWSC) and ordinary least squares (OLS) representing treatment intensity across cropped areas. We then conducted a regional-scale analysis of factors influencing HR

development. For this, we used national HR testing datasets alongside a range of potential predictors, including national climate (temperature and rainfall) and soil data, and farm survey datasets related to farm characteristics, farm technology adoption, and cost of weeds survey associated with IWM practices information. We used the Least Absolute Shrinkage and Selection Operator (LASSO) technique to identify 18 key variables associated with HR status, followed by a machine learning-based Bayesian linear regression to explore regional factors.

We found that the presence of HR was significantly correlated with cropping scale, years of zero-tillage, pre- and post-emergence herbicide application, IWM adoption, and use of advisory support, indicating that while some associated factors may likely be causal (e.g. years of zero-tillage), others are not (e.g. IWM adoption). IWM adoption, including HWSC, was higher in western and southern regions of Australia, likely due to its relatively high effectiveness on major weeds, including annual ryegrass and wild radish. The presence of HR was found to be associated with the use of more diverse IWM practices that could limit further resistance. There was no evidence linking IWM adoption with reduced herbicide use, although herbicide use data was very limited. These findings, together with results from regional-scale analysis of glyphosate resistance, build on the capacity to pre-emptively identify sustainable weed management scenarios in various regional farming system contexts, including where earlier 'reactive' adoption of resistance management practices may now be offering 'pro-active' benefits.

Can cropping systems in the Northern Grains Region maintain sustainability

James Hagan
DAF, Toowoomba, Australia

Paper Abstract:

The Northern Farming Systems project (NFS) started in 2015 with long-term experiments at established at seven locations to examine farming systems performance and identify opportunities for improvement. These sites comprised a core experimental site comparing 38 farming systems at Pampas near Toowoomba, and a further six regional sites that included 6–9 locally relevant farming systems at Emerald, Billa Billa and Mungindi in Queensland and Narrabri, Spring Ridge and Trangie in NSW.

The farming system treatments at these sites are modelled on a "baseline" system which represents a typical rotation for the local area, with additional treatments included as modifications which test the ability of these systems to adapt to different scenarios. These modifications include, changes in cropping intensity, greater crop diversity to reduce disease burden, higher nutrition, and a no herbicide treatment.

Each of the modifications provides us with some guidance as to the economic sustainability of northern cropping systems in the face of current and future challenges:

- declining soil fertility
- loss of major herbicide options
- changing rainfall patterns
- net-zero and carbon accounting.

Whilst the farming systems experiments have provided guidance on many of these questions, it has also raised several new ones:

- Are low intensity systems actually less risky?
- How can we build or maintain soil nutrition levels in a run of good seasons?
- How have increased input costs affected systems performance?

These long-term experiments are also complemented by APSIM (Agricultural Production Systems sIMulator) modelling, which allows further desktop evaluation, and has been used to retroactively phase the experiment to understand its impacts at a farm scale.

In summary the NFS project has provided insights into the long term economic and environmental sustainability of cropping systems in the Northern Grains Region, whilst addressing critical challenges.

Barriers and Drivers Influencing Intentions to Adopt Traceability Systems for Grains' Sustainability Credentials in Western Australia.

Emanuel Gomez[1], Michael Burton[1], Ross Kingwell[2], Amin Mugera[1]
[1]The University of Western Australia, Perth, Australia. [2]Department of Primary Industries and Regional Development, Perth, Australia

Paper Abstract:

The increasing demand for sustainability data in agricultural supply chains has amplified the necessity for enhanced responsibility and transparency among supply chain stakeholders. Consequently, traceability systems (TS) have regained prominence as a viable solution for reporting on Environmental, Social, and Governance (ESG) metrics, which are of growing importance. For major agricultural exporters like Australia, failing to meet these market expectations could result in losing access to lucrative markets. Therefore, this study examines the perceptions, attitudes, and intentions of Western Australian grain growers regarding the adoption of information technologies, such as TS, to document the sustainability credentials associated with grain production. To achieve this, a survey was conducted targeting 82 grain growers across the WA Wheatbelt from July 2023 to April 2024. The questionnaire delved into seven crucial dimensions essential to the adoption of TS, informed by the Unified Theory of Acceptance and Use of Technology (UTAUT). These dimensions encompassed perceived performance benefits, adoption efforts, data security risks, social influences, facilitating conditions, environmental attitudes, and sustainability-oriented innovativeness. Exploratory factor analysis was employed to identify the key influencing factors, followed by presenting participants with eight alternative scenarios reflecting varying levels of enforcement and clarity in the value proposition of TS. The identified factors were then analysed in relation to respondents' intentions to assess their impact on different adoption stances. The findings from the factor analysis revealed that perceptions about adopting TS were strongly influenced by the perceived marketing advantages, both for the broader WA grain industry and for individual farm businesses, alongside positive perceptions regarding consumer preference for enhanced sustainability credentials. Conversely, high effort expectancy and data security concerns emerged as significant barriers to adoption. Notably, 66% of respondents showed a positive willingness to adopt TS if it became mandatory in conventional marketing channels, with this figure increasing to 85% if price premiums were

provided. However, in scenarios without direct perceived benefits, the likelihood of voluntary adoption remained low. Importantly, none of the respondents expressed an outright refusal to adopt TS. The study offers actionable insights for policymakers and industry stakeholders seeking to promote TS adoption, particularly if such adoption could result in economic benefits for the WA grain industry. Identifying clear value propositions early, addressing data security concerns, and leveraging trusted industry bodies for effective information dissemination will be crucial for promoting widespread initial adoption. Future efforts should focus on targeted communication and support mechanisms to minimise the risk of creating a digital divide among growers, thereby encouraging adoption across farmers of varying scales and degrees of technological familiarity. Such an approach would help expedite the widespread adoption of TS. While this study represents a preliminary exploration into a topic of growing interest with significant implications for the long-term competitiveness of the Australian grain industry, the findings should be generalised to other cropping regions in Australia with caution, given the unique characteristics of Western Australia's export-oriented grain supply chains.

Parallel 5F - Ecosystem Accounting

Location Chancellor 6, LVL 0

Time: 08:30 - 10:10

Chair: John Kandulu

Natural Capital Project: Quantifying the benefits of nature-positive on-farm projects

David Waters, Nick Marsh, Rob Ellis, Linsday Bradford, Thomas Maalem, Tory Grice, Nyssa Henry
Truii Pt Ltd, West End, Brisbane, Australia

Paper Abstract:

There is a push for land stewardship to incorporate environmental, social, and governance (ESG) accountability in line with Global reporting frameworks. Project aggregators/developers and landholders need to be able to capture individual site-based projects and quantify the benefits at that scale to encourage investors. The current ad-hoc approach to project oversight often results in large transaction costs, thereby reducing the money available for on-ground investment, which is less appealing to investors.

Natural Capital Project (https://naturalcapitalsuite.au/project), quantifies the current condition and the benefits of potential on-farm projects, for a range of indicators with Environmental, Social, Governance and Productivity Impact scores consistently assessed.

One of the major challenges in designing Natural Capital Project has been aligning outputs across a range of alternative reporting and governance frameworks such as the United Nations Sustainable Development Goals (SDGs), Taskforce for Nature Related Financial Disclosures (TNFD), and the Kunming-Montreal Global Biodiversity Framework Targets.

Natural Capital Project will have national coverage, with a growing range of project types to be offered over time. The initial project type focus is for land restoration work such as revegetation or changes to grazing management practices.

Natural Capital Project streamlines investment thus reducing the transaction costs and enables users to undertake simple and repeatable ESG reporting against international frameworks. The outputs will also enable users to easily incorporate projects into environmental crediting schemes where relevant.

Assessment of options for monetising fisheries ecosystem services from multispecies fisheries in ecosystem accounts

Sean Pascoe, Gabriela Scheufele
CSIRO Environment, Brisbane, Australia

Paper Abstract:

Central to the SEEA-EA (System of Environmental Economic Accounts – Ecosystem Accounts) is the concept of an exchange price, which measures the value of the ecosystem contribution (i.e., the ecosystem service) to the associated economic activity. SEEA-EA proposes a number of approaches for deriving appropriate exchange prices to value these services. These approaches, however, have largely been developed with a terrestrial focus, and their application to the marine environment has been limited. Of interest in this study is the attribution of the value of ecosystem services, in particular fisheries biomass provisioning services, to individual ecosystem functional groups impacting Australian fisheries. Many fisheries, however, straddle several ecosystems, and in the case of multispecies fisheries, the combination of species may change across these different ecosystems. While the ecosystem service in quantity terms (i.e., the retained harvest) can often be assigned to the different ecosystems, identifying the contribution of the ecosystem to the value of this catch is more complex. If a well-established quota market existed, quota leasing price may provide an appropriate exchange price. However, in many fisheries the quota market does not exist, or is not well functioning due to factors such as a small number of buyers and sellers and high transactions costs. In such cases, "resource rent" based methods are proposed by SEEA-EA to estimate exchange values. However, any resource rent generated is often derived only at the level of the sector, so allocating these rents to individual species in a multispecies fishery is not straightforward. In this study, we consider a number of different approaches that might be used to estimate exchange prices for individual species, allowing the value of biomass provisioning services produced in different ecosystems to be estimated. We use an Australian multispecies fishery as a case study, and assess the implications of the different assumptions on the resultant distribution of ecosystem service value across a range of ecosystems that provide these services.

Using ocean accounts to corroborate corporate reporting on sustainability performance and build trust among communities and investors

Syezlin Hasan, James Smart, Harte Jeremy, Buckwell Andrew, Christopher Fleming, Alana Knight
Griffith University, Brisbane, Australia

Paper Abstract:

Blue economy development and expansion generates beneficial outcomes for the economy. However, ocean resources and ecosystem space need to be responsibly managed and monitored by all actors to ensure sustainability of the ocean economy and protection of our global commons. While ocean accounts are increasingly being compiled to augment existing national accounts to support policies relating to

ocean development, parallel developments in corporate environmental management, science-based target setting, and sustainability reporting and disclosures present new opportunities for businesses to leverage information contained in ocean accounts. Building on this corporate sustainability momentum and using southeast Tasmania, Australia, as a case study, this study highlights synergies between ocean accounting and corporate climate- and nature-related disclosures aligned with the Task Force on Climate-related Financial Disclosure (TCFD) and the Taskforce on Nature-related Financial Disclosures (TNFD), and shows how these synergies can help normalise and expedite corporate reporting and disclosures of financially and environmentally material information. We argue that focusing on double materiality (i.e. financial and environmental) and proactively engaging with sustainability initiatives such as TCFD and TNFD can help blue economy businesses build trust among communities, investors and other stakeholders, and better position businesses to respond to changing societal expectations. Challenges in navigating the complexity inherent in coastal and ocean data are explored, including difficulties in attributing ecosystem change to exerted pressures and their management in the presence of cumulative impacts. Resolving these challenges and complexities will likely require private, public and third sector partnerships in data sharing to provide robust and consistent underpinning for ocean governance and corporate reporting and disclosures. An agenda for further research in sustainable blue economy development is proposed. This study is funded by Blue Economy Cooperative Research Centre (Project 5.21.001).

Conducting an Industry Scale Natural Capital Assessment and Valuation of Australian Cotton

Campbell Jones
Queensland Department of Agriculture and Fisheries, Brisbane, Australia

Paper Abstract:

As financial institutions, supply chains and governments attempt to meet *their* challenges of transitioning to a sustainable future, the need for industry and macro scale natural capital assessments has emerged as a priority for agricultural industries. For governments and peak organisations, such assessments provide additional metrics to inform decision making. For the supply chains and investors, this data can strengthen Australian agriculture's reputation as a sustainable choice. For growers these assessments can provide a basis for engaging deeply with farm scale natural capital accounting.

To capture these benefits a pilot study has been conducted in collaboration with the Australian cotton industry to assess and value the industries' natural capital impacts and dependencies, establish a framework for voluntarily industry scale natural capital reporting and, identify data gaps and barriers to conducting such an assessment. In quantify the cotton industry's relationship to water, native vegetation, soil and human capital findings have been made across the themes of data and valuation for macro scale sustainability reporting.

Conducting a natural capital assessment and appraising the value of the impacts and dependencies on a macro scale remains a significant challenge due to data gaps, assumption requirements and varying approaches to valuation of natural capital all constituting significant and interrelated challenges.

Data: This project sought to use publicly available data to populate impact and dependency metrics as defined by various sustainability reporting standards. It is evident that because data is collected for different reasons, under different methodologies and from different perspectives, a consistent easily repeatable and transferable approach is difficult to achieve. Misaligned databases and metrics, outdated data, spatially limited data, data access and usability, normalization and aggregation remain a significant barrier in conducting macro natural capital assessments. It is the recommendation of this paper that universal datasets be constructed that estimates the extent of key on-farm natural capital data, specifically water availability and use, and on farm native vegetation extent.

Valuation: In valuing natural capital impacts and dependency monetary valuation is used to assess how costs and benefits are distributed among different stakeholders given an incremental change in natural capital metrics. When a market price does not exist, valuation of natural capital is highly dependent on the perspective taken, regional variance and valuation methodology which makes it potentially unsuitable for the purposes of consistent sustainability reporting. This paper advocates for the use of market prices in valuing natural capital for industry wide reporting while noting that progress in establishing a knowledge base on the productive benefit of natural capital to farm financial performance through farm scale trials will be invaluable to the creation of future natural capital assessments.

Baselining with the best available data has provided relevant insights and foundations for future reporting however further development of the data infrastructure through the process of data modernisation and increased understanding as to the ways in which natural capital provide value to the industry whether through market access, environmental markets, institutional investment and benefits to production is required to enhance future assessments.

Codesigning SEEA EA accounts with the Traditional Owners of a wetland in north Queensland

Diane Jarvis, Silva Larson
James Cook University, Cairns, Australia

Paper Abstract:

United Nations System of Environmental-Economic Accounting Ecosystem Accounts (SEEA EA) is a comprehensive framework that enables the organisation of data about habitats and landscapes, measuring ecosystem services, tracking changes in ecosystem extent and condition, valuing ecosystem services and assets, and linking this information to measures of economic and human activity. If updated over time, the SEEA EA can provide a time series of information on environmental change and how this impacts the flow of services. Longitudinal monitoring can also be used to evaluate benefits or otherwise of ecosystem interventions.

Whilst briefly mentioning the Indigenous knowledge and perspectives, the SEEA EA documentation provides no specific guidance on how these may be included within the SEEA EA accounts. Despite global recognition of the need to protect and preserve traditional knowledge, the extent and significance of First Nations Peoples values is not well understood, and is poorly considered in environmental management

and planning. Failure to reflect this knowledge and perspectives results in accounts that are not representative or inclusive of First Nations communities values and connections to Country, diminishing the usefulness of the accounts for decision making by the First Nations groups and also diminishing the contribution the accounts can make to properly inform environmental and social policy. Including First Nations Peoples values in the SEEA EA may be one way to better ensure that values of the traditional owners are reflected in government management and planning frameworks and that these frameworks are useful for traditional land and sea owners.

