The Australian Agricultural and Resource Economics Society Inc.

www.aares.org.au

61st Annual Conference

Brisbane Convention and Entertainment Centre
Brisbane, Queensland
7-10 February 2017

Handbook

CONFERENCE SPONSORS

AARES thanks the following sponsors for their support of the Conference:

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CONTENTS

WELCOME

It is my pleasure, on behalf of the organising committee, to welcome fellow delegates to the 61st annual conference of the Australian Agricultural and Resource Economics Society. We have selected the Brisbane Conference and Exhibition Centre because of its great facilities and central location in Brisbane. We hope that you also find some time to explore Brisbane and the Southbank area with its associated galleries, museums, theatres and restaurants – or the more alternate West End - if you can find time in the busy program!

The AARES President-Elect, Quentin Grafton, has assembled an outstanding list of invited speakers on a cross-section of economic issues including environmental management, choice behaviour, Brexit, biodiversity, the Great Barrier Reef, spatial dimensions and renewable resources.

In addition, there are a record number of seven mini-symposia sessions covering themes in productivity, weed and pest management, fisheries, energy, climate, and water issues.

The program format mostly follows that of previous conferences, but there is an addition in the form of a Three Minute Thesis competition on the Friday morning. We've added this event to the program this year as a way of highlighting the skills of our younger members.

The social program has been designed to help build contacts and networks as well as some fun. The Welcome Reception is here at the venue (Sky Room), with great views over Brisbane. Following that there is the Early Career Professionals event at the Fox Hotel, which is 10 minutes walk. On Wednesday night the conference dinner will be in the Boulevard Room at the BCEC, and on Thursday night the Social Night will be at the South Bank Surf Club, which is close by.

This year's conference has continued to receive welcome support from continuing and new sponsors, including the University of Queensland and ACIAR (Theme sponsors), CQUniversity (Premier sponsor), and Queensland University of Technology and the Australian Government Department of Industry, Innovation and Science (Principal sponsors). Without this level of financial assistance we would not be able to host the number of international speakers that have been organised or hold the conference in such a high quality venue. We've also received support from a number of other organisations through sponsorship, in-kind support and involvement – that help is gratefully acknowledged.

Thank you for your participation in the conference. We are sure that you will find it both enjoyable and stimulating along with the rest of your visit to Brisbane and south-east Queensland.

John Rolfe
Chair, Local Organising Committee
AARES, 2017

Local Organising Committee members

Chair	John Rolfe
Contributed papers	Chris O'Donnell, Trevor Hutton, John Rolfe
Handbook and materials	Annie Hurst, Megan Star, Jeremy de Valck
Invited speakers	Quentin Grafton, John Rolfe
Poster sessions	Rebecca Gowen
Program	John Rolfe, Annie Hurst, Sean Pascoe
Secretary	David Monkton
Selected Papers	Chris O'Donnell, Trevor Hutton
Social programme	Sabah Abdullah, Katrina Davis, Megan Star
Sponsorship	Rod McInnes, Quentin Grafton, John Rolfe, Peggy Schobback
3 Minute Thesis competition	Rebecca Gowen, George Antony
Treasurer	Andrew Zull

AARES FEDERAL COUNCIL AND STAFF

Conference registration and website	Annie Hurst
AARES Manager, Promotion and Development	Rod McInnes

GENERAL INFORMATION

ACCOMMODATION

Delegates to the AARES 2017 Annual Conference need to book their own accommodation. The conference venue, the Brisbane Conference and Entertainment Centre (BCEC) does not offer hotel accommodation, however there are many other options in the vicinity.

CAR PARKING

BCEC conveniently offers its guests secure under cover parking for 1500 vehicles for a maximum of $28.00 per vehicle, per day with direct lift access to the Centre's convention and exhibition facilities.

CATERING

Morning and afternoon teas will be served in the Plaza Foyer area, as will the Lunches.

CONFERENCE EVALUATION

An electronic evaluation will be distributed post-Conference. To assist with the planning of future AARES events, we hope that you will take the time to provide feedback on the Conference.

CONFERENCE PAPERS

Papers from the Conference will be made available on the AgEcon Search website after the Conference – http://ageconsearch.umn.edu/

DISCLAIMER

The information presented in this handbook is correct at the time of printing. In the event of unforeseen circumstances, the Local Organising Committee reserves the right to delete or alter items in the Conference Program.

DRESS STANDARDS

Conference Sessions – smart casual

Social Functions – smart casual

INTERNET

Wireless internet will be available free to delegates for the duration of the Conference through the BCEC link. There is no password required, but the internet speed is limited.

LIABILITY/INSURANCE

In the event of industrial disruptions or natural disasters, Australian Agricultural and Resource Economics Society (AARES), the Local Organising Committee, or any professional Conference organiser engaged by the Society,

cannot accept responsibility for any financial or other losses incurred by the delegates. The Australian Agricultural and Resource Economics Society (AARES), the Local Organising Committee or any professional Conference organiser engaged by the Society take no responsibility for injury or damage to persons or property occurring during the Conference. All insurance, including medical cover, or expenses incurred in the event of the cancellation of the Conference are the individual delegate's responsibility. Attendees are encouraged to choose a travel insurance policy that includes loss of fees/deposits through cancellation of your participation in the Conference, or through the cancellation of the Conference itself, loss of airfares for any reason, medical expenses, loss or damage to personal property, additional expenses and repatriation should travel arrangements have to be altered. The Conference organisers will take no responsibility for any participant failing to insure against these potential losses.

LOCAL TRANSPORT

The conference venue is adjacent to South Brisbane Train Station with direct Air Train service and 5 mins walk from the Cultural Centre Busway. There is also undercover parking for 1500 vehicles on site. For more information on up and coming exhibitions and events, visit www.bcec.com.au

- **Pedestrian** – Russell Walk connects pedestrians between Merivale and Grey Street underneath the building.
- **Parking** – Car park 1 is best for Merivale Street rooms, Car Park 2 & 3 are best for Exhibition Halls and Grey Street rooms via Russell Street Walkway. For more information about parking at BCEC please head over to our Car Parking Page.
- **Airtrain** – Catch the Airtrain from South Brisbane station to Brisbane's international and domestic airports. Tickets are available for this service from the Information Desk or you can pre-book at the Airtrain website.
- **Bus Services** – The Cultural Centre Station on Melbourne Street and the South Bank Busway Station on the corner of Colchester and Tribune Streets are closest to BCEC. Translink manage the Brisbane City bus services, for more information on routes and to plan our journey click here.
- **CityCats** – CityCats operate every day and stop at the South Bank River Terminal on the Clem Jones Promenade. The inner-city ferry travels between the CBD, North Quay and Kangaroo Point, stopping at South Bank Terminal 1 and 2 on the Clem Jones Promenade.
- **Taxi** – Taxi ranks are located outside the main entrance to the Centre on Merivale Street. There is a taxi drop off located at the Convention Centre Grey Street entrance.
- **Trains** – South Brisbane Railway Station adjacent to the Convention Centre on Grey Street or South Bank Railway Station are the most convenient stations to the Brisbane Convention & Exhibition Centre.

MESSAGES and NOTICES

Messages for delegates may be left with the staff at the registration desk. A noticeboard will be located near the registration desk; please check this board for messages and important information.

MOBILE TELEPHONES

As a courtesy to other delegates and speakers, please refrain from using your mobile phone within Conference sessions, and switch it off or to silent.

NAME BADGES AND TICKETS

Name badges will be issued at registration and should be worn at all times. Admission to the Conference and related activities is by name badge only. Tickets for social functions will be issued at registration, please ensure you have a ticket for each function you have booked for.

POSTERS

Posters will be available to view in the Plaza Foyer area for the duration of the Conference. Presenting authors should be by their posters during the allocated session (Thursday morning 9.50 – 10.10) and the morning tea break immediately after. All posters must be collected by 12.10pm on Friday 10th February.

REGISTRATION and INFORMATION DESK

All delegates must collect their registration pack upon arrival to the Conference. The registration desk will be located in the Plaza Foyer area at the BCEC, and will be open during the following times:

Tuesday 7 February:	4:00 pm-6:00 pm
Wednesday 8 February:	7:30 am-5:30 pm
Thursday 9 February:	7:30 am-5:30 pm
Friday 10 February:	7:30 am-4:00 pm

TIME ZONE

Brisbane operates on Australian Eastern Standard Time, which is UTC plus 10 hours.

TOURIST INFORMATION

A map of Brisbane and information booklet will be provided in your conference satchel. Please visit the registration desk if you would like further information.

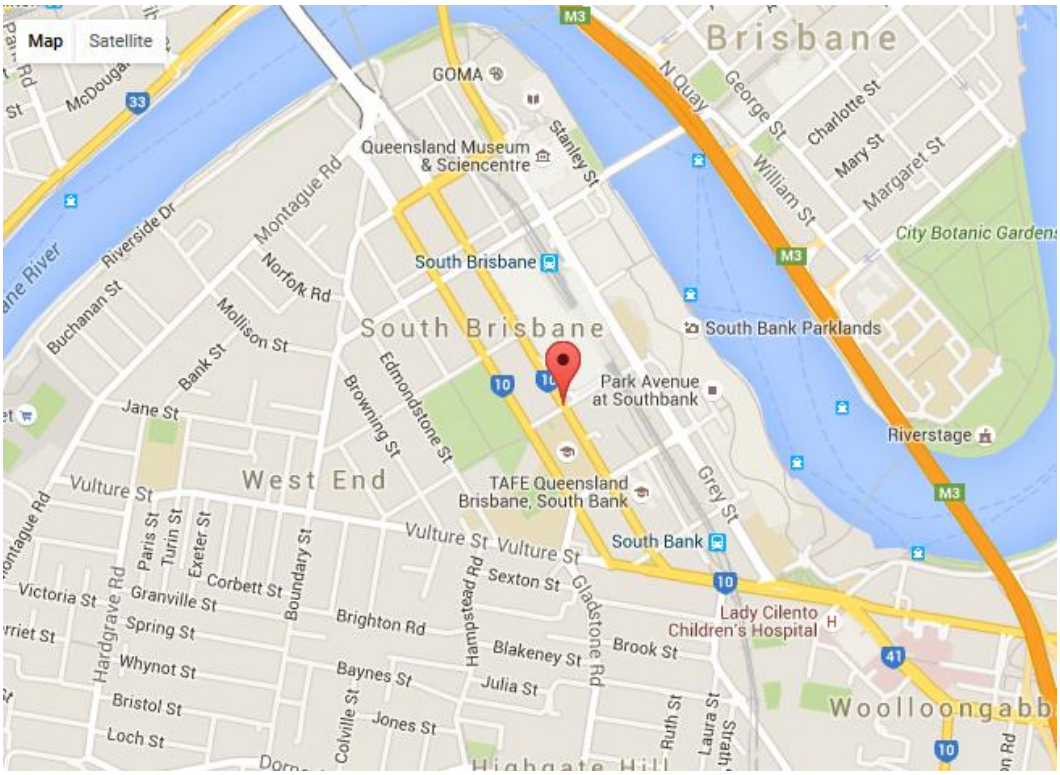
SECURITY

Please ensure that you take all items of value with you at all times when leaving a room. Do not leave bags or laptop computers unattended.

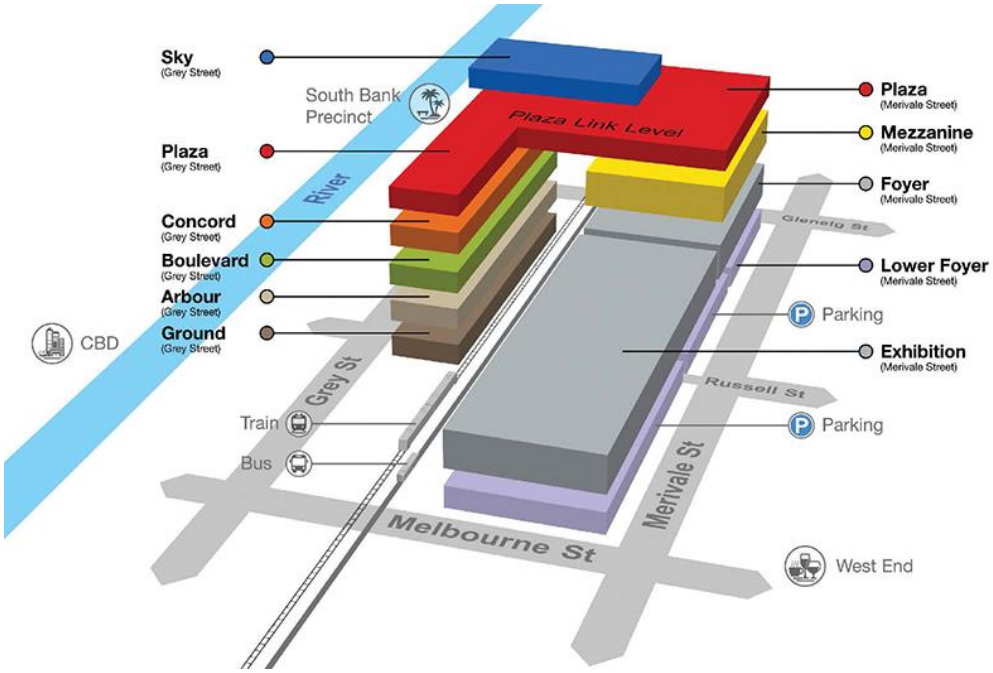
SPECIAL REQUIREMENTS

If you have advised the Conference organisers of any special dietary requirements, please identify yourself to the waiting staff for assistance.

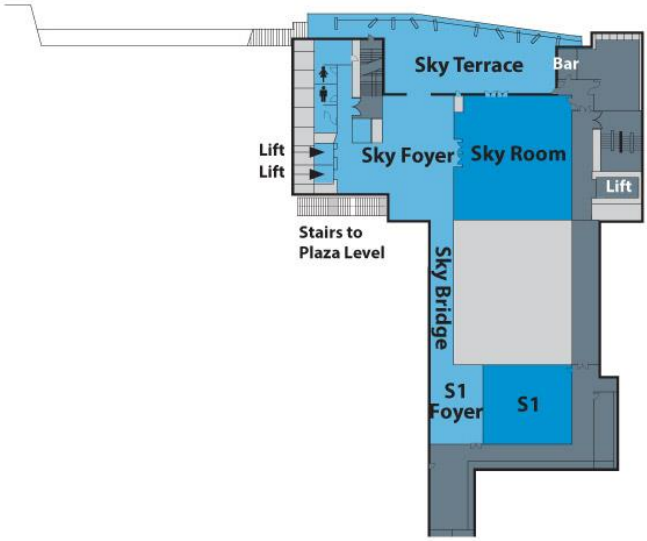
LOCATION MAP –
BCEC, BRISBANE, QUEENSLAND



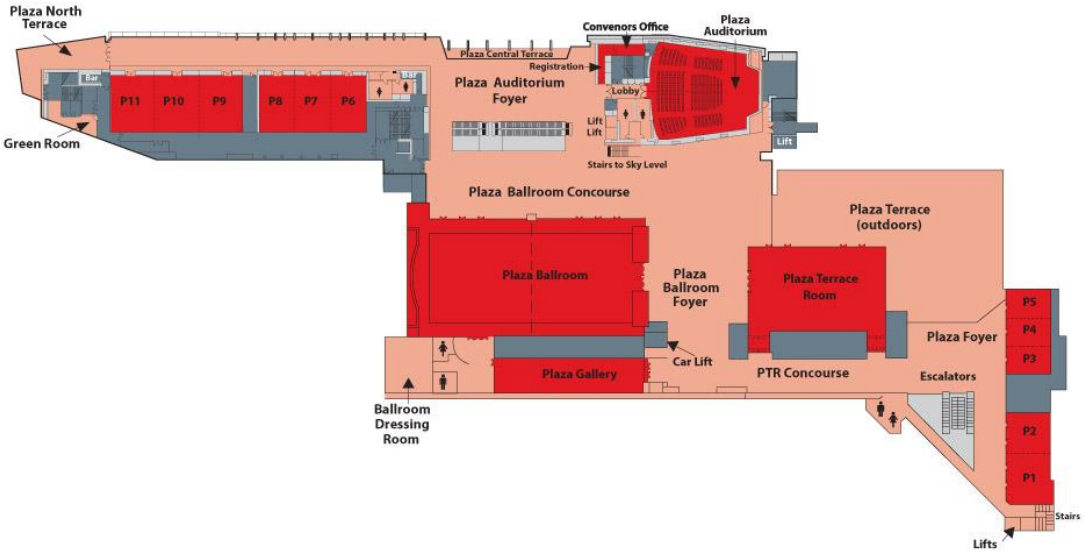
VENUE MAP – BCEC, QUEENSLAND



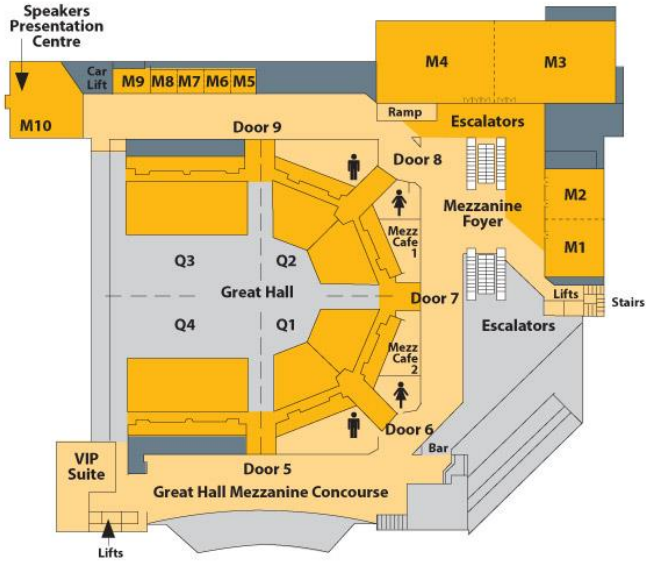
BCEC – Sky Level



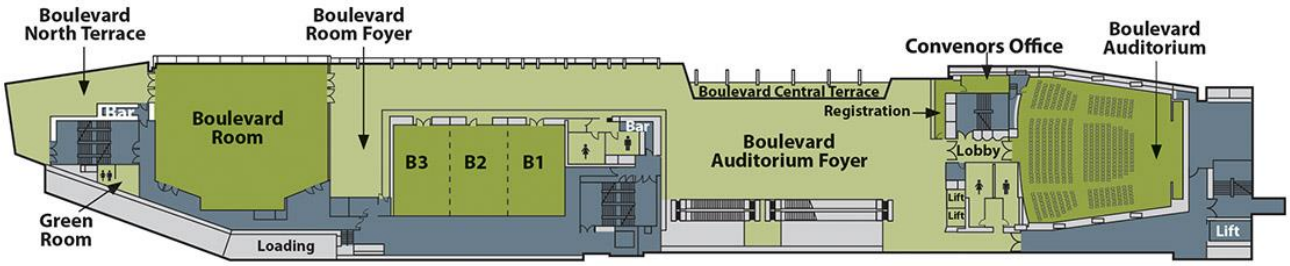
BCEC – Plaza Level



BCEC – Mezzanine Level



BCEC – Boulevard Level



CONFERENCE PROGRAM

Disclaimer

The speakers, topics and times are correct at the time of printing. In the event of unforeseen circumstances, the Local Organising Committee reserves the right to delete or alter items in the Conference Program.

TUESDAY, 7 FEBRUARY 2017		
Time	**Session**	**Location**
8.30 am – 5.00 pm	**Pre-Conference Workshop 1** *Exploring the economic, social and environmental aspects of land clearing in Australia* Convenor: Dr Katrina Davis, University of Queensland	Room P2, BCEC
8.30 am – 5.00 pm	**Pre-Conference Workshop 2** *The Economics of improving water quality into the Great Barrier Reef* Convenor: Prof. John Rolfe, Central Queensland University	Room P3 & P4, BCEC
4.00 pm - 6.00 pm	Registration for conference delegates	BCEC
5.30 pm – 7.30 pm	Welcome Reception	Sky Room BCEC
7.45 pm – late	Early Career Professionals' Event	Fish Lane Studio The Fox Hotel 71-73 Melbourne Street South Brisbane

WEDNESDAY, 8 FEBRUARY 2017		
Time	**Session**	**Location**
7.30 am - 4.30 pm	Registration	BCEC
8.30 am - 9.00 am	**Conference Official Opening**	Plaza Terrace Room
9.00 am - 10.00 am	**Opening Plenary Session** (Chair, Steven Schilizzi UWA) Professor Jason Shogren, University of Wyoming *Non-market commitments for public goods*	Plaza Terrace Room
10.00 am - 10.30 am	Morning Tea	Atrium
10.30 am – 12.30 pm	**Contributed Papers Session A**	PTR, P1, P2, P3, P4, P5, M5&6, M7&8
12.30 pm - 1.30 pm	Lunch	Plaza Foyer
12.30 pm - 1.30 pm	**Wiley Publishing Event**	Room P2
1.30 pm – 3.00 pm	**Invited Papers Session A - Evaluation** 1. *Perceptions, choices and valuation – a synthesis and research agenda* Prof. Vic Adamowicz, University of Alberta 2. *Spatial Dimensions in Economic Analysis: What you don't know might hurt you* Prof. Robert Johnston, Clark University	Plaza Terrace Room
1.30 pm – 3.00 pm	**Invited Papers Session B – Policy settings** 3. *Collective approaches to environmental and resource management* Prof. Kathleen Segerson, University of Connecticut 4. *Strengthening frameworks for natural resource management* Dr Gordon de Brouwer, Secretary, Dept of the Environment	P1
3.00 pm – 3.30 pm	Afternoon Tea	Plaza Foyer
3.30 pm – 4.15 pm	**Presidential Address** Prof. Wendy Umberger, University of Adelaide	Plaza Terrace Room, BCEC
4.15 pm – 5.30pm	**Strategic Planning Feedback - Help shape the future of AARES** Chair – Dr Deborah Peterson	Plaza Terrace Room, BCEC
6.30 pm – 10.30 pm	Conference Dinner and Presentations Speaker: Prof. John Quiggin, ARC Australian Laureate Fellow in Economics at the University of Queensland	The Boulevard Room, BCEC

THURSDAY, 9 FEBRUARY 2017		
Time	**Session**	**Location**
8.00 am - 4.30 pm	Registration	Atrium
8.30 am – 9.50 am	**Contributed Papers Session B** **Mini – Symposia** 1. *Pests and diseases in agriculture: What can we learn from case studies?* Kate Fuller, Montana State University	P1, P2, P3, P4, P5, M5&6 Plaza Terrace Room
9.50 – 10.10	**Poster Session**	Plaza Foyer
10.10 am – 10.40	Morning Tea	Plaza Foyer
10.40 am - 12.15 am	**Mini-Symposia** 2. *Is agricultural productivity a good news story? The factors at play and the role of policy* Shiji Zhao, ABARES 3. *Maximising net economic returns from Australian Fisheries* Sean Pascoe and Trevor Hutton, CSIRO 4. *Energy Transitions* Frank Jotzo, Australian National University 5. *Climate resilient water sources: Economic efficiency, implementation and public acceptance of recycled water* Simone Valle de Souza, University of New England 6. *Urban Water Economics* Sayed Iftekhar and Maksym Polyakov, UWA 7. *Environmentally adjusted efficiency and productivity* Vincent Hoang and Clevo Wilson (QUT), Tiho Ancev (USyd)	Plaza Terrace Room M5&6 P1 P2 P3 P4
12.15 pm - 1.15 pm	Lunch	Plaza Foyer
12.15 pm - 1.15 pm	**ACIAR Information Session**	Room P2
1.15 pm - 3.15 pm	**Contributed Papers Session C**	PTR, P1, P2, P3, P4, P5, M5&6
3.15 pm - 3.45 pm	Afternoon Tea	Plaza Foyer
3.45 pm - 4.45 pm	**Keith Campbell Distinguished Lecture** (Chair, Quentin Grafton ANU) Prof Sir John Beddington CMG FRS, Oxford Martin School, UK *What is happening to the world? Key challenges as we approach the third decade of the 21st century*	Plaza Terrace Room
4.45 pm - 5.30 pm	**Annual General Meeting**	Plaza Terrace Room
6.30 pm – 8.30 pm	Social night at the Beach	South Bank Surf Club 30a Plaza Parklands Stanley Street, Brisbane City

FRIDAY, 10 FEBRUARY 2017		
Time	**Session**	**Location**
7.30 am - 4.00 pm	Registration	Plaza Foyer
8.30 am - 10.30 am	**Contributed Papers Session D**	Breakout rooms: PTR, P1, P2, P3, P4, P5, M5&6
10.30 am – 11.00 am	Morning Tea	Plaza Foyer
11.00 am - 12.30 pm	3 Minute Thesis Competition	Plaza Terrace Room
12.30 pm - 1.30 pm	Lunch – Meet with 3MT Competitors	Room P2
12.30 pm - 1.30 pm	Meet with 3MT Competitors	Plaza Foyer
1.30 pm - 3.00 pm	**Invited Papers Session C** - *Trade* 1. *Brexit: Separating the UK from the EU in the WTO* Prof. Alan Winters, University of Sussex (UK) 2. *Before and after: how the commodity boom changed Australia's resource sector* Mark Cully, Australian Department of Industry, Innovation and Science	Plaza Terrace Room
1.30 pm - 3.00 pm	**Invited Papers Session D** – *Environmental Decision Making* 3. *The 'curse of dimensionality' resolved! Optimal surveillance measures for the early detection of pests and diseases* Prof. Tom Kompas, Australian National University 4. *Topic: Northern Development and the Great Barrier Reef* Prof. Natalie Stoeckl, James Cook University	P1
3.00 pm - 3.30 pm	**Afternoon Tea**	
3.30 pm - 4.00 pm	**Conference close and awards** Chair – Professor Quentin Grafton, The Australian National University	Plaza Terrace Room
4.00 pm - 5.30 pm	**AARES Incoming Council Meeting** Chair – Professor Quentin Grafton, The Australian National University	BCEC P5

Posters will be displayed for the duration of the Conference.