In Australia, more than 87 million of hectares of land and 5 million hectares of sea are managed by Traditional Owners of land and sea under Indigenous Protected Areas (IPAs) arrangements, promoted as means for supporting First Nations peoples to care for their Country. However, IPAs represent 50 per cent of the Australia's National Reserve System, under which 22 per cent of land in Australia is protected. Thus, it can also be argued that IPAs are means for Australian government to meet its international environmental obligations, such as Kunming-Montreal Global Biodiversity Framework of protecting at least 30 per cent of lands and oceans by 2030. Thus, the role that the land and sea under First Nations Peoples care plays in achieving Australia's international obligations should not be underestimated.

In this paper we explore how First Nations Peoples knowledges can be reflected within Ecosystem Accounts prepared following the SEEA EA requirements. We present our approach for elicitation, measuring and monitoring of the ecosystem services (flows accounts) for a wetland in north Queensland owned and managed by a First Nations group. Values and benefit flows are elicited from the traditional knowledge base, rather than determined by external 'experts'. We discuss the relevance of this approach for use in other ecosystems, for policy development, and for a range of management interventions including but not limited to Nature Repair Markets, Blue Carbon Credits, and other environmental markets.

Learnings for environmental accounting from small-scale seagrass restoration in Port Gawler: a tiered SEEA framework

John Kandulu, Sarah Wheeler
Flinders University, Adelaide, Australia

Paper Abstract:

Environmental and natural resource accounting is a crucial tool for aligning the financial interests of both private and public stakeholders with sustainable natural resource management. By systematically identifying, quantifying, and measuring the stocks, flows, and changes in natural resources caused by human activity, this approach provides a standardised framework for understanding and managing the economic value of our natural assets. The System of Environmental-Economic Accounting (SEEA) is a leading framework for environmental accounting that has gained global recognition. It is typically applied in regions with high levels of economic activity, where it is used to integrate environmental and economic data into national accounts, especially for large-scale terrestrial ecosystems. However, SEEA's application faces significant challenges, especially in marine and small-scale remote settings. Emerging interest in leveraging marine ecosystems as carbon sinks for climate change adaptation, through measures like seagrass restoration, highlights SEEA's limitations in capturing benefits in areas lacking developed markets

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(e.g., blue carbon) and with low economic activity stemming from remoteness and lack of development. This study draws on a case study of seagrass restoration at Port Gawler (South Australia) to explore shortfalls SEEA's capacity to inform public investment decisions. To address the challenges and limitations faced by similar sites and small-scale applications, particularly those with short timeframes and limited economic data, we propose a tiered SEEA framework. We believe this framework will make SEEA more adaptable to remote and coastal areas and provide valuable guidance for future applications.

Parallel 5G - Agricultural Finance

Location Chancellor 3/4, LVL 0

Time: 08:30 - 10:10

Chair: Derek Baker

A Study of Digital Credit Adoption by Kenyan Smallholders

Hendrik Wever, Albert Nsengumuremyi, Vanessa Bonke, Marius Michels, Oliver Musshoff
Georg-August-University, Goettingen, Germany

Paper Abstract:

This study investigates the adoption of digital credit among Kenyan smallholders using the Unified Theory of Acceptance and Use of Technology (UTAUT) framework that includes Perceived Trust. Using data analyzed from 676 farmers through Partial Least Squares Structural Equation Modeling (PLS-SEM) in 2023, we found Performance Expectancy, Perceived Trust and Facilitating Conditions to be the statistically significant predictors of Behavioral Intention, while Effort Expectancy and Social Influence had no statistically significant influence. Logistic regression confirmed the strong predictive role of Behavioral Intention in actual digital credit adoption. This study contributes to our understanding of digital credit adoption among smallholder farmers by highlighting the critical roles of latent factors in the adoption process. Among others, the results highlight the importance of Performance Expectancy and Perceived Trust in the uptake of digital credit and suggest that service providers focus on these aspects to enhance adoption rates among smallholder farmers. This paper provides a foundation for developing more effective strategies to promote digital financial inclusion in agriculture, potentially contributing to broader economic development and poverty reduction efforts in rural areas. As Kenya is one of the leaders in digital financial services (DFS) in Africa, these findings are relevant for other countries and provide insights into the role of digital finance in rural economic transformation.

Impact of access to credit on mechanization service expenditure: An analysis considering formal and informal credit

Xiance Sang[1], Wanglin Ma[2]
[1]Huazhong Agricultural University, Wuhan, China. [2]Lincoln University, Christchurch, New Zealand

Paper Abstract:

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This study estimates the effects of access to credit on mechanization service expenditure, utilizing the 2020 China Rural Revitalization Survey data. We distinguish between formal and informal credit access and employ a conditional mixed process (CMP) model to address selection bias issues. The results reveal that access to credit significantly increases mechanization service expenditure by 41.4 yuan/mu, and the impact is larger on farmers cultivating small-sized farms and those residing in the less developed western region. Access to formal and informal credit affects mechanization service expenditure differently. Specifically, accessing credit from formal sources (e.g., banks) significantly increases mechanization service expenditure by 34.9 yuan/mu. However, accessing credit from informal sources (e.g., friends and relatives) significantly decreases mechanization service expenditure by 5.8 yuan/mu. These results are further verified by estimating the effects of loan amounts on mechanization service expenditure. Our findings highlight the importance of improving farmers' access to formal credit in promoting farm investment, which eventually increases crop yields and farm revenue.

Sugar Shock: SSB Tax Adoption, Culture and Health

Akwasi Ampofo
University of Adelaide, Adelaide, Australia

Paper Abstract:

To curb rising health risks from increased sugar-sweetened beverage (SSB) consumption, health groups and policymakers are advocating for fiscal measures to control sugar intake. Allcott et al. (2019) and others have shown that SSB tax policies reduce purchase of sugary drinks for mostly high income earners in the United States. However, little is known about the effectiveness of SSB taxes in Africa and Asia, and importantly, on the health of individuals in these countries. We fill this gap by examining the effectiveness of SSB tax adoption for countries in Africa and Asia, two continents with different attitudes to the intake of sugary foods. Specifically, we compare adopting and non-adopting countries of SSB taxes across countries in Africa and similarly for those in Asia. Using micro-level data and a difference-in-differences identification strategy, we show that residents in SSB tax adopting African countries see a 2% reduction in their BMI, and have lower likelihood of the population being obese by 0.032 percentage points. We, however, find the tax to be effective for high income individuals in these countries but regressive for low income individuals. For Asian countries, we find increased BMI and higher likelihood of the population being obese for adopting countries. These findings are robust to underlying assumptions and alternative definitions within the difference-in-differences technique. The striking differences among countries reflect the varying attitude to the consumption of sugary products; a must have in all-year-round religious festivities in Asia relative to occasional consumption in Africa.

Impact of Access to Credit on Farm Investments: An Analysis Accounting for Adequate and Inadequate Credit

Hepei Zhang[1], Wanglin Ma[2]
[1]Huazhong Agricultural University, Wuhan, New Zealand. [2]Lincoln University, Christchurch, New Zealand

Paper Abstract:

Although credit is critical to improving farm performance, not all credit-constrained farming households can get credit or the required amount due to higher transaction costs associated with credit market access and imperfect information. This study investigates whether farmers with and without credit access and those with and without adequate credit access behave differently in farm investments. We distinguish between chemical input investments (i.e. chemical fertilizers and pesticides) and environmentally friendly ones (i.e. green pest management and organic fertilizers). We utilize the inverse probability-weighted regression adjustment estimator and multivalued treatment effects model to mitigate the selection bias and estimate first-hand data collected from 946 citrus farmers in China. The results show that access to credit significantly increases farmers' expenditures on chemical pesticides and green pest management by 12.1% and 47.7%, respectively. However, farmers with and without access to adequate credit appear to differ in farm investments. Specifically, farmers accessing adequate credit spend 19.2% more on chemical pesticides and 42.1% more on green pest management than their counterparts without credit access, and they also spend 47.9% more on chemical pesticides than those accessing inadequate credit. Farmers receiving inadequate credit spend 62.6% more on green pest management but 19.4% less on chemical pesticides than those without credit access. Access to credit, regardless of adequate or inadequate credit, does not significantly affect chemical and organic fertilizer investments.

Examining the Usage Metrics and Determinants of Digital Financial Service Adoption Among Rural Cambodian Farmers

Panharoth Chhay, Alexandra Peralta, Rida Akzar
The University of Adelaide, Adelaide, Australia

Paper Abstract:

Digital financial services (DFS) have been widely promoted and are deemed widely adopted in the developing world. DFS are expected to reduce transaction costs, address issues of information asymmetry, and improve efficiency in rural financial markets. However, their adoption remains low, particularly in rural areas. The most studied type of DFS is mobile money, while other forms of DFS have been less explored, despite the rapidly changing DFS landscape in developing nations. Moreover, there is limited understanding of DFS usage among rural households, especially regarding the differences between women and men.

Several studies have found that the use of DFS, specifically mobile money, contribute to economic growth, improved market access, reduced transaction costs, and better resource allocation in rural financial markets. However, these services have been criticised for being ill designed to meet the needs of farming households and for their limited impacts beyond facilitating remittances. DFS are relatively new, with mobile money becoming available to rural populations after 2007. Much remains to be learned about the adoption and use of DFS, especially in agriculture.

In this paper, we explore the determinants of DFS adoption and non-adoption among women and men in farming households, considering institutional and socio-economic factors as well as the availability of

infrastructure. We define DFS as financial services delivered through digital technologies, primarily mobile phones. DFS encompass various financial services accessible via digital platforms, including mobile finance, mobile money, savings, credit, insurance, and accounts held through digital apps, which may or may not be linked to traditional financial institutions such as banks, credit unions, or microfinance organizations.

We conducted our research in Cambodia, which has experienced rapid economic growth and increased internet penetration. We utilized a comprehensive dataset on the use of DFS among 1,000 households in three provinces: Battambang, Kampong Cham, and Kandal. These provinces are characterised by high levels of agricultural commercialisation, access to export markets, proximity to main urban centres, and availability of infrastructure that facilitates access to DFS. Key variables measured include access to and usage of DFS, usage frequency, digital literacy levels, and trust in digital systems. For those not using DFS, the survey explores the reasons behind their non-adoption. Additionally, we analyse socio-demographic factors such as age, gender, income, occupation, education, migration patterns, and geographical location to assess their influence on DFS adoption. We also take into consideration transaction costs and relationships with buyers to better understand the context in which DFS operates. Our analysis is conducted at the household level, with a focus on examining the differences between women and men in farming households.

The findings from this research are expected to deepen our understanding of the usage metrics and the factors influencing the adoption and non-adoption of DFS by women and men in farming households in Cambodia. Additionally, the study will shed light on the barriers and potential benefits of DFS as mechanisms to enhance financial inclusion and improve the performance of rural financial markets in developing countries.

LUXURY BRANDS' PROFITS AS SOURCES OF INVESTMENT IN PUBLIC GOODS: THE CASE OF RANGELANDS

Derek Baker
University of New England, Armidale, Australia

Paper Abstract:

Natural resources and assets generate multiple services which enable agrifood and fibre production and the transmission of value through to consumers. Some of the emerging products are differentiated in pursuit of luxury status, and are manifest as high profile brands which feature extremely high markups along the value chain. Meanwhile natural resources such as soil, water, biodiversity and skill sets which are essential in securing future production are being degraded. This paper examines the scope for profits from luxury brands to be directed to regeneration of such natural assets. A landscape scale is employed, and rangelands are addressed as an example.

Investment in value chains' structure and function is a well established – indeed dominant – approach to pro-poor development. There is widespread awareness of environmental and social impacts of value chain-based development, and a rich research literature on various forms and pathways of interaction amongst pro-poor development and other goals. Landscape level modelling and rapidly expanding remote

sensing capabilities have supported these analyses. The current paper is a response to the urgency of agricultural resource degradation, and the desirability of securing these resources' benefits for future generations: in development as well as in the regeneration of the resources. The regeneration of rangelands is addressed, particularly as the enabler of grazing systems which supply luxury products to distant high value markets.

The juxtaposition of luxury and development is well argued by scholars along several lines of causality and ethics which variously conclude inevitability, dependence on management skill, and irrelevance. Similarly, so-called sustainable development has been examined through the lens of production level penury as a price paid for consumer excess. The current paper focuses on the production and marketing systems which deliver luxury products from the rangelands, and the institutional mechanisms – such as brands – which maintain them. Numerous examples are available of brands' owners' investment in natural assets which are not directly associated with the value chain: LVMH's role in saving the vicuna species is one. Many other investments in resources are value chain oriented: such as the facilitation of traceability. In any case, the abovementioned magnitudes of margins derived from luxury products makes them an appealing source of investment, but the mechanisms that would enable such investment on a large scale remain unknown.

In the current paper, a model of investment incentives for rangelands restoration is presented, along with enabling features of specific supply chains. Connections between value chain performance, brand implementation and rangeland productivity are drawn and discussed, and certain disconnections recognised previously are re-examined. Commercial and policy implications are discussed, with reference to specialised past actions by multinational actors such as the UN Convention to Combat Desertification; broad based actions such as the utilisation of rangelands in Carbon sequestration; and global initiatives such as the International Year of Rangelands and Pastoralists in 2026.

Keynote 7: Prof. Nick Hanley: Markets for biodiversity credits

Location Main Room 1 (ROMA), LVL1

Time: 10:40 - 12:20

Chair: Gabriela Scheufele

Special Session 9A – (RECOE sponsored): The resilient farm: lessons learned from southern Queensland

Location Main Room 1 (ROMA), LVL1

Time: 13:20 - 15:00

Chair: Ben Lyons

Over the past 4 years, the Institute for Resilient Regions (IRR) at the University of Southern Queensland – which includes: the Regional Economies Centre of Excellence team (RECoE-UNISQ) and the Southern Queensland/Northern NSW Drought Innovation Hub (SQNNSW) - have undertaken number of key projects focussed on the sustainability and resilience of agricultural enterprises in southern Queensland. In particular, these projects have examined resilience from various perspectives: drought and climate change; economic shocks; personal and social wellbeing; tools and skills to build resilience; policy and governance frameworks to support resilient agriculture and rural communities. This panel session would showcase some of those projects (many still ongoing) and highlight some of the key lessons learned – that together help build a profile of the "Resilient Farm" Format: a panel session – hosted by an MC/Facilitator, with short presentations followed by Q&A .

Special Session 9B - On the economics of pathways to sustainable agricultural and land systems.

Location Main Room 2 (TERRACE), LVL1

Time: 13:20 - 15:00

Chair: Annette Cowie

This session explores innovative approaches to reducing emissions in Australian agriculture and bioenergy production.

It focuses on exploring how technology, policy and environmental dynamics interact and influence long-term sustainability outcomes.

The presentations will provide a multidisciplinary perspective on how Australian agriculture can adapt to meet climate targets, examining both current practices and future opportunities for sustainable growth.

Session program:

13:20   Annette Cowie (NSW DPIRD) (Chair): Introduction
13:35   Aaron Simmons (NSW DPIRD): Agricultural Management Practices for Climate Change Adaptation.
13:50   Mengyu Li (Uni. of Sydney): Integrated Assessment Modelling (IAM) of climate mitigation scenarios for Australia with a focus on energy and emissions trends.
14:05   Adam Charette-Castonguay (CSIRO): Agricultural system implications of Australia's Sustainable Aviation Fuel Roadmap.
14:20   Yuyao Zhu (IIASA): Potential yield impacts on major crops in Australia using global mainstream crop models under different scenarios.
14:35   Trang Tran (CSIRO): Assessing domestic to global multi-sector impacts of land-based emission reduction policies.
14:50   All speakers: Q&A
15:00   Close

Parallel 6A - Valuation 2

Location Main Room 3 (WICKHAM), LVL 1

Time: 13:20 - 15:00

Chair: Bethany Cooper

Exploring preferences of Australian and Chinese tourists towards behavioural restrictions: A Discrete Choice Experiment in Fiji

Yanyan Dong, Burton Michael, Abbie Rogers
University of Western Australia, PERTH, Australia

Keywords: 14. Environmental Economics; 29. Valuation

Paper Abstract:

In order to conserve ecological and economic values attached to coral reefs in Pacific islands, restrictions on activities such as snorkelling, diving and swimming have been proposed. These restrictions, if implemented, would have impacts on tourists in the short term (through constraining their activities) and the long term (through conserving coral reefs for future tourism). Understanding how tourists view these short- and long-term impacts may be helpful in formulating policies that appropriately balance these impacts. However, there has been limited research on these issues in the Pacific. This study explores Australian and Chinese tourists' preferences for restrictions on marine-based activities in Fiji. The preferences of Australian and Chinese tourists are particularly relevant because Australia has a strong tradition of outdoor and nature-based activities and is a large contributor to Pacific tourism, while China represents one of the fastest-growing sources of international tourists with increasing interest in marine and coastal destinations. A discrete choice experiment (DCE) approach is used to quantify how much Australian and Chinese tourists would be impacted by different restrictions on the characteristics of a marine tourism trip (snorkelling). The behaviours considered include restricting the use or type of sunscreen, use of underwater cameras with/without a flash, the distance to which marine animals can be approached and the numbers of boats/tourists in an area. Overall, we find significant heterogeneity in preferences; although, on average, people approve these restrictions, there are significant segments who do not. We identify that Australian and Chinese tourists have different preferences for behavioural restrictions. For example, Australian tourists are less favourable about restrictions on sunscreen while Chinese tourists are more likely to oppose restrictions on the use of underwater cameras. Our results indicate that some restrictions that would improve the condition of the marine environment in Fiji are likely to be feasible. The broader applicability of the results to other Pacific islands needs further investigation.

The Health and Socio-Economic Value of National Park Visitation in South Australia

Agamoni Majumder, Patrick O'Connor, Adam Loch, Akwasi Ampofo
University of Adelaide, Adelaide, Australia

Paper Abstract:

National parks provide many health benefits that enhance both physical and mental well-being for visitors, adding to their primary function as reserves for biodiversity conservation. This study utilizes an annual recall survey conducted between 2020 and 2023 to assess benefits from the South Australian population's visitation to national parks. The study examines the relationship between park visitation and the health outcomes of park visitors, based on self-reported visitation rates and health status. It also explores socio-economic disparities associated with access to parks. The relationship between health and frequency of visits to parks is bidirectional, with healthier individuals are more likely to visit parks and regular park visitation improving visitors' health. To address this reverse causality issue in the visitation survey data, an instrumental variable probit regression was employed. The results indicate that regular visits to parks enhance health, with each additional visit increasing the likelihood of reporting improved health by 0.32%. This measure can then be used to estimate the monetary value of the health gains associated with visitor frequency, park selection, and equity of access. In this context, "improved health" refers to individuals who rate their health as excellent or very good in association with park visits and other demographic data. While most people visit parks infrequently, more frequent visits significantly enhance the likelihood of experiencing greater health benefits. Individuals who visit parks more frequently tend to have higher incomes and belong to higher IRSD (Index of Relative Socio-economic Disadvantage) deciles, highlighting that income and social inequality impact access to parks and the subsequent distribution of health benefits from parks.

Heterogeneity of Value of Statistical Life from Biomass Smoke due to Sociodemographic Characteristics and Health Risk Attitude

Bassie Limenih
University of Tasmania, Hobart, Australia

Paper Abstract:

Air pollution, particularly from biomass smoke generated by landscape fires and domestic heaters is a significant global health concern, causing hundreds of thousands of deaths annually. In Tasmania, Australia, like many other parts of the world, air pollution is a significant issue. Despite this, limited information is available about the willingness to pay (WTP) to reduce smoke-induced health impacts. This study addresses this gap by estimating the Value of a Statistical Life (VSL) (people's willingness to reduce their risk of death from biomass smoke) and examining how sociodemographic and health risk attitudes shape these estimates. The study collected data from 732 individuals through a double-bounded dichotomous choice contingent valuation survey. The collected data were analysed using parametric and non-parametric techniques. The associated non-parametric (lower bound) estimate of VSL for death risk reduction from smoke emission was AUD 928,000, while the parametric estimation derived from a Seemingly Unrelated Bivariate Probit (SUBP) model was AUD 1.1 million. The study revealed that factors such as gender, use of wood-based heaters, negative health experiences related to smoke emission, and

education significantly influenced the WTP and VSL. We also found a U-shaped pattern in the VSL-age relationship, where the VSL reaches its minimum at the age of 51. In addition, risk averse individuals demonstrate lower VSL compared to risk seeking individuals, likely due to their existing investment in reducing health risks. The result of the study highlights the importance of incorporating sociodemographic and health risk attitudes when evaluating VSL from biomass smoke policies, providing valuable insights for Tasmanian policymakers and other regions facing similar challenges.

Public willingness to pay for tree planting on livestock farms in New Zealand

Maksym Polyakov[1], David Worden[1], Dan Richards[2], Michael Burton[3]
[1]Manaaki Whenua – Landcare Research, Auckland, New Zealand. [2]Manaaki Whenua – Landcare Research, Lincoln, New Zealand. [3]UWA, Perth, Australia

Paper Abstract:

Trees play a crucial role in carbon capture, biodiversity support, soil erosion prevention, water quality improvement, and enhancing the aesthetic and livability of landscapes. In New Zealand, where forests once dominated, only 38% of the land remains forested due to widespread agricultural and developmental clearing. Livestock farms, covering nearly 40% of the country's landscape, are vital to the economy; however, only about a quarter of these farms have more than 25% tree and shrub cover. Integrating tree planting with livestock grazing offers significant benefits, including increased carbon sequestration, habitat creation for native birds, reduced soil erosion, and enhanced sustainability without resorting to large-scale plantation forestry. Research shows that approximately half of livestock farmers are willing to plant trees if adequate support is provided. National and local governments are considering programs to assist farmers in this effort, with public input playing a critical role in shaping these initiatives. This study presents the findings of a nationwide choice experiment in New Zealand designed to estimate community values for different attributes of tree plantings on livestock farms. We used a mixed logit model in willingness-to-pay (WTP) space to estimate these values. The WTPs vary by species and planting type, showing diminishing marginal benefit. These findings will inform cost-benefit analyses and landscape-scale modelling of tree integration on farms, helping policymakers design effective incentive programs.

Tasting the difference: Using Anchored Best Worst Scaling in Non-Hypothetical taste tests to understand (un)acceptability of drinking water quality and inform investment choices

Bethany Cooper[1,2], Dan Rigby[3], Lin Crase[1], Kelly Newton[4], David Cook[4]
[1]University of South Australia, Adelaide, Australia. [2]Australian Research Council Industry Fellow, Canberra, Australia. [3]University of Manchester, Manchester, United Kingdom. [4]SA Water, Adelaide, Australia

Paper Abstract:

Australia's drinking water supplies vary in quality, reliability, and aesthetics, especially in regional communities. The prospect of more erratic supplies under a drying climate means water utilities are investigating upgrades to reduce the widening gap between regional and metropolitan water customers. Nonetheless, the cost of infrastructure upgrades needs to be balanced against delivering services that are acceptable and perceptible to the public. This is complicated by the limited information about the ability of customers to actually detect an improvement in the taste of their drinking water and what they would willingly accept as a water supply to their home. This has important economic implications, because expensive infrastructure projects might be undertaken with no obvious benefits to consumers.

The taste of water is driven by a range of considerations. In some regional areas, there is heavy reliance on groundwater and the intensity of total dissolved solids (TDS) in those supplies can influence its taste and acceptability. While these types of waters may be safe to drink, they can be perceived as aesthetically unpleasant for some customers who then opt for different water products or consume other fluids, sometimes with deleterious health outcomes. The same can occur with specific surface water supplies; e.g. where the presence of algae and the subsequent treatment leave unpleasant aesthetics for customers.

This paper presents the results of a study that empirically investigated when customers experienced a change in the taste of water and their willingness to accept that water as a drinking source. We describe the use of Anchored Best Worst Scaling using real consumption, rather than the usual hypothetical products or attributes. This approach has the attraction of being rooted in formal economic and statistical theory.

The project was developed as a proof-of-concept to establish a robust method for systematically testing consumer preferences for water among a sample with varying water consumption histories. The results support the view that: (a) customers can detect a change in taste when a paired comparison method is deployed (b) there are differences in the perceived taste of drinking water between regional and metropolitan water consumers and (c) it is possible to identify a threshold of acceptability for different customers. This is important information that can lead to more efficient investment upgrades and an approach for applying this information to costly decisions is explored.

The effect of choice experiment response format on attribute non-attendance

Curtis Rollins, Michael Burton
University of Western Australia, Crawley, Australia

Paper Abstract:

Attribute non-attendance refers to a situation where survey respondents appear to ignore one or more attributes when responding to choice tasks. Non-attendance implies a person gains no marginal utility from the attribute, and that their willingness-to-pay for it is zero. Attribute non-attendance can reflect true preferences in cases where respondents do not care about an attribute. However, it may may also

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indicate various forms of bias. For instance, attribute non-attendance may reflect decision-making heuristics or cognitive limitations.

The design of the experiment may also drive attribute non-attendance. For example, a binary choice task may mask the importance of different non-cost attributes if respondents tend to prefer the new alternatives over the status quo. Or, a respondent may consistently indicate that they prefer one alternative, but the intensity of their preference for that alternative is not captured. Presumably, as attributes change, their preference intensity may change, but this change is not captured by discrete responses collected by the researcher.

This study examines how different choice experiment formats cause attribute non-attendance. We collected survey responses from a national sample of approximately 3000 Australians. The survey sought to measure willingness-to-pay for pollutant reductions in the wastewater management process, such as microplastics or greenhouse gas emissions.

Respondents were randomly allocated to one of three different survey treatments, in which the design of the choice tasks were different. The first treatment was a binary choice task, in which respondents were asked to select between the status quo and a new state of the world. The second treatment involved three choice alternatives: the status quo, and two new states of the world. The third treatment modified the binary choice task, where respondents were asked to rate the extent to which they preferred an alternative using a 7-point scale.

Attribute non-attendance will be compared between the three treatments. Responses will be analysed using equality-constrained latent-class (ECLC) models to infer patterns of non-attendance. In the ECLC models, different classes of respondents will have different combinations of attribute parameters constrained to zero. Stated levels of attribute non-attendance will also be compared between the three treatments.

Parallel 6B - Consumer choice

Location Main Room 4 (LEICHARDT) , LVL 1

Time: 13:20 - 15:00

Chair: Jing Zhang

How Muslim Consumers React When They Are in the Desert of Halal-Labeled Food Market: Insights from the Theory of Planned Behavior

Anang Nur Ardiyanto, Shang-Ho Yang
National Chung Hsing University, Taichung, Taiwan

Keywords: 1. Agribusiness; 9. Consumer Choice

Paper Abstract:

The global halal industry has seen remarkable growth in recent years, driven by the expanding Muslim population and increasing demand for halal products in non-Muslim regions such as Europe, North America, and Taiwan. This surge presents both opportunities and challenges for businesses in the halal food sector, particularly in non-Muslim-majority markets where the availability of halal-labeled products is scarce, posing unique barriers to Muslim consumers. Understanding how Muslim consumers navigate these challenges is essential for businesses seeking to meet their needs and develop effective strategies in such contexts.

This study applies the Theory of Planned Behavior (TPB) to explore how Muslim consumers respond to limited halal options, using Attitude (ATT), Subjective Norm (SN), and Perceived Behavioral Control (PBC) as the primary predictors of behavioral intention (I), Data were collected through online surveys from 342 Muslim consumers residing in Taiwan and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM), employing SmartPLS version 4. The findings confirm that Attitude (ATT) plays a significant role in shaping both Religiosity (R) ($\beta = 0.600$, $p < 0.001$) and behavioral intention (I) ($\beta = 0.414$, $p < 0.001$). While Subjective Norm (SN) does not directly influence Religiosity (R), it has a marginally significant effect on behavioral intention (I) ($\beta = 0.136$, $p = 0.063$). Perceived Behavioral Control (PBC) significantly impacts behavioral intention (I) ($\beta = 0.106$, $p = 0.041$), and Religiosity (R) serves as a partial mediator between TPB constructs and behavioral intention (I) ($\beta = 0.115$, $p = 0.085$).

In the context of the halal food market in Taiwan, the study reveals that Attitude (ATT) is the strongest predictor of halal product purchase intention, followed by Perceived Behavioral Control (PBC) and Subjective Norm (SN). These findings hold significant implications for businesses aiming to capture the growing Muslim consumer segment in non-Muslim majority regions. By leveraging insights from the Theory of Planned Behavior and incorporating religious factors, companies can tailor their marketing strategies to effectively address the attitudes, perceived barriers, and religious sensitivities of Muslim consumers.

This research offers valuable contributions to both theory and practice, highlighting the importance of aligning business strategies with consumer preferences and religious standards in the dynamic halal food sector. As demand for halal products continues to rise globally, especially in non-Muslim markets, businesses that prioritize consumer behavior insights and comply with halal certification will be better positioned for sustained growth.