SOCIAL PROGRAM

The Local Organising Committee has developed an exciting social program to complement the Conference day sessions. Delegates are encouraged to participate in the social aspects of the Conference. Please see the staff at the registration desk if you have not pre-booked for any of these functions and wish to attend.

WELCOME RECEPTION

The Sky Room, BCEC
Tuesday, 7 February 2017
5.00 pm – 7.00 pm

The Sky Room & Terrace, Brisbane's most sophisticated boutique venue with spectacular city views, offers the perfect opportunity to renew old acquaintances and meet new contacts at tonight's official Conference Welcome Reception.

AARES YOUNG MEMBERS' EVENT

The Charming Squire
Tuesday, 7 February 2017
7.30 pm – late

Postgraduate students, recent graduates, early career professionals and young members new to AARES are encouraged to come together for a fun evening. As well as being a good opportunity to meet colleagues and become connected.

Situated just a hop, skip, and a jump from the Brisbane Entertainment and Convention Centre, The Charming Squire honours the life of James Squire – the infamous, yet charismatic, rogue convict-turned-brewer who inspired the creation of the award-winning and flavoursome beers Australians have come to know and really, really dig.

The extraordinary fit-out of this venue encourages patrons to get to know the brewing process and appreciate the style and robust flavours of James Squire beer. The Squire also boasts delicious meals which perfectly complement their beer counterparts. James Squire's Charming alter-ego is a must-visit.

CONFERENCE AWARDS DINNER

The Boulevard Room, BCEC
Wednesday, 8 February 2017
7.00 pm – 11.00 pm

Join colleagues and friends for a sumptuous dinner at which we will recognise the achievements of some of our leading agricultural and resource economists, and seize the opportunity to engage in some professional debate.

NETWORKING SOCIAL EVENT

South Bank Surf Club
30a Plaza Parklands, Stanley Street, Brisbane City
Thursday, 9 February 2017
7.00 pm -10.00 pm

Relaxed, welcoming and casual, South Bank Surf Club knows that waterfront dining should be accompanied by friendly service and a traditional beach vibe. The Surf Club has a relaxed and welcoming setting, with great food and stunning views over the glistening waters of South Bank's Streets Beach perfectly framed by the natural radiance of the Parklands. A short walk from BCEC, this is a great place to wind up your day.

Thank you to our Theme Sponsors of the 61st Annual Conference

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA
School of Economics

Australian Government
Australian Centre for International Agricultural Research

INVITED SPEAKER BIOGRAPHIES

Dr W L (Vic) Adamowicz
University of Alberta, Canada

Dr Adamowicz is the Vice Dean in the Faculty of Agricultural, Life and Environmental Sciences, and a Distinguished University Professor in the Department of Resource Economics and Environmental Sociology, Faculty of Agricultural, Life & Environmental Sciences, University of Alberta. He obtained his BSc and MSc from the University of Alberta and his PhD from the University of Minnesota. His research has focused on the economic valuation of environmental amenities and ecosystem services and the incorporation of environmental values into economic analysis, with applications to forestry, water quality, air quality, endangered species and agriculture. His research involves the analysis of choice behavior with applications to food demand, recreation and environmental quality.

Dr Adamowicz is the research director of the Alberta Land Institute. He was the Scientific Director of the Sustainable Forest Management Network of Centres of Excellence, from 1998 to 2004. He was a Canada Research Chair (Tier I) from 2001 to 2008 and was an Associate Dean (Research) from 2007 to 2009. He is a Fellow of the Royal Society of Canada, Academy II – Social Sciences (awarded in 2007). He became a Fellow of the Canadian Agricultural Economics Society in 2011. He was awarded the Canadian Institute of Forestry's Canadian Forestry Scientific Achievement Award in October, 2004. In 2001-2002 Adamowicz was a Gilbert White Visiting Fellow at Resources for the Future in Washington DC, and in 2011 he was an Erik Malmstem Visiting Professor at the University of Gothenburg.

Abstract: ***Environmental valuation and land management***

For some time economists and other social scientists have suggested that perceptions play a significant role in choice and behaviour. Yet there has been relatively little systematic analysis of the collection, modelling and use of perception information in applied economics – including valuation and welfare measurement. This presentation will explore issues around elicitation, modelling and interpretation of perceptions in a set of models of economic choice and valuation. Findings in economics, psychology and other sciences will be discussed including the emergence of some stylized facts about perceptions. The presentation will construct links between perceptions and choice, preference heterogeneity, welfare measurement, policy analysis, updating and behavioural economics.

Professor Sir John Beddington CMG FRS

Oxford Martin School

Professor Sir John Beddington specialises in the application of economics and biology to particular problems in the management of fisheries and other renewable resources. He has particular expertise in the design of licensing regimes and the optimal analysis of management strategies for fisheries. He has been at Imperial College since 1984, he was promoted to Reader in 1987 and is currently Professor of Applied Population Biology.

He has acted as a Senior Advisor in fisheries development and management to several major national and international bodies including the British Government, the European Commission and the United Nations Environment Programme and Food and Agriculture Organisation. In June 1997, he was awarded the Heidelberg Award for Environmental Excellence and in 2000 he became a Fellow of the Royal Society. In 2003 he was awarded the Companion of the Order of St Michael and St George by the Queen for services to fisheries science and management.

Abstract: ***What is happening to the world? Key challenges as we approach the third decade of the 21st century.***

Changes in the 21st century arguably pose some of the most difficult problems that humanity has faced. Some are familiar: population, urbanisation, food, energy and water security and the risk multiplier of climate change. Less familiar, but of real importance, include issues of sustainability of human health, the threat of pandemics and the fraught issues of technological impacts on society.

Dr Gordon de Brouwer

Department of the Environment

Gordon de Brouwer is the Secretary of the Department of the Environment, responsible for the Australian Government's environment and heritage, climate, and cities and the built environment policies.

He was previously Associate Secretary in the Domestic Policy Group of the Department of the Australian Prime Minister and Cabinet, leading departmental and cross-government policy advice to the Prime Minister on domestic policy matters and was also the senior official representing Australia's interests in the G20.

Abstract: ***Strengthening frameworks for natural resource management***

Mark Cully
Department of Industry, Innovation and Science

Mark Cully commenced as Chief Economist for the Department of Industry, Innovation and Science in September 2012. Mark has a first-class Honours degree in Economics from the University of Adelaide. From 1992-95 he was a British Council Commonwealth Scholar at the University of Warwick obtaining a Master of Arts in Industrial Relations, while working at the Warwick Business School.
He has had a varied career in applied economic research at the intersection of government and academia. In 1995 he was appointed head of research on employment relations for the UK Government, where he ran what was the world's largest survey of working life. He returned to Australia in 1999 to join the National Institute of Labour Studies as Deputy Director, and was then General Manager at the National Centre for Vocational Education Research for six years, running its statistical then research operations.

In 2009 he was appointed Chief Economist at the Department of Immigration and Citizenship and in that role chaired the OECD's Working Party on Migration. He is a member of the CEDA Council on Economic Policy.

Abstract*: Before and after: how the commodity boom changed Australia's resource sector*

Australia has had five major commodity booms over its history. Each of these booms has had certain features in common: a spike in prices, a rush of investment, and rapid resource shifts throughout the economy. By some measures, however, the latest boom is different from the booms which preceded it. This presentation examines what features make this boom unique and what the long-term effects are likely to be on the resource sector as well as the wider economy.

Dr Robert Johnston
Clark University

Dr Robert Johnston is Director of the George Perkins Marsh Institute and Professor of Economics at Clark University. He received a BA in economics from Williams College and a PhD in environmental and natural resource economics from the University of Rhode Island. Dr Johnston's research addresses nonmarket valuation, benefit transfer, and ecosystem services, with an emphasis on aquatic, riparian and coastal systems. Other interests include fisheries, tourism and meta-analysis. He has served on the US EPA Science Advisory Board, a National Research Council Committee evaluating the effectiveness of fish stock rebuilding, the Senior Advisory Board of the Connecticut Sea Grant Program, the Program Advisory Council of the New York Sea Grant Program, and the Program Committee for the Charles Darwin Foundation in Galapagos, Ecuador. Among other past and present offices, he is Past-President of the North- Eastern Agricultural and Resource Economics Association and Vice President of the Marine Resource Economics Foundation. Dr Johnston has published over one hundred books, chapters and peer reviewed journal articles. His work has been supported by agencies including the National Science Foundation, United States Environmental Protection Agency, United States Department of Agriculture, and the National Oceanic and Atmospheric Administration, and has contributed to national, state and local policy in the United States and elsewhere.

Abstract: ***Spatial Dimensions in Economic Analysis: What you don't know might hurt you***

Most topics of concern to environmental and natural resource economists are explicitly or implicitly spatial, and space is an important driver of economic behaviour. Topics such as climate change, fisheries, ecosystem services, recreation, pollution, land preservation, water supply and cost-benefit analysis, for example, all involve important spatial aspects. Yet spatial dimensions, although increasingly acknowledged, are frequently treated as an inconvenience or assumed to be of secondary importance in economic analysis. In other cases, spatial effects are assumed to be captured sufficiently by the use of simple univariate measures such as distance. Treatments such as these can influence the results and implications of economic analysis in ways that far exceed the effects of other issues given greater attention in the economics literature. This talk draws from empirical applications across multiple areas—including hazard adaptation, endangered species, ecosystem services, land preservation and valuation—to illustrate the influence of spatial dimensions on economic analysis and discuss modeling alternatives. Emphasis is given to cases in which spatial patterns or behaviours differ from those commonly assumed within economic analysis, ways in which economic models can be enhanced to better accommodate spatial dimensions, and lessons that can be learned from other disciplines.

Prof. Tom Kompas
Australian National University

Tom Kompas is a Professor of Economics, the Foundation Director of the Australian Centre for Biosecurity and Environmental Economics (ACBEE) and one of four Chief Investigators in the Centre of Excellence for Biosecurity Risk Analysis (CEBRA) at the University of Melbourne. He has dedicated much of his recent time and work to public policy in Australia and the region. Until recently, he was a part-time Senior Economist at the Australian Bureau of Agricultural and Resource Economics (ABARE), a Commonwealth Environment Research Facilities (CERF) project leader on biosecurity and Editor-in-Chief of the Australian Journal of Agricultural and Resource Economics. In 2010, Tom was appointed to the Eminent Scientists Group (ESG) in the Department of Agriculture. The ESG provides independent advice to the Minister and the Secretary of the Department on matters of biosecurity and risk analysis. In 2012, Tom became Editor-in-Chief of Asia and the Pacific Policy Studies, President of the newly-formed Asia and Pacific Policy Society and Publisher of APPS Policy Forum. He is a Fellow of the Academy of Social Sciences in Australia.

In 2009, Tom was a recipient of the University's highest award for teaching, the 'Vice Chancellor's Award for Excellence in Teaching'. In 2008, Tom also received the 'Award for Teaching Excellence' from the College of Asia and the Pacific at ANU, and in 2010 he received a national teaching award, the Australian Learning and Teaching Council 'Citation for Outstanding Contribution to Student Learning'. Tom's research specialises in applied economic dynamics and natural resource and environmental economics. His bioeconomic modelling has been published in the world's leading international journals and his current work focuses on the major biosecurity issues in Australia and internationally. In 2009, Tom received the 'CSIRO Medal for Research Achievement', in 2004, the 'Crawford Award for Research Excellence' from ABARE, and in 2011 the 'Eureka Prize for Water Research and Innovation'.

Abstract: ***The 'curse of dimensionality' resolved! Optimal surveillance measures for the early detection of pests and diseases***

Solving large scale optimisation problems over space and time quickly generates a computational impasse, termed the 'curse of dimensionality'. This severely limits the practical use of economic models, especially for natural resource management. In this presentation, we detail an innovative approach for solving (otherwise unsolvable) large scale systems through the use of parallel processing techniques, a 'sample average approximation' method, and a pruning device along a probabilistic network-tree. The method is illustrated across three key concerns in biosecurity: (1) The optimal trapping grid for fruit fly invasions in Queensland, Victoria and South Australia; (2) The use of bulk milk testing as an active surveillance measure for foot-and-mouth disease (FMD) in Victoria; and (3) The optimal vaccination buffer zone and protocol for FMD, post-incursion, in Australia.

Dr Kathleen Segerson
University of Connecticut

Dr Kathleen Segerson is a Board of Trustees Distinguished Professor and UConn Alumni Association Distinguished Professor of Economics at the University of Connecticut. She previously held the Philip E. Austin Endowed Chair and served as department head in the Department of Economics. She received a BA in mathematics from Dartmouth College and a PhD in agricultural and resource economics from Cornell University. She is a Fellow of the Association of Environmental and Resource Economists (AERE) and of the Agricultural and Applied Economics Association.

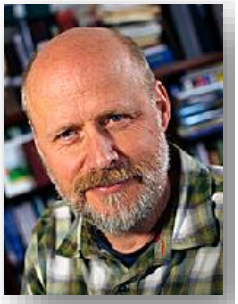
Dr Segerson's research focuses on the incentive effects of alternative environmental policy instruments, with particular emphasis on the application of legal rules and principles to environmental problems. Specific research areas include: the impact of legal liability for environmental damages in a variety of contexts, including groundwater contamination, hazardous waste management, and workplace accidents; land use regulation and the takings clause; voluntary approaches to environmental protection; the impacts of climate change on U.S. agriculture; and incentives to control nonpoint pollution from agriculture.

Dr Segerson is currently a member of the Board on Agriculture and Natural Resources of the National Research Council of the National Academy of Sciences, and served from 2005-2011 as a member of the Chartered Board of the U.S. Environmental Protection Agency's Science Advisory Board (SAB). She is also past-president of AERE, and has served as Vice-President and a member of the AERE Board of Directors. She is currently a co-editor of the Journal of the Association of Environmental and Resource Economists and has previously served as a co-editor and an associate editor of the American Journal of Agricultural Economics and an associate editor of the Journal of Environmental Economics and Management.

Abstract: ***Environmental valuation and land management***

In many natural resource contexts, the behaviour of a group of individuals or firms contributes to environmental or resource degradation or conservation. Historically, policies have been based on individual-level regulations, penalties or rewards. However, in many contexts (including fisheries, water quality, food and energy, policies can be based on group performance. A key question is whether, or under what circumstances, such policies are likely to be effective and efficient. This talk presents an overview of theoretical, empirical, and experimental research on this topic and the implications that this work has for policy design.

Professor Jason Shogren
University of Wyoming



Dr Jason Shogren is the Stroock Professor of Natural Resource Conservation and Management, Professor of Economics, University of Wyoming,

Jason Shogren's research and teaching focus on global economic issues, microeconomics, natural resource and environmental economics, and experimental economics, among other topics. He was among the elite group of scientists who shared the 2007 Nobel Peace Prize with former Vice President Al Gore as a member of the Intergovernmental Panel on Climate Change, an organization of more than 2,000 natural and social scientists from around the globe. Professor Shogren, who is the Stroock Professor of Natural Resource Conservation and Management at the University of Wyoming, was among the lead authors for the IPCC's third Assessment Report in 2001. He joined the economics faculty at the University of Wyoming in 1995 and served as chair of the department of economics and finance from 2010-13. He was editor of the International Review of Environmental and Resource Economics from 2010-14 and of Resources and Energy Economics from 2005-10.

Abstract: ***Non-market commitments for public goods***

Public good games are notorious for producing neither pure free riding nor pure cooperative behaviour. Rather most people prefer to cooperate – but only if the other players cooperate too. Real economic commitment (or the lack of it) by others affects a person's preferences to cooperate. But what if one cannot observe ex ante the commitment of others to the public good? Herein we step back and ask whether an alternative non-monetary institution – an archetypal solemn oath of honesty – can create real economic commitment within the public goods game. Commitment-through-the-oath creates an environment in which people are asked to hold themselves to a higher standard of integrity. The open question is how this commitment device affects total contributions to the public good. Our results suggest the oath can help increase cooperation (by 33 percent) – but the oath itself does not change preferences for cooperation. Rather the oath gets people to think fast in which some go with their instincts to "do the right thing" (i.e., cooperate) rather than ponder and reflect on the strategy of rational choice and its subsequent consequences.

Professor Natalie Stoeckl
James Cook University

Natalie was born in the U.S.A (Boulder Colorado), but went to school in the U.S., New Zealand, the U.K. and Australia. After completing high school (in Canberra), she went ´walkabout´ - spending several years on a Prawn Trawler, travelling with a circus, and helping run a small silvicultural contracting business. She then started University at ANU – to find that she thoroughly enjoyed economics, academia and research.

Nowadays, Natalie is perhaps best described as an economist with a keen interest in the environmental and social/distributional issues associated with economic growth - with extensive experience in a variety of non-market valuation techniques. What distinguishes her from many other economists is her track record of collaborative cross-disciplinary research using models that combine economic, environmental and social variables to explore interactions between socio-economic and ecological systems. She has published widely in both national and international forums and supervises many (mostly multidisciplinary) research students.

Abstract: ***Northern Development and the Great Barrier Reef***

The biophysical health of the Great Barrier Reef World Heritage Area (GBRWHA) is influenced by numerous factors, including, but not limited to, climate change and land-use in the adjacent river catchments. Since European settlement, the quantity of sediments, nutrients and pesticides flowing into the GBR lagoon has risen rapidly, contributing to measurable declines in reef health and in late 2015/early 2016, the reef suffered from the most severe coral bleaching event ever recorded in the region. The Australian Government has developed the Reef 2050 Plan, which focuses primarily, but not exclusively, on ways of improving water quality since this is believed to help improve reef resilience, better enabling it to recover from adverse shocks. Running parallel to these efforts is a plan to encourage further 'development' across Northern Australia: the key policy challenge being to identify development strategies that support the Reef 2050 Plan by helping to promote, rather than further erode, reef resilience. This is a non-trivial task, given the numerous complex inter-relationships within and between two very connected natural and socio-economic systems and given the existing complex institutional arrangements associated with the GBRWHA. There is much that economists can contribute to this problem – with many opportunities (and much need) to refine, extend and develop methods of assessing the costs and benefits of 'development' in ways that are able to adequately deal with such complexities.

Professor L. Alan Winters
University of Sussex

L Alan Winters CB is Professor of Economics in the University of Sussex. He is Director of the UK Trade Policy Observatory and CEO of the Migrating Out Of Poverty Research Programme Consortium. He is a Research Fellow and former Programme Director of the Centre for Economic Policy Research (CEPR, London) and Fellow of IZA, Munich. Alan is a leading specialist on the empirical and policy analysis of international trade, especially in developing countries, and has recently also worked on migration, the brain drain and economic growth.

From 2008 to 2011 he was Chief Economist at the British government's Department for International Development (DFID), and from 2004 to 2007 Director of the Development Research Group of the World Bank. He has previously worked as Division Chief and Research Manager (1994-99) and Economist (1983-85) in the World Bank and in the Universities of Cambridge, Bristol, Bangor and Birmingham. He has been editor of the World Bank Economic Review, associate editor of the Economic Journal, and is now editor of The World Trade Review. He is Chairman of the Global Development Network and is member of the UK Economic and Social Research Council (ESRC) for which he chairs the Research Committee. He has also advised, inter alia, the OECD, DFID, the Commonwealth Secretariat, the European Commission, the European Parliament, UNCTAD, the WTO, and the Inter-American Development Bank. He was made a Companion of the Most Honourable Order of the Bath (CB) in June 2012.

Abstract: Brexit: Separating the UK from the EU in the WTO

At present, many aspects of UK trade policy are determined centrally by the European Union, and all are notified to the WTO through it. Brexit changes this and will require the UK to determine its own policies and to interact wholly independently with the WTO. Even if the UK does not wish to change any of its policies, it still needs to be separated from the EU within the WTO. This presentation discusses this process and its possible implications for other WTO members; it asks, inter alia, whether any of these implications would be sufficient to constitute a reasonable

case for other members seeking further trade concessions from the UK and the EU. It notes that the issues that arise concern both the UK and the remainder of the EU (EU27).

This presentation first argues that there is no doubt that the UK is a member of the WTO in good standing. It then discusses the process by which its obligations under the WTO can be separately notified – so-called 'rectification' – and concludes that this is relatively uncontentious for the vast majority of policies: at worst, the segmentation of the UK from the EU27 may impose minor trade costs on other members. Three areas may generate more friction, however. In agriculture, tariff rate quotas and the limits on subsidies were agreed at the EU level and have to be disaggregated. With no law or precedent to rely on, this will be an analytical and then a political task, and one in which Australia and New Zealand may feel they have important interests. The third area is the Government Procurement Agreement, which the UK will need to sign and for which the UK provides around 25% of the total 'concessions' offered by the EU.

PRE-CONFERENCE WORKSHOPS

PRE-CONFERENCE WORKSHOP 1

Exploring the economic, social and environmental aspects of land-clearing in Australia

Organiser: Dr Katrina Davis, University of Queensland

Speakers: Dr Neil MacLeod, CSIRO Agriculture and Food
Dr Martine Maron, University of Queensland
Dr Jo-Anne Bragg, Environmental Defenders Office
Professor David Pannell, University of Western Australia
Carla Archibald, University of Queensland

Workshop Description

Since European settlement, 40% of Australia's original forest extent has been cleared or extensively modified for agricultural, urban or industrial development. Recent figures show that land clearing is a globally significant issue in Australia, with implications for land productivity, biodiversity and Australia's international carbon-mitigation commitments. Land clearing legislation is currently being debated in both Queensland and New South Wales, the two states responsible for the majority of cleared land in Australia's recent history. In Queensland alone, 296,000 hectares of bushland was cleared between 2013 and 2014.

A number of suggestions for managing land clearing have been made, including policy regulation and market based instruments. For these mechanisms to be successful, a better understanding of how to encourage, support and enforce compliance with vegetation laws is needed. If land clearing in Australia is to be controlled over the long term, economic solutions are needed which are informed by a sound understanding of the ecological impacts and political ramifications of land clearing.

In this session we bring together speakers from a range of disciplines to discuss the economic, environmental and legislative aspects of land clearing. By adopting an inter-disciplinary setting, this workshop will shed new light on how land clearing can and should be managed. Participants will gain from being exposed to a range of views on the causes and consequences of land clearing and potential management solutions to improve economic and environmental outcomes.

PRE-CONFERENCE WORKSHOP 2

Assessing the costs of improving water quality into the Great Barrier Reef

Organiser: Prof. John Rolfe, Central Queensland University

Speakers:

Professor John Rolfe, CQUniversity Rockhampton
Professor Robert Johnston, Clark University Massachusetts
Jane Waterhouse, James Cook University Townsville
Professor Natalie Stoeckl, James Cook University
Dr Megan Star, CQUniversity Rockhampton
Dr Jill Windle is a Research Fellow at CQUniversity
Tony Weber, Alluvium Brisbane
Jim Binney, Mainstream Economics Brisbane
Dr Steven Rust, Qld DAF Rockhampton
Mark Poggio, Qld DAF Ingham
Angela Cameron, Department of Environment Canberra
Dr Stuart Whitten, CSIRO Canberra.
Dr Jim Smart, Australian Rivers Institute Griffith University Gold Coast

Workshop Description

Catchments in the Great Barrier Reef (GBR) in Australia are the focus of substantial effort to reduce water quality impacts from agriculture. The key priorities to improve water quality identified by the 2013 Scientific Consensus Statement were:

- Excess nutrients, predominantly nitrogen associated with excess fertilizer applications in the sugar industry
- Fine sediment discharges, largely from grazing lands
- Pesticides, largely from intensive cropping including sugarcane and horticulture.

Cost effectiveness is a key criterion for judging both the performance of past investments and guiding the allocation of future investments. In practice there are a number of challenges in estimating the cost-effectiveness of investments in agricultural water quality improvement measures. These can be summarised into several areas. The first are variations in the costs measure, where public investment costs may or may not be augmented with additional private costs and/or administration and transaction costs. The second challenge is to deal with the bundling nature of many output measures, reflecting the reality that many programs can deliver multiple pollution improvements, and sometimes other environmental and landholder engagement benefits. Other key challenges include the difficulties of measuring benefits accurately, assessing benefits that have time lags or long time horizons, incorporating uncertainties and risks, dealing with threshold and interaction effects, and assessing potential crowding-in and crowding-out effects where projects may have positive or negative influences on subsequent landholder management practices.

MINI-SYMPOSIA SESSION DESCRIPTIONS

MS 1: Pests and Diseases in Agriculture: What we can learn from case studies

Convenor: Kate Fuller, Montana State University

Speakers: Kate Fuller, Montana State University
Julian Alston, University of California, Davis
David Pannell, University of Western Australia
Philip Pardey, University of Minnesota

Session Description

Agricultural economists are often tasked with evaluating the costs of particular agricultural pests and diseases and the economic benefits from developing damage-mitigation technologies to address those issues. As a result, there now exist many case studies of various aspects of pest and disease issues. While estimates of costs and benefits from studies of individual pests are often particular to that pest, case studies can lend insight into broader questions regarding the role of pests and diseases in commodity and food prices, regional and global food security, and models used by agricultural economists for a host of purposes. This session will provide insight into these issues from policy, modelling, and teaching perspectives.