How Retailers Pass Cost-up on Prices? Sales Frequency as A Passing-on Strategy

Yusuke FUSHIKI, Tomoaki MURAKAMI, Nobuhiro ITO
Policy Research Institute, Ministry of Agriculture, Forestry, and Fisheries, Tokyo, Japan

Paper Abstract:

Worldwide shocks, such as the COVID-19 pandemic or the Russian invasion of Ukraine, have recently affected countries' food systems. Especially in Japan, where grains are mainly imported from other countries, the effects of the price soaring of grains and transportation costs are significant. However, it has not been revealed how retail prices of commodities would respond to such a cost shock and its economic implications. The situation is not so simple because sellers have some options for price passing. They can raise regular prices, increase sales prices where sales mean a temporal discounted-price selling, or reduce the frequency of sales. If their price-passing strategies have different consequences on economic welfare, it's important to investigate them under the increasing risks of geopolitical and climate issues.

Our study will answer the following research questions derived from observations of the analysis of the POS data of wheat flour sold in Japanese stores, from the theoretical point of view:

1. Why did stores react differently to cost-up regarding price passing?

2. What are the sources and welfare implications of such differences?

We first organize some facts on wheat flour prices in a specific region of Japan during soaring imported prices, as evidenced by the POS data. Subsequently, we construct a robust theoretical model that explains these facts and derives some implications about economic welfare.

We analyzed wheat flour's price data recorded by stores with location information from July 2021 to June 2023, 104 weeks, provided by Nikkei Press. To analyze the relationship between the competition environment and stores' pricing behavior, we focused on 82 stores from 7 prefectures suited for the purpose. The price data were arranged to weekly per kg prices weighted by stores and weeks. From the analysis, we found that, to cope with cost-up, (1) stores in urban areas raised both regular and sales prices, (2) stores in rural areas raised sales prices while keeping regular prices, and (3) stores in rural areas reduced the sales frequency.

To explain the facts above, we constructed a theoretical model of the store's pricing behavior. Considering the literature, we assumed that there are two types of consumers: Time-constrained and Cherry-pickers and they have a different kind of demand. Given the share of consumer type and the number of rival

stores in the same region, the store's decision variables are regular price, sales price, and sales frequency. In the symmetric equilibrium, the model captures the observed facts well.

Our theoretical model revealed that the competition environment induces different store responses to deal with marginal cost shocks. In rural areas where the competition is weak, the cost-up will cause stores to reduce sales frequency since the relative benefit of sales to regular selling will become low. Sales reduction would not affect cherry-pickers' surplus so much in our calculation. However, when the aggregate demand will be affected by cost-shocks, the damage on consumers' surplus is larger in rural area than in urban area.

Consumer preferences for sustainability-focused seafood attributes: A comparative study of Australia and its 11 key export countries

Peggy Schrobback
CSIRO, Brisbane, Australia

Paper Abstract:

Seafood consumers are increasingly becoming aware of products with sustainability-focused attributes, such as low greenhouse gas emissions, animal health/welfare, production methods that comply with regulations, and work conditions in the fishery/aquaculture sector. Such attributes are - to varying extent - already part of existing seafood sustainability standards, e.g., Marine Stewardship Council, Fiends of the Sea, Carbon Neutral. However, it is unclear, how consumers rank these attributes compared to conventional attributes such as price, product appearance, food safety and taste. There is also limited information available about how consumers' preferences vary across countries.

The aim of this study was to examine consumer preferences for key sustainability-focused and conventional seafood attributes across Australia and its top 11 seafood export markets.

The best-worst-scaling method was applied to an online survey design, which was conducted between December 2023-Feburary 2024 in Australia, China, Hong Kong, India, Indonesia, Japan, New Zealand, Singapore, South Korea, Taiwan, USA, and Vietnam.

The results suggest that safety and taste are by far the most important attributes for consumers across all 12 countries, followed by sustainability-focussed attributes such as seafood with healthy fish populations, compliance with regulations and limited pollution. Interestingly, social/ethical seafood attributes such as work conditions, animal health/welfare and community engagement ranked among the least important across all countries. A latent class analysis of the survey data identified four consumer segments across the 12 countries in relation to preferences for seafood attributes; these include the: 'sustainability-focused', 'indecisive', 'origin-focused', and 'traditional' consumers. The 'sustainability-focused' consumers had positive and relatively high mean scores for almost all sustainability attributes. The 'indecisive' consumers had mean scores close to zero for both sustainability-focused characteristics and conventional food attributes. The 'origin-focused' consumers reported high mean scores for country of origin, traceability, local produced and some sustainability attributes such as compliance with regulations, limited pollution, and healthy fish populations. Finally, the 'traditional' consumers displayed very high preferences for conventional seafood attributes such as price, taste and appearance and a very low

preference for all sustainability-focused attributes, except for healthy fish population. Socio-economic characteristics of the four consumer segments were derived, as well as the percentage of the four consumer segments in each country.

The findings from this study provide information for Australian seafood producers to better understand the current market for sustainability-focused seafood attributes as a foundation for targeted promotion of their seafood products to specific consumer groups and markets. The results can also be useful for wild-catch and aquaculture sectors as a baseline to refine their economic and social fishery management objectives.

Sweeping the canaries under the rug: Impediments to correcting for market failure to achieve sustainability.

Richard Reeve
Brisbane, Australia

Paper Abstract:

This paper investigates the psychological, political and communications barriers to achieving sustainability. Focusing on cognitive biases that impede progress in addressing market failures, it draws heavily from Daniel Kahneman's Nobel Prize winning behavioural economics work Thinking, Fast and Slow, highlighting biases that lead voters to resist policies that entail short-term costs for long-term environmental benefits.

As discussed by Sunstein and Thaler in Nudge, vested interests exploit these biases, fostering public reluctance toward sustainability through strategic misinformation. This tactic, also analyzed by O'Connor and Weatherall in The Misinformation Age, breeds skepticism about the requirement to act on sustainability. The current cost-of-living crisis exacerbates these biases, making voters more resistant to policies that would raise prices for environmentally harmful activities, such as Pigouvian taxes.

Drawing on Robert Greene's The Laws of Human Nature, the paper highlights how psychological motivations—like fear of loss, mistrust of authority, and preference for immediate gratification, lead to the perception that sustainability initiatives are overly costly or unnecessary. This phenomenon is further explored by George Marshall in Don't Even Think About It: Why Our Brains Are Wired to Ignore Climate Change, describing how voters are averse to policies that impose costs, particularly during economic hardship. Politicians, aware of these voter sensitivities, often shy away from confronting uncomfortable truths about the costs of correcting for market failure to achieve sustainability.

Milton Friedman's Tyranny of the Status Quo illustrates how entrenched interests and short-term political thinking hinder meaningful reform. Politicians tend to avoid unpopular decisions, such as those involving increased taxes or prices that are essential to achieve sustainability, creating a cycle of avoidance where both voters and politicians ignore the real costs associated with environmental degradation.

The analysis extends to the role of media in shaping public perception, often amplifying misinformation and creating a polarized discourse around sustainability. The challenge lies in bridging the gap between

the urgent need for policy change and the public's reluctance to accept difficult messages about environmental costs.

Cialdini's framework in Influence: The Psychology of Persuasion, shows that people default to relying on experts when they lack the ability or desire for controlled responding. However, in the context of sustainability, people often actively reject expert opinion, opting instead for emotionally comforting but factually inaccurate narratives. This resistance stems from the complexity of climate science, the discomfort of acknowledging the need for higher costs, and the influence of vested interests and media that exploit cognitive biases.

To address this challenge, it's essential to create communication strategies that make sustainability concepts accessible and emotionally resonant, while simultaneously rebuilding trust in scientific expertise. Only then can we hope to shift public opinion toward accepting the necessary policies for a sustainable future.

The dynamics of food purchases during the inflationary periods

Nobuhiro Ito, Tomoaki Murakami
Policy Research Institute, Ministry of Agriculture, Forestry and Fisheries, Tokyo, Japan

Paper Abstract:

Global economic challenges, such as the COVID-19 pandemic and international conflicts, have led to rising living costs, including food prices. Although there is a wide variety of food products available, purchasing decisions are shaped by multiple factors, including price and consumers' brand preferences. While prior studies have examined consumer adjustments during economic downturns, few focus on the dynamic shifts in specific food categories under inflationary pressure. This study investigates how consumers' purchasing behaviour for cooking oils in Japan evolved between June 2020 and December 2022, amidst a surge in prices. Understanding these shifts is critical for both retailers and policymakers aiming to adapt to inflationary trends.

This research uses monthly home-scan data from households in the Tokyo area, specifically targeting cooking oil purchases—an essential product with substantial price increases during the study period. The dataset includes purchases of various oils, such as rapeseed-based oils (e.g., canola oil), grapeseed, soy, corn, cottonseed, sunflower, and safflower oils, which are mainly used for stir-frying and frying. A Latent Markov Model is applied to identify distinct consumer segments and analyze the transition probabilities between these segments over time. The study focuses on four dependent variables: (1) price ranges, (2) oil types, (3) store formats, and (4) private vs. national brands.

The analysis reveals five distinct consumer segments. Segment 1 prefers low-priced private-label canola oil, while Segment 2 chooses for vegetable oils other than rapeseed-based oils purchased through online or speciality stores. Segment 3 favours premium-priced oils at online shop, whereas Segment 4 focuses on discount-store shopping for low- or mid-priced oils. Segment 5 is characterized by consumers loyal to low-priced national brand canola oils. Transition probabilities indicate stable preferences within these segments because about 90% consumers stay in the same segment. In particular, 99% for those preferring non-canola oils (Segment 2) stay at the same. However, partial consumers moved from national brand

loyalty (Segment 5) to private-label preferences (Segment 1), likely in response to rising oil prices. The proportion of Segment 1 consumers increased from 10% to 19% over the study period, while Segment 5 shrank from 46% to 32%. This trend highlights the increasing appeal of low-cost private-label oils for price-sensitive consumers, while preferences for specialty oils remain stable.

These findings suggest that inflation drives some consumers to modify their purchasing behavior, shifting toward more affordable options, while others, especially those in special vegetable oils, such as rice bran oil, segments, maintain stable shopping patterns. Retailers can use these insights to better tailor their pricing and product strategies in times of economic uncertainty.

Evolving consumer preferences for infant milk formula in China: from the 2008 melamine crisis to Covid-19 and beyond

Jing Zhang[1], Scott Waldron[1], Xiaoxia Dong[2]
[1]University of Queensland, Brisbane, Australia. [2]Chinese Academy of Agricultural Sciences, Beijing, China

Paper Abstract:

China, the largest consumer of infant milk formula (IMF), has seen shifting preferences over the past decade. Following the 2008 melamine crisis, trust in domestic IMF dropped, leading to a rise in imported products. However, recent trends have revived confidence in domestic brands. Our study, based on a choice experiment with Chinese parents, reveals that while quality and safety – such as functional ingredients, organic certification and traceability – remain priorities, there is growing trust in domestic IMF and a shift away from foreign premium products. Interestingly, food safety governance, ethnocentrism, and concerns about COVID-19 influence purchase decisions through perceived product quality and behavioral control. These findings have important implications for both domestic producers and international IMF markets.

Parallel 6C - Farm Management & Farmer Behaviour

Location Chancellor 1, LVL0

Time: 13:20 - 15:00

Chair: Md Monirul Islam

Assessing land utilization patterns and their impact on farm economy – a study in Eastern Gangetic Plains of India

Kalyan Kanti Das[1], Arunava Ghosh[1], Poushali Nag[2], Apurba Kumar Chowdhury[1], Ravi Nandi[3], Tamara Jackson[4]

[1]Uttar Banga Krishi Viswavidyalaya, Cooch Behar, India. [2]Seacom Skill University, Sriniketan, India. [3]International Maize and Wheat Improvement Centre (CIMMYT), Dhaka, Bangladesh. [4]The University of Adelaide, Adelaide, Australia

Paper Abstract:

Diversification is generally regarded as a risk management and coping strategy and a means of augmenting income. Farmers, whose primary source of income is crop cultivation, often resort to multiple cropping to achieve their goal. This study aims to understand the extent of crop diversification through a pilot study conducted in Eastern Gangetic Plains of the Indian sub-continent during the 2020-21 agricultural year. We calculated Simpson Diversification Index (SDI) from primary data to measure land utilization patterns in crop cultivation in an agricultural year. Our findings reveal that S.D.I to range from 0.53 to 0.89 in the study area with an average of 0.70, indicating a moderate level of diversification. The net value product of the crop output increases with a higher level of diversification, but up to a certain level only. Also, contrary to the general myth, allocation towards horticultural crops (such as vegetables, spices etc.) decreases with increases in crop diversification indices. Regression analysis identifies significant positive determinants like training exposure ($p<0.05$) and number of farm family adults ($p< 0.05$); and negative factors like distance of crop field(s) from residence ($p< 0.01$) to influence the extent of crop diversification. We observe an inverse relationship (though non-significant) between size of land holding and land ownership with crop diversification too. Thus, besides focusing due attention towards these significant determinants, key infrastructure (like roads, supply chain management mechanisms, information communication, etc.) development and better institutional arrangements (exposure visits, access to farm credit, mechanization) are essential for promoting positive intent on crop diversification among farming households. Simultaneously, greater insight is needed to determine the optimal level of crop diversification for maximizing net farm income.

INTEGRATING THE KEY SUSTAINABILITY RICE PLATFORM INDICATORS FOR THE EVALUATION OF THE RICE COMPETITIVENESS ENHANCEMENT NATIONAL PROGRAM IN THE PHILIPPINES

Lemuel Preciados[1], Ceasar Peter Aves[1], Renato Andrin Villano[2]
[1]Visayas State University, City of Baybay, Philippines. [2]University of New England, Armidale, Australia

Paper Abstract:

The importance of lowering environmental costs in agricultural food systems while increasing yields has lately gained prominence, as it has a substantial impact on the long-term sustainability of environmental and economic progress. To address this issue, a global multi-stakeholder alliance of the public, business, research, civil society, and finance sectors formed the Sustainable Rice Platform (SRP). The SRP encourages widespread adoption of sustainable practices throughout the rice value chain by utilizing a three-pillar evaluation approach (economic, environmental, and social) to establish sustainability targets. Our study attempted to investigate the utilization of various indicators, such as nitrogen use efficiency (NUE), yield, and benefit-cost ratio (BCR), as an innovative sustainability metrics for evaluating the holistic effects of the Rice Competitiveness Enhancement Fund (RCEF). We found the number of farms experiencing unsustainable levels and benchmarked the sustainable-performing farms using these three essential parameters. We used proportionate random sampling procedures to interview 301 rice farmers in Ormoc, Leyte, including 139 RCEF beneficiaries and 162 non-RCEF beneficiaries. Based on the 2023 cropping season, we discovered that around 60% of these farms are in the sustainable NUE category, while 40% are still operating under unsustainable NUE (using excessive N fertilizer or mining soil N). However, we observed that most unsustainable rice farms came from non-RCEF beneficiaries. We also discovered that more Ormoc rice farms had transitioned from unsustainable to sustainable levels. The RCEF programs resulted in significant positive improvements in yield and benefit-cost ratios. Furthermore, we used the PSM-DID econometric technique and pooled OLS models to provide more robust estimates of the net effects of RCEF and the reasons driving the differences in sustainable performance metrics among the rice farmers surveyed. We hope that the findings of this critical assessment of RCEF's effects on yields, profit, and environmental outcomes will serve as a catalyst for developing best-fit, cost-effective, and climate-smart policies to improve the sustainability performance of smallholder rice farms not only in Leyte, but also aggregated to the Philippines and beyond.