This session will feature studies of agricultural pests and technology either currently being used, or proposed, to address them, conducted by four agricultural economists who have extensive experience in such evaluation. The papers presented will address pest and disease issues that range in scale from very specific, regional questions up to multi-national analysis. Each presentation will highlight unique features of the particular problem in question, and will also draw comparisons to other such studies, and postulate broader policy relevance.

Topics

1. Benefits from developing grape varieties resistant to pests and diseases
2. Potato virus Y and certification of Montana seed potatoes
3. Herbicide resistance in Australia: bioeconomic lessons
4. A spatio-temporal, multi-peril perspective on wheat rust losses

MS 2: Is Agricultural Productivity a Good News Story? The factors at play and the role of policy

Convenor: Shiji Zhao, Productivity Section, Farm Analysis and Biosecurity Branch, Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES)

Chair: The Secretary (or a Deputy Secretary) of the Department of Agriculture and Water Resources or the presiding commissioner of the Productivity Commission on the Regulation of Agriculture inquiry

Speakers: Peter Gooday, ABARES
Caroline Gunning-Trant, ABARES
Rosalie McLachlan, Productivity Commission
Ana Markulev, Productivity Commission

Session Description

Productivity is an important measure of how Australian agriculture is performing. It reflects improvements in the efficiency with which inputs such as land, labour and capital are used to produce outputs such as crops and livestock products. Productivity growth is also important for maintaining growth of agricultural production, farm profitability and international competitiveness given the long-term decline in Australian farmers' terms of trade.

Productivity growth in the Australian broadacre and dairy industries between 1977-78 and 2014-15 has generally been very good, albeit with some major variations. Climate variability, and increasingly climate change, have clear negative impacts on the productivity of the two industries. Australian agriculture is strongly export-oriented and international commodity markets also exert significant influence on the production and productivity of Australian agriculture. Recent ABARES research on growing food demand in international commodity markets and implications for Australian agriculture will be presented.

The Productivity Commission (PC) released a draft inquiry report on the Regulation of Australian Agriculture in July, with a final report due to the Australian Government on 15 November 2016. The inquiry has extensive coverage of regulatory issues confronting Australian agriculture, many with direct or indirect implications for the future growth of productivity in agriculture. Drawing on the findings from the inquiry, the Commission will explain how regulation can impose unintended as well as intended distortions in production practices, and raise costs for Australian agriculture. Animal welfare provides an example of the challenge of getting the policy balance right to satisfy community concerns without affecting long-term productivity.

Topics

1. An overview of productivity trends in agriculture, including the impact of climate
2. Competition in export markets – where does our advantage lie and what to expect from our competitors
3. The impact of regulation on agricultural productivity – costs and distortions
4. Animal welfare regulation

Sponsorship

This symposium is jointly sponsored by the Australian Bureau of Agricultural and Resource Economics and Sciences and the Productivity Commission.

MS 3: Maximising net economic returns from Australian Fisheries

Convenors: Sean Pascoe, CSIRO
Trevor Hutton CSIRO

Presenters: Sean Pascoe, Trevor Hutton and Eriko Hoshino, CSIRO
Satoshi Yamazaki, UTAS
Tom Kompas, ANU
David Galeano, ABARES

Session Description

An objective of the Fisheries Management Act 1991 is 'maximising the net economic returns to the Australian community from the management of fisheries', which has been interpreted as achieving the biomass that, on average, produces maximum economic yield (BMEY) in the Commonwealth Fisheries Harvest Strategy. Deriving appropriate economic-based target reference points in multispecies fisheries is well recognised as a complex problem. Further, "standard" methods for assessing MEY do not accounted for environmental externalities, particularly in terms of bycatch and discards, which may affect the optimal outcome from a broader societal perspective. These standard methods also ignore the impact of changes in consumer benefits from moving to a fishery profit maximisation target if this also results in higher prices to consumers. In such a case, a broader definition of MEY to include both consumer and producer benefits may be appropriate.

The aim of the mini-symposium is to present recent research highlighting the effects of these broader considerations on fisheries targets, and to instigate discussion around how best such a broader definition could be implemented in practice. The outcomes of the mini-symposium will contribute to the current revision of the Commonwealth Fisheries Harvest Strategy Policy.

Topics

1. Current overview of the revision of the Commonwealth harvest strategy policy
2. Review of definitions of MEY and net economic returns
3. Modelling analysis including cost of bycatch of iconic species and consumer surplus in "MEY"
4. Modelling analysis of potential harvest strategies in an example multispecies fishery

MS 4: Energy Transitions

Convenor: Associate Professor Frank Jotzo, Crawford School, Australian National University

Chair: Professor Quentin Grafton, Crawford School, Australian National University

Speakers: Dr Ross Lambie, Department of the Environment and Energy, Federal Government
Dr Tim Nelson, AGL
A/Professor Frank Jotzo, ANU Crawford School
Professor John Wiseman, University of Melbourne MSSI
Dr Sabah Abdullah, University of Queensland Energy & Poverty Research Group

Session Description

Productivity is an important measure of how Australian agriculture is performing. It reflects **Energy Transitions.** Changes in energy supply technologies and the drive for low-emissions energy systems are set to change energy market conditions. Both Australia's domestic energy system and energy exports may see significant change over coming decades. This session will draw out different aspects of the energy transition, drawing on ongoing research and discussing policy implications, with a focus on Australia and the region.

The session will cover coal markets and policy, drawing on a ongoing research under an international project with modelling and policy analysis (Jotzo); regional and social issues of coal transition, drawing on ongoing empirical research (Wiseman); analysis of global gas markets and implications for Australian gas production and exports (Lambie); and prospects for investment in and financing of renewable energy in Pacific Island States, as foreseen in pledges under the Paris Agreement on climate change (Abdullah).

Topics

1. Going with the flow: The effect of transitions in global LNG markets on Australia
2. Electricity sector market reform and transition to renewables
3. Global low-carbon scenarios and coal transition: roles for policy to help adjust
4. Social and regional transition away from coal: the Latrobe Valley case
5. Financing to meet Pacific Islands Countries & Territories (PICT) renewable energy targets

MS 5: Climate resilient water sources: Economic efficiency, implementation and public acceptance of recycled water

Convenor: Dr Simone Valle de Souza, University of New England

Chair: Professor Quentin Grafton, Crawford School, Australian National University

Speakers: Professor Lin Crase, University of South Australia
Professor Jeff Bennett, Australian National University
Mr Rod Carr, Director, Marsden Jacob
Professor Rui Cunha Marques, University of Lisbon

Session Description

This mini symposium aims to discuss advantages and disadvantages of industrial-agricultural- and urban-relevant uses of recycled water in Australia. Speakers are invited to tackle two aspects of the use of recycled water: (i) the economic efficiency of recycling water, including the efficient allocation of recycled water across sectors according to specific infrastructure costs and pricing mechanisms, and (ii) the social aspects of providing water security through recycled water; both in the context of increasingly intense cycles of droughts and floods as a consequence of climate change. It is expected that through the understanding of public perception of water reuse a market-based framework can be designed to assist decision making processes in private and public sectors, promoting thus the efficient allocation of this scarce resource.

Australians' annual consumption of domestic use of water has been increasing significantly with the growth or urban areas and relatively low prices which deceive demand (Radcliffe 2008). The country, which relies heavily on groundwater supplies (NHMRC 2004), requires alternative climate resilient water sources such as desalinated or recycled water for long-term water security (CRWS 2016), lessening the direct impact of climate variability on water availability. Notwithstanding, the already variable availability of the freshwater in Australia due to uneven rainfall (NHMRC 2004), is now threatened by the probable increased frequency, intensity and duration of weather-related disasters, such as floods, cyclones, and droughts, as a consequence of climate change (IPCC 2012). Many of the impacts of extreme weather changes fall on water supply, stormwater and drainage infrastructure capacity and roads and buildings (Hardwicke 2010) potentially upsetting economic and social activities and systems in the community.

While wide research focuses on engineering and technical efficiency within sectors, an important gap in water recycling research exists from an economic and a social perspective (Devi, Davidson and Boland 2007). This discussion group recognises the relevance of human dynamics in the adoption of recycled water and the need to optimise its use across sectors in the economy considering particular costs and benefits associated with different levels of treatment.

Topics:

1. Integrated decisions about water: Property right and scope considerations
2. Community Preferences for Recycled Water in Sydney
3. Governance and Economic Assessment of Recycled Water Schemes in Australia
4. The Role of Different Tariff Structures in New Water Sources

Sponsorship

This symposium is sponsored by Australian WaterSecure Innovations.

MS 6: Urban Water Economics

Convenors: Sayed Iftekhar, University of Western Australia
Maksym Polyakov, University of Western Australia

Speakers: Dr Anke Leroux, Monash University
Professor John Quiggin, University of Queensland.
Dr Sorada Tapsuwan, CSIRO
Dr Sayed Iftekhar, University of Western Australia

Session Description

In Australia, the traditional model of urban water service provision has evolved through a number of phases. In 1993 the Federal Government started water sector reform in terms of the price of water, water rights and water resources management system recognising the need for an integrated management approach to potable, wastewater and stormwater management. Over the past decade, water utilities in Australia have invested heavily in augmenting water supplies to urban areas. The estimated investment in supply augmentation by Australia's largest water utilities was $30 billion between 2005/06 and 2011/12. In addition, there has been investment in various green infrastructure projects in urban areas, including rain gardens and green roof and walls supported by the City of Sydney; and swales, rain gardens and wetlands supported by the City of Melbourne.
In this session, we have brought together presentations on a diverse set of topics related to urban water management: optimal water supply portfolio, water pricing, groundwater replenishment and non-market values of decentralised stormwater treatment system. These topics will cover different areas of economic research related to urban water supply, demand, and ecosystem services. Further, three experienced panellists will discuss the presentations, relating them to current policy and management issues, and identifying directions of future research.

In addition, due to the highly applied nature and policy relevance of the theme, we shall encourage people from end user organisations (such as Brisbane City Council, Queensland Urban Utilities, WA Water Corporation and Melbourne Water) to attend the session. In order to facilitate their presence, we shall use our already existing strong connections with the end users through the CRC for Water Sensitive Cities. Thus, we hope to give a broad picture of the issues related to economics and policy of urban water and to achieve synergy by combining academic and industry experiences in answering questions about optimal water management in urban settings.

Topics

1. Optimal water supply portfolios and consumption patterns in the presence of uncertainty surrounding reservoir inflows and rainfall
2. Efficiency and equity in urban water pricing
3. A cost-benefit and risk assessment of managed aquifer recharge for industrial use
4. Amenity value of water sensitive urban infrastructure

MS 7: Environmentally adjusted efficiency and productivity

Convenors: Associate Professor Tihomir Ancev, University of Sydney
Dr Viet Ngu (Vincent) Hoang, Queensland University of Technology
Professor Clevo Wilson, Queensland University of Technology

Speakers: Dr Samad Azad, UniTas
Dr Viet Ngu Hoang, QUT
Dr Heidi Millington, Griffith
Dr Sriram Shankar, ANU
Associate Professor Atakelty Hailu, UWA

Session Description

This Session has a special focus on recent scholarly developments in the areas of environmentally adjusted productivity analysis and efficiency measurement. The need to account for environmental impacts from various economic activities in human society is increasingly important and these areas have received increasing attention in recent economic literature. This mini symposium will provide timely updates on recent updates in theoretical and empirical literature in these fields. In addition, the workshop also offers panel discussion by leading researchers in this field. The overall audience of the AARES will be able to know future research directions as well as potential applications in the real world.

This workshop has three specific objectives. First, it gathers researchers in Australia to present their recent research outcomes or agenda. Second, it provides opportunities for discussions between researchers and wider audience. Third, it generates high quality papers for the special issue on Economic Policy Analysis (http://www.journals.elsevier.com/economic-analysis-and-policy).

Topics

1. Indicators of Natural Capital on Farms
2. Material Balance & Efficiency-Productivity Analysis
3. Assessing Stream Health with Respect to Ecological Connectivity
4. Contingent Production Technologies & Its Application in Environmental Analysis

3-MINUTE THESIS COMPETITION

Benyam, Addis	Ord
Brown, Brendan	Stu
Chen, Yangzing	Ord
Dorner, Zack	Stu
Flores Tenorio, Pedro	Stu
Gunathilaka, Dayani	Stu
Hardaker, Talia	Ord
Khang, Tien Dung	Stu
Li, Kuo	Ord
Majiwa, Eucabeth	Stu
Manero, Ana	Stu
Mustafa, Seeshan	Ord
Nguyen, Thu Hung	Stu
Paul, Sudeshna	Stu
Tighe, Kara	Stu
Velarde Sandra	Stu
Wlisinghe, Buddhini	Stu
Zhang, Bao	Ord

SELECTED PAPER ABSTRACTS

Beghin, John C; and Xiong, Bo

TTIP AND AGRICULTURAL TRADE: THE CASE OF TARIFF ELIMINATION AND PESTICIDE POLICY COOPERATION

Session 17A: Friday 8:30 am – 10:30 am

A possible Trans-Atlantic Trade and Investment Partnership (TTIP) agreement will further integrate agricultural markets between the United States and the European Union. The elimination of tariffs and cooperation on Sanitary and Phytosanitary measures will promote cross-Atlantic trade. We empirically estimate the impacts of tariffs and Maximum Residue Limits (MRLs) on trade in plant products between the two partners. Furthermore, we simulate trade expansions under plausible negotiation outcomes. We find that a TTIP agreement promotes cross-Atlantic trade in plant products, in both directions, by over 60% if tariffs are removed and MRLs are mutually recognized or harmonized to Codex levels.

Brown, P; Daigneault, A; Tjernstrom, E; Zou, W

NATURAL DISASTERS, SOCIAL PROTECTION, AND RISK PERCEPTIONS

Session 4A: Wednesday 10:30 am – 12:30 pm

We study the impact of being struck by Cyclone Evan on Fijian households' risk attitudes and subjective expectations about the likelihood and severity of future natural disasters. The randomness of the cyclone's path allows us to estimate the causal effects of exposure. Our results show that being struck substantially changes individuals' risk perceptions and beliefs about the frequency and magnitude of future shocks. However, we find sharply distinct results for the two ethnicities in our sample, indigenous Fijians and Indo-Fijians, the former of whom are noted for their "collectivist" social organization and the latter of whom are largely self-reliant: the impact of the natural disaster aligns with previous results in the literature for Indo-Fijians, whereas they have little to no impact on those same measures for indigenous Fijians. Anchored in the institutional context of Fiji, this result is sensible and has implications for how social protection can mitigate some of the negative impacts of natural shocks on households' expectations. To provide welfare implications for our results, we compare households' risk perceptions to climate and hydrological models of future disaster risk and find that both ethnic groups over-infer the risk of future disasters relative to model predictions. If such distorted beliefs encourage over-investment in preventative measures at the cost of other productive investments, these biases could have negative welfare impacts.

Dissanayake, Sumali; Asafu-Adjaye, John; and Mahadevan, Renuka

ADDRESSING CLIMATE CHANGE CAUSE AND EFFECT ON LAND COVER AND LAND USE IN SOUTH ASIA

Session 17A: Friday 8:30 am – 10:30 am

This paper evaluates the role of trade liberalization and agricultural intensification in mitigating climate change cause and effects on land use and emissions using a computable general equilibrium model. Our results indicate that cropland expansion triggered by climate-induced crop productivity changes results in deforestation and increases emissions in South Asia and globally. Global full trade liberalization on all goods is the optimum policy for South Asia despite significant global deforestation, but for the world, unilateral partial trade liberalization on all goods is a more appropriate policy while ensuring a considerable emissions reduction for South Asia. These results indicate that mitigation responses to climate change are location specific and no one trade policy is suitable at the regional and global levels. Lastly, agricultural intensification by improving productivity growth is the best strategy in land-based emissions mitigation, thereby avoiding the transformation of forest and pasture lands for agricultural cultivation both at regional and global levels.

Etwire, Prince Maxwell

IMPACT OF CLIMATE CHANGE AND VARIABILITY ON CHOICE OF FARMING SYSTEMS IN GHANA

Session 1D: Thursday 1.15 pm – 3.15 pm

Agriculturalists are already adjusting their practices as a response to climate change and variability. An important adaptation strategy is switching from a vulnerable farming system to one that is more resilient. When farmers adjust their practices, the majority of studies assume that those adjustments are made as a response to climate change and therefore completely ignore climate variability. Using household, farm, and climate data (8978 observations), we estimate a multinomial logit in order to determine the factors that influence the choice of farming systems in Ghana. We find that both climate change and climate variability are important determinants of the choice of farm type.

Holligan, Eamon; and Collier, Alison

EFFECT OF YIELD AND PRICE VARIATION ON MULTI-YEAR ECONOMIC PERFORMANCE: AN APPLICATION TO A SUGARCANE FARM IN HERBERT REGION, NORTH QUEENSLAND.

Session 10C: Friday 8:30 am – 10:30 am

For sugarcane enterprises, multiple years of adverse price and yield outcomes may have a significant and compounding impact on profitability, limiting the ability to service increased levels of debt, and posing a threat to long-term financial resilience. In this regard, year-to-year yield and price risk and the accumulating effects of these over time are important considerations to represent the full range of economic outcomes for sugarcane enterprises. Currently, an important research gap exists in the risk analysis of sugarcane production. This research seeks to address this gap by developing a methodology for conducting a comprehensive multi-year risk analysis for a sugarcane enterprise. The analysis has been conducted on a hypothetical 150 hectare sugarcane farm in the Wet Tropics region of north Queensland. Price and yield risk have been incorporated into the analysis using a Monte Carlo multi-year cash flow simulation model. Results presented include both the CDF for the 10-year ending cash balance and the CDF for the ten-year minimum cash balance. The proposed multi-year risk analysis detailed in this paper may improve existing farm level and aggregate level modelling and analysis efforts by permitting the assessment of sequences of outcomes within a specified timeframe.

Khanal, Uttam; Wilson, Clevo; Lee, Boon; and Hoang, Vincent

DO CLIMATE CHANGE ADAPTATION PRACTICES IMPROVE TECHNICAL EFFICIENCY OF SMALLHOLDER FARMERS?

Session 1F: Wednesday 10:30 am – 12:30 pm

This paper provides one of the first empirical studies that examine the impact of climate change adaptation practices on technical efficiency (TE) among smallholder farmers in Nepal. An adaptation index is used to explore the impact of farmers' adaptation on TE in the framework of stochastic frontier analysis. Data for six districts of Nepal representing all three agro-ecological regions (Terai, Hill and Mountain) were collected from a focus group discussion, a stakeholder workshop and a household survey. The survey shows that about 91% of the farming households have adopted at least one practice to minimize the adverse impacts of climate change. Empirical results reveal that adaptation is an important factor explaining efficiency differentials among farming households. Farming households adopting a greater number of adaptation practices on a larger scale are, on average, are found to be 13% more technically efficient than those adopting fewer practices on smaller scale. The empirical results also show that average TE is only 0.72, meaning that farming households in Nepal could further improve productive efficiency by 28%. Other important factors that explain variations in the productive efficiency across farming households include farmer's education level, irrigation facility, market access, and social capital such as farmer's participations in relevant agricultural organizations and clubs.

Khataza, Robertson

ON THE OPPORTUNITY COST OF ENHANCING LEGUME-BASED SUSTAINABLE AGRICULTURAL INTENSIFICATION PRACTICES

Session 16A: Wednesday 10:30 am – 12:30 pm

Examining the trade-off between competing objectives, such as farm profitability and environmental conservation, could improve our understanding on the adoption dynamics of conservation agriculture. Using directional output distance function (DODF) and data from Malawi, we evaluate the opportunity cost of supplying environmental services through in-situ crop-residue management practices. The opportunity cost is computed in terms of foregone grain value. Our results show that maize stover is costly to produce because it sacrifices more grain than legume biomass. The findings highlight the need for a number of policies that could enhance the adoption of conservation agriculture practices. First, there is need to strengthen property rights to secure landholders' investments towards resources for conservation agriculture. Second, there is need to link farmers to high-value markets that offer competitive prices for eco-products produced from resource-conservation or "green" farms.

Kingwell, Ross; Thomas, Quenten; Feldman, David; Farre, Imma; and Plunkett, Brad

TRADITIONAL FARM EXPANSION VERSUS JOINT VENTURE REMOTE PARTNERSHIPS

Session 4A: Wednesday 10:30 am – 12:30 pm

Traditionally farms expand by buying out a neighbour. But might joint venture (JV) remote partnerships be a better way of expanding a farm business in the face of projected climate change and price volatility? This question is addressed using farm business financial modelling. Representative farms at 27 locations in Western Australia are constructed to enable comparison of the value of traditional farm expansion (buying out a neighbour) versus expansion using geographically distant JV partners. The farm models consider economies of size, bulk purchase price discounts, the variability and correlation of returns associated with farm expansion, and impacts of climate change. Over all locations, under current and projected future climate, 13 and 17 percent respectively, greater wealth is generated by a JV farm expansion involving remote locations versus only localised expansion. Locations identified as highly preferred JV partners under current climate are similarly preferred partners under projected future climate. The main sources of additional wealth attributable to the JV come from economies of size advantages, the risk-spreading benefits of combining geographically separated farms and in many cases bulk discount advantages. Farmers intent on business expansion may need to more carefully consider the benefits of geographical diversification.

Kouser, Shahzad; Ward, Patrick S; and Spielman, David J

FARMER PREFERENCES FOR COTTON LEAF CURL VIRUS RESISTANT CULTIVARS: EMPIRICAL EVIDENCE FROM PAKISTAN

Session 1D: Thursday 1.15 pm – 3.15 pm

Cotton leaf curl virus disease (CLCuD) is one of the major biotic constraints of cotton production in Pakistan. Many cotton producers consider CLCuD as the major threat to their crop, rivaling bollworm infestation, and various research stations are struggling to develop resistant cultivars. This study aims to help crop developers by investigating farmers' preferences for different attributes of CLCuD-resistant cultivars. To this end, we conducted a discrete choice experiment and a household survey among a random sample of 551 cotton farmers drawn from within all cotton-producing zones of Punjab and Sindh provinces in eastern Pakistan. Random parameter logit model is used to incorporate preference heterogeneity in the stated choice analysis. Empirical findings suggest that farmers are willing to pay for cultivars that protect cotton yields against increasing disease stresses. Based on these findings, we suggest there is considerable scope for the rapid development and widespread adoption of such cultivars, even if marketed at prices that are significantly higher than current cotton seed prices.

Majiwa, Eucabeth; Lee, Boon; and Wilson, Clevo

TOTAL FACTOR PRODUCTIVITY AND UNDESIRABLE OUTPUTS: AN ANALYSIS OF AFRICAN AGRICULTURE

Session 3A: Friday 8:30 am – 10:30 am

Total factor productivity of agriculture for twenty-seven African countries is measured using panel data from Food and Agriculture Organization of the United Nations database for the period 1980 to 2012. Using the Färe-Primont productivity index, TFP was decomposed into measures of technical and efficiency change with the efficiency change being decomposed further into finer measures of technical, mix and scale efficiency changes. The results indicate TFP change and technical change growth rates of 1.82% and 2.19% respectively. Incorporating the emissions, TFP and technical change growth rates were 2.08% and 1.27% respectively in the presence of CO2. Incorporating N2O in the analysis, the TFP and technical change growth rates grew by 2.36% and 1.64% respectively. When CH4 was included, the TFP change and technical change growth rates grew by 1.63% and 0.6% respectively. When considering the three emissions (CO2, N2O and CH4) in the analysis, the TFP and technical change growth rates were 1.63% and 0.6% respectively. The results thus imply that estimating TFP without incorporating emissions does not account for the true productivity change. Examining the determinants of TFP, mean years of schooling, agriculture spending on R&D, political stability, the ratio of adult HIV prevalent and per capital land were found to affect TFP.

Manero, Ana

INCOME INEQUALITY WITHIN SMALLHOLDER IRRIGATION SCHEMES IN SUB-SAHARAN AFRICA

Session 1C: Thursday 8:30 am – 10.10 am

While poverty levels are decreasing on a global scale, economic inequalities are rapidly growing in many developing areas, including sub-Saharan Africa. Mitigating such disparities is crucial for ensuring effective, long-lasting poverty reduction, which is extensively document in the exiting literature. However, most studies on economic inequality are based on regional and country-wide data, yet fewer empirical investigations have been conducted at smaller scales, such as rural communities. This paper examines income disparities within six smallholder irrigation schemes in Zimbabwe, Tanzania and Mozambique, comparing inequalities at local and national levels, as well as decomposing inequality by-group and by-source. The results reveal very high levels of income inequality at the community levels, with households having diversified incomes earning significantly higher incomes than those exclusively relying on agriculture. Agricultural incomes tend to reduce inequality within the communities, while wages have an unequalising effect and business and other sources have varying impacts across the six case-studies. The results of this study suggest that, inadvertently, nation-wide strategies may overlook high inequalities at smaller scales and thus, development policies should be tailored to the specific areas of intervention.

Nordblom, Thomas; Penfold, Chris; Weckert, Melanie; and Norton, Mark

STRAW AND LIVING MULCHES COMPARED WITH HERBICIDE FOR UNDER-VINE WEED SUPPRESSION IN A PUBLIC-PRIVATE BENEFIT FRAMEWORK

Session 1A: Wednesday 10:30 am – 12:30 pm

A common practice in Australian vineyards is to manage under-vine weeds with approved herbicides applied one or more times each year. A current project is testing the potentials in a range of pasture species and cereal straw as under-vine mulches compared to herbicides for weed control. Grass and legume pasture species in under-vine trials in 2015-16 have shown promising results at some sites, with grape yields in some cases exceeding those of the herbicide control plots. Weeds compete with vines for water and nutrients and may provide a 'green bridge' between seasons, hosting pests and pathogens below the vines. Among the problems with repeated use of herbicides is the evolution of resistant populations of weeds, and their spread within the vineyard and to neighbouring properties and public lands.This study subtracts the costs of typical herbicide regimes and those of alternative mulches and other vineyard costs from the values of their respective grape yields as baseline prices and yields vary over time. This allows estimation of a private financial risk profile for each option. Juxtaposing these with the value of reduced risk of herbicide resistant weed seed spreading beyond the vineyard, permits analysis in a Public-Private Benefit Framework.

Owusu Coffie, Rebecca; and Hailu, Atakelty

TECHNICAL INEFFICIENCY AND TECHNOLOGY GAP OF RICE FARMS IN DIFFERENT AGRO-ECOLOGICAL ZONES OF GHANA: AN APPLICATION OF ALTERNATIVE STOCHASTIC METAFRONTIER APPROACHES

Session 3A: Friday 8:30 am – 10:30 am

The subject of technological heterogeneity has been a major issue in the application of production function approach to efficiency estimation. Building on the meta production function concepts of Hayami (1969) and Hayami and Ruttan (1970), Battese et al. (2004) introduced a metafrontier approach that addresses technological heterogeneity in efficiency estimation. Battese et al. (2004) construct the metafrontier using linear programming (LP) methods to envelop average production functions (APF) representing group frontiers. In this paper, we propose two alternative methods for constructing the metafrontier and establishing its statistical properties. Our first proposal relates to constructing the metafrontier using upper confidence bounds for the group frontiers and estimating the metafrontier using Bayesian regression methods. The second alternative integrates the group and higher-level frontier estimations into a single Bayesian estimation procedure by constructing LP based metafrontier for each Markov Chain Monte Carlo (MCMC) group frontier draws. We apply our proposed models to examine technical inefficiency and technological gap of rice farms in the Guinea and Sudan savannah agro-ecological zones of Ghana. Empirical estimates from the models show that overall, rice production in the agro-ecological zones are characterised by inefficiencies. However, farms in the Guinea savannah zone are more efficient compared with those in the Sudan savannah zone. Methodologically, we find that the alternative metafrontier models generate comparable technology gaps overall but the full integration of the metafrontier estimation into the group frontier estimation using Bayesian methods provides better separation of technology gap estimates between regions.

Schaak, Henning; and Mußhoff, Oliver

BEHAVIORAL DRIVERS FOR GRAZING PRACTICES IN DAIRY FARMING

Session 10A: Thursday 8:30 am – 10.10 am

Grazing based milk production has become a topic of interest in agricultural policy as well as dairy product marketing due to its simultaneous decline in agricultural practice and increased favourability and demand by society. This paper studies the behaviour of German farmers with respect to the adoption of grazing practices. To do so, a structural equation model on basis of the technology acceptance model (TAM) is developed. According to the TAM, the perceived usefulness (PU) and perceived ease of use (PEOU) are key determinants of the intention to use (IU) and the actual usage behaviour of a technology (UB). The results indicate that the PU and PEUO significantly influence the adoption of grazing practices. Other important aspects are the production limitations on the individual farm and the farmers' subjective norm towards grazing. Furthermore, the analysis reveals differences between conventional and organic farmers, showing that the influence of the farmers' beliefs on the UB tend to be greater for conventional farmers. The results show the potential influence of public information and communication on grazing usage by German dairy farms, since the beliefs of the decision maker play an important role in the decision-making process.

Scharadin, Benjamin; and Jaenicke, Edward

IT ALL ADDS UP: NON-FOOD RELATED TIME ALLOCATIONS AND DIET QUALITY

Session 8A: Thursday 1.15 pm – 3.15 pm

High and increasing rates of obesity, diabetes, and heart disease are found in all demographics of the U.S, but they are particularly high in low-income households. Since these diseases are directly related to diet quality, the lower level of diet quality among low-income households has been a focus of research for many years. Current research often focuses on the roles of household income and the retail food environment. However, research shows that these two factors explain only a fraction of the differences between the dietary healthfulness of low and high socioeconomic status households.

In this paper, we investigate the role that household-specific non-food related time allocations have on food group expenditure shares by combining data from the American Time Use Survey (ATUS) and the USDA's National Household Food Acquisition and Purchase Survey (FoodAPS) through the Two-Sample Instrumental Variables approach. While prior research has focused on time allocations related to food activities, we focus on

non-food related activities because it may be more feasible to implement policies on these activities. Using a Multinomial Fractional Logit model we find that time spent in childcare, adult care, and non-car transportation affect the healthfulness of foods purchased. In particular, time spent in own childcare is related to reduced expenditure on fruits and vegetables and increased expenditure on snack foods and sugary beverages. In addition, the magnitude of the influence of these time expenditures differs by other characteristics such as SNAP participation, car access, and education about nutrition information.

Singerman, Ariel; Lence, Sergio; and Useche Pilar

IS AREA-WIDE PEST MANAGEMENT USEFUL? THE CASE OF CITRUS GREENING

Session 9A: Friday 8.30 am – 10.30 am

Citrus greening currently poses a severe threat to citrus production worldwide. No treatment or management strategy is yet available for growers to deal with the disease. While working on developing short- and long-term treatments, scientists recommend controlling the vector of the disease. In this regard, area-wide pest management has been proposed as a superior alternative to individual pest management. We analyze a unique dataset of farm-level yields that allowed us to test such hypothesis, and quantify the differential economic benefit in two areas with different implicit level of participation. In addition, we present survey data that provide insights about producers' preferences and opinions regarding area-wide pest management. Such information should prove useful in designing incentive mechanisms to enhance grower participation in area-wide pest management.

Thapa, Ganesh; Kumar, Anjani; and Joshi, Pramod

IMPACT OF AGRICULTURAL DIVERSIFICATION ON RURAL POVERTY IN NEPAL

Session 1E: Friday 8.30 am – 10.30 am

Agricultural diversification using high-value crops (HVCs) can be an important strategy to augment income, generate employment and reduce poverty in developing countries. We studied the impact of agricultural diversification on household welfare measures in Nepal, using three rounds of the nationally representative Nepal Living Standard Surveys (NLSS): NLSS I (1994/95), NLSS II (2004/05) and NLSS III (2010/11). The dose-response function, propensity score matching and instrumental variable techniques were used to estimate the impact of agricultural diversification. Results showed the positive impact of HVCs on monthly per capita consumption expenditure and poverty reduction. We found that in order to escape poverty, marginal farmers needed to generate at least 35% of their revenue from HVCs.

Wang, Jiayu; Quiggin, John; and Wittwer, Glyn

MODELLING THE AUSTRALIA PROPOSED LIGHT VEHICLE EMISSIONS STANDARDS IN A CGE FRAMEWORK

Session 12A: Wednesday 10:30 am – 12:30 pm

Policy makers around the world deem fuel-efficiency improvement schemes as a cost-effective way to reduce energy consumption and greenhouse gas emissions in the private transport sector. However, there has been heated discussion over whether the mechanical approach of improved fuel efficiency may be offset by behavioural changes that lead to more consumption of energy goods and services. In previous literature, economists have defined this adjustment on the consumer side as the "rebound effect", and if the rebound effect were larger than the "mechanical effect", there would be a "backfire effect. To investigate this effect, first we examine theoretically the possible results of an exogenous technological improvement in fuel use, and then empirically analyse the magnitude of the rebound in a computable general equilibrium (CGE) model of the Australian economy. We simulate a 3% increase in fuel efficiency, in accordance with the target of the mandatory policy on light-vehicle emission standards proposed by the Climate Change Authority (CCA) of Australia in 2014. The simulation results show that for the Australian economy, although a specific technological improvement in transport fuel produces a rebound effect, it still results in an overall fuel saving. In addition, a 0.02% growth in GDP is achieved, meaning that the overall energy efficiency is improved, since fuel consumption has been reduced. However, the results and policy implications of this analysis should be taken cautiously, as this simulation applies only to one specific improvement in fuel efficiency; not to a general energy-efficiency improvement.

White, Benedict; Gunawardena, Asha; Hailu, Atakelty; and Pandit, Ram

POLICY CHOICE AND RIVERINE WATER QUALITY IN DEVELOPING COUNTRIES: AN INTEGRATED HYDRO-ECONOMIC APPROACH

Session 11A: Thursday 8:30 am – 10.10 am

Industrialization and urbanization, as a result of rapid economic development, have led to the deterioration of water quality in many rivers in developing countries. Kelani River in Sri Lanka provides drinking water to Colombo and a range of market and non-market ecosystem services, but these services are threatened by deteriorating water quality. A range of policy options are evaluated including: the existing policy based on effluent concentration standards and emission trading with multiple zones. Tradeable permits with multiple zones are the least cost policy option that accounts for both spatial externalities and abatement costs. A zonal effluent tax would be recommended as the initial step to transit from the current policy as current institutional capabilities are being developed to charge an emission fee or tax.

CONTRIBUTED PAPER ABSTRACTS

Akbar, Delwar; Rolfe, John; and Smith, Phillip

FACTORS AFFECTING ADOPTION OF LAND MANAGEMENT PRACTICES IN CANE FARMING THAT HAVE WATER QUALITY BENEFITS IN THE GBR CATCHMENTS

Session 10C: Friday 8:30 am – 10:30 am

The aim of this study was to identify the factors affecting adoption of land management practices (LMPs) in cane farming that have water quality benefits in the GBR catchments through two case study areas of Bundaberg and Mackay. This study used a mixed methodology that captured 17 stakeholders' interviews and 116 cane farmers' survey responses. Their responses were then analysed though fuzzy logic and a measure of consensus and agreement supported by a thematic analysis. The study found the cane farmers are more interested in nutrient and herbicide management practices (with an average 70% consensus and agreement) compared to soil and erosion management, and water and irrigation management practices (with an average 50% to 60% consensus and agreement). Four major categories of factors (i.e. socio-demographic, cultural, economic and support services) influenced the adoption of LMPs that have water quality benefits in this region. The study found both economic and cultural factors are affecting the adoption of LMPs with similar effect to the farmers. Therefore policies should not only be directed towards subsidies to the practice(s) but should also be directed to the socio-demographic and cultural factors that affect the rate of adoption.

Amarasinghe, Minoli; Brown, Colin; Foster, John; and Wagner, Liam

THE IMPACT OF DEMAND SIDE MANAGEMENT ON ELECTRICITY MARKETS IN DEVELOPING NATIONS: THE CASE OF SRI LANKA

Session 12A: Wednesday 10:30 am – 12:30 pm

Demand side management (DSM) and energy efficiency programs have yet to be effectively deployed in the developing world. They offer the mechanisms to defer investment in electricity generation and transmission infrastructure while also providing more effective short term control in the electricity market. State owned utilities such as the Ceylon Electricity Board (CEB) of Sri Lanka have found it challenging to maintain continuous electricity supply during a number of enduring power crises in 1995/1996 and 2000/2001. Furthermore, the Sri Lankan electricity market has the opportunity to adapt to regulatory and policy frameworks that are better suited to face future electricity sector challenges needed to enhance the reliability of supply. This paper examines the use of DSM and efficiency programs as effective risk mitigation options for the future management and expansion of electricity networks in developing countries. Using half hourly dispatch data and generator marginal costs, marginal dispatch is estimated using a partial equilibrium model, applying both Python and MATLAB mathematical modeling architecture. From the derived merit order dispatch, the effects of DSM deployment in the industrial sector on the wholesale electricity market are then examined. Results of the study indicate that deployment of DSM and efficiency programs in the Sri Lankan electricity market will provide significant incentives for commercial and industrial users to reduce their electricity demand. Furthermore, the study reveals other significant potential benefits from the deployment of DSM in terms of a reduction in carbon emissions from non-renewable sources and lower wholesale spot market price volatility.

Ancev, Tiho; and Talbot, Monica

ENVIRONMENTAL FLOW RELEASES FROM A DAM AND THE COST OF MUNICIPAL WATER SUPPLY

Session 11B: Friday 8:30 am – 10:30 am

This paper examines the effect of releasing environmental flows from a water storage on the cost of municipal water supply, with a focus on the case when there is a high cost backstop water supply option (e.g. a desalination plant). The backstop is only used when the level of water in the storage is lower than some threshold value. We argue that the release of environmental flows from the storage speeds up the movement towards the threshold, and therefore increases the average cost of municipal water supply over a long run. The paper focuses on the case of Warragamba Dam, Sydney. In an attempt to rectify problems stemming from the

damming of the rivers, regulatory interventions are put in place that require certain environmental water flow releases from this dam. In addition, a desalination plant was recently built in Sydney. The cost of municipal water supply from the desalination plant is significantly higher than the cost of supplying water from the dam. Consequently, we treat the desalination plant as a backstop supply source. We find that the cost of municipal water supply rises by more than AUD 4 million per month at times when the desalination plant is put into operation as a result of the quantity of water stored in the dam falling below the threshold, which can be attributed to the mandatory environmental flow releases. This paper shows that there could be substantial costs involved that are not envisaged when making decisions about mandating environmental flow release rules.

Anwar, Md. Mazharul; Molla, Md. Samim Hossain; Rola Rubzen, Maria Fay; Hossain, Md. Shakhawat; Islam, Md. Rashadul; Khan, A.S.M. Mahbubur Rahman; Tiwari, Thakur Prasad; Gathala, Mahesh Kumar; and Dixon, John

PARTICIPATION AND TECHNICAL EFFICIENCY OF WOMEN FARMERS USING CONSERVATION AGRICULTURE TECHNOLOGIES IN WHEAT AND MAIZE PRODUCTION IN BANGLADESH

Session 1B: Thursday 1.15 pm – 3.15 pm

The present study was undertaken to measure women's participation, returns to women labour, technical efficiency (TE) and factors affecting inefficiency of rural women farmers practicing conservation technologies (CA) in wheat and maize production in Rangpur and Rajshahi of Bangladesh. The CA technologies include both strip and bed planting of wheat and maize. A total of 120 selected women farmers (60 from wheat and 60 from maize) were interviewed 2015–2016. The empirical analysis was conducted and technical efficiency scores were obtained using the Cobb-Douglas stochastic frontier production function. The study showed a clear evidence of the extent of women's participation in farming using CA as well as in various household decision making areas. Returns to women labour were much higher compared to wage labour. The mean TE score of the sample women farmers was 0.71, which indicated that opportunities still exists for increasing their efficiency. Technical inefficiency effects were modeled as a function of farm specific socio-economic factors. Technical inefficiency in the production of wheat and maize was found be significantly negative related with education, effective family member (EFM) and involvement in extension services. Those were indicating that the women farmers with more years of schooling tend to be more technically efficient in agricultural production and farmers who received extension services would produce wheat and maize more efficiently using CA technologies. However, age showed a positive relationship with inefficiency. These results suggest that TE is significantly influenced by strengthening education, EFM, and extension services.

Anyiro, Chidozie

THE EFFECT OF CLIMATE CHANGE ON AGRICULTURAL LAND USE IN NIGERIA

Session 6A: Thursday 8.30 am – 10.10 am

Climate change remains one of the biggest challenges facing Nigeria's agricultural sector. This is due to the country's over-dependence on rain-fed agriculture, poor infrastructure, weak institution, inequitable land distribution, high levels of poverty, and low levels of human and physical capital. In recent years, large expanses of arable farmlands have been devastated and lost due to flooding, frequent drought and desertification occasioned by climate change, thus reducing the availability and use of viable agricultural lands and other agricultural resources. This study made use of meteorological and land use data covering the periods of 1974 – 2014 to empirically analyze the effect of climate change on agricultural land use in Nigeria. Given the absence of empirical research on the subject matter, this study is therefore relevant in contributing to the knowledge bank of climate change in general and its implications on agricultural land use in particular. The results revealed that the level of use of arable land had been unstable with a dramatic swing within the period under review. The inferential statistics results show that the total hectares of agricultural land area cultivated within the period of study was positively affected by temperature and negatively affected by rainfall. Furthermore, the hectarage of agricultural land area equipped for irrigation was positively influenced by temperature in the long run and responded negatively to changes in the one-year lag of rainfall in the short run. The use of land management practices was advocated as a coping strategy to climate change.

Asafu-Adjaye, John; and Mallawaarachchi, Thilak

FARM PRODUCTIVITY AND CLIMATE-RELATED RISK MANAGEMENT STRATEGIES: A CASE STUDY OF ETHIOPIAN SMALLHOLDER FARMERS

Session 6A: Thursday 8.30 am – 10.10 am

The African continent is projected to be adversely affected by further global warming. Africa is particularly vulnerable because it is amongst the hottest places on the Earth and therefore any further warming is likely to have adverse socioeconomic consequences. Africa's vulnerability is heightened by the fact that most of the economies in this region rely mainly on natural resources and rain-fed agriculture, which are very sensitive to climate change and variability. Given the adverse climatic predictions, a better understanding of how farmers have coped with past and current climate change and variability would enable us to propose more effective strategies to reduce their vulnerability in the future. In this paper, we use panel data collected at the plot level to examine the coping and adaptation strategies of Ethiopian smallholder farmers. In addition to other relevant variables, we explore how farm productivity affects farmers ex-ante and ex-post climate-related risk management strategies. The findings are used to draw implications for the development of climate risk management policies.

Batstone, Chris; Moores, Jonathan; and Yalden, Sharleen

THE COSTS AND BENEFITS OF THE RESILIENCE OF ESTUARY ECOSYSTEM SERVICE PROVISION TO THE FORM OF URBAN DEVELOPMENT

Session 10D: Wednesday 10:30 am – 12:30 pm

Estuary ecological resilience may be assessed in terms of the distance of key indicators from thresholds of potential concern, beyond which ecosystem service provision becomes compromised and the potential for estuary rehabilitation is questionable. Stormwater discharged from urban areas contains contaminants, such as the metals copper and zinc, which can accumulate in estuary sediments, driving down their ecological condition. Expert evidence provides values for indicators such as the estuary benthic health – metals index (BHI-metals) that describe the demarcation zone between healthy states that enable high levels of ecosystem service provision, and compromised states associated with degraded waterbodies whose condition may be irreversible. In a case study in the Lucas Creek catchment located at the rural-urban margins of Auckland, New Zealand, we consider a number of options for the form of future urban development. Against a base case of historical development with low density greenfields forms and status quo stormwater treatment, we consider alternate scenarios that feature water sensitive design principles such as lower impervious surface area and technologies that are more effective for preventing stormwater contaminant discharges to the estuary. Framing estuary resilience in terms of the system's capacity to retain function in response to these alternate urban development forms, we use the Urban Planning that Sustains Waterbodies (UPSW) decision support system to take a social-ecological modeling approach to understanding the contrasting lifecycle costs of development and the ecosystem services benefits associated with maintaining resilience in the Lucas Creek Estuary.

Best, Rohan

THE IMPORTANCE OF GOVERNMENT EFFECTIVENESS FOR THE ELECTRICITY SECTOR IN DEVELOPING COUNTRIES

Session 12A: Wednesday 10:30 am – 12:30 pm

Electricity is a vital factor underlying modern living standards, but there are many developing countries with very low levels of electricity access and use. This paper finds that the effectiveness of governments is the most important governance attribute for increasing electricity use in developing countries. This implies that policy to improve government effectiveness could be important for developing countries seeking to increase electricity use. In contrast, other governance attributes such as political stability or regulatory quality are not as crucial. I use a cross-sectional regression approach with national-level data up to 2012 for 135 countries that are classed as low-income or middle-income by the World Bank. The paper adds to the growing evidence on the importance of governance for development outcomes.

Boaitey, Albert; and Goddard, Ellen

PUBLIC PREFERENCES FOR SUSTAINABLE DAIRY PRODUCTS FROM HIGHER FEED EFFICIENT COWS

Session 15B: Thursday 1.15 pm – 3.15 pm

The environmental sustainability of livestock production is continually under scrutiny, partly driven by the contribution of the sector to agricultural Greenhouse Gas (GHG) emissions. A significant proportion of these emissions are attributable to feed digestion in ruminants, including dairy cattle (enteric fermentation). Methane emissions (CH4) from enteric fermentation constitute 80% of agricultural CH4 and 35% of anthropogenic methane emissions. Given this, widespread breeding of feed efficient cattle may represent an important strategy to reduce farm-level GHG emissions. Adoption of any technology is only successful when interests of different agents are aligned. In the case of higher feed efficiency cattle (bred using genomics or other methods), producers must decide to adopt, consumers must decide dairy products from these cattle are worth consuming, and the public must accept this as an effective approach for enhancing sustainability. In this research, the acceptability of dairy products, produced from higher feed efficiency cows and identified as being more sustainable, is investigated through a contingent valuation experiment in an online survey of 1500 Canadians. Factors influencing willingness to purchase the higher sustainability dairy products include environmental attitude (Corral-Verdago et al. 2008), beliefs about the causes of climate change, willingness to change behaviour to limit personal contribution to climate change, pride and guilt about environmental behaviour (Onwezen et al. 2014), attitudes towards genomic selection and social norms as well as socio demographic characteristics and dairy product purchasing behaviour. We examine willingness to purchase in two ways- as individual purchase decision with private benefits and as an advisory referendum.

Brown, Brendan; Nuberg, Ian; and Llewellyn, Rick

ESTIMATING ADOPTION OF PRODUCTIVITY INCREASING INNOVATIONS IN AFRICA

Session 1C: Thursday 8:30 am – 10.10 am

Ambiguity in the methodologies used to classify adoption of agricultural technologies have made comparisons across studies difficult. This is further compounded but weak methodological frameworks that limit our understanding by framing adoption as a binary outcome. We propose a new standard for the quantification of the 'how' of adoption via the 'Process of Agricultural Utilisation Framework (PAUF)' and the 'what' of adoption via the 'Conservation Agriculture Based Sustainable Intensification Nomenclature (CABSIN)'. We apply this to 27,627 plots cultivated by 6,205 farmers in 5 African countries to compare the adoption of 5 sustainable intensification technologies. Overall, adoption was found to be more limited than published estimates and whilst we find different levels of adoption across countries, common trends were evident, particularly with issues of exposure of farmers to new technologies and the relevance of the technologies to the farmer's contexts. Whilst applying these frameworks has provided novel findings, deeper qualitative researches is now required to understand them.

Burke, Paul; and Kurniawati, Sandra

ELECTRICITY SUBSIDY REFORM IN INDONESIA: EFFECTS ON ELECTRICITY USE

Session 12A: Wednesday 10:30 am – 12:30 pm

Indonesia's budget has for years been burdened by large subsidies for electricity consumption. In this paper we estimate demand-side effects of historic recent reforms to Indonesia's electricity subsidies. We use an annual panel covering six consumer groups, 16 regions, and 1994–2015. We obtain estimates of the same-year and multi-year price elasticities of electricity demand of –0.2 and –0.5. Electricity use by industry and government buildings appears to be particularly sensitive to price changes. Our estimates suggest that reforms since 2013 have induced electricity savings of around 12% relative to the no-reform counterfactual. Phasing out remaining subsidies has the potential to generate further improvements in the efficiency of electricity use, while freeing up resources for other priorities.

Burton, Michael; Permadi, Dwiko; Walker, Iain; Pandit, Ram; and Ma, Chunbo

AN APPLICATION OF AN INFERRED VALUATION METHOD TO ESTIMATING SMALLHOLDERS' PREFERENCES FOR GROWING ACACIAS TREES UNDER CONTRACT IN INDONESIA

Session 15C: Friday 8:30 am – 10:30 am

This paper explores social desirability bias in an application of a choice experiment to investigate smallholders' preferences for growing acacia in afforestation programs. Social desirability bias can emerge when the respondents have a tendency to please the researchers or other people in the survey. Understanding this bias would improve the design of policy as it relates to program incentives. We compare an inferred valuation method (what is other's choice?) to a direct question (what is your choice?) in estimating smallholders' preferences for attributes of a contract and their current farming practices. The attributes include contract length, labour participation, timber insurance, training, road improvement and expected income compensation. The preliminary results based on 486 respondents indicates that the marginal utility of attributes change, suggesting social desirability bias may exist when valuing the status quo (their current contracts), and attributes such as contract length and labour participation, which reduce utility. The estimate of willingness to accept (WTA) the current contract was US$830/ha/year, which is significantly less than the WTA estimates of 'other' people (US$1404/ha/year). However, no social desirability bias was found for attributes that increased their utilities, including timber insurance, training, and road improvement. We discuss these findings by including explanatory factors such as socio-demographic factors, and cognitive reasons, e.g. false consensus effect.