The Economic Cost of Ewe Deaths in Sheep and Beef Farms In New Zealand

Peter Tozer, Anne Ridler
Massey University, Palmerston North, New Zealand

Paper Abstract:

The impact of breeding stock loss on the profitability of animal production systems is well understood. Higher breeding stock losses reduce overall revenue through lower numbers of offspring sold, higher on-farm stock numbers as more replacements, typically non-breeding, have to be retained to maintain herd/flock size, and more, older, lower-values cull females are sold. The current research aims to examine the impact of breeding ewe deaths on cash profits of sheep and beef in New Zealand. Twenty-three farmers (12 from the North Island (NI), 11 from the South Island (SI)) from farms of different sizes (Area: mean 1329ha, range 270 -4000ha, Ewes: mean 5408, range 920 – 17,461), were interviewed to gather data on their sheep management practices, particularly with respect to reproductive management. The results how that the average scanning rate was 175%, and range of age at culling was from 4 – 6 years, although several farmers did not cull on age, but on other characteristics, and the average ewe death rate was 4.91% (Range 2.1 – 11.58%). The data was used in a dynamic bioeconomic model utilising regional information for economic data, such as costs and sale prices, to estimate the impact of ewe death rate on cash operating surplus per ewe (COS/ewe). The average COS/ewe was $34.83 (range $15.82 - $62.33), with a 55% correlation to death rate (NI correlation 66%, SI 45%). Further analysis was undertaken on farms with ewe death rates above 4% to estimate the increase in COS/ewe with reductions in the death rate of 20% and 50%, this was done to examine the benefit of reducing death rate and to provide guidance on the available cash that could be used to reduce death rate in breeding ewes.

Holding farmers to account for their greenhouse gas emissions and answering their question about what to do, let's first ponder how to answer their question.

Jonathan Jenkin, Bill Malcolm, Alex Sinnett, Paul Deane
The University of Melbourne, Melbourne, Australia

Paper Abstract:

Increasingly, the natural and economic realities of changes in climate is affecting farmers. Messages from markets are being delivered to farmers via their value chain partners, while less-than-veiled threats are being heard from some international policy-makers: Do Something!

After having had a good, long, unimpeded run emitting carbon dioxide, methane and nitrous oxide, the unambiguous message to farmers is they, along with everyone else, is that 'Its Time'.

Farmers are being called to account. The status quo is not an option. Hence, the question, becoming common: 'So what do we do?'

The research questions at theirs broadest are about the choices managers of farms might face about the way they run the farm in the future when they are being held to account for their contribution to global warming from their farm's emissions of carbon dioxide and its equivalents. And, of the options available in this farm system, and importantly, for the mix of options - they may be many - what are the implications of these potential changes to farm systems for their goals of profit, cash, growth, and for risk?

At a general level, the choices about changes to a farm system to reduce how much a farm business is adding to social cost from carbon pollution boil down to (i) increasing farm profit and paying for the

carbon cost and (ii) reducing the quantity of carbon dioxide equivalent emissions from the system. Either way, there are costs.

Before answering these broad questions though, it is first necessary to consider how to analyse and answer the farmer question about what might be best for them to do now they are to be held to account for their emissions of greenhouse gases.

This paper is about the agricultural and economic 'in-principle' considerations that go into thinking about the choices involved with making farm systems and their managers accountable for their contributions to the stock of the global warming gases. Also, how to go about investigating the implications and net benefits and risks of the choices and the combinations of choices on offer.

Nexus between Cooperatives and Agricultural Mechanization: Differences between Outsourcing Machinery Services and Household-owned Machines

Wanglin Ma
Lincoln University, Christchurch, New Zealand

Paper Abstract:

Although mechanization is reshaping rural and agricultural development by reducing drudgery through substituting farm labourers, improving input use efficiency, and increasing farm productivity, the level of mechanization in developing countries still needs improvements. This study explores whether agricultural cooperatives can improve mechanization levels by investigating the differences between outsourcing machinery services and household-owned machines. We consider mechanization adoption status and the mechanized ratio at different production stages, including tillage, seeding, pesticide spraying, fertilization, and harvesting. Utilizing data collected by the Chinese Academy of Social Sciences and an inverse-probability-weighted regression adjustment estimator, we find that, overall, agricultural cooperatives significantly increase the probability of farmers' adoption of mechanization for tillage, seeding, pesticide spraying, fertilization, and harvesting by 5-38% and mechanization ratios by 6-29%. Disaggregated analyses reveal that agricultural cooperatives significantly increase the adoption probabilities and ratios of machines provided by outsourcing services by 9-102% and 10-79%, respectively. Among household-owned machines, agricultural cooperatives only significantly impact tillage adoption, reducing farmers' adoption probability and ratio by around 16-21%. Our findings highlight the importance of agricultural cooperatives in improving farmers' access to and use of machines provided by outsourcing services.

Sustainability and efficiency gains can be achieved through crop diversification of smallholder farming systems in the salinity-prone coastal zone of Bangladesh

Md. Monirul Islam[1,2], Mohammad Chhiddikur Rahman[3], Esmat Begum[4], Afroza Chowdhury[3,5], Arifa Jannat[2,6], Mahanam Das[7], Marta Monjardino[1], Mohammed Mainuddin[8]

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[1]CSIRO Agriculture and Food, Adelaide, Australia. [2]Bangladesh Agricultural University, Mymensingh, Bangladesh. [3]Agricultural Economics Division, Bangladesh Rice Research Institute (BRRI), Gazipur, Bangladesh. [4]Bangladesh Agricultural Research Institute (BARI), Gazipur, Bangladesh. [5]University of Queensland, Brisbane, Australia. [6]University of Adelaide, Adelaide, Australia. [7]Shushilan, Khulna, Bangladesh. [8]CSIRO Environment, Canberra, Australia

Paper Abstract:

The coastal zone of the Ganges Delta in southern Bangladesh is dominated by smallholder farming systems, which face significant challenges, including widespread poverty and environmental issues like drought, soil salinity, and waterlogging. Promoting on-farm diversity presents a promising strategy to improve the sustainability and resilience of these farming systems, as well as bolster rural livelihoods. However, the process of diversification is influenced by a variety of factors and dynamics that differ across agroecological and socioeconomic contexts. Understanding the drivers and constraints of crop diversification is essential for developing effective strategies to reduce production risks and improve income stability and food security for farmers in this vulnerable coastal region. This study examines key factors influencing farmers' decisions to grow diverse crops on their arable land. We analysed 200 farm data collected from three regions in the coastal zone of Bangladesh (Barguna, Khulna, and Patuakhali). This dataset was examined using the Herfindahl Index to assess the level of on-farm crop diversity. We then employed a fractional correlated Probit model to explore the determinants of crop diversification in the region, focusing on various factors, including edaphoclimatic conditions (e.g., changes in waterlogging and soil salinity), farm resources (e.g., number of land parcels, water sources, and livestock owned; farm machinery use, and total fertilizer applied), and socioeconomic factors (e.g., farmer age, experience, education, dependency ratio, market distance, hired labour, farm income, family member migration, and household savings). Our results revealed an average crop diversity index of 0.36, indicating relatively low crop diversity. Notably, about half of the farmers surveyed reported values above this average, highlighting substantial scope for further diversification. The econometric analysis highlighted that edaphoclimatic factors, particularly decreasing soil salinity and improved waterlogging conditions, significantly and positively influenced crop diversification. Access to irrigation water from three or more sources, the use of farm machinery, and the number of land parcels were all positively correlated with crop diversification, but not livestock as expected. These findings align with expectations that abundant natural resources and cost-effective mechanization encourage diverse cropping practices. For example, farmers in the study areas have started to replace fallow land with a variety of crops, including potato, garlic, watermelon, sunflower, mungbean, and various vegetables. Socioeconomic factors like proximity to markets and access to hired labour encourage diversification, helping farmers manage risks. Additionally, growing more crops creates new market opportunities for farming households. However, seasonal migration of family members and reduced household savings have hindered crop diversification in the area. The Khulna region showed greater diversification, while Patuakhali is threatened by tidal flooding that limits agricultural potential. The findings support research and policy recommendations for on-farm diversification in Bangladesh's salt-affected coastal zone, including investing in soil rehabilitation, drainage systems, and irrigation technologies; developing community-level water infrastructure and water-harvest solutions; providing affordable farming machinery; enhancing rural infrastructure and implementing financial programs like crop insurance and low-interest loans to improve economic security. Overall, improving environmental conditions, optimising farm resource efficiencies, and addressing socioeconomic barriers enhance the diversity, resilience, and sustainability of systems in the region.

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Parallel 6D - Climate Change 2

Location Chancellor 2, LVL 0

Time: 13:20 - 15:00

Chair: Ramilan Thiagarajah

On the Extent that Changing Climate Has Structurally Changed Marginal Crop Yield Distributions and Crop Losses

Alan Ker
Michigan State University, East Lansing, USA

Keywords: 8. Climate Change; 12. Econometric Modelling

Paper Abstract:

The Biden Administration significantly raised its Social Cost of Carbon because of revised predictions that increased global crop yield losses under a changing climate. Although many have estimated/predicted the effect of climate change on moments of crop yield distributions {-}{-} thereby showing a difference between two conditional (\textit{on climate)} moments or distributions {-}{-} no one has considered to what extent, if any, a changing climate has structurally changed marginal crop yield distributions or tail probabilities (i.e. crop losses). To that end, we apply a new test for the presence of distributional structural change to U.S. county-level crop yields for corn and soybean. We then investigate the extent to which the spatio-temporal variation in the structural change results is explained by the spatio-temporal variation in climate change measures. Interestingly, we find that the climate change measures are jointly statistically significant and explain a notable extent of the variation despite mitigating factors like on-farm adaptation efforts and measurement error. Our results are consistent across different structural change measures, different regions of the marginal yield distribution, various methods to account for technological change in mean yields, and correcting or not for temporal changes in variance. Importantly, our results statistically justify approaches that consider the effect of climate on the entire distribution rather than those that only consider the first moment or first two moments.

Econometric Estimation of the Macro-Economic Impact of Climate Change

David Stern
Australian National University, Canberra, Australia

Keywords: 8. Climate Change; 12. Econometric Modelling

Paper Abstract:

Existing approaches to estimating the effect of climate change on GDP have various shortcomings including focussing on weather instead of climate change while ignoring reverse causality and potential omitted variables bias. The estimated impact of climate change is very sensitive to small changes in specification. In this presentation, I will present exploratory research that uses long differences to attempt to measure the long-run effect of climate change on the economy while addressing various misspecifications.

Analyzing the Impact of Climate Variability on Pulses Production in Khyber Pakhtunkhwa, Pakistan: A Panel Data Analysis

<u>Khuram Nawaz Sadozai</u>[1], Rizwan Ahmad[2], Munawar Raza Kazmi[3], Rajendra Adhikari[4], Awais Habib[5]

[1]Associate Professor, Department of Agricultural & Applied Economics, The University of Agriculture, Peshawar, Peshawar, Pakistan. [2]Director P&D, The University of Agriculture, Peshawar, Peshawar, Pakistan. [3]Country Manager Pakistan, Australian Centre for International Agricultural Research, Islamabad, Pakistan. [4]Sr. Lecturer, School of Agriculture and Food Sustainability, The University of Queensland, Brisbane, Australia. [5]Department of Agricultural & Applied Economics, The University of Agriculture, Peshawar, Peshawar, Pakistan

Paper Abstract:

Climate change and crop production are intrinsically associated with each other. This research endeavor is designed to analyze the impact of climate variability on pulses production in Southern districts of Khyber Pakhtunkhwa (KP) Province of Pakistan. Two pulses (i.e. chickpea and mung bean) were selected for this research study with respect to climate change. Climatic variables such as temperature, humidity and precipitation along with pulses production and area under cultivation of pulses were encompassed as the major variables of this study. Secondary data of climatic variables and crop variables for the period of thirty-six years (1986-2022) were obtained from Pakistan Metrological Department and Agriculture Statistics of KP respectively. Panel data set of chickpea and mung bean crops was estimated separately.

The Shapiro-Wilk test was estimated to assess normality, resulting in a P-value of 0.63 which confirmed P-value as insignificant, hence we accepted the null hypothesis, concluding that the data follow a normal distribution. For the Wooldridge test, F-value was 6.39, with a P-value of 0.0717. This P-value is also insignificant at the 5% level, leading us to accept the null hypothesis and conclude that there is no issue of serial correlation. The analysis validate that both data sets were a balanced panel data. The Hausman specification test was run separately for both the panel data sets whose findings had suggested the fixed effect model can be deemed as an appropriate model for chickpea panel data, however random effect model was appropriate for estimation of the panel data of mung bean.

Major findings confirm that maximum temperature is statistically significant for the chickpea yield. This implies if maximum temperature increases by 1 ^{0}C, it can enhance the chickpea yield by 0.0463 units. However, the impact of precipitation was reported insignificant. The overall result suggested that climate has a significant impact on chickpea yield in the study area for the said time span. The R-square value is

calculated as 0.537 which means that 53% variation in the chickpea yield is due to explanatory variables. Furthermore, the humidity was statistically significant and has a positive association with chickpea yield.

In case of mung bean, the minimum temperature was significantly contributing to the yield of mung bean. The estimates further illustrate that the humidity contribution towards Mung Bean yield is observed as significant which reflects that if humidity increase by 1 percent can enhance the mung-bean's yield by 0.023 units. The R-square value is calculated as 0.577 which means that 57 percent variation in the Mung Bean yield is due to explanatory variables.

This study concludes that temperature and humidity can significantly contribute to enhance the pulses yield. It is recommended that capacity building of pulses growers may be made to adapt the climate change strategies. Such strategies may include water harvesting methods to ensure sustainable irrigation supply, mitigating the effects of erratic rainfall caused by climate change. Moreover, government may ensure the availability of heat or drought-tolerant varieties of pulses to encourage the pulses cultivation.