Burton, Michael; and Rigby, Dan

PAIN AND SUFFERING: VALUING NON-MARKET CONSEQUENCES OF FOOD BORNE ILLNESS

Session 15C: Friday 8:30 am – 10:30 am

In an era of deregulation and consumer choice, costly interventions in the food industry to mitigate food borne illness need to be justified by greater benefits to consumers. This study reports the results of an investigation into the value consumers place on avoiding the pain and suffering that arises from food borne illness in the UK. It uses a discrete choice framework, and considers both more prevalent but less significant short run illness (i.e. vomiting and diarrhoea for up to 14 days) as well as rarer but much more debilitating long run impacts (such as kidney failure and irritable bowel syndrome). The illness states are described using the EQ5D-3L framework commonly used in health valuation studies, but extends the analysis by directly including a monetary attribute, duration of illness and (in the long run case) duration of life in full health.

Carter, Chris

FOR WHEAT QUALITY, WE ARE WILLING TO PAY, WHAT? COGNITIVE POLYPHASIA IN SOUTH EAST ASIAN MILLING COMPANIES

Session 15C: Friday 8:30 am – 10:30 am

In a choice modeling exercise completed with SEA milling companies, our design included an indicator variable, being whether each respondent within each company identified themselves as technician or purchaser. Subsequent analysis indicates a general disagreement between the two groups, over the willingness to pay for the set of tested quality characteristics for wheat. So, when using the analysis to assess the company's willingness to pay, who do we trust? While the purchasing group were heavily influenced by price when making decisions between parcels of wheat, the technical respondents placed higher weight on quality characteristics. Comparing each group's willingness to pay for wheat quality, the purchasers were more likely to forego quality for price, and the technicians were the opposite. While this is not completely unexpected, the interpretation and use of the results in an economic framework to predict the company's decisions becomes complicated. This paper discusses some implications of this internal disagreement, regarding the value of wheat quality characteristics, within companies that comprise the major purchasers of Australian wheat. The treatment of the disagreement becomes important when we use the research to make recommendations to the wheat industry. The discussion takes an industry good approach, including the opportunities arises from this disagreement on the value of wheat quality.

Chudleigh, Fred; Cowley, Trisha; Moravek, Tim; McGrath, Tim; and Sullivan, Mick

ASSESSING THE VALUE OF CHANGING BEEF BREEDER HERD MANAGEMENT STRATEGY IN NORTHERN AUSTRALIA

Session 1E: Friday 8.30 am – 10.30 am

The scope for improving the economic and financial performance of beef businesses by changing breeder herd management practices and reproduction efficiency was investigated across a range of regions in northern Australia from early 2013 to late 2015. Case studies and desktop analyses were applied to identify the relative and absolute value of altering management strategies, such as: weaning, pregnancy testing, herd segregation, supplementation, genetic improvement, mating, culling, infrastructure investment, enterprise selection, herd bull use and age of turnoff. In more extensive herds with uncontrolled mating, emphasis was placed on answering the question: what are the costs of out-of-season calving?

The project provided insight into:

- the value of changing management strategies,
- the capacity of industry participants to appropriately assess the value of strategies,
- the nature and value of indicators applied by industry to assess strategies.

Analysis identified that a relatively large proportion (>50%) of the changes in management strategy selected by project co-operators were unlikely to improve profit, with about one-third likely to significantly reduce profit. The inability of beef business managers to nominate profitable changes in management strategy was due, in large part, to a lack of appropriate skills in identifying the most profitable option for change and to the use of spurious indicators unlikely to assist in the identification of profitable change. The provision of decision support frameworks that incorporate an appropriate disciplinary balance and focus on developing skills and knowledge are identified as important in helping beef enterprise managers make better choices.

Coglan, Louisa; and Pascoe, Sean

KEEPING FISHERS POOR: THE PARADOX OF SOCIAL OBJECTIVES

Session 7A: Thursday 1.15 pm – 3.15 pm

While the last decade or so has seen an increase in the role in economic objectives in fisheries management, there is a growing trend to formalize and implement social objectives. This has been seen in the recent Queensland fisheries policy green paper and even the Productivity Commission draft report into Marine Fisheries and Aquaculture. This rise has been championed in some cases by the industry itself, that see social objectives as a means to avoid some of the short-term challenges faced by moving to an economically efficient fishery. Social objectives around maintaining regional communities generally assume that more fishers are preferable to less, with subsequent lower individual profit levels and incomes. This can potentially result in fewer benefits flowing to the regional economy. Locking individuals into a low income industry may result in longer term intergenerational issues. Other social objectives relating to recreational fishing potentially limit the availability of the resource to commercial fishers. Other social objectives, such as maintaining heritage values, may benefit society but at the expense of the industry. In this paper, we review and discuss some of the implications of social objectives for industry incomes, longer term prosperity and opportunities for individuals.

Cramb, Rob; Newby, Jonathan; and Smith, Dominic

DEVELOPING VALUE-CHAIN LINKAGES TO IMPROVE SMALLHOLDER CASSAVA PRODUCTION SYSTEMS IN VIETNAM AND INDONESIA

Session 1G: Thursday 1.15 pm – 3.15 pm

Cassava production in Southeast Asia is now a largely commercial activity to meet growing regional demand for feed, starch products, and biofuel. Vietnam grows over 500,000 ha of cassava, generating over USD 1 billion per year in export earnings, making it the world's second largest exporter of cassava products. Indonesia, on the other hand, cultivates over 1,000,000 ha of cassava but remains the second largest importer of cassava starch. Despite its current economic importance, the sustainability of the industry is under increasing pressure from factors such as soil erosion, declining soil fertility, emerging pests and diseases, and increasing labour costs. Furthermore, while global demand is strong it is highly variable, exposing farmers to considerable risk. Cassava

production is well suited to resource-poor farmers in marginal upland areas. It provides an important source of cash income for these upland households, contributing to food security and livelihoods. Despite growing in marginal conditions, the crop responds well to improved management, and significant yield gaps have been identified. Over the last decade, various technologies have been developed to address many of the issues facing the crop, including improved industrial varieties, fertility management, pest management, intercropping systems, and clean-seed approaches. However, there is large variation in technology adoption, with varying incentives for value-chain actors to engage in technology dissemination in the absence of strong government extension programs. Developing improved value-chain linkages has the potential to increase adoption of cassava technologies and enhance smallholder livelihoods. We explore that potential in this paper.

Crase, Lin; Pham, Hung; and Cooper, Bethany

STRATEGIES FOR INTEGRATING FARMERS INTO MODERN VEGETABLE SUPPLY CHAINS IN VIETNAM: FARMER ATTITUDES AND WILLINGNESS TO ACCEPT

Session 15B: Thursday 1.15 pm – 3.15 pm

In Vietnam, the development of so-called 'modern' vegetable supply chains is receiving considerable interest amongst researchers and governments. This interest partly stems from the view that enhancements in food safety can be achieved if farmers are willing to adopt alternative supply chains often associated with 'western' forms of retailing. This paper is used to consider farmers' willingness to accept the transition to two alternatives – a supply model based on cooperatives and another based on investors facilitating the change. Using discrete choice data drawn from 412 farmers, random coefficient logit models are developed that reveal the relative importance of different drivers of change. The paper offers important insights that can inform governments about the incentives required to bring about change.

Csereklyei, Zsuzsanna; and Stern, David

ADOPTION OF ENERGY EFFICIENT TECHNOLOGIES IN THE US ELECTRICITY INDUSTRY

Session 12A: Wednesday 10:30 am – 12:30 pm

This paper studies the drivers of high-efficiency technology adoption in coal and gas fired electricity generation between 1970 and 2014 in the lower 48 US states. We construct a unique database of over 20 different technologies with annual grid connections and retirements based on EIA-860 data. We then investigate the impact of electricity prices, own and substitute fuel price elasticity, economic growth, and state income differences on the adoption of highly efficient vs. less-efficient technologies. Since the 1990s, major electricity market restructuring took place in some parts of the United States, changing from a regulated "cost-of-service" system to competitive or partly deregulated markets. Our paper explores the impact of this deregulation on energy efficiency developments.

Dalziel, Paul; Driver, Tim; Guenther, Meike; Miller, Sini; Rutherford, Paul; Saunders, Caroline; Saunders, John; and Tait, Peter

REWARDING RESPONSIBLE INNOVATION WHEN CONSUMERS ARE DISTANT FROM PRODUCERS: EVIDENCE FROM NEW ZEALAND

Session 13A: Thursday 1.15 pm – 3.15 pm

Recognising that increased intensification of agri-food production is pushing up against environmental constraints, a New Zealand national science challenge aims to enhance primary sector productivity while improving land and water quality for future generations. This might be conceptualised as 'responsible innovation' but, as Blok et al. (2015) and Blok and Lemmens (2015) have pointed out, there are several practical issues undermining the adoption of a responsible innovation approach. This is made particularly difficult when local production is exported to distant consumers. In this context, this paper reports on a study of consumers in five export markets for New Zealand agri-food products (China, India, Indonesia, Japan and the United Kingdom), exploring the importance of product credence attributes and sub-attributes in these markets and how capturing price premiums for these attributes can provide increased returns to reward responsible innovation.

Davidson, Rachael

IS THERE A SILVER LINING IN LOW MILK PRICES?

Session 16A: Wednesday 10:30 am – 12:30 pm

The global dairy market has been strained by increased supply in Europe, the US and the Southern hemisphere. This, amidst a reduction in demand by China and Russia, has seen a global downturn in milk prices. New Zealand dairy farmers are facing their third consecutive season of low milk price and, in response to the financial pressures, are undergoing changes on-farm in order the minimise the impact. Many of the adjustments made to suit the current downturn have led to improved efficiency and are in line with those that will help farmers meet existing and proposed environmental limits set by regional councils. Could the adjustments being made have lasting environmental benefits for farmers and the industry? Understanding how farmers respond to milk price volatility and the impacts this has on the environment will help inform policy decisions as environmental regulations shape the New Zealand dairy industry. The key adjustments made to dairy farm systems in response to the lower milk price were reduced cow numbers, reductions in fertiliser use and reductions in the use of supplementary feed. These adjustments had subsequent impacts on milk production. The changes observed had slight implications for environmental outputs, including nitrogen leaching and greenhouse gas emissions. The methodology used to determine the environmental impacts of these adjustments involved creating typical regional farms and modeling the changes experienced from a drop in milk price in Farmax and Overseer. The outcomes will put into perspective the likely changes required to meet environmental limits.

Davis, Katrina; Burton, Michael; Rogers, Abbie; Pandit, Ram; Rhodes, Jonathan; and Camus, Antoine

ELICITING VALUES FOR COMPLEX GOODS: COMMUNITY PREFERENCES FOR THE MARINE ENVIRONMENT

Session 15C: Friday 8:30 am – 10:30 am

We elicit spatially explicit non-market values for marine ecological features at a case study area in South-East Queensland. We build on recent work which suggests that people may value higher order abstracts, and attributes within choice experiments are used to generate these higher level "constructs". We identify these higher level constructs as they pertain to a 'well-managed marine area', and implement the approach using a hierarchical information integration (HII) framework. The latter also has an advantage in that it allows large numbers of attributes to be included in the model. Our results will be incorporated into a systematic conservation planning exercise to reconcile community values for marine ecological features with more traditional ecological and market data. Major outcomes of this analysis are a novel methodology for evaluating community values for marine ecological assets, and recommendations for marine planning priorities which incorporate the same.

De Cara, Stéphane; Henry, Loïc; and Jayet, Pierre-Alain

THE OPTIMAL THRESHOLD OF AN EMISSION TAX IN PRESENCE OF MONITORING, REPORTING, AND VERIFICATION COSTS

Session 6A: Thursday 8.30 am – 10.10 am

Environmental policies often include provisions that grant exemption to some firms, e.g. to the smallest emitters. This text explores the implications of such exemptions in the case of an emission tax and in presence of monitoring, reporting, and verification (MRV) costs. The issue of the optimal threshold above which firms should be subject to the emission tax is first addressed using an analytical framework that captures the trade-off between the cost-effectiveness of a wider tax base, and the savings on MRV costs permitted by the exemption of some firms. Determining this threshold is demanding in terms of ex ante information regarding individual abatement and MRV costs. A simpler rule that approximates the optimal threshold is proposed. This rule only requires the knowledge of the aggregate marginal abatement cost curve and MRV costs under full coverage. In addition, it offers a simple graphical interpretation based on the Lorenz curve of emissions. This framework is then applied to the issue of agricultural greenhouse gas (GHG) emissions. The application relies on a supply-side model of the European agriculture, which provides both EU-aggregated and individual (1802 representative farms across Europe) results. This model is used to (i) estimate the aggregate abatement supply and the corresponding abatement costs under full coverage, and (ii) assess the cost-effectiveness of the exemption threshold. The findings indicate that an emission tax targeting only the largest emitters may provide

significant savings on MRV costs compared to the full coverage, while still achieving a larger social benefit than in the laissez-faire situation.

De Valck, Jeremy; Rolfe, John; and Windle, Jill

MAKING ECOSYSTEM SERVICES VALUATION RELEVANT TO INVESTMENT PRIORITISATION IN THE GREAT BARRIER REEF

Session 10C: Friday 8.30 am – 10.30am

Ecosystem services valuation (ESV) has developed in the environmental and ecological economics literature to provide a more comprehensive approach to valuing major environmental assets that have multiple interactions with society. In the context of the Great Barrier Reef (GBR) in Queensland, there have been some preliminary attempts to develop a typology of ecosystem services that are relevant and to assemble estimates from relevant non-market valuation studies. Yet there is no evidence that frameworks or value typologies are being used to help prioritise where actions and investments should be occurring. This study has three major aims: (i) to review existing approaches to categorise and provide ecosystem services values for the GBR; (ii) to identify the detail and context in which these values need to be provided to be relevant for prioritisation, and (iii) to prioritise opportunities for future work to provide more detailed value frameworks. Through a thorough ESV review, we identify the main approaches that have been tested so far and, taking inspiration from successful approaches applied elsewhere, we suggest new possible directions of relevance to the GBR. We then investigate the major limitations associated with current ESV exercises (e.g. excessive use of benefit transfer, lack of understanding of interaction effects, need to make values spatially and temporally explicit…) and propose potential solutions. Finally, different options are presented to develop a prioritisation tool encompassing all types of ecosystem services values. The Total Economic Value (TEV) framework is used to set the initial structure for that prioritisation tool.

Dong, Xiaoxia; Waldron, Scott; Brown, Colin; and Zhang, Jing

BEEF PRICE TRANSMISSION IN REGIONAL MARKETS: AUSTRALIA, CHINA AND SOUTHEAST ASIA

Session 17A: Friday 8:30 am – 10:30 am

With increasing trade volumes in the Asian region, it could be expected that beef markets are becoming increasingly integrated. Major beef exporters or importers can be expected to lead others, but others can be separated by small trade volumes or obstacles to trade. This paper examines price transmission between the key regional beef markets of Australia, China, Indonesia and Vietnam. It draws on quarterly price data from 2005 to 2015 and methods including co-integration analysis, granger causality, vector error correction model (VECM) and impulse response function (IRF). The results show that log-run equilibrium relationships do exist in the beef prices of the four countries where the beef price in Indonesia is affected by the Australian market while the beef price in Vietnam is impacted by the Chinese market. However, Australia and China's beef prices are not impacted by Indonesian or Vietnamese prices. Reasons behind these price inter-relationships are then discussed.

Dorner, Zack

BEHAVIOURAL DRIVERS OF THE REBOUND EFFECT: EVIDENCE FROM A LABORATORY EXPERIMENT

Session 15C: Friday 8:30 am – 10:30 am

Evidence around the rebound effect to date is largely from secondary field data, such as household energy usage and household production technology change. Most of these studies are not designed to identify behavioural drivers (Gillingham et al., 2016; Sorrell et al., 2009). A laboratory setting allows behavioural aspects of the rebound effect to be isolated, which are difficult to identify in the field. I capture particular aspects of the rebound effect using a real effort task. Participants earn money for their effort (household consumption) and must decide whether to reduce the damage to an environmental charity that their consumption causes (environmental externality) by putting in extra effort (pro-environmental effort). The technological change that underpins the rebound effect is reproduced within subjects by varying earnings, environmental damages and ease of pro-environmental effort between periods. Between subjects, the experiment investigates two

potential behavioural drivers. First, with exogenously imposed technological change, the experiment explores order effects; the extent to which baseline environmental damage from consumption affects future pro-environmental effort. Second, technology is allowed to vary endogenously to identify any moral licencing as a response to choosing an environmental technology. The importance of ease of pro-environmental effort is also measured. The findings may help improve methods for measuring the rebound effect in the field. It is also hoped the study will contribute to the evidence base around using technological change in environmental policy, particularly to increase the efficacy of policy and strengthen understanding of the overall potential of policy to mitigate environmental damage.

Escarcha, Jacquelyn; and Zander, Kerstin

TOWARDS CLIMATE-SMART LIVESTOCK: THE ROLE OF WATER BUFFALO IN INCREASING LIVELIHOOD RESILIENCE IN CENTRAL LUZON, PHILIPPINES

Session 1E: Friday 8.30 am – 10.30 am

Water buffalo, locally known as "carabao" in the Philippines, play a critical role in the economies of smallholder farmers, improving livelihoods in view of pressing agricultural production challenges in the region. This study examines farmer perceptions and conditions that underlie livelihood resilience possibilities for water buffalo farming households and communities that face and respond to climate and other changes, in Central Luzon, Philippines. The fieldwork was conducted in Nueva Ecija province, home to many water buffalo farmers and chosen as the National Impact Zone (NIZ) for the implementation of carabao development program in the country. Documentary research, key informant interviews and household surveys carried out across farming systems were used for data collection. In this paper, analysis is based on a combination of qualitative and quantitative datasets; exploring social, political, and economic contexts, in addition to climate, as key drivers of change. Water buffalo farming significantly contributed to the livelihoods of smallholder households: economically as primary income source, as a buffer to cover unexpected household costs, as an accessible protein (milk) for the family, and as means to recover from natural disasters or insurance in case of serious crop failure. Understanding the interaction between the identified key drivers of change from farmers' perspectives shows evidence that the role of water buffalo in providing livelihood benefits to households is enhanced, particularly through their improved farming practices. The identified practices highlight the need to improve farmers' resources to enhance the ability to undertake strategies for increased livelihood resilience of smallholders against the changing environments.

Farquharson, Robert; Ramilan, Thiagarajah; Thar, So Pyay; Than, Shwe Mar; and Aung, Nay Myo

NITROGEN FOR SMALLHOLDERS AND CEREAL CROPS IN MYANMAR: ECONOMIC AND SOCIAL DIMENSIONS FOR FERTILITY DECISIONS

Session 1C: Thursday 8:30 am – 10.10 am

It is widely recognised that the underperformance of cereal crops in Myanmar is closely related to the inadequate supply of nutrients, particularly nitrogen (N). Although other crop management practices can limit crop yields, management of nutrients for crop production is an important contemporary issue. Myanmar rice growers have changed from being mainly subsistence to semi-subsistence, and there are also good prospects for increasing rice exports. Therefore there are incentives to improve rice yields and profits. Similarly for maize, as a higher value crop, there is a strong incentive to improve production and profits. But smallholder options to increase crop fertility must be considered in the social and economic context of their farming systems and village livelihoods. With small farm sizes, indebtedness, potentially high borrowing costs, and aversion to risk, their personal perspectives must be identified, discussed and incorporated into development activities. The decision to use more fertiliser is an investment with potential benefits and costs, which can be considered by superimposing a high hurdle rate of return. Smallholder personal (subjective) beliefs about crop yield improvements from added fertiliser are important in considering such decisions. An economic framework is available for evaluating such decisions (marginal analysis of returns from incremental N applications with a high target rate), which can be used in conjunction with field demonstrations of crop yield responses to fertiliser. But further study of social aspects such as understanding smallholder perspectives, motivations and limits to action will need to be undertaken in conjunction with agronomic and economic activities.

Fleming, Christopher; Ambrey, Christopher; Smart, James; Binney, Jim; and Hasan, Syezlin

Session 10D: Wednesday 10:30 am – 12:30 pm

WILLINGNESS-TO-PAY FOR HEALTHY WATERWAYS IN SOUTH EAST QUEENSLAND: EVIDENCE FROM A CONTINGENT VALUATION SURVEY

South East Queensland's catchments, lakes and coastal waters are valuable natural assets that provide multiple economic, social and environmental benefits for communities. They provide clean drinking water, underpin agricultural production, enable the disposal of treated waste water, and sustain tourism and fishing industries. However, with a rapidly growing population and increasingly unpredictable climate, the region's waterways are under increasing pressure from threats such as soil erosion, storm water run-off, litter and land clearing. This paper employs data from the Healthy Waterways Limited Report Card and an online contingent valuation survey of South East Queensland residents to assess their willingness-to-pay to prevent a decline (or achieve an improvement) in waterway health in the region.

Florec, Veronique; Pannell, David; Burton, Michael; Kelso, Joel; and Milne, George

THE COSTS AND BENEFITS OF PRESCRIBED BURNING IN THE SOUTH-WEST OF WESTERN AUSTRALIA

Session 16A: Wednesday 10:30 am – 12:30 pm

Wildfires can cause significant damage to ecosystems, life and property, and to reduce the impact of wildfires, governments spend large amounts of money on mitigation and prevention strategies. But despite the considerable sums involved, there are very few economic evaluations of these mitigation strategies. In an effort to fill this gap in research, we have applied economic analysis to fire management in the south-west of Western Australia (WA), focusing on prescribed burning. We used an economic model in conjunction with a wildfire simulator to test different prescribed burning strategies and identify the strategy that yields the highest returns to society under different scenarios. We found that for a short-term analysis, there is not a significant difference in the economic results when the level of prescribed burning is varied over a wide range of values. However, a long-term analysis shows an entirely different outcome. With the current prescribed-burning program that the Department of Parks and Wildlife has in place, large benefits are being generated for society. The results from the model indicate that considerable benefits may be gained from increasing the amount of area that is prescribed burned per year, but this will come at an additional cost that may be high. The optimal rate obtained from the long-term model suggests an increase in prescribed burning in the region to the levels applied in the 1960s and 1970s. However, in today's context this may not be possible.

Flores Tenorio, Pedro

A CHOICE MODELING EXPERIMENT TO EXPLORE THE OPPORTUNITIES TO INVEST IN BIODIVERSITY CONSERVATION IN THE AMAZON

Session 15A: Wednesday 10:30 am – 12:30 pm

We focus our study on the opportunities that exist in investment for conservation of biodiversity in tropical countries. It allows natural and multiple benefits of mitigation of climate change, as well as addressing the global environment problem of biodiversity loss. We observe that the implementation in Australia of the "carbon tax" during 2012 and 2013 (subsequently dismantled following the Federal Elections of 2013) was inadequately explained to the general public. It was seen and criticised by them as being a one-party unilateral initiative and the mitigation tools, such as reduction of energy consumption using non-natural means, such as more products, were rejected by the majority of the population. It was a contradictory relation of less climate change with more material production. We hypothesise that the support and understanding of the Australians will provide a support to develop policy design that include this component in a long term strategy for Australia, including the development of investment in biodiversity conservation in tropical forest countries as a better alternative than man-made carbon sequestration or strategies. A choice modeling experiment was designed with a sample of 100 University students from Melbourne and Sydney. It presents a hypothetical scenario about a hypothetical investment program to maintain the resilience of the Amazon forest ecosystem. The results presented show the trade-offs of the attributes assigned to a public program of investment in biodiversity conservation in Peru. It will provide results that contribute to build sound policies.

Freebairn, John

EFFECTS ON SUPERMARKET MONOPSONY PRICING ON AGRICULTURE

Session 13A: Thursday 1.15 pm – 3.15 pm

Potential effects of alleged monopsony pricing of farm products by large supermarket chains on farm product prices and quantities, and on land values, are assessed relative to competitive pricing. Initially a partial equilibrium model for a net export product, an import competing product and a non-traded product is considered. A more general equilibrium multiple farm product context then is considered. Farmers are treated as price takers for labour, materials, and capital inputs. Rent is a residual return to land, and land value equals the discounted value of the future stream of expected rents. For the traded products, the effects of a shift to monopsony pricing are found to be minimal; for non-traded products, the opportunity value of land reallocated to traded farm products places a floor on the downside effect on price, quantity and land value.

Friesen, Lana; MacKenzie, Ian; and Nguyen, Mai Phuong

COASEAN BARGAINING IN THE PRESENCE OF EX ANTE AND EX POST TRANSACTION COSTS

Session 16A: Wednesday 10:30 am – 12:30 pm

Coasean bargaining has a role in solving local environmental conflicts. However, it is well known that efficient Coasean bargaining requires clearly defined and enforceable property rights as well as negligible transaction costs. In this paper, we compare the impact of ex ante transaction costs, which agents incur to establish property rights, with ex post transaction costs of bargaining once property rights are established, in an experimental context. Traditionally, the literature has focused on ex post transaction costs, but clearly ex ante costs are of practical relevance. In the first stage of the experiment, agents compete in a Tullock contest to determine which party has the property right in the second, bargaining, stage of the experiment. We vary whether ex post transaction costs exist and whether they are symmetric or asymmetric across agents, as well as conduct a control treatment with randomly assigned property rights. Theoretically, ex ante transaction costs should not influence bargaining in the second stage, and our experimental results confirm this prediction. Symmetric transaction costs do not affect efficiency compared to zero transaction costs. On the other hand, asymmetric transaction costs significantly lessen bargaining efficiency, even though they are sufficiently small not to offset all of the gains from trade.