Climate change, natural hazards, and social welfare in rural Indonesia: Evidence from a decade of longitudinal data

Sonia Akter[1], Talitha Chairunissa[2], Shofie Azzahrah[3]
[1]Crawford School of Public Policy, Australian National University, Canberra, Australia, Australia. [2]Lee Kuan Yew School of Public Policy, National University of Singapore, Singapore, Singapore. [3]Department of Economics, University of Indonesia, Depok, Indonesia

Paper Abstract:

The research study analyses over ten years of climatic hazard data from rural Indonesia, covering the period from 2011 to 2021. The study aims to address several key research questions. First, it investigates whether the frequency of climatic hazards has increased in rural areas of Indonesia during the study period. Second, it explores the geographical concentration or hotspots for climatic hazards. Lastly, it seeks to identify the impact of climatic hazards on rural institutions and infrastructure.

By utilizing four rounds of Podes survey data from 2011, 2014, 2018, and 2021, the study creates a comprehensive longitudinal climatic hazard dataset at the village level, including ~80,000 villages. In the majority of these villages, agriculture is the main source of livelihood. This is the first study in the disaster risk reduction literature to use such large-scale representative longitudinal data to study the trends of climatic hazards and their impacts on social welfare. Our study is also the first to study the impacts of climatic hazards on rural infrastructure and institutions. The study estimated a series of panel fixed-effects regression models controlling for a wide range of control variables and time and province interaction effects.

The findings of the study indicate that the frequency of climatic hazards has indeed increased in rural Indonesia over the study period. Notably, the rate of increase was significantly higher during the second half of the study period (2018-2021) compared to the initial years (2011-2014). Floods, flash floods, and landslides experienced the most significant increase in frequency, while other climatic hazards such as

droughts, hurricanes, and wildfires showed modest rises. On the other hand, the frequency of non-climatic hazards such as earthquakes and volcanic eruptions remained unchanged over time. The study also reveals that the majority of climatic hazards occurred in the southern and southeastern provinces of Indonesia. The hazard-affected villages also exhibit weak village institutions and poor infrastructure. Weak village institutions were linked to poor service delivery and social welfare loss. In the case of infrastructure, internet and phone connectivity were poor in hazard-prone villages. Phone and internet connectivity are crucial for receiving early warnings and communicating and coordinating disaster response, recovery, and rehabilitation efforts. Lack of investment in critical infrastructure such as phone and internet accessibility increases vulnerability to climatic hazards. The study presents new evidence of non-economic losses, i.e., an erosion of local institutions and infrastructure, that were not previously reported by any other empirical study.

Drought And Hotter Temperature Impacts On children's educational performance

Ying Xu, Alec Zuo, Sarah Wheeler
Flinders University, Adelaide, Australia

Paper Abstract:

As Cutter (1995, 2017) has eloquently outlined, women and children disproportionately bear the burden of global environmental change. The risks associated with natural hazards can vary by gender, age, and country; however, there remains a significant gap in research regarding the magnitude and geographic extent of these environmental changes and their impacts on children. Given their vulnerability, understanding the effects of climate change on children's educational performance is a critical area that needs further exploration.

In the US increasing temperature and hot days reduce student exam scores (Roach & Whitney 2021); while hot school days disproportionately impact on minority students, accounting for 5% of the racial achievement gap (Park et al. 2020). There is an urgent need to assess the effects of hotter temperature and drought on children's educational performance in Australia; this has important implications for both future development and education disparity.

Therefore, this study examines the impacts of climate on children's performance on the Australian National Assessment Program – Literacy and Numeracy (NAPLAN), utilizing two-step system generalised methods of moments (GMM) estimation with SA2 2016-fixed effects and time-fixed effects to capture unobserved heterogeneity. In System GMM, the lagged values of the dependent variable are used as instruments to account for the endogeneity problem. To our knowledge no prior studies on education performance studies has yet used the dynamic panel System GMM estimator, which therefore may be contaminated with endogeneity.

The empirical analysis is based on the sample of children participating in Longitudinal Study of Australian Children (LSAC), which is an ongoing biennial survey of children and families throughout Australia, providing rich individual demographic, behavioural, health information, as well as household socio-economic characteristics. Other data including linked NAPLAN data and collected weather data (i.e.

monthly average maximum temperature, monthly total rainfall) from Australian Bureau of Meteorology (BOM) and the widely used drought index Palmer drought severity index (PDSI) to measures drought duration and intensity. The controlled variables are chosen informed by an ecological theoretical model of child development (Bronfenbrenner, 1979), which focus on the direct and indirect impacts on the child of the 'enduring environment in which he lives' (Carmichael et al., 2014).

Using two-step system GMM, we found that extreme drought and hotter temperatures were associated with worse NAPLAN performance. However, the impacts where heterogenous across gender, and age group, while indigenous, children in the family with lower income and remote areas are more vulnerable to the increased temperatures and extreme drought. Therefore, providing targeted interventions in vulnerable groups and remote areas is warranted to reduce the negative effect on education of climate change.

Marginal abatement costs GHG mitigation options in New Zealand dairy production systems

Thiagarajah Ramilan[1], Taisekwa Chikazhe[2], Lydia Farrell[2], Alvaro Romera[3], Erandi Kalehe Kankanamge[1], Peter Tozer[1], Cecile De Klein[4]
[1]Massey University, Palmerston North, New Zealand. [2]DairyNZ Ltd, Hamilton, New Zealand. [3]AgResearch Ruakura, Hamilton, New Zealand. [4]AgResearch Invermay, Mosgiel, Nicaragua

Paper Abstract:

New Zealand's agriculture sector contributes about 50% of the nation's gross greenhouse gas (GHG) emissions. Most agricultural emissions, around 90%, can be directly attributed to ruminant livestock, including dairy cattle. Reducing biological GHG emissions from New Zealand's dairy system through various mitigation options continues to be a focus of research. Due to the diversity in NZ dairy farm systems, the effectiveness of GHG mitigations varies across farms, which presents unique challenges and opportunities for reducing emissions in the sector.

While individual GHG mitigation options may have measurable impacts on greenhouse gas emissions when implemented independently, combining or "stacking" these options can lead to varying outcomes depending on how they interact within a farm system. As a result, the cost-effectiveness of 'stacked' mitigations also varies across farming systems. Understanding these implications is important to promote adoption of mitigation options. The marginal abatement costs (MAC) often overlook the interactions among different mitigation options, which can lead to an incomplete understanding of their true costs and benefits when implemented together. Therefore, we derived Marginal Abatement Cost Curves (MACC) for a range of options in stacks as well. This approach allowed us to assess the abatement potential and associated abatement costs of various technology stacks.

This research is a part of the Climate Neutral Farms (ClieNFarms: https://clienfarms.eu/) project that is supporting the transition to climate resilient farming. This study used Farmax to model the dairy farmlets of the Southern Dairy Hub (SDH) near Invercargill, which differed in stocking rate, nitrogen fertiliser use, and wintering management. These baseline farm systems were then modelled to assess their potential for reducing GHG emissions by adding a range of mitigation options, higher genetic merit cows, reduced

stocking rate, feed substitution, forestry and fertiliser management. In our study, interaction effects among technology options changed the marginal abatement potential and the overall GHG abatement potential compared to the individual mitigation options. The GHG mitigation potential of some low-cost options was limited, but forestry options were attractive especially under lower stocking rates. The MACC provide information for choosing mitigation options at farm level as well as deriving policies to scale out the mitigation options.

Parallel 6E - Food, Health & Nutrition 2

Location Chancellor 5, LVL 0

Time: 13:20 - 15:00

Chair: Emilio Morales

The Effects of Climate Change on Nutrient Demand

Christian Rojas[1], Jung Hoon Han[2], Xiaoyong Zheng[3], Ezgi Cengiz[3], Lei Pan[3]
[1]University of Massachusets Amherst, Amherst, USA. [2]Korea Rural Economic Institute, Seul, Korea, Republic of. [3]North Carolina State University, Raleigh, USA

Paper Abstract:

Over the past several decades, overweight and obesity have become one of the major public health issues worldwide. The type of food people eat plays an important role in the overweight and obesity epidemic. People's demand for nutrients is affected by various factors. Weather is one such factor. One line of research, typically in the developing country context, has studied the effects of weather and climate change on crop production and food price, which, in turn, impact the availability and affordability of food and nutrient, as well as the risk of hunger (e.g., Darwin 2004; Hasegawa et al. 2014; Kuwayama et al. 2019; Yu and Babcock 2010; Zhang, Zhang, and Chen 2017). However, there exists another potential channel through which climate change affects consumer demand for nutrients. Even when there is no change in food availability and affordability, consumers may choose to eat different types of food items in response to changes in weather and climate. Surprisingly, to the best of our knowledge, no study has explored this more direct channel of how climate change affects diet quality.

To fill this gap in the literature, in this study, we measure the impact of climate change on household nutrient demand, following the approach of Deschênes and Greenstone (2007). To investigate the effects of weather on nutrient demand, we have compiled a unique dataset that connects nutrients to households' food purchases and links weather to households' residences. Our data come from different providers and the creation of a novel data set is a contribution of this study to the existing literature. Household food purchase data are sourced from the Nielsen Homescan dataset, offering information on the type and quantity of food items households purchase each week at the Universal Product Code (UPC) level. We merged these food purchase data with UPC-level nutrition data as constructed by Cengiz and Rojas 2024. Additionally, we supplemented households' nutrient intake with weather data from Schlenker and Roberts 2009. After merging these three databases, our sample includes 194,470 U.S. households' weekly nutrient demand and weather exposure from 2004 to 2019 (a total of 35,215,971 observations spanning 307,683 barcoded products).

Using a panel data model with fixed effects, we find that higher temperature decreases the demand for calories, saturated fat, sodium, and sugar, while higher precipitation increases the demand for calories and sodium. Next, we explore heterogeneity in estimated effects across demographics. Our results show

larger effects for younger individuals, high-calorie consumers, and those with higher incomes, but the effects are less sizable for females and smaller households. Finally, we assess how climate change (predicted changes in weather over long horizons) affects nutrient demand. We find that climate change improves diet quality. Specifically, predicted rises in temperature and precipitation by 2099 decrease nutrient demand by up to 633.07kcal(1.38%) for calories, 31.50g (1.07%) for sugar, 11.23g (1.63%) for saturated fats, and 1.51g (2.38%) for sodium. Results also show that heterogeneities among demographics intensifiy over longer horizons and under high-emission scenarios.

Drought and Food Security in Bangladesh - Does Women's Earning Status Matter?

Most Nilufa Khatun[1,2], Md Sayed Iftekhar[1], Athula Naranpanawa[1]
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Paper Abstract:

Rising global temperatures and abnormal rainfall will cause disruptions across entire food systems, impacting the quantity of food produced and the nutritional quality of diets, as well as reducing food distribution and access (WFP, 2024; WHO, 2022). As the effects of climate change are becoming more apparent, food insecurity has increased in tandem in several regions of the world including Bangladesh. Women in Bangladesh are highly vulnerable to climate change due to their higher reliance on agriculture, limited access to resources, and restricted employment and decision-making opportunities. Despite the fact that women in Bangladesh are traditionally responsible for managing household's food and nutrition, their potential/ability to gain, maintain and enhance/improve household food security is underexploited, particularly in light of climate change challenges.

To address this knowledge gap, using three waves of panel data (year 2012, 2015 and 2018) from the Bangladesh Integrated Household Survey, this paper has examined the effect of women's economic condition on household food security with relation to weather variables. Household food security was measured using two widely used complementary measures, the Household Dietary Diversity Score (HDDS) and the Food Consumption Score (FCS). Women's earning and ownership status were used to represent women's economic condition while the temperature and rainfall data represented the climatic conditions. Fixed effect panel regression and instrumental variable regression model were employed as analytical models. Initial results show that women's economic condition has a statistically positive impact on HDDS and FCS. However, this effect is influenced by climate conditions. Further analysis is ongoing to test the robustness of the findings.

In order to enhance women's access to resources, targeted policy intervention regarding women's income earning opportunities like creating and promoting economic programs, providing access to financial resources, as well as offering training and support for women is necessary. In addition, to combat the climate change impact, the adoption of climate-resilient crop varieties and technologies is inevitable for the most vulnerable farming communities in Bangladesh. Moreover, women's active participation in adaptation planning and disaster response operations is essential for tackling the climate change challenge as well as building a sustainable society.

Rural-urban migration and its impact on food security status of the left behind members of the farm households in Bangladesh.

Shamima Akhter
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Paper Abstract:

Internal migration more particularly rural-urban migration is considered as an important diversified livelihood and survival strategy of the rural poor farm households in Bangladesh. This study is conducted to assess the food security situation of the migrant's family members who left behind in the village. Primary data were collected from the 172 farm households with purposive random sampling from three upazillas of Kishoreganj district in Bangladesh. Among 172 farm households 89 households had at least one migrant member to the cities and 83 households had no migrant member either internal or international. Migration is likely to be endogenous and to address the simultaneous causality between migration and food security, Two Stage Least Square (2SLS) technique with instrumental variable is applied to estimate migration impact on food security. In this econometric model, dependent variable is household calorie intake per day per adult male equivalent and several demographic, social and economic factors are used as explanatory variables along with instrumental variable. Migration of one or more members from the farm family is found to have a significant positive impact on food security situation of the left behind members of the farm households with migrant member. Descriptive results also show that farm households with migrant member are better off in food security situation compared to farm households without any migrant member. It is found in the study that 14 percent farm households are food insecure in farm households having migrant member where as in the farm households without any migrant member, 31 percent households are food insecure in terms of required per day calorie intake. It has also been found from the empirical analysis that all the demographic variables have negative impact on daily calorie intake of the household members except very young dependent members. Among social variables, mother education has positive impact on household calorie intake. The study results also revealed that households having more land, livestock holding and other assets are better in food security situation compared to others. These economic variables have significant positive impact on daily calorie intake of the household members. The study concluded that farm household's food security situation has been improved due to migration of their family members in to the cities. Proper internal migration policy is needed to accrue the positive benefits of the rural - urban migration in Bangladesh by avoiding negative effects of internal migration from farm families in Bangladesh.

Positioning Microgreens within the Food and Nutrition System: A Systematic Review of Drivers, Barriers, Interventions and Multi-Dimensional Impacts.

Nisrina Qotrunnada, Risti Permani
The University of Queensland, Gatton, Australia

Paper Abstract:

Global food insecurity has worsened in recent years, severely impacting the undernourished population worldwide with 309 million people facing acute levels of food insecurity in 2024. Moreover, high population growth continues to place immense pressure on food security, which is further exacerbated by climate change. To this end, microgreens have been seen as the potential solution to these challenges.

Microgreens, which are young and tender greens from vegetables, herbs, legumes, or grain seeds can be grown in a small and controlled environment. They require significantly less input compared to traditional crops and have a shorter time to harvest, allowing them to enhance food availability and farm business viability while maintaining the ecological state. With a high concentration of vitamins, minerals, and antioxidants compared to mature crops, microgreens present a potential solution for dietary diversity and support overall food security.