Geetha, Mohan; Shaibu, Abdul-Ganiyu; Hirotaka, Matsuda; and Ishikawa, Hirohiko

THE EFFECTS OF CLIMATE CHANGE AND FARM MANAGEMENT PRACTICES ON MAIZE CROP YIELD IN NORTHERN GHANA

Session 1G: Thursday 1.15 pm – 3.15 pm

The achievable yields based on on-farm trails are in between 4 to 6 t/ha. However, the low amount of rainfall and lack of farm management practices normally lead to high yield gaps in maize crops. This paper examines the potential of farm management practices to enhance maize yields in Tolon and Wa West districts in the Northern region of Ghana. A decision support system for agro-technology transfer (DSSAT), CERES-Maize crop model is used in this study, which necessary data (viz. maize cultivar: Obatampa; weather data: minimum temperature, maximum temperature, rainfall and solar radiation; farm management: planting distance and fertilizer application; and soil information). The maize crop field experiment was setup in 2014 in two communities in Tolon and one community in Wa West of Northern region. We employed four different treatments of planting distance (20x80 cm, 30x80 cm, 40x80 cm and 50x80 cm) and fertilizer applications (full fertilizer, full manure, half fertilizer & half manure and control) in the model. In addition, we conducted a cross sectional field survey with the sample of 200 households in both districts in the year 2015. The calibration results are adequate between observed (experiment) and simulated values of maize yield for both treatments. Remarkably, the changing planting distance and the combination of half fertilizer and half manure observed a positive impact on maize yields. The household survey results clearly exhibit that selected community farmers who adopted these new farm management practices improved their maize yields from 8 to 12 per cent.

Genova, Christian II; Umberger, Wendy; Newman, Suzie; and Peralta, Alexandra

UNDERSTANDING THE RELATIONSHIP BETWEEN A HOUSEHOLD'S FOOD CHOICES, THE HOUSEHOLD FOOD INSECURITY ACCESS SCALE (HFIAS), AND THE WAIST-HIP RATIO (WHR) OF CHILDREN IN RURAL VIETNAM

Session 1H: Thursday 8:30 am – 10.10 am

Lao Cai province is a temperate vegetable-producing region in Vietnam where ethnic minorities dominate and where rural farming is the main source of livelihood. However, it also has one of the highest rates of poverty and undernutrition (stunting and underweight) among children under 5 years. This paper explores the relationship between the motives that determine food choices of food secure and food insecure households, and the waist-hip ratio (WHR) as a preliminary indicator of nutritional status. Using data from n=510 households in four districts (Bac Ha, Sa Pa, Muong Khuong and Si Ma Cai) in the province, it answers the following questions:

1. How do rural households in different ethnic minority groups select the food that they eat daily using the modified Food Choice questionnaire [Steptoe, Pollard and Wardle (1995)]?
2. How valid and reliable are these instruments?
3. Is there a difference between food secure and food insecure households based on the Household Food Insecurity Access Scale (HFIAS), and "healthy" households versus "non-healthy" households using WHR, controlling for gender, age, income and ethnicity?

The preliminary analysis provide the basis for understanding the dietary habits of these rural households.

Ghahramani, Afshin; and Kokic, Philip

ECONOMIC RISK IMPLICATION OF LAND USE CHANGE IN MIXED CROP-LIVESTOCK SYSTEMS AS TRANSFORMATIVE ADAPTATION TO CLIMATE CHANGE

Session 1F: Wednesday 10:30 am – 12:30 pm

Nearly 3 billion people, one-third of the world population, lack access to clean energy for cooking and lighting. The majority of this population lives in rural areas in developing countries, which creates challenges for providing energy services. Despite challenges, various energy solutions, such as improved cook stoves and solar home systems, are promoted. These technologies provide clean energy and reduce carbon emissions. Such carbon reductions can be certified as credits and traded in carbon markets to offset the carbon emissions in the industrialised countries. This trade results in money flowing to the developing countries as carbon revenues. The global carbon market is expected to increase and expand as a result of the new market mechanisms post Paris ratification. But, so far, the current carbon market has often overlooked the technology owners' rights on the carbon revenue in developing countries. This paper will present the result of literature review and the method (choice modeling) to understand the impact of carbon revenue distribution on the uptake of clean energy technologies.

Gibson, John; Webb, Mike; and Strutt, Anna

THE IMPORTANCE OF BIOSECURITY: HOW DISEASES CAN AFFECT INTERNATIONAL BEEF TRADE

Session 17A: Friday 8:30 am – 10:30 am

We quantify the effect of disease outbreaks on trade in agricultural commodities. A gravity model is used to study the impact on international beef trade of foot and mouth disease (FMD) and bovine spongiform encephalopathy (BSE). We account for both a country's official FMD status and for the impact of recent disease outbreaks. Both during and after an FMD outbreak, exporting countries substitute away from markets recognized as FMD free toward lower value markets that are not recognized as FMD free. Regaining official recognition of FMD free status may assist recovery, but it is not sufficient to negate the effects of a recent FMD outbreak. For countries that are free of FMD, our results suggest that modeling of the impact of FMD should incorporate such medium run effects, otherwise it is likely to significantly understate the costs of an outbreak, which may lead to less resources being allocated to biosecurity. For countries that are not free of FMD, we show that if the disease were to be eradicated, after several years an exporter should be able to substitute towards higher value FMD free markets. The advantages of this change in export market profile should be taken into account when considering the benefits of FMD eradication programs. Similarly, we find that a country that has experienced BSE will export less to markets that have not experienced BSE and more to markets that have.

Goswami, Sarah

VARROA MITE ERADICATION: COST BENEFIT ANALYSIS IN BIOSECURITY

Session 9A: Friday 8.30 am – 10.30 am

Varroa is likely to affect both the profitability and the structure of the Australian bee industry and affect the input costs and yields of selected cropping industries in Australia. This paper details the economic feasibility of undertaking an eradication program for varroa mite, using Cost Benefit Analysis (CBA). In calculating benefit it included production cost increases and yield losses for 25 Australian cropping industries. The analysis estimated net present values (NPV) of conducting an eradication program for varroa between $318.8 million and $914.5 million, with a mean of $589.1 million. The estimated benefit cost ratios (BCR) of conducting eradication ranged from 82:1 to 232:1, with a mean of 152:1. Sensitivity analysis was conducted on the probability distributions for the 'time to adaptation from Asian Honey Bee (AHB) to European Honey Bee (EHB)' and the 'time to impact from adaptation' so as to examine the impact on the NPV and BCR of conducting an eradication program for varroa. Results under all sensitivity scenarios remained positive, with the mean BCR's ranging between $669.5 million and $512.9 million. Supplementing the CBA at the Australian level, a disaggregated impact analysis was conducted to ascertain the expected apportionment of benefit from eradication by State. This analysis included production cost increases and yield losses for 14 Australian cropping industries.

Gregg, Daniel; and Wheeler, Sarah

IMAGE MANAGEMENT AND SELF DECEPTION RESPONSE BIASES IN STATED PREFERENCE STUDIES: A CONTINGENT AND INFERRED VALUATION STUDY FOR THE PRESERVATION OF A WETLAND IN SOUTH AUSTRALIA

Session 15B: Thursday 1.15 pm – 3.15 pm

Stated preference studies have come under considerable scrutiny due to their lack of clear incentive compatibility, and the evidence for response biases leading to inflated estimates of Willingness To Pay (WTP). A Contingent Valuation (CV), augmented with the Inferred Valuation (IV) method of Lusk and Norwood (J. Env. Econ. Mgmt. 2009) study was undertaken using an internet panel of 1000 respondents considering the WTP to preserve an at-risk wetland in the Upper South East region of South Australia – a region in which few pristine wetlands remain after substantial pastoral and farming development in the last 50 years. The IV approach has been shown to generate substantially lower WTP than the CV approach, but the source of these deviations has not been formally considered. This paper presents an outline of how 'Image Management' and 'Self-Deception' may generate CV-IV deviations and presents a formal test of their contribution to these.

Gunathilaka, R P Dayani; Smart, James C R; Fleming, Christopher M; and Hasan, Syezlin

ECONOMIC CONSEQUENCES OF CLIMATE CHANGE ON PLANTATION AGRICULTURE: THE CASE OF TEA PRODUCTION IN SRI LANKA

Session 1F: Wednesday 10:30 am – 12:30 pm

Limited opportunities for crop switching, the lengthy pre-harvesting period and the labour and land-intensive nature of plantation crops compared to annuals are likely to make the sector more vulnerable to climate change. Surprisingly, however, the economic consequences of climate change on plantation crops are seldom analysed. Drawing on a unique monthly panel dataset from a representative cross section of 34 tea estates over a 12-year period, 2002-2014, this study implements a structural econometric model of estate profit maximisation based on a two-stage approach. The structural system is estimated to quantify the impacts of climate change on profitability, demand for inputs (labour, fertilizer, fuel and electricity) and output supply for tea production in Sri Lanka. The two-stage methodology permits us to quantify how tea plantation profits and labour demand are affected by long-term climate change. Results indicate long-term profits and demand for labour from tea plantations will decline in a hotter and wetter climate. Furthermore, our predictions show a negative economic impact for Sri Lankan tea plantations from increased mean temperature and increased rainfall under high, medium and low emissions scenarios. Overall, the predicted negative impacts of climate change on Sri Lankan tea plantations are considerable, both economically and socially. Our findings will assist in developing appropriate policies and recommendations for climate adaptation in tea plantations. The approach is also relevant for other climate-susceptible plantation crops such as rubber, coconut and oil palm, which are important components in the economies of many developing countries.

Gundersen, Craig; Kreider, Brent; and Pepper, John

RECONSTRUCTING SNAP TO MORE EFFECTIVELY ALLEVIATE FOOD INSECURITY IN THE U.S.

Session 1H: Thursday 8:30 am – 10.10 am

Food insecurity in high income countries and numerous associated health consequences has drawn increasing attention from policymakers and program administrators. In the United States, the primary program to alleviate food insecurity is the Supplemental Nutrition Assistance Program (SNAP, formerly known as the Food Stamp Program). SNAP has shown to be remarkably effective in this role – after appropriately controlling for selection, participants are about 20% less likely to be food insecure than eligible non-participants. Despite this, the majority of SNAP households with children are food insecure. One way to enable more of these households to be food secure is to provide higher benefit levels. To identify the extra benefits that would be needed to ensure food security, we use a question taken from the 2014 December Supplement of the Current Population Survey (CPS – the data set used to establish the official food insecurity rates in the U.S.) that asks respondents how much additional money they would need to be food secure. Based on the resulting responses, we propose changes in the benefit formula which would lead to declines in food insecurity from 51% to 59% with costs ranging from $11 billion to $16 billion. While these potential increases in SNAP would be non-trivial, the costs should be weighed against the potential benefits of reductions in food insecurity, especially for health care expenditures.

Haensch, Juliane; Wheeler, Sarah; and Zuo, Alec

THE SPATIAL DISTRIBUTION AND DETERMINANTS OF PRICE PREFERENCES FOR WATER ENTITLEMENT TRADING

Session 11B: Friday 8:30 am – 10:30 am

It has been suggested that trading permanent water can be affected by spatial influences, such as biophysical factors, regional population growth and neighbourhood interaction. This research extends this spatial analysis to irrigators' stated price preferences when deciding at which price levels they would start buying or stop selling water entitlements. This research question is related to the concepts of 'willingness to pay' (WTP) and 'willingness to accept' (WTA). The spatial pattern of WTP and WTA are increasingly considered in agricultural economics, but so far, no study has analysed the spatial pattern of price preferences for water trading. Irrigators' individual and price preference data were sourced from a survey conducted in 2011 in the southern Murray-Darling Basin. Irrigator locations were spatially referenced and spatial characteristics were linked to the irrigator survey data (n=531). Overall, this analysis confirms the relevance of various spatial influences on water entitlement sales decisions but not so for water entitlement purchases. Thus, irrigators' value their water differently if they own it compared to if they are going to own it, which may relate to the 'endowment effect'. The results particularly confirmed the influence of poor resource areas (relating to salinity and water scarcity issues) and irrigators' location in the southern Murray-Darling Basin (regarding rural areas and the different states). Identifying the spatial distribution and determinants of irrigators' price preferences for water trading facilitates the identification of high or low value areas, which can be useful when planning for agri-environmental policy programs.

Hagan, James; and Zull, Andrew

THE ECONOMICS OF TILLAGE IN MODERN BROADACRE FARMING SYSTEMS

Session 1A: Wednesday 10:30 am – 12:30 pm

No-till farming has been embraced by Australian broadacre with between 85 and 90% of farmers currently using no-till in their system, paradoxically 48% of broadacre farmers also claim to have used tillage in the previous year. Using a combination of real world examples from Queensland and Western Australia and economic modeling, this paper will examine why this juxtaposition should be expected to continue, and show how both situations can be true in modern broadacre farming systems. The increasing pressure being placed on ever smaller available chemical methods of control, and effective chemical options significantly increasing in price as herbicide resistance removes prior control options, the difference in upfront cost of chemical and mechanical control is shrinking. For example, newer formulations such as (Pyrasulfotole) Velocity®, Isoxaflutole (Balance®), and Pyroxasolfone (Sakura®), can all cost over $30/ha for a single pass at popular rates and potentially double

this when considering the higher rates and use of double knocks to control hard to kill weeds. In addition to this upfront cost, over-reliance on a few working modes of action increases the risk of further resistance developing, thus the addition of non-chemical methods of control are a key in the war against weeds. Farm businesses profitability of their no-till farming systems, by setting up paddocks for long term control with low weed burdens, whilst not drastically compromising the benefits of their no-till operations.

Hardaker, Talia; Chudleigh, Peter; and Hardaker, J. Brian

AUSTRALIAN AGRICULTURAL RESEARCH: INVESTMENT, PERFORMANCE, INSTITUTIONAL CHANGES AND LESSONS LEARNED

Session 4A: Wednesday 10:30 am – 12:30 pm

The economic returns to investment in agricultural research in Australia and elsewhere have received much attention by economists. These analyses have included individual research project investments in individual countries and internationally, program investments, and meta-analyses. While these evaluations have used different methods, the results have generally been highly positive. However, some questions have been raised about their credibility.

Hasan, Syezlin; Curwen, Graeme; Stewart, Morag; and Smart, Jim

MODELING AGRICULTURAL LAND USE CHANGE IN SOUTH EAST QUEENSLAND

Session 11A: Thursday 8:30 am – 10.10 am

Agricultural land use has a major influence over water quality and water quantity. Future changes in agricultural land use are therefore a major concern for water supply agencies as a central input to their planning for future infrastructure investments. This paper presents current work to predict future agricultural land use changes in South East Queensland by implementing a structural econometric model of farm profit maximisation at 1 x 1km grid square resolution using historical data. Land use share equations are derived from the optimal land use allocation problem as proposed by Fezzi and Bateman 2011. Input and output prices, environmental and physical characteristics and policy variables are identified as potential drivers of land use change. Drawing on the literature, the land use share equations are estimated as a system of two-limit multivariate Tobit models using a quasi-maximum likelihood approach. Future scenarios under climate change are then applied to the calibrated land use model to predict agricultural land use in South East Queensland at specific intervals into the future. The results will be useful for water supply agencies planning for potential impacts on water quality and quantity.

Heagney, Elizabeth; Rose, John; Ardeshiri, Ali; and Kovac, Mladen

TOWARDS MORE REPRESENTATIVE TRAVEL COST MODELING: AN ECONOMIC VALUATION OF THE NSW PROTECTED AREA NETWORK

Session 15B: Thursday 1.15 pm – 3.15 pm

Travel cost modeling has been used to value recreational sites since the 1940s, but typically, studies have relied on data collected through on-site survey at a relatively small number of sites. Our study explores the implications and advantages of shifting towards more representative survey methodologies. We have analysed data from a random stratified phone survey of more than 60,000 households across four states and territories (NSW, QLD, Victoria and the ACT) in which survey respondents were questioned about their recent use of any and all of the 728 protected areas across NSW. We have used novel travel cost modeling techniques, including ordered choice modeling and zero-inflated choice set formation, to estimate consumer surplus and identify key drivers of recreational demand. This methodology confers a range of advantages over traditional analysis techniques, including the capacity to ensure value estimates are robustly and representatively scaled to the broader population, the ability to undertake empirical analysis of the distributional effects, and a means of imputing visitation rates to individual sites across a protected area network – including low visitation sites for which data is usually unavailable. We provide the first revealed-preference estimate of the tourism and recreation value of an entire protected area network and explore implications for strategic development of recreational opportunities within the NSW protected area network.

Herring, Matthew; Zander, Kerstin; and Garnett, Stephen

DOUBLE-DIPPING: INTEGRATED WATER MANAGEMENT FOR BITTERN FRIENDLY RICE GROWING

Session 16A: Wednesday 10:30 am – 12:30 pm

Achieving food security while conserving biodiversity is a key global challenge. To complement dedicated conservation areas like national parks, wildlife-friendly farming initiatives capitalise on potential win-win scenarios where agricultural production and biodiversity conservation can be integrated. The rice fields of the Murray-Darling Basin have important biodiversity values and support the largest known breeding population of the Australasian Bittern, a globally endangered waterbird. However, water resource management remains polarised, with the concerns of irrigators and environmentalists characterised by opposition. The Australian rice industry is compelled to reduce water use and greenhouse gas emissions, resulting in a condensed rice season. Direct-drill crops with delayed permanent water, shorter season varieties and mid-season drainage are creating a potential ecological trap for bitterns, where successful breeding is no longer possible. This situation highlights trade-offs in natural resource management and provides an opportunity to develop and test integrated water management scenarios, assessing the cost of bittern- friendly rice growing, and the most cost effective means of applying it. We identify and discuss three key areas for future research: (i) the novel use of environmental water within irrigation infrastructure and its public acceptance; (ii) the feasibility of premium branded bittern-friendly rice products including the public willingness to pay; and (iii) payment for ecosystem services including the best suite of incentives and cost-sharing for stewardship. There is strong support for the bitterns in rice phenomenon from both farming and environmental communities, and promising opportunities to integrate the management of water in the Murray-Darling Basin.

Higashida, Keisaku; Tanaka, Kenta; and Vista, Arvin

DO RESOURCE DEPLETION EXPERIENCES AFFECT SOCIAL COOPERATIVE PREFERENCES? ANALYSIS USING EXPERIMENTAL DATA ON FISHERS IN THE PHILIPPINES AND INDONESIA

Session 7A: Thursday 1.15 pm – 3.15 pm

This paper examines the relationship between social cooperative preferences and socio-economic factors of fishermen and fishing villages. In particular, we focus on the effect of experiences on social cooperative behaviour, which can be one of critical factors for proper management of fish resources. To this end, we carried out experimental sessions at 16 fishing villages (5 islands) in the Philippines and Indonesia. The fishing industry, in particular coastal fishing, is one of the important industries for local people in the targeted regions, and natural characteristics, such as fishing species and climate conditions, are different across regions. In addition, fishery management methods also differ across regions: some regions have implemented management schemes voluntarily, while governments have enforced measures for controlling fishing activities in other regions. We adopt (i) the value orientation test to measure cooperativeness; and (ii) experiences that are subjectively perceived. Additionally, we focus on the perceived causes of resource depletion experienced by fishermen. We also surveyed fishermen's personal attributes and socio-economic factors they face. Our results are very interesting. First, in line with previous studies, we find clear correlations between experiences and preferences. Second, the impact of an experience of resource depletion may depend on whether fishermen perceive that the depletion was caused by artificial factors or changes in the natural environment. Particularly, experiences of resource depletion caused by artificial factors are likely to make fishermen more cooperative, while experiences of resource depletion caused by changes in the natural environment are likely to make fishermen less cooperative.

Higuchi, Angie; and Morales, Emilio

THE EFFECT OF HEALTHY AND NUTRITIOUS PERCEPTIONS ON CONSUMERS' WILLINGNESS-TO-PAY EXTRA FOR FISH VERSUS MEATS IN PERU

Session 8A: Thursday 1.15 pm – 3.15 pm

Scientific evidence has demonstrated positive effects of seafood consumption on human health. Consequently, governments have invested resources to promote fish consumption. But, would consumers be willing to pay more for fish than meat? Using consumer survey data collected in Lima, Peru, zero-inflated negative binomial models are estimated to contrast those variables affecting consumers' willingness-to-pay extra for fish versus

beef, chicken and pork. The results demonstrate that household income and size are significant variables that influence the willingness-to-pay more for fish over meats. In addition, the level of taste preference for fish consumption has a positive effect on the propensity to pay extra for this product rather than meat. Finally, there is a positive effect of the perceptions that fish is healthy and nutritious on willingness-to-pay more respect to all meats studied. This finding supports the use of campaigns to promote fish consumption, and suggests that additional information about health benefits derived from eating fish could affect consumers' preferences, and ultimately their willingness-to-pay.

Ho, Thong; Hoang, Viet-Ngu; and Wilson, Clevo

ECO-EFFICIENCY ANALYSIS OF SUSTAINABILITY-CERTIFIED COFFEE PRODUCTION: EVIDENCE FROM VIETNAM

Session 1G: Thursday 1.15 pm – 3.15 pm

Most consumers believe that sustainability-certified coffee production helps to increase economic benefits to the farms and reduce environmental impacts. However, international empirical evidence is not conclusive and there lacks empirical evidence for Vietnam – the second largest coffee producing country in the world. This paper provides the first empirical examination on the differences in eco-efficiency between conventional and sustainability-certified coffee production in Vietnam. A data set of 712 farms in Vietnam over three crop years from 2012/13 to 2014/15 are employed in a standard Data Envelopment Analysis (DEA) framework. Environmental pressures measured by the consumption of nitrogen, phosphorus, irrigation water, pesticides, herbicides, fungicides and arable land per are analysed in conjunction with the added values of coffee outputs. The results show that in each crop year, the coffee farms could reduce environmental pressures by about 50% while maintaining the value added constant overall. Sustainability-certified farms are found to be more eco-efficient than conventional farms; however, differences in eco-efficiency between two groups are smaller over time. Empirical results also show statistical differences in the distribution of eco-efficiency between the conventional and sustainability-certified farms. In addition, the results also indicate that farms are more eco-efficient in higher elevation locations than lower elevation locations. Wind-break trees and drip or spray irrigation systems are found to help coffee farms be more eco-efficient. However, the availability of shaded trees and the extension service provided by government agencies do not help to generate the eco-efficiency.

Houk, Eric; and Mehl, Steffen

WATER TRANSFERS AND GROUNDWATER IN CALIFORNIA: ESTIMATING THE SPATIAL AND TEMPORAL IMPACTS OF AQUIFER DECLINE IN AGRICULTURE

Session 11B: Friday 8:30 am – 10:30 am

In California, a majority of the fresh water supplies are located in the northern part of the state while a majority of the water consumption occurs in the south. As such, large federal and state projects have been developed in order to transfer northern water supplies to southern water users. This ability to transfer water has placed pressure on northern California farmers to transfer/lease their surface water and increase groundwater pumping to offset these water transfers. Although "groundwater substitution transfers" are already occurring, the impact on the underlying aquifer and agricultural water users is often poorly understood. This paper provides an overview of California water issues and estimates the impacts associated with a set of groundwater substitution transfer scenarios. The scenarios were first evaluated using the United States Geological Survey's (USGS) Central Valley Hydrologic Model (CVHM) to estimate the impact that each scenario will have on water table depth. Using the estimated changes in water table depth, groundwater extraction volume, and regional groundwater pumping efficiency, the additional electricity and agricultural pumping costs that would be expected to occur throughout the region are estimated over a 10 year period. This work demonstrates the use of regional scale models to predict the temporal and spatial changes in water table elevations and the associated external costs on agricultural groundwater users. This should be relevant to a broad range of participants as more regions of the world face water scarcity, water reallocation, and groundwater decline.

Iftekhar, Sayed; and Fogarty, James

IMPACT OF WATER ALLOCATION STRATEGIES TO MANAGE GROUNDWATER RESOURCES IN WESTERN AUSTRALIA: EQUITY AND EFFICIENCY CONSIDERATIONS

Session 11B: Friday 8:30 am – 10:30 am

In many parts of the world groundwater is depleting at an alarming rate. Water regulation authorities are facing the challenge of reducing groundwater extraction by existing users. However, to take appropriate adaptation measures, it is necessary to understand the distributional consequences of groundwater depletion. In water resource management, the issue of the equity-efficiency trade-off has been explored in a number of different areas, but not in the context of water allocation reduction from a groundwater system. To contribute to this knowledge gap, we conduct an empirical case study for the Gnangara Groundwater System (GGS) of Western Australia. The water level in this system is depleting at a consistent rate. Using an individual-based farm optimization model parameterized with the individual licence-specific data on area and water allocation, we test a combination of scenarios: with and without area constraint, regional and individual farm-specific models. We observe that, with the current land use distribution, a 25% reduction of allocation could reduce net revenues per hectare by 14%. However, in absence of area restriction, the loss in net revenues could be as high as 22%. Farm level analysis showed farms with larger areas or more initial water allocation are likely to lose more revenue per unit of water reduction. As a consequence, an efficiency argument would dictate reduction of water from farms that already have low water allocation per hectare and the equity argument would suggest the opposite. These results reveal the complexity in setting up an appropriate allocation reduction strategy.