The global microgreens market accounted for US$ 1.8 billion in 2022 and was estimated to reach US$ 2.6 billion by 2031. In line with this positive market trend, there has been an increased volume of literature on microgreens. Most existing studies related to microgreens have primarily focused on their nutritional properties, cultivation methods and potential health benefits. Despite this increased interest in microgreens, there is a gap in the current understanding of the role of microgreens within the broader food and nutrition system. The existing systematic reviews tend to focus on the technical dimension of microgreens, such as the use of artificial lighting and production systems. Fewer studies look at factors influencing microgreens market development and an approach to positioning microgreens into the food and nutrition system framework.

Given the above background, this study aims to comprehensively review the drivers, barriers and interventions to promote microgreens as well as the impacts of microgreens development through a three-pronged approach. First, guided by the PRISMA framework, this study conducts a systematic literature review (SLR) to analyse studies discussing drivers, barriers, and interventions for promoting microgreens and microgreens' impact on economic, social, environmental and nutritional aspects by assessing the existing international studies. Second, the SLR results are used to develop a novel framework for positioning microgreens within the food and nutrition system. Finally, a case study on microgreens development in Indonesia is presented using the new framework. Indonesia provides a relevant context given its continued challenge to address food security. The country intensifies its efforts to ensure food availability, dietary diversification, and environmental sustainability. Yet, microgreens remain under-explored.

Results from this study can inform various stakeholders on critical factors affecting the microgreens development and lessons learnt from past interventions to promote microgreens, which can consequently lead to a more resilient and sustainable food and nutrition system globally.

Managing food price volatility through regional food system resilience mapping

Wiji Tri Wilujeng, Risti Permani, Adam Komarek
The University of Queensland, Gatton, Australia

Paper Abstract:

Rising food demand and food prices in developing countries have been a concern. According to the World Food Program, 309 million people in 71 countries face chronic hunger in 2023, combined with global food price volatility. Food system resilience offers a potential solution to the problem by mitigating food price volatility and providing sufficient food.

Price volatility results from the tight gap between supply and demand, while enormous food system resilience studies in a multi-faceted approach focus more on the supply, especially the interaction between agriculture and environmental aspects. There is a gap in the literature regarding consumption and food issues, both of which are important in determining the social movement of food. Therefore, this study will contribute to the food system resilience study by developing a novel index incorporating 40 variables across the economic, social, and environmental dimensions of the food systems using data from the provincial level. The resulted index can inform the mapping of food system resilience considering regional variations as well as their temporal change.

Indonesia presents a fitting case since 71% of Indonesians cannot afford a healthy diet, greater than the global average of 36% and Southeast Asia's 48%. This condition is worsened by high food volatility, which has a potential impact on reducing food access and the poverty rate. To quantify regional food system resilience, this study undertakes a four-stage approach. First, all the data are standardised to address the different measurements and identify the strengths and weaknesses of each region in each food system resilience aspect. Second, a novel food system resilience index is developed using the Principal Component Analysis utilising the provincial data from the regional statistics office from 2018 until 2022. This method allows for comparisons between regions and over time. Third, a panel data analysis is employed to assess the association between food price volatility and the food system resilience index. The food price volatility variable is defined as the summation of the deviation of the inflation rate, based on the monthly consumer price index, from the inflation trend, which is calculated by employing the Hodrick-Prescott (HP) filter.

The food system resilience index provides valuable insights regarding regional disparities. Defeat weakness and bolstering strength may enhance the food system's robustness and can contribute to ensuring food security and fostering sustainable food systems.

Who Pays More for Goat Meat? - Factors Influencing Willingness to Pay among Consumers in Vietnam

Luis Emilio Morales[1], Nam Hoang[1], Huu Van Nguyen[2], Xuan Ba Nguyen[2], Thi Nga Bui[3], Thi Kim Cuc Ngo[4], Viet Don Nguyen[1], Alison Colvin[1], Stephen Walkden-Brown[1]

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Paper Abstract:

Food consumption has evolved to include a greater variety of items aimed at enhancing dietary nutrition. Recently, non-traditional foods such as goat meat have gained popularity due to their high nutritional

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benefits and health-promoting properties. Goat meat has the advantage of being perceived as leaner and lower in cholesterol and fat content compared to traditional red meats, such as beef and lamb. The purchase decision of goat meat instead of other substitutes, similar to other food items, is influenced by several factors, including attitudes, perceptions, individual characteristics, preferences, and a range of product attributes categorised under food motives, such as health, mood, convenience, sensory appeal, natural ingredients, price, weight management, familiarity, and ethical considerations. This study aims to assess the influence of different factors on the willingness to pay for goat meat among Vietnamese consumers. For this purpose, 470 goat consumer interviews were selected from a survey conducted between April and October 2022 in Vietnam, and they were analysed using regression modelling. Results indicate that goat meat consumers who had a higher monthly household income, those who spent a higher proportion of their income on food and those who had ethical concerns about goat meat products increased their willingness to pay for goat meat. Conversely, those who were concerned about weight control and those who considered relevant the origin of the goat meat tend to reduce their willingness to pay for goat meat among Vietnamese consumers. These findings suggest that the goat meat industry should enhance the traceability within the goat value chain to provide consumers with detailed information about the origin of the goat meat, which is currently unavailable in the market. Additionally, the industry should promote the low-fat content of the goat meat respect to other meat products. Finally, the industry should target their efforts to attract wealthy consumer who spend a bigger proportion of their income on food and have ethical concerns, as they are prepared to pay more for goat meat.

Parallel 6F - Circular Economy & Waste

Location Chancellor 6 , LVL 0

Time: 13:20 - 15:00

Chair: Maria Estela Varua

Behavioural Incentives for Food Loss and Waste Mitigation: Optimising Farm to Retail Supply Response Under Uncertainty

Thilak Mallawaarachchi[1,2], Nauman Ejaz[3]

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Keywords: 3. Agricultural Production; 24. Mathematical Programming; 30. Value Chain Analysis and Marketing

Paper Abstract:

This paper applies mathematical programming to enhance supply chain dynamics, focusing on antifragility and quality improvements. It addresses the challenges of incorporating uncertainty and variability into supply chain models and evaluates technological adoptions to improve performance. The study examines sources of fragility in mango supply chains in Pakistan and Sri Lanka, proposing behavioural incentives for loss mitigation. It outlines a standards-based approach for quality improvements and provides a detailed analysis of opportunity costs using a state-contingent mathematical programming model. By integrating productivity and environmental performance objectives, the model offers a framework to analyse options for reducing loss and waste across different supply chain stages. Insights are drawn for prioritizing measures to address root causes of food losses in Pakistan and Sri Lanka through affordable technological and organizational improvements. The paper also highlights the importance of quality and food safety awareness in fresh fruit and vegetable value chains, essential for meeting inclusive growth, food security, and nutritional goals. It explores opportunities to reduce costs, increase market value, and enhance business competitiveness, making practice changes attractive from primary production to retail stages.

Economic Benefits of Mine Waste Reduction: The Case of Ore-Sand

Juan Soto-Diaz, Steven Micklethwaite, Ian Mackenzie, Daniel Franks, Flavio Menezes, Juliana Segura-Salazar, Lulit Ekubatsion
The University of Queensland, Brisbane, Australia

Keywords: 21. Land and Natural Resource Management; 29. Valuation

Paper Abstract:

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Amid rising mineral demand for the renewable energy transition and a long-term decline in average metal ore grades, mine waste is expected to increase significantly. This paper presents an economic model to assess the economic benefits of extracting large-volume by-products to reduce mine waste. Using the case of ore-sand —a type of manufactured sand that can be produced as a by-product of metal ore mining— this paper quantifies profitability across various adoption scenarios. The economic model is calibrated to a representative large-scale iron-ore operation covering a 30-year mine's life, and considers stochastic factors on revenue and costs, such as price volatility, ore grades, and tailings management and storage. Simulations indicate significant economic incentives for ore-sand adoption. The findings highlight that, while ore-sand profitability is subject to important uncertainty in costs and final demand, cost savings in tailings waste management and mine rehabilitation from the primary operation provide robust economic incentives for adoption.

Exploring Food Loss Interventions and Their Adoption to Support Food Security: A Systematic Literature Review

Arif Syaifudin[1,2], Risti Permani[1]
[1]The University of Queensland, Gatton, Australia. [2]National Food Agency, Jakarta, Indonesia

Paper Abstract:

Despite progress has been made in reducing hunger worldwide, about 258 million people were still in high level of food insecurity and 735 million people or 9.2% of the global population were categorised undernourished in 2022. Multiple crises ranging from the shock of unprecedented Covid-19 pandemic, persistent conflicts, to climate change hampered the progress to reduce global hunger. Indeed, it is estimated that almost 600 million people still face hunger in 2030.

To this end, food loss and waste reduction has been identified as a mean to improve food security. Around one-third of all food production in the world is either lost or wasted amounting to 1.3 billion ton/year. Moreover, food is largely lost at the early and middle stage of supply chain in developing countries, while in developed countries, more food is wasted at retail and consumer level. Lack of infrastructures, technology adoption, handling practices, and inadequate market structure are the major drivers for food loss generation in developing countries mostly suffering from food insecurity.

Hence, concrete actions to reduce food loss are urgently needed. Many literature review studies have been undertaken to systematically evaluate food loss interventions with focus on, for instance, specific measure (technology adoption and good handling practices), part of food supply chain (storage stage), and particular region (Sub-Saharan Africa and South Asia). However, most of those studies do not include review of the performances of food loss interventions and conditions facilitating and constraining the adoption. Failure to acknowledge the intervention's efficacy as well as its facilitators and barriers could lead to poor adoption and consequently less impacts on food loss reduction.

Therefore, this study aims to systematically review the current food loss interventions and factors supporting and hampering their adoption. Adhered to PRISMA guideline, 880 records were identified as relevant studies from Web of Science and Scopus database on 11 August 2024. After implementing deduplication, title and abstract screening, and full-text review based on inclusion and exclusion criteria,

92 studies were included for data extraction and synthesis. This study used Covidence to manage the literature and ASReview to support screening process.

As the results, most of the interventions focuses on technology at storage stage. Crops and Africa countries dominate the commodity group and location of the tested interventions, respectively. Combination of multiple interventions along food supply chain is recognised as an effective way to reduce food loss. Low-cost and locally available materials support the level of adoption, while the major barrier is high initial investment cost. Limited studies on capacity building, policy, and market interventions indicate the need for interventions other than technologies. These results also call for interventions along the entire food supply chain beyond storage stage. The increasing number of studies found in the last five years highlight the growing concern on food loss reduction. Furthermore, grounded on those results, a novel framework for adopting food loss interventions is developed to inform stakeholders and policy decision-making process in designing appropriate food loss interventions.

Mapping the Landscape of Food Waste and Circular Economy Research: A Bibliometric Analysis

Mallika Roy[1,2], Delwar Akbar[1], Darshana Rajapaksa[3], Azad Rahman[3]
[1]Central Queensland University, Rockhampton, Australia. [2]University of Chittagong, Chittagong, Bangladesh. [3]Central Queensland University, Rockhampton, Bangladesh

Paper Abstract:

Food waste is a significant global issue, with far-reaching effects on the environment and the economy. The implementation of a circular economy provides a solution by adding value to waste, transforming it into useful resources, and promoting sustainability. Despite the growing research interest in exploring circular economy practices to reduce food waste, there is still a lack of a comprehensive and contemporary overview of this topic. To bridge this gap, there is an urgent need for high-level insights that integrate various aspects of circular economy principles and food waste management. This paper aims to analyse current research trends in food waste management through circular economy principles, and to provide actionable strategies and future research directions in this field. Firstly, the paper presents a descriptive analysis of trends in the literature on food waste and circular economy principles. Secondly, it conducts a bibliometric analysis to map the existing research landscape, highlighting key authors, influential publications, and emerging research themes. Thirdly, the paper collates actionable strategies for applying circular economy principles to enhance food waste management by analysing key research themes, identifying gaps, and highlighting emerging trends from existing literature. Finally, it outlines future research directions, calling for further investigation into technological advancements, behavioural and policy analyses, and cross-sector collaboration for food waste management. The study includes a systematic literature search in the Scopus database within the time frame from 2014 to 2024. The final dataset considered 890 English-language publications which were narrowed down from an initial 1001 documents. Through keyword analysis, it reveals that "Food Waste", and "Circular Economy" are dominant themes, underscoring the emphasis on waste reduction and resource efficiency. The analysis further highlights "Sustainability" and "Waste Management" as critical components in addressing long-term environmental and societal goals. The top relevant keyword in this analysis is Food Waste, which leads to 522 occurrences, 607 links, and the highest total link strength of 8634, highlighting its significant

role and impact in the study of sustainable practices and circular economy. The research also discloses gaps in the literature, particularly the need for more empirical studies on the effectiveness of circular economy principles across various food supply chain stages. Citation analysis identifies key authors, journals, and institutions, with the Journal of Cleaner Production emerging as the most influential source. The top-cited authors in the citation network reveal varying levels of influence and integration, with Daniel C.W. Tsang leading in citations, demonstrating the highest influence in the field. However, Dominika Alexa Teigiserova and Marianne Thomsen, though well-connected, show a moderate level of influence. Their work is significant, but their citation impact is less extensive than Tsang's. Antonis A. Zorpas had a high document count but lower citation impact and network strength. Despite the impact of individual studies, the analysis reveals limited interconnectedness among top-cited works, suggesting a need for more integrated research efforts.

Accelerating the Achievement of Waste Management Targets through Circular Economy in Indonesia

Fitri Nurfatriani, Aulia Primananda, Hanifah Nisrina, Mimi Salminah, Faozan Indresputra
National Research and Innovation Agency, Jakarta, Indonesia

Paper Abstract:

The Indonesian government has set a target to reduce waste generation by 30% and effectively manage 70% of the total waste by 2025. However, as of 2021, only a 15.46% reduction and 48.86% management have been achieved. Various technical and non-technical challenges have hindered the progress towards this target. This paper aims to analyse these challenges using the fishbone analysis method based on the Focus Group Discussions (FGDs) findings and in-depth discussions with relevant stakeholders in waste management. The analysis reveals that waste reduction and management in Indonesia face multidimensional issues, which can be categorized into four main aspects: technical aspects, community participation, industry involvement, and government roles. Within these aspects, several fundamental problems have been identified. These include the reliance on conventional landfill-based waste management systems, limited human and financial resources, the absence of established incentive mechanisms, and low levels of community engagement. No single solution can overcome the complexity of waste management problems in Indonesia. The transformation of waste management based on a circular economy needs to be carried out gradually. The current practice of linear waste management needs to be progressively pushed towards management using the circular economy concept. Therefore, several strategies are necessary for each aspect to support the achievement of the 2025 waste reduction and handling target in line with the development of a circular economy. The current practice of linear waste management needs to be gradually pushed towards management by improving the product life cycle, reducing waste production, and creating secondary raw materials. To meet the target, a range of policy interventions are necessary. These may include shifting the waste management paradigm away from landfill dependence, strengthening waste sorting and processing at the source and non-landfill waste treatment facilities, and enhancing the Extended Producer Responsibility policy by making it mandatory for priority industries rather than voluntary.

Circular Economy in SMEs of Australian Agricultural Sector: Challenges and opportunities

Maria Estela Varua, Dorothea Bowyer
Western Sydney University, Sydney, Australia

Paper Abstract:

The vital role of Small and Medium Enterprises (SMEs) in the Australian economy underpins this research, which develops an empirical analysis that allows us to explore and understand the actions that SMEs in the agricultural sector are taking to meet the challenges and opportunities of the circular economy (CE).

This study involved 75 SMEs operating in the agricultural sector. A multi-method approach was applied, including interviews and surveys. Twelve different CE practices related to waste management, recovery and reuse, supply chain and product/process design have been explored. The results reveal that although only 61% of the sample SMEs adopts CE, they implement several CE practices simultaneously, supporting the notion that CE implies a systemic approach to company's value creation. Specifically, CE requires SMEs to rethink their value creation and stakeholder relationships. Waste management and the use of bio/natural raw materials were widely practiced by 57% of the SMEs surveyed, while recovery or reuse of plastics were implemented by only 13% of the sample. The lack of coordination of regulations in Australia at the federal, state, and local level in the field of sustainability was identified as the main barrier to CE by adopters. Yet, SMEs that practices CE activities perceive them as a business opportunity rather than a cost, thus indicating that CE may represent a source of value creation for SMEs in the agriculture sector.

Parallel 6G - Practice Change & Adoption 3

Location Chancellor 3/4, LVL 0

Time: 13:20 - 15:00

Chair: Vanessa Bonke

The behavioural economics of technology adoption

German Puga, Marit Kragt
University of Western Australia, Perth, Australia

Paper Abstract:

In this study, we use behavioural economics to explain adopters' choices throughout the adoption process. That is, from awareness to adoption and extending to after adoption, also covering dis-adoption. To explain adopters' decision-making processes, we rely on the concept of bounded rationality, prospect (and cumulative prospect) theory, dual-system theory, and mental accounting, among others. Some of these theories have already been applied to study cases of adoption – although not extensively. Compared to those studies, we provide a more holistic view of how various behavioural economics theories can be used to explain adoption choices.

We compare behavioural economics theories to frameworks that are commonly used in the agricultural adoption literature. These frameworks include theory of planned behaviour, task-technology fitness model, diffusion of innovation theory, technology acceptance model, and theory of reasoned action. These adoption theories often overlap and complement each other in explaining adoption. We show how behavioural economics can explain all these adoption models, and that multiple aspects of adoption decisions that are explained by behavioural economics are not explained by the typical adoption frameworks.

We explain the adopter's decision-making processes using concepts from behavioural economics – most of them arising from the abovementioned theories. We also highlight the relevance of social norms and participative processes. Goodwill, trust, herding and anti-herding, and moral standards can significantly shape adoption processes.

Last, we introduce a tool in development to help technology designers and policymakers understand some key characteristics of the decision-making processes that underpin adoption. The tool aims to give the user a better understanding of the behavioural nature of adoption decisions and to provide choice architecture recommendations to nudge the adoption of the technology of interest.

How farmer's perceptions about soil organic fertilization affect farmer's behaviour towards future adoption of the practice in climate hazardous location?

Shaima Chowdhury Sharna
University of Southern Queensland, Toowoomba, Australia

Paper Abstract:

Understanding farmers' perceptions of sustainable farm-practices to advance the adoption of sustainable agriculture is an essential pathway to address soil degradation. This study investigated farmers' perceptions of Soil Organic Fertilization (SOF); and how these perceptions, along with other socio-economic and environmental factors affect willingness to adopt SOF for short-term (i.e., for a season/more than one season in a year) and long-term (i.e., a season/more than one season throughout the next five years) period in future. Primary data were collected from 441 rice farmersthrough stratified random sampling in four districts of Bangladesh. These sites cover various climate-hazardous locations in the country: Rajshahi (drought-affected), Khulna (salinity-affected), Sunamganj (flood-affected) and Gazipur (less climate vulnerable). Data were analyzed using the Control Function model with generalized inverse mills ratio (GIMR) to address endogeneity issues. Focus Group Discussions (FGDs) were conducted with farmers and agricultural extension officers to obtain supplementary information.

Approximately 32% of the respondents are currently practicing SOF. Additionally, 26% and 25% of the sample rice-farmers are interested in practicing SOF respectively for short-term and long-term in future. Results indicate that perception of production cost reduction from SOF application and beneficial impact of SOF on soil properties are the key factors influencing both short-term and long-term adoption decisions. Farmers who perceive that SOF application reduces production cost are 9% more likely to adopt SOF both for short-term and long-term. Farmers are intended to choose SOF when the practice is conducive to increase net benefit by minimizing production cost. The perception that SOF improves soil organic matter, increases the probability of short-term and long-term adoption by 9% and 10% respectively. Farmer's perception of reducing soil salinity by using SOF also increases the likelihood of short-term and long-term adoption respectively by 11% and 10%. The GIMR for both perceptions are significant, indicating the presence of selectivity bias and justifying the use of a two stages model with GIMR. Farmers consider location-specific climatic and soil issues while making future adoption decisions. SOF is considered for future adoption by farmers in drought prone Rajshahi district as a solution to improve water retention and enhance drought resilience. However, farmers in flood and salinity affected Sunamganj and Khulna districts are less willing to practice SOF. Policy design should include site specific conditions based on climate vulnerability and soil properties, farmers' perceptions, and information access to enhance the dissemination of SOF, ultimately aiming to mitigate soil degradation and improve farmers' livelihoods.

Smallholder farmers' willingness to accept for adoption of direct seeded rice in India

Vikram Patil[1], Prakashan Chellattan Veetttil[2], Virender Kumar[3]
[1]Inclusive Markets & Value Chains Research Unit, International Rice Research Institute (IRRI), Varanasi, India. [2]Inclusive Markets & Value Chains Research Unit, International Rice

Research Institute (IRRI), New Delhi, India. [3]Sustainable Impact Department, International Rice Research Institute (IRRI), Los Baños, Laguna, Philippines

Paper Abstract:

Adoption of sustainable management practices has potential to enhance not only resilience among the farmers but also environmental sustainability. Inadequate / lack of incentives continue to be a major constraint to adoption of sustainable management practices among smallholder farmers in developing countries. Direct seeded rice (DSR) in one such agronomic practice that offers reduced irrigation use, cost of cultivation, drudgery as well as greenhouse gas (GHG) emission, and improved system level productivity of rice-based cropping systems, as compared to conventional transplanting method. Despite research innovations addressing the technical challenges in DSR and several policy measures, including an incentive approach by federal governments, the scaling efforts for DSR have not met the expected levels of adoption in India. This study assesses the rice farmers' willingness to accept (WTA) and willingness to pay (WTP) for adoption of DSR and DSR associated risk mitigation respectively. Using an interval regression model, responses to a double-bounded contingent valuation survey with primary data collected from 815 rice farmers from the state of Odisha in India were analysed. The results showed that majority of the farmers were WTA (87.35%) and WTP (82.8%) for DSR adoption, indicating an existing opportunity to changing farmers' decision to adopt DSR. DSR training, perception about environmental issues of agriculture, and motivation for mechanised DSR adoption influenced farmers' WTA for adoption of DSR, while previous experience with DSR, irrigation access, primary income sources, and gender influenced their WTP premium for insuring crop establishment failure risk associated with DSR. These findings underscore the critical importance of aligning incentive-based approaches with the preferences of farmers for effectively scaling sustainable management practices, thereby generating economic benefits for farmers while promoting the overarching goal of environmental sustainability.

Agricultural Mechanization and Nutrition Security : Evidence from Rice-producing Households in China

Huanyu Zhu, Wanglin Ma
Lincoln University, Christchurch, New Zealand

Paper Abstract:

Nutrition security is a critical global issue and a key focus of the United Nations Sustainable Development Goals (SDGs), which underscore the right of all individuals to have sustainable access to sufficient, safe, and nutritious food that meets their daily dietary needs and personal preferences, supporting a healthy and active life. The existing literature on nutrition security has primarily focused on individual and social determinants and interventions aimed at enhancing nutrition security. However, limited attention has been given to the impact of technological advancements in agricultural practices on the nutrition security of smallholder farming households. This study contributes to the literature by analyzing the effects of adopting different mechanized farming strategies (i.e., non-mechanized, semi-mechanized, and fully mechanized farming) on the nutritional security of rural households. We use the household dietary

diversity score (HDDS) and per capita food expenditure to measure household nutrition security, using data collected from 1,577 rice-producing households in Hubei, Jiangsu, and Yunnan provinces of China. This study employs the multinomial endogenous switching regression model to address selectivity bias caused by observable and unobservable factors. The results indicate that farmers' decisions to adopt semi-mechanized farming are influenced by household size, assets, and risk attitudes, while decisions to adopt fully mechanized farming are determined by factors such as age, gender, household size, and proximity to markets. We also find that adopting semi- and fully mechanized farming significantly increases HDDS and per capita food expenditure compared to non-mechanized farming. The effects of agricultural mechanization on nutrition security are heterogeneous across the survey locations. Our findings highlight the critical role of facilitating the transition to agricultural mechanization in improving household nutrition security and well-being.

Role of Social Capital on Adoption of Conservation Agriculture-based SustainableIntensification (CASI) Technologies by Farmers in Nepal

Menaka Rathnayaka Mudiyanselage, Maria Fay Rola-Rubzen, Atakelty Hailu
University of Western Australia, Perth, Australia

Paper Abstract:

This study investigates the role of social capital in adopting Conservation Agriculture-based Sustainable Intensification (CASI) technologies in Nepal, focusing on social dynamics and explanatory variables such as gender, education, and other socio-demographic factors. Using data from 337 households in the Sunsari and Dhanusha districts, the study constructs a social capital score along two dimensions: perceived community trust/cohesion and perceived threat to property. These dimensions were derived from factor analysis to assess how social capital influences CASI adoption. Multiple regression models revealed that higher levels of perceived community trust and cohesion significantly increased the likelihood of adopting CASI, emphasising the role of social networks in facilitating sustainable agricultural practices. Conversely, concerns over property security posed challenges, suggesting that while social capital promotes adoption, addressing individual-level concerns is also crucial. Gender disparities were evident, with male farmers more likely to adopt CASI than female farmers, likely due to inequalities in resource access. Education emerged as a key factor, especially for women, suggesting that targeted educational interventions could help address the gender gap. The findings suggest the importance of implementing policies that strengthen social networks, secure property rights, and provide support to address operational barriers to accelerate CASI adoption and advance sustainable agricultural development in Nepal.

Clearing down old oil palms: Experimental insights on the disinvestment behavior of smallholder producers in Indonesia

Vanessa Bonke, Charlotte Reich, Silke Hüttel, Oliver Musshoff
Georg-August-University, Göttingen, Germany

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Paper Abstract:

Oil palm production is under massive scrutiny worldwide for its negative environmental impacts. In Indonesia, many smallholders rely on oil palm production as their main source of income thereby adding considerably to the global palm oil supply. As smallholder oil palm production increased drastically in the 1990's, contributing to reduce poverty, a large share of plantations is reaching the end of their economic lifespan. In order to avoid new land openings for oil palm, it is crucial that overmatured oil palms are cleared properly to make way for new, more sustainable, plantations. Since oil palms become less productive only after three decades and clearing down old trees is associated with high costs, this study applies an incentive compatible framed field experiment to investigate the disinvestment behavior of smallholder oil palm producers.

The experiment models the choice to clear down an old oil palm plot as a dynamic problem of optimal stopping under uncertainty. In the experiment, smallholders are owners of a 25-year-old plantation plot and have to decide when to clear down the plot within the next five years. In the beginning, the plot still generates positive yearly gross margins which, however, vary from year to year and can become negative. Once participants decide to disinvest, they earn a positive liquidation value, framed as a governmental subsidy for properly clearing down the old plot.

We investigate whether and to what extent the intuitive decision making of smallholders can be predicted by the normative benchmarks of the Net Present Value and the Real Options Approach. Applying a within-subject design with two scenarios, we further investigate whether different payment structures for the positive liquidation value have an effect on smallholders' disinvestment behavior. In addition, an extended version of the Eckel-Grossman and a Coller-Williams task were implemented to elicit smallholders' risk and time preferences. These preferences as well as measures for financial literacy are inter alia analyzed for their influence on the smallholders' disinvestment decision patterns.

Primary data were collected in the major oil palm cultivating province of Jambi, Indonesia. A sample of 199 Indonesian smallholders with 3,980 observed experimental disinvestment decisions is used for the analysis. Results show that smallholders decisions are in accordance with the Net Present Value benchmark in around half of the observations and simultaneously too early according to the Real Options Approach, implicitly neglecting the value of waiting. In contrast, around 22 percent of the total observations even exceed the normative Real Options Approach benchmark, implying these smallholders' hold on to an unproductive plantation plot for too long. The diverse decision patterns highlight that neither theoretical approach can entirely explain observed behavior. Further results imply that differently framed payment structures for the liquidation value do not considerably affect disinvestment decisions. Additional preliminary regression results suggest that financial literacy has a larger influence on the disinvestment timing than risk and time preferences. Our results are of interest for researchers and policy makers alike, as they provide insights into pathways promoting a more sustainable smallholder oil palm production.

Awards and Closing Session

Location Main Room 1 (ROMA), LVL1

Time: 15:30 - 16:15

Chair: Dominic Smith

2025 AARES LOC members:

- **Chair:** Dominic Smith (Griffith University)
- **Website:** Dominic Smith (Griffith University)
- **Venue selection:** Peggy Schrobback (CSIRO)
- **Social events (Dinner, ECR night, social night, WEN session, pre-conference tour)**: Gabriela Scheufele (CSIRO), Anthea Coggan (CSIRO), Bernardo Cantone (CSIRO)
- **Finance:** John Rolfe (Central QLD University), Andrew Zull (QDAF)
- **Program:** Jeremy De Valck (Central QLD University), Chris Fleming (Griffith University)
- **Sponsorship:** Peggy Schrobback (CSIRO), Finona Dempster (AARES Council Promotion & Development co-ordinator)
- **Conference theme/Keynote speakers** (President Elect): Jeff Connor (UNI SA)
- **Social media:** Disha Gupta (AARES Council social media channels co-cordinator)
- **Media:** Cathy Read (Crawford Fund)