Jackson, Tom; and Malcolm, Bill

BEYOND THE NPV – UNDERSTANDING INNOVATION ADOPTION DECISIONS

Session 4A: Wednesday 10:30 am – 12:30 pm

Adoption of innovations is the key driver of productivity growth and therefore the long-run competitiveness and profitability of farms. Recognising this, public and private entities spend billions of dollars every year developing new agricultural technologies. These efforts have led to constant improvements in machinery, chemicals and many other aspects of farming. However, it has always been the case that some innovations are adopted widely and rapidly while others are adopted slowly or not at all, and our understanding of the reasons for this remains limited. This paper presents analysis of innovation adoption that explicitly considers the static and dynamic components of these decisions. In particular, distributions of returns for a set of pasture improvement scenarios are constructed using stochastic simulation of a whole-farm economic model calibrated with information obtained from a group of farmers in south-west Victoria, Australia. Real options analysis is used to identify the most profitable pasture improvement scenarios, given an explicit allowance for the value of risk. Separately, a Bayesian learning model is used to represent the process of learning to reduce uncertainty over time. This approach provides a more comprehensive explanation of observed adoption decisions than traditional (static-only) analyses, and sheds light on some key processes that could be targeted by technology developers and others to facilitate adoption.

Jayalath, Kankana Vidanage Nandika Nilmini; Mallawaarachchi, Thilak; and Cramb, Rob

WEATHER VARIABILITY AND COCONUT PRODUCTION IN SRI LANKA: STATE-CONTINGENT ANALYSIS

Session 4A: Wednesday 10:30 am – 12:30 pm

Weather variability presents an additional impediment that increases the uncertainty of production in perennial crops under rain-fed cultivation. Producer behaviour under uncertainty can be modelled using stage-contingent theory established in Chambers and Quiggin (2000). This theory advocates farmers manage uncertainty by allocating inputs into different states of nature. By using variable production technologies, farmers have the potential to gain flexibility in adapting to manage uncertainty associated with unexpected events. However, empirical estimation of state-contingent models for perennial crops is limited to irrigated agriculture (Adamson et al 2006, Mallawaarachchi et al 2016), and its application in rain-fed coconut farming is absent. Estimation of production functions for perennial crops encounter issues such as long gestation period, gradual increase in yield for an extended period, yield stabilization through gradual replacement and the treatment of those risks over long time horizons. This is complicated further due to climate variability that could affect both the level of

production and the quality of output, thus making the decision process more complex. This paper assesses empirically how farmers manage production uncertainty under different states of nature drawing on coconut production data from a sample of commercial coconut plantations in the traditional coconut growing region of Sri Lanka. We explore how weather variability affects coconut production and the potential to reduce weather variability risks by implementing flexible farming technologies that are amenable to weather variability.

Kau, Joseph Sello; Mashimbyi, Nkhensani; and Madyo, Sipho

THE GENERAL EXCLUSION OF SMALLHOLDER FARMERS IN THE MAIZE VALUE CHAIN, IN THE FACE OF HIGH YIELDS

Session 1H: Thursday 8:30 am – 10.10 am

While smallholder farming sector is the lifeblood of the agricultural economy in most parts of the African and Asian continents, in South Africa this sector is marginalised and smallholder farmers are excluded from participating, even in sectors where the commodity is their staple food, such as in the case of the maize sector. This fly in the face of South Africa having made significant gains in terms of the increase in the per capita yield of maize. On the other hand, the retail price of the maize meal, which is the staple food for the majority of the poor, has increased dramatically. This situation is feared to worsen the status of food insecurity in the country. In this study investigations, which included literature review, discussions with industry stakeholders and review of the data collected from the past studies, have brought forth a number of results as to the factors that led to smallholder farmers being marginalised. The factors include: the collapse of the subsistence farming sector, poor institutional arrangements and lack of technical support, lack of access to markets and market information. Drawing insight from literature and the results, two recommendations are put forward. The first is for the government to revive the subsistence farming sector, also ensuring transformation among its key institutions. The second is about making provision for an emergency fund that will provide a relief during times of drought and whenever maize-meal prices are extremely high.

Kerr, Geoff

MARGINAL SATISFACTION OF RECREATIONAL HUNTERS' RED DEER HARVESTS

Session 15B: Thursday 1.15 pm – 3.15 pm

Maximisation of aggregate recreational hunter benefits involves managing both the prey and the hunter. The biology of game animals, and hence the supply side of the management situation, is reasonably well understood, but there is relatively little information on the demand side. On public lands, where there is no market to signal the quality of the hunting experience, the game manager has little guidance on how to allocate the resource amongst individual hunters. In New Zealand, there is no attempt to do so. While seeing and killing game are known to enhance individual hunters' benefits, the allocation of the resource across hunters raises the prospect of limiting individual hunter harvests, normally enacted through a bag limit. The benefits of doing so are dependent upon the marginal benefits of harvest for different hunters. The relationship between hunter satisfaction and the number of animals killed is explored using data from a longitudinal study of a large group of deer hunters. Latent class models of satisfaction outperform random parameters models and identify heterogenous groups of hunters whose satisfaction is differentially dependent on game sightings and harvest. Personal attributes and hunter motivations help explain some of these differences. Heterogenous and rapidly diminishing marginal satisfaction present a strong case for management of at least part of the open-access New Zealand red deer herd to enhance social welfare by increasing the number of hunters harvesting a deer rather than going home empty-handed.

Khong, Tien Dung; Young, Mike; Loch, Adam; and Thennakoon, Jayanthi

FARM-HOUSEHOLD PREFERENCES FOR REDUCING SALINITY INTRUSION RISK: A CASE IN THE MEKONG RIVER DELTA

Session 15B: Thursday 1.15 pm – 3.15 pm

In this research, we explore farmers' willingness to contribute to the cost of reducing salinity intrusion risk in the Mekong River Delta (MRD). Salinity intrusion occurs where saline water mobilises into freshwater sources

as a consequence of reduced upstream freshwater pressure. Salinity intrusion effects have significantly reduced farm-household income for an area that produces 45% of Vietnam's national rice crop. As such, the MRD is expected to be one of the worst affected areas in South East Asia. In response, the Vietnam Government has begun an assessment of two policy options: a 'soft' policy aimed at transitioning to aquaculture systems; and a 'hard' infrastructure policy aimed at constructing and upgrading sea dike and river mouth sluices system to cope with this problem. However, a lack of government financial resources is limiting progress toward implementing these options. To assist with the development of more cost-effective policies we collected data on farmer perceptions and their responses to adaptive requirements in the face of salinity intrusion. Our survey strategy and design incorporated recent improvements to the use of Contingent Valuation Methods through the testing of inferred valuation and relative economic sacrifice indices. As a result, we can estimate how much farm-households are willing to contribute to a government-administered salinity reduction fund. Results from our study provide information needed to help decision makers determine how much to invest in 'hard' infrastructure or 'soft' policy approaches. Three groups of farm-households stratified by salinity intrusion risk also provided differences in terms of the WTP level and its determinants.

Kim, Khoi Dang

IMPACTS OF FARMERS' ADAPTATION TO DROUGHT AND SALINITY INTRUSION ON RICE YIELD IN MEKONG RIVER DELTA: AN ENDOGENOUS SWITCHING REGRESSION APPLICATION

Session 1B: Thursday 1.15 pm – 3.15 pm

(No abstract available at time of printing)

Kishore, Avinash; Joshi, P K; and Pandey, Divya

PRODUCTIVITY, SUSTAINABILITY AND EQUITY IN WATER MARKETS OF THE EASTERN GANGETIC PLAINS (EGP): A COMPARATIVE STUDY OF BANGLADESH, INDIA AND NEPAL

Session 1B: Thursday 1.15 pm to 3.15 pm

We surveyed 1464 farmers from 72 villages in eight districts or divisions across the EGP in 2014-15 to understand how farmers access and use groundwater. Since nearly 90 percent of farmers in EGP rely on rental services for groundwater irrigation, our survey focused on understanding how the groundwater markets work and what is their impact smallholders who rely more on water markets. Several key findings emerge. First, access to groundwater is universal across our study area. Second, almost all farmers use groundwater, but most of them practice deficit irrigation due to high variable cost of lifting groundwater. This results in lower yield of both paddy and wheat. Cultivation of a summer crop is also uncommon because of the high cost of irrigation. Expensive irrigation also makes agriculture in the region less resilient to droughts and the late onset of monsoon. Third, pump density has increased significantly over the last 10-15 years and more sub-marginal farmers' own pumps today compared to a decade ago. Still, water markets continue to be just as uncompetitive as they were when pump-sets were more expensive, less fuel efficient and fewer in number. Fourth, increase in pump density is unlikely to make water markets more competitive till diesel is the main motive power for pump-sets. A shift to a cheaper source of energy for pumping groundwater is essential to ensure affordable access to irrigation in the EGP region. Fifth, inequitable ownership of pump-sets (and other agricultural equipment) reinforces existing economic inequities.

Kiyama, Shoichi; and Kobayashi, Akira

HOW DOES A POLICY OF ECOSYSTEM SERVICES CHANGE PRODUCTIVITY OF THE AUSTRALIAN FOREST MANAGEMENT?

Session 10B: Wednesday 10:30 am – 12:30 pm

Forest management with ecosystem services (ES) approaches is a crucial topic for a sustainable land usage policy. However, little knowledge has been shown about whether payments for ecosystem services enhances productivity in the case that producers have to produce the ES goods in addition to the forest plantation. The purpose of this study is to show a view of changes in productivity of the Australian forestry and forest management sector subject to the NSW-GGAS policy. This study assumes that a forest sector produces multiple goods of roundwood removals (RR) for wood material supply, plantation establishment (PE), and carbon

sequestration/carbon credits (CC) associated with forest plantation. The production function is then formulated to describe the following characteristics: (i) Changes in the productivity is permitted in the production process of the aggregated PE and CC goods; and (ii) a constant elasticity of transformation function describes production allocation between the RR and the aggregated PE and CC goods. This study has the following two major findings. First, the coefficient of transformation between the RR and the aggregated PE and CC goods is estimated as 1.407. Second, the CC improves productivity. In fact, the share of CC issued PE against a total PE is estimated up to 0.228%. The corresponding productivity of PE itself is improved up to 6.168%, which amounts to 0.612% of productivity improvement associated with the total activity of the forest management. It is therefore suggested that a considerable productivity improvement of the forest conservation is expected by the ES policy.

Kloessing, Karl

QUEENSLAND SORGHUM EXPORT SUPPLY CHAIN - POTENTIAL BENEFITS FROM REDUCED REGULATION
Session 1A: Wednesday 10:30 am – 12:30 pm

This report assesses the Queensland export supply chain of grain sorghum, assisting an inquiry by the Australian Productivity Commission into the economic impacts of regulation. Four domestic supply chain segments and costs per tonne are assessed:

1. On farm sorghum production (Segment 1: variable costs per tonne of sorghum $108; farm gate price $178; leaving gross margin of $70 per tonne)
2. On farm storage, levies, road & Rail Leg 1 transport to up-country receiving points or Port (Segment 2: cost $25; cumulative cost or Silo return price $204)
3. Shrinkage, quality certificate & Rail leg 2 to Port (Segment 3: cost $8: cumulative cost (Track price to Port $212)
4. At Port fees (grain handling, fumigation, Australian quarantine service vessel inspection and ship loading) – (Segment 4: cost $29; cumulative cost or Free on Board price $241)

Regulation applies to Segment 4

Reducing port grain handling and storage fees in central Queensland ports by a notional 10 per cent saves $461,000 (0.5 per cent of total FOB value $99 million) across 411,000 tonnes exported. If stringent grain fumigation requirements by export customers were eliminated, total grain fumigation costs fall 25 per cent, saving $49,000. Although combined savings from regulation reduction are marginal in dollar terms ($1.24 per tonne or 0.5 per cent FOB value), they are viewed as worthwhile; increasing farm gross margin $1.24 (1.7 per cent), boosting supply chain efficiency/equity and making Queensland export sorghum more competitive in a globally influenced grains market.

Kovac, Mladen; and Heagney, Elizabeth

PREDICTING FUTURE RATES OF LAND CLEARING IN NSW: AN INFORMATION THEORETIC APPROACH TO ECONOMETRIC MODELLING
Session 10A: Thursday 8:30 am – 10.10 am

The economic literature has linked land clearing to a broad range of potential driver variables, including terms of trade, commodity prices and selected climate variables. However, given the interrelationships amongst agricultural price indicators, and the interconnectedness of market-climate systems, many of these proposed drivers are conceptually and / or statistically correlated. Consequently, it can be difficult to determine which variables are true drivers of observed land clearing rates, or, at the very least (with issues of causality aside), which is the best set of variables for predicting future land-clearing risk. Econometric models of the drivers of land clearing in Australia that have been developed to date, have had very low explanatory power and are of limited utility for predictive and other management purposes.

A solution is found in the 'information theoretic approach' to econometric modelling. We have developed ten hypotheses that compare and integrate alternative drivers of land clearing that have been proposed in the literature. We test each hypothesis at both state- and regional scales- to identify a small number of key drivers that act in concert to influence rates of land clearing across NSW. These include prices paid and received by farmers, the price of individual commodities, and the Southern Oscillation Index. We also present results from predictive modelling techniques (ARIMAX, neural network modelling) to demonstrate how our findings can be used to predict future land clearing rates, and thereby contribute to proactive, targeted land-clearing policy that focuses management efforts on those areas at greatest risk of clearing.

Kouser, Shahzad; Anjum, Abedullah; and Ibrahim, Muhammad

HETEROGENEOUS DEMAND FOR AFLATOXIN-FREE MILK: EVIDENCE FROM PAKISTAN

Session 8A: Thursday 1.15 pm – 3.15 pm

Aflatoxins are highly toxic compounds in milk and are posing serious risks to human health in developing countries. Many studies have reported the concentration of aflatoxins beyond the safe limits in raw milk of Pakistan. This study aims to help milk producers by investigating consumers' preferences for different attributes of aflatoxin-free milk. For this purpose, we conducted a discrete choice experiment with a random sample of 360 households drawn from three mega cities of Punjab province. Random parameter logit and latent class models are used to incorporate preference heterogeneity in the stated choice analysis. Empirical findings suggest that consumers have maximum willingness to pay for milk having low concentration of aflatoxin. Based on these empirical findings, we suggest that there is considerable scope for the rapid development of aflatoxin-free raw milk, even though it is marketed at prices that are significantly higher than current milk prices.

Law, Elizabeth

PRIVATE LAND CONSERVATION: UNDERSTANDING STAKEHOLDERS TO IMPROVE POLICY DESIGN

Session 10B: Wednesday 10:30 am – 12:30 pm

Biodiversity conservation planning in private areas is challenging as there are no guarantees that landholders with prioritised parcels will comply with conservation requirements. One solution to this problem is to treat participation as uncertain. This approach is inefficient, however, as not all landholders will have the same probability of participation, and these are also likely to vary with alternative policy options. Given observed low rates of conservation easement and tax program participation, even small reductions in the uncertainty could lead to large improvements in targeting and cost-effectiveness of the program. We use market segmentation methods to identify potential stakeholder groups for our study region in south-western Canada, based on observable biophysical, cadastral, and census variables hypothesized to influence participation and behaviour in conservation easement and tax programs. Using known rates of uptake, we compare conservation priority designations, and likely outcomes, from three scenarios: (i) no consideration of participation rates, (ii) consideration of uniform participation rates, and (iii) uptake rates differentiated using market segmentation. Identified stakeholder groups can also be used to stratify sampling for further research surveying stakeholder preferences and willingness to participate. This could further improve policy design by identifying avenues that will provide the most cost-effective conservation across private lands.

Leu, Shawn; Lefley, Ed; and Baker, Derek

DEVELOPMENT OF INDICATORS OF ECONOMIC RESILIENCE IN AUSTRALIA'S REGIONS: AN APPLICATION TO RURAL NSW

Session 10D: Wednesday 10:30 am – 12:30 pm

Advancement of Australia's regions is an important policy objective at both Federal and State level. Historically, work (employment) is unevenly spatially distributed within Australia. Accounts of regions' resources and capacities are important information for investors from both public and private sectors. For primary industries, creation of employment and retention of value added in the regions is seen by many as vital to rural and regional communities. For rural and urban planners, product flows to distant consumer markets call for public and private investment in infrastructure, and similar arguments address regionally-based export industries. This study applies a methodology used in the United Kingdom to available data series for regions of NSW. Indicators based on labour market dynamics are employed to map the resilience of the State's regions. Cyclic patterns emerge, which interact in a number of ways between and within the regions studied. Exogenous data is used to explain the periodicity and amplitude of fluctuations, and the spatial pattern of linkages between regions. Extensions of the method are discussed with regard to industry-specific impacts of change, particularly in agriculture, agribusiness and mining; and applications using alternative data sources.

Li, Kuo

MEASURING THE RETURNS TO INVESTMENT IN R&D IN THE AUSTRALIAN GRAINS INDUSTRY

Session 13A: Thursday 1.15 pm – 3.15 pm

The relationship between investments in agricultural R&D and agricultural productivity has been long studied. Governments and funding agencies need to demonstrate the social and economic impacts of research programs to justify their investments, as well as to prioritise future research. Estimating the economic benefits of investment in agricultural R&D and the distribution of benefits has conceptual, method and practical challenges. Equilibrium Displacement Models (EDMs) can be used to estimate the net benefits of agricultural R&D and the distribution of benefits between producers and other participants in the value chain, better informing investment decisions. EDMs have been developed for various livestock industries, but not for the Australian grains industry. This is partly because of the complexity of modeling the multi-sector grains industry. This paper focuses on constructing an EDM of the Australian grains industry. The grains industry in Australia produces cereal grains, oilseeds and pulses, often also associated with livestock production. These grains are grown in the northern, southern and western cropping regions of the country, in sequences to meet agronomic and other farm system criteria. The grain supply chain has multiple stages and end uses: production, storage and transport, marketing, processing and exports. The relationships of different grains in crop rotations and in competing end uses, as well as numerous supply chains across the three different production regions, add scale and complexity to the challenges of constructing an EDM. Furthermore, previous empirical studies showing evidence of imperfectly competitive market structures for grains has implications for evaluating the distribution of benefits.

Liu, Li; Ross, Helen; and Ariyawardana, Anoma

VEGETABLE VALUE CHAIN SUSTAINABILITY AND RURAL COMMUNITY DEVELOPMENT: A CASE STUDY IN CHINA

Session 9A: Friday 8.30 am – 10.30 am

Rural community development is a neglected issue in agri-food value chains, which misses many opportunities to co-create shared value. This research adopts a case study in China to explore the significant role of rural community in diversifying sustainability capability of vegetable value chains. The qualitative data is analysed through Nvivo software. The results show that rural community capital assets promote chain-wide competence through organisational innovation, indigenous knowledge creation, brand construction, and operational risks reduction. Meanwhile, vegetable value chain is not only a chain of agricultural products, but also a chain of culture, social interaction, and social justice. Multi-level social interaction in vegetable value chain suggests that a sustainable business model in vegetable industry has to be incorporated into the social fabric of the communities. As value co-creation requires collaborative, complementary and coordinated practices, any capabilities or constraints in the either value chain or the community may transcend to the other sector. This is the key idea of linking value chains with community development. This research provides significant managerial implications on agribusiness model innovation in China where smallholder farmers dominate the agricultural industry. The value chain process is likely to create community conflicts, as efficiency seeking initiatives and market competition are fundamentally exclusive. Mutually supportive interaction has triggered chain actors to attach extended identity and value to the rural “place” or community, which constructs a collective logic to promote holistic sustainability.

Loch, Adam; and Settre, Claire

PRIVATE WATER TRADE TRANSACTION COSTS IN THE MDB: AN EMPIRICAL ASSESSMENT OVER TIME

Session 11B: Friday 8:30 am – 10:30 am

Transaction costs comprise a significant component of public agency investments to develop, implement, administer and alter policy and program arrangements aimed at achieving social welfare objectives. Private individuals can also incur transaction costs where they interact with these policies, or where those policies result in increased time or resources required to search, negotiate, contract and enforce exchange. Very few studies investigate the impact of transaction costs on private exchange, particularly with a view to informing policy-makers on the effectiveness of public investments. We collect and analyse private water trade and use

charge data from eight major irrigation districts in the southern Murray-Darling Basin to determine whether transaction costs—inclusive of monetary fees and charges, but also time and effort costs—have been increasing or decreasing over time. Our results support the conclusion that public investments have largely resulted in private welfare gains, consistent with objectives enshrined in the Water Act 2008. Some water trade activities, however, require further effort.

Malek, Lenka; and Umberger, Wendy

SEGMENTATION OF AUSTRALIAN MEAT CONSUMERS BASED ON ATTITUDES REGARDING FARM ANIMAL WELFARE AND THE ENVIRONMENTAL IMPACT OF MEAT PRODUCTION

Session 8A: Thursday 1.15 pm – 3.15 pm

While public concern over the welfare of farm animals is believed to have intensified across Australia in recent years, no empirical research has sought to quantify the extent of this concern or to examine the variation in concern among Australian consumers. The present paper is the first to address this knowledge gap. Data was collected in 2015 from a representative sample of Australian meat consumers using a comprehensive online survey instrument. Using this data, we were able to segment meat consumers according to their attitudes regarding farm animal welfare and the environmental impact of meat production. Six unique clusters were identified and characterised by socio-demographic variables, livestock-management knowledge, farming background and experience, purchase behaviour, beliefs regarding the implications of improved farm animal welfare, and influential information sources in an effort to link differences in farm animal welfare and environmental attitudes to observable covariates, and better understand the unique clusters of Australian meat consumers. Our findings show that despite recent media stories suggesting unethical treatment of farm animals, the majority of Australian meat consumers (70%) hold relatively neutral views towards farm animal welfare. Smaller shares of consumers were either 'pro-animal welfare' (10%) or 'anti-animal welfare' (20%). The new insight provided into how differing levels of animal welfare and environmental concern may be linked to other characteristics of the consumer, is expected to be of value to policy makers and stakeholders in meat markets tasked with developing more effective and targeted education and labelling strategies focusing on animal welfare and the environment.

Maligalig, Rio; Demont, Matty; and Umberger, Wendy

FARMER PREFERENCES FOR INVESTMENTS IN VARIETAL TRAIT IMPROVEMENTS: THE CASE OF RICE FARMERS IN NUEVA ECIJA, PHILIPPINES

Session 1D: Thursday 8:30 am – 10.10 am

Farmers have their own preferences for agricultural technology attributes, which have been found to significantly influence adoption decisions. However, these are not always known, nor do they always match with the objectives of the researchers. We conducted a framed field experiment to elicit farmers' preferences for rice varietal trait improvements (VTIs). The experiment provided the farmers the opportunity to participate early in rice breeding research by expressing their need for trait improvements. In the experiment, farmers were given an endowment fund of 100 Philippine pesos and were asked to invest it among the VTIs they prefer and need using the Investment Game Application (IGA), a newly developed application for eliciting preferences. Farmers were sampled from randomly selected villages in three municipalities in Nueva Ecija, a major rice producing province in the Philippines. In total, 122 households joined the experiment, with both husband and wife participating. We use the fractional multinomial logit model to examine the relationship of the proportion invested to VTIs with various factors that may influence farmers' preferences. Results indicate that wet season cropping, farm size, discount rate and output price are among the factors that influence farmers to invest in trait improvements. Moreover, results of the gender-disaggregated analysis indicate that there are differences in the factors that influence husband and wife in investing in trait improvements. Overall, information from this study can assist breeders in their efforts to make rice breeding more resource efficient and client-oriented, which could help facilitate adoption of new and improved varieties.

Mallawaarachchi, Thilak; Orton, Tom; Pringle, Matthew; and Farquharson, Bob

ESTIMATING ECONOMIC GAINS FROM ADDRESSING SOIL LIMITATIONS DRIVING YIELD GAPS

Session 3A: Friday 8:30 am – 10:30 am

Global food security concerns—driven by growing population, changing economic conditions and constraints to productivity linked to climate change as well as evidence of a general slow-down in productivity gains in developed countries—have drawn researchers' interest to addressing the gap between yields that are currently achieved by farmers (Ya) and those potentially attainable in rainfed farming systems (Yw). While substantial methodological progress has been made in measuring yield gaps, important conceptual problems remain about the economic basis of the gains being sought, such as through the management of limiting factors. In this research, we hypothesise that the effective management of soil constraints presents an economic opportunity, and develop a framework to quantify the magnitude of this opportunity by spatially mapping the yield gap for wheat and relating it to specific soil constraints. While economists would consider this problem as a simple application of constrained optimisation, much of the literature assumes little or no opportunity costs for inputs in managing such limitations. Moreover, obtaining realistic estimates of the magnitude and the spatial and temporal variability of yield gaps (Yg), attributable to soil constraints, is difficult. We develop a procedure that uses potential yield gap estimates drawn from a numerical model that captures yield gap as a function of soil constraints and available information on rainfall and soil conditions. The study highlights how uncertainties associated with underlying biophysical processes, technological change and varying states of nature in agriculture affect the optimal effort that may be directed to close such yield gaps.

Martinez, Raymundo Marcos; Bryan, Brett A; Schwabe, Kurt A; Connor, Jeff; and Law, Elizabeth

FOREST TRANSITION IN DEVELOPED AGRICULTURAL REGIONS REQUIRES EFFICIENT REGULATORY POLICY

Session 10D: Wednesday 10:30 am – 12:30 pm

Although shifts from net forest cover losses to gains—i.e., forest transition—have been associated with socioeconomic, institutional, and technological development, such an effect is not deterministic. In recent years, significant forest cover loss has occurred in developed countries at rates comparable to that observed in tropical regions. We used a high-resolution spatiotemporal dataset, coupled with state-of-the-art spatial econometrics, to investigate the influence of climate, commodity prices, property rights, land characteristics, and land clearance regulations on net forest cover dynamics in Australia's intensive agricultural region from 1988 to 2014. Whilst forest cover remained at roughly the same level across the majority of the study area, forest cover dynamics were not spatially uniform. Our results indicate that extreme drought conditions, commodity prices, and forest policy incentives all had marginal influence on net forest cover spatiotemporal dynamics. Differences in land clearing regulations in one State in particular (i.e., Queensland) dominated the national forest cover trends that resulted in forest transition in the late 2000s. Our findings suggest that, if the private benefits of forest conservation in agricultural land are small—and forest regulatory protection is not effective—forest cover loss could increase, or resume, under projected socioeconomic and environmental pressures, even in developed countries.

McCullough, Michael; Hamilton, Lynn; and Delbridge, Timothy

A COMPARISON OF THE COST OF REGULATION IN THE WINE INDUSTRY: CALIFORNIA VS. SOUTH AUSTRALIA

Session 1A: Wednesday 10:30 am – 12:30 pm

The wine industry has long been heavily regulated throughout the world. The industry faces a range of regulations, from those related to wine production, such as varietal designated growing regions, ethanol taxes, and input restrictions, to general agricultural regulations, such as mandatory dust control, employee training, and pesticide use restrictions. Regulatory costs are embedded into current costs of production but are typically not detailed. The goal of this work is to categorize the total cost of regulation relative to the cost of producing a bottle of a single varietal of wine in well-known wine producing regions of California and Australia. Case studies are conducted on two wineries, of roughly equal size with associated vineyards, to detail the observed costs of producing a single varietal bottle of wine in each region. In addition to the variable cost of production, the average regulatory costs are also compiled. While production and regulatory costs change given the size and location of the vineyard/winery, these case studies will serve as an initial investigation into identifying the total regulatory costs faced by the wine industry. The cost of regulation comparison will help detail the forced

competitive advantage differences between the two wine producing regions and shed light on the complex regulatory environment in the global wine industry.

Meyerhoff, Jürgen; Bertram, Christine; and Rehdanz, Katrin

PREFERENCE MATCHING EFFECTS: IT'S ALWAYS GOOD TO HAVE MORE CHOICE OPTIONS, ISN'T IT?

Session 15A: Wednesday 10:30 am – 12:30 pm

The literature shows that the number of options on a choice set can significantly affect choices. While the preference matching effect suggests that offering more options increases the likelihood that respondents find an attribute combination that matches their preferences, at the same time more options might raise choice complexity as more comparisons are required. This can lead to non-compensatory decision making, such as serial non-participation. In the present study, we examine whether it is beneficial to offer more options using split samples that differ only due to the number choice sets. They range from two to six options, including each time one SQ option. Respondents were randomly assigned to a treatment and block facing eight sets coming from an efficient design. Subsequently, four sets were randomly drawn from the first eight sets and presented, again in a randomized order, to test choice stability. Respondents next faced questions regarding their choice certainty, perceived choice difficulty, attribute importance and general decision making style. Overall, 1512 useable interviews were gained from an online survey conducted in Germany in September 2016 concerning the quality of the Baltic Sea. Results so far indicate that the choice behaviour significantly differs across the set formats. More options seem not to be beneficial per se as they influence, at least in the present study, the choice behaviour, i.e., the frequency of SQ choices, the choice stability, the importance of attributes, and also the marginal WTP values.

Monckton, David

ECONOMIC IMPACTS OF COAL SEAM WATER FOR AGRICULTURAL ENTERPRISES, LESSONS FOR EFFICIENT WATER MANAGEMENT

Session 11A: Thursday 8:30 am – 10.10 am

While the coal seam gas (CSG) industry is relatively new in Australia its growth has been significant. To date, development has been located almost entirely in Queensland. Significant quantities of coal seam water (CSW) are produced as a by-product of this industry. Once treated, it provides a potential benefit for agricultural use. How much water is being produced, where, and what proportion can practically be used for this purpose depends on a number of social and environmental limitations. One of these limitations is that much of this water is only available for a restricted timeframe, perhaps only 20 years, and much of this water is only available in proximity to large treatment plants. While these provide short term benefits, these may have been improved through more efficient storage and distribution. The lessons from improved groundwater management and alternative storage mechanisms has the potential to yield major improvements for sustainable agriculture.

Mullen, John; de Meyer, Julien; Gray, Doug; and Morris, Geoff

RECOGNISING CAPACITY BUILDING IN ACIAR BILATERAL PROJECTS

Session 1B: Thursday 1.15 pm – 3.15 pm

ACIAR bilateral projects typically fund activities across a spectrum, including human capacity building and the development of farm ready technologies, in pursuit of economic, social and environmental benefits. ACIAR has a strong record in estimating changes in economic welfare from the development of new technologies. However, the contribution of capacity building is qualitatively identified at best. The scientists we interviewed had little trouble in listing sets of skills developed during the projects. However, we had less success in eliciting how capacities built were later utilised in technologies adopted by farmers, partly because appropriate data were unavailable, but also because of inexperience on the part of scientists and economists in being able to develop plausible (though still conjectural) impact pathways linking capacity building and other activities with outcomes beyond the life of the initial projects. It seems to us that the only feasible way of making credible subjective judgements about capacity building is through plausible impact pathways through to projected adoption of technologies on farm, even if conjectural.

Mustafa, Zeeshan; and Ibrahim, M.N.M.

ANALYSIS OF LIVESTOCK SECTOR IN TROPICAL AND SUB-TROPICAL AREAS OF PAKISTAN: STRUCTURAL EQUATION MODELING APPROACH

Session 1G: Thursday 1.15 pm – 3.15 pm

It is generally observed that poor farmers are facing financial constraints and management related problems that restrain the development of the livestock sector. In order to investigate the farmer's problems, a snapshot survey involving 697 respondents was conducted in the provinces of Punjab-sub-tropical climate (450) and Khyber Pakhtunkhwa tropical climate areas (247) of Pakistan. It provides insight to target interventions action plan based on farmers' practices. The results of the survey indicate that a high proportion of the animal houses in sub-tropical area villages (>80 percent) did not have roof covers, thus exposing animals to extreme weather conditions. The animal housing in both climatic conditions lack proper drainage facilities, free access to water and proper flooring which significantly influence animal health as well as milk production. Feeding of energy concentrates (wheat bran) is common in tropical areas (96 percent), and farmers in sub-tropical regions (68 percent) feed more of cotton seed cake. In both systems, feeding of minerals is not practiced, except occasional feeding of common salt. Farmers were also not immunizing (90 percent in tropical), and de-worming in both areas (>70 percent), which poses a greater threat to the health of animals as well as production. The Structural Equation Modeling approach was used for the further exploratory analysis and determinants contributing poor housing, animal health and farm management practices. The above constraints could be addressed through farmer participatory field demonstrations and targeted capacity building on specific issues, which could eventually lead to change in mind-set and significantly increase livestock productivity.

Mwebaze, Paul; Paini, Dean; and Kuhnert, Petra

A RISK-RETURN PRIORITISATION TOOL FOR GLOBAL TRADE INSPECTIONS

Session 9A: Friday 8.30 am – 10.30 am

The spread of invasive species continues to provide significant challenges to those government biosecurity agencies charged with protecting a country's borders. In an increasingly connected world, these invasive species are potentially able to spread further and more rapidly. Human mediated pathways, such as ships and airlines, are the most obvious ways in which invasive species can be spread. Direct routes from one port to another are currently monitored, but indirect pathways, in which a ship picks up an invasive species and then travels to a number of different locations before arriving at the final destination, present more challenging scenarios. For the Australian Government Department of Agriculture, one particular concern is for ships arriving into Australia carrying viable eggs of the Asian gypsy moth (Lymantria dispar). We are developing a real-time tool that will analyse the pathways for incoming ships and determine the likelihood the ship could be carrying viable eggs. This strategy is likely to deliver significant benefits in terms of reduced overall costs of inspections to the Department of Agriculture and the wider shipping industry. In this paper, we present updated estimates of the benefits and costs of the proposed policy. We discuss the implications, and the further work required.

Naseer, Asad; and Ashfaq, Muhammad

ASSESSING THE IMPACT OF PARTICIPATORY IRRIGATION MANAGEMENT ON AGRICULTURAL PRODUCTIVITY: EVIDENCE FROM PUNJAB-PAKISTAN

Session 1B: Thursday 1.15 pm – 3.15 pm

Water is essential for agriculture and is being provided to farms through canal irrigation system in Pakistan, which has one of the best and largest canal irrigation system in the world with designed cropping intensity of about 60-70 percent. At present the cropping intensity becomes more than double and this old system need to be improved to make it more efficient. This is possible by involving farmers in its operations and management. For this purpose, Punjab Irrigation Development Authorities (PIDA), is working along with the farmer's organization (FO's), for irrigation management at provincial level. It was established under formal acts in Punjab province and this authority has formally initiated a policy of Participatory Irrigation Management (PIM) in the country. The objective of present study was to assess the farmer's attitude towards the role and responsibilities of farmers for operation and management of irrigation water in Punjab, Pakistan. For this purpose, comprehensive farm survey and farmers' group discussions were organized from the six districts of Central Punjab. The results revealed that farmers were happy and ready to accept the responsibilities up to minor and

distributary level to collect the water charges (Abiana) and the collection rate is 27 percent higher after FO's formation. Results also revealed an increase in major crops yield in the study area after FO's formation i.e. 4.6, 6.5, 7.6, 1.8 and 6.6 percent in case of wheat, rice, cotton, sugarcane and maize, respectively. Hence, study supports the involvement of farmers in the operation and management of irrigation.

Nguyen, Huong

THE EFFECTS OF CHINA'S AGRICULTURAL EXPORTS ON OECD EXPORTERS

Session 17A: Friday 8:30 am – 10:30 am

The paper investigates the effects of China's agricultural exports on the export performance of OECD countries in global third markets between 1993 and 2012 at the product level, on both intensive and extensive margins of trade. To analyse China's effects, we estimate a gravity equation using six-digit HS classification data of China and major OECD agricultural exporters to the top 50 importing countries. We use China's distance as an instrument for China's bilateral exports to address the problem of endogeneity, and also include the importance of China's agricultural imports in the analysis of the effects of China's agricultural exports. The paper further explores China's effects by agricultural subsector and third market. Additionally, similarity indices of Chinese exports and the exports of OECD countries are used to explain China's effects. The empirical results reveal heterogeneity in China's effects, but complementarity is found to be dominant and significant in agricultural exports in global third markets, especially in the Asian and OECD markets. There is still strong evidence of China's displacement effects on OECD agricultural products in the African market on the intensive margin, and in the Latin American market on the extensive margin. Additionally, China's key agricultural products—animals and meat, fruit and vegetables—have strong competitive power over OECD agricultural exports on both margins of trade. Similarity indices of China's and OECD's agricultural exports partly support the effects of China's exports on the agricultural trade of OECD countries.

Nichols, Rachel; Yamazaki, Satoshi; and Jennings, Sarah

MANAGING HABITAT DEGRADATION IN FISHERIES: A MULTI-INSTRUMENT ANALYSIS

Session 7A: Thursday 1.15 pm – 3.15 pm

Fishing-induced habitat damage has become the subject of increasing concern and study, particularly the way in which this habitat damage may impact the sustainability of fish stocks, as well as affecting the profitability and employment prospects of fisheries. Here we explore options for limiting or preventing habitat degradation through the implementation of marine reserves and fishing gear restrictions. We include two types of fishing gear in our analysis: a 'high impact' gear, which causes habitat degradation, and a 'low impact' gear, which does not. Through the allocation of harvest between these two types of gear, a fishery manager can control the level of fishing-induced habitat degradation. The fishery manager may also choose to control habitat damage through the implementation of a marine reserve. We incorporate these management approaches into a bioeconomic model, and simulate this model using parameter values from a real fishery to explore (i) the combined effect of these management options; (ii) what combination of gear restrictions and marine reserve size result in optimal outcomes for performance indicators; and (iii) the loss associated with ignoring potential habitat changes. Preliminary results suggest that, where habitat damage is being controlled through gear restrictions, there is no need to establish a no-take marine reserve also. Further, establishing a marine reserve which permits harvest by low impact gear has negative consequences for spill-over into the rest of the fishery, which may have the unintended consequence of 'shutting out' other fishers.

Palomo-Hierro, Sara; Loch, Adam; and Wheeler, Sarah Ann

IMPROVING WATER GOVERNANCE: LESSON-DRAWING FROM WATER MARKET COMPARISONS IN SPAIN AND AUSTRALIA

Session 11B: Friday 8:30 am – 10:30 am

Water crises now pose one of the highest global social impact risks. Increasing uncertainty complicates future water governance arrangements as supply management options diminish and demand management arrangements such as water markets are increasingly proposed to deal with complex sharing requirements. The transfer of water market governance processes between settings is often suggested or adopted by policy

makers. However, this approach does not often occur successfully. Comparison analysis can be useful in addressing this problem by identifying, and then transferring, successful governance processes between settings. But simple comparative studies offer no guidance about how positive water market achievements in one country can improve water governance outcomes in another country, nor opportunities to learn from past failures. Lesson-drawing approaches to water market transfers offer a promising alternative approach, addressing the critical question of whether successful governance procedures in one context can be transferred to another. The proposed paper tests lesson-drawing approaches to water market transfers using data from Spain and the Murray–Darling Basin, Australia. Spain is the blueprint country for water market adoption in Europe, while Australia is often presented as the world's leader in innovative water demand management. A comparative analysis framework linking good governance principles to institutional arrangements and management outcomes is provided. Finally, key lessons, problems and policy transfer potential to stimulate and enhance Spanish water markets from lesson-drawing approaches is drawn.

Paredes, Samantha; Pascoe, Sean; Stoeckl, Natalie; Tobin, Renae; Innes, James; Coglan, Louisa; and Richards, Carol

THE IMPORTANCE OF LOCALLY CAUGHT FISH TO QUEENSLAND CONSUMERS: A CHOICE EXPERIMENT

Session 7A: Thursday 1.15 pm – 3.15 pm

Previous studies have indicated that consumers prefer to eat and are willing to pay a premium for local food, however there has been little investigation with respect to consumers' preferences for local seafood. While there have been many studies that examine the drivers and barriers of seafood consumption, the importance of origin to the consumer has mostly been examined on a broader 'country of origin' basis. Using a choice experiment, this study determines the preferences of Queensland residents for locally caught fish. The study determines how much Queensland residents are willing to pay for the origin of the fish (locally caught fish, as distinct from fish caught in Queensland or in Australia), as well as other desirable seafood attributes (sustainability and freshness). The potential influences of specific individual characteristics on this choice are also examined. This study contributes to the ongoing research into what consumers classify as 'local' and may provide insight into the utility gained from purchasing local fish.

Pascoe, Sean; Doshi, Amar; Kovac, Mladen; and Austin, Angelica

ESTIMATING COASTAL ASSET VALUES USING MULTI-CRITERIA AND VALUATION METHODS

Session 10D: Wednesday 10:30 am – 12:30 pm

Optimising the use of coastal natural resources and the marine estate requires management. There are numerous uses for these resources, some commercial and others for non-commercial activities. In some cases, management of these assets requires investment in appropriate infrastructure to either protect the resource or enhance its use. Hence management requires balancing uses and users, as well as ensuring that the benefits of management exceed the costs. However, many of the benefits from coastal planning and management are not readily observed in the market place. Cost benefit analysis of coastal projects requires estimates of these benefits to be made. Most traditional valuation methods (e.g. choice experiments) can only practically estimate a relatively small number of values, while the potential range of assets that need to be considered is substantially greater. In this study, we combine different economic and multi-criteria approaches to estimate a wider range of NSW coastal asset values. The assets that are considered most important in terms of management needs are assessed using standard economic valuation techniques. The relative importance of other coastal assets are assessed using multi-criteria preference elicitation techniques, which form the basis of the value extrapolation to these assets.

Paul, Sudeshna; and Sarker, Tapan

OCCUPATIONAL DIVERSIFICATION: A SUCCESSFUL CLIMATE CHANGE ADAPTATION STRATEGY FOR COASTAL FARMERS IN BANGLADESH

Session 1F: Wednesday 10:30 am – 12:30 pm

In recent years, the agriculture sector in the coastal part of Bangladesh has been facing significant crop loss due to sea level rise and salinity intrusion. This has affected the socio-economic livelihood conditions of the coastal poor marginalised farmers. Therefore, various adaptation strategies - such as migration, diversification of crops

and varieties, and diversifying income sources - have been undertaken by the poor small land owners/ marginalised farmers. This study examines the determining factors behind diversifying the primary or secondary occupation from farming to either on-farming or off-farming activities as part of their coping strategy. It also focuses on the impacts of occupational diversification on current total income and the happiness of those poor farmers. The results reveal that location, extent of salinity, age, land ownership, and family size have been found to be the key elements behind diversifying their primary occupation. Farmers, who have diversified their primary occupation from farming to either on-farming or off-farming, have managed to increase their current income by approximately up to 20%- 50% compared to their previous income. The findings of the study will make a significant policy contribution as they can provide useful insights to the policymakers to design policies that can help marginalised coastal poor farmers to successfully adapt to the future impacts of climate change.

Piggott, Nicholas; and Marsh, Tom

MEASURING PRE-COMMITED QUANTITIES THROUGH CONSUMER PRICE FORMATION

Session 8A: Thursday 1.15 pm – 3.15 pm

We investigate how to theoretically and empirically measure pre-committed quantities through price formation utilizing translating in the consumer distance function. The translated consumer distance function is defined as a dual to the translated utility, indirect utility, and expenditure functions. Translating procedures provide more general analytical means to incorporate pre-committed quantities (and other shift or demographic variables as functions of these pre-committed quantities) into inverse demand systems. This approach yields a class of inverse demand functions that can nest most known functional forms. For example, the Inverse Generalized Almost Ideal Demand (IGAI) model, derived for the first time in this article, can be formed by applying translating procedures to the Inverse Almost Ideal Demand (IAI) model. In this article, an empirical application of the IGAI model is applied to aggregate time-series data for U.S. food demand, including food-away-from-home (FAFH), food-at-home (FAH), and alcoholic beverages (AB), over the period 1962-2011. Model selection criterion, including statistically significant parameter estimates, nested and non-nested hypothesis tests, one-period ahead out-of-sample forecast performance, and plausibility of flexibilities, all favour the inclusion of translating parameters in the IAI model.

Polyakov, Maksym; Iftekhar, Sayed; and Pannell, David

ACCOUNTING FOR HETEROGENEITY OF OPPORTUNITY COSTS IMPROVES COST EFFECTIVENESS OF ECOLOGICAL RESTORATION

Session 10A: Thursday 8:30 am – 10.10 am

An important issue which has not received enough attention in the restoration planning literature is the heterogeneity of opportunity costs. Specifically, when restoration is implemented on private land, opportunity costs increase as landholder allocates more land to restoration. Furthermore, restoration projects implemented on private land, in addition to public benefit, often also generate private benefits enjoyed by the landholders. Private benefits of restoration may reduce opportunity cost and increase the probability of landholders participating in a restoration project. The role of private benefits has not been adequately considered in planning and prioritisation of ecological restoration. In this study, we analyse how assumption of increasing marginal opportunity costs and consideration of private benefits impact the outcomes of prioritising ecological restoration. We use a case study in north-central Victoria and employ a spatially explicit bio-economic model that maximises ecological benefits by selecting revegetation sites subject to a set of budgets. We observe that the scenario with increasing marginal opportunity costs that accounts for private benefits (i) gives a better biodiversity outcome, (ii) results in a spatial pattern of ecological restoration shifting towards smaller properties, (iii) generates greater private benefits to the landholders, and (iv) improves cost effectiveness of ecological restoration.

Quiggin, John; and Siddiqi, Hammad

RAIN FOLLOWS THE PLOUGH: ANCHORING BIAS AND AWARENESS IN THE DEVELOPMENT OF NATURAL RESOURCES

Session 4A: Wednesday 10:30 am – 12:30 pm

During the 19th century, the over-expansion of agriculture in low-rainfall areas of the United States and Australia was encouraged by a number of good seasons, leading to the development of the theory that 'rain

follows the plough'. In this paper, we apply recent developments in decision theory with bounded rationality to understand processes like these. The starting point is the observation that, given limited awareness of possibly relevant contingencies, decision-making heuristics will inevitably be applied in conjunction with, or in place of, Bayesian reasoning. One such decision-making heuristic is anchoring-and-adjustment, in which one uses the risk factors that one can measure to furnish an informative starting point, and then attempts to adjust it appropriately for the unmeasured factors. Anchoring bias implies that such adjustments fall short. We show that the anchoring heuristic may give rise to pioneer's curse by making landowners overconfident about the productive capacities of their lands.

Ramilan, Thiagarajah; Thar, So Pyay; Than, Shwe Mar; Aung, Nay Myo; and Farquharson, Bob

CHARACTERISATION OF FARMING SYSTEMS IN CENTRAL MYANMAR

Session 1D: Thursday 1.15 pm – 3.15 pm

Agriculture is the backbone of the Myanmar economy. Sixty-seven percent of the population is rural, and agriculture accounts for 32% of gross domestic product, 56% of employment, and 21% of exports. So agricultural development can play an essential role in economic progress and poverty reduction. However agricultural productivity is reportedly low. The major cause is inadequate supply of nutrients, particularly nitrogen (N). An ACIAR-funded project on the management of nutrients for improved profitability and sustainability of crop production is directed at raising the yields of major cereal crops via improved fertiliser management. Achieving yield improvements depends on an understanding of the farming systems in terms of livelihood practices and resource constraints, and the effects of N management on farm performance, which is conceptualised by farmers as wider than yields. Reliable indicators of farm performance and cost functions are needed in order to model the impact of changed management, and therefore be able to design interventions which meet the differing needs of specific systems. This study describes the farming systems and derives activity cost functions using multivariate statistical techniques. The initial empirical assessment is carried out using Livelihoods and Food Security Multi-Donor Trust Fund (LIFT) project data and supplemented by an innovative household survey tool designed to rapidly characterise farming systems using a digital implementation platform. This will provide a sound basis for the development of bio-economic models enabling further analysis.

Ramsey, Ford; Ghosh, Sujit; and Goodwin, Barry

RATING EXOTIC PRICE COVERAGE IN CROP REVENUE INSURANCE

Session 2A: Thursday 8:30 am – 10.10 am

Revenue insurance is now the most popular form of insurance made available through the federal crop insurance program. The majority of this insurance is sold with a harvest price replacement feature that pays out on lost yields at the higher of a realized or projected harvest price. We detail the construction and rating of revenue insurance policies with exotic price coverage. This is a more general type of price replacement feature where the payout on the insurance policy is made on an order statistic or an average of prices. Price coverage is one area where private insurers have the flexibility to furnish products beyond those offered under the federal crop insurance program. Comparison is made with Revenue Protection (RP) insurance and deficiencies in common modeling approaches are highlighted. In general, standard methods may not be flexible enough to appropriately account for multivariate risks. Modeling of the within-contract serial dependence of futures prices is a prerequisite for pricing exotic coverage. Using hierarchical Archimedean copulas, we show that it is possible to characterize underlying dependence structures and quantify the risk associated with these types of insurance offerings.

Rivera, Nathaly

RESOURCE EXTRACTION AND ENVIRONMENTAL QUALITY: ANALYSIS OF HOUSEHOLDS' PERCEPTIONS OF ENVIRONMENTAL POLLUTION IN AREAS NEAR TO MINING

Session 10A: Thursday 8:30 am – 10.10 am

This paper uses households' perceptions of environmental pollution to elicit marginal values for air and water quality in areas near to mining, taking Chile as a case study. Willingness-to-pay (WTP) measures are estimated from hedonic regressions on wages and rental prices using a spatial equilibrium model where mining firms lack

perfect mobility and environmental quality is allowed to affect the cost functions. In this set up, environmental quality is allowed to vary with cities' ore endowments and with proximity of these reservoirs to urban centres. Environmental quality is approximated using households' perceptions of air and water quality. Resource endowments are proxied using the number of mineral deposits per location. Hedonic equations are estimated using OLS, SUR and 2SLS regressions, including fixed effects to control for unobserved neighbourhood characteristics. Results show that housing prices rise in areas that simultaneously exhibit poor environmental quality and a rich resource endowment. This entails a situation where individuals' WTP for a clean environment decrease with proximity to the resource extraction activity which is consistent with a sorting of individuals across locations.

Rodriguez, Divina Gracia; Hegrenes, Agnar; and Rejesus, Roderick

SHIFTING PLANTING DATE TO ADAPT TO CLIMATE CHANGE: EVIDENCE FROM CEREAL PRODUCTION IN NORWAY

Session 1F: Wednesday 10:30 am – 12:30 pm

Shifting planting date is a first line of defence to mitigate the impacts of climate change. Planting too early when the soil is cool and wet can result in soil compaction, increased disease in seedlings, and susceptibility to insect pests. Planting too late can result to early flowering, reduced moisture availability, and reduced yield as a result of the shorter growing season. Empirical estimates of the effectiveness of shifting planting date are scarce. In this article, we estimate the effect of shifting planting date on mean, variance and skewness of yields, and evaluate the welfare implications of these effects using risk premium and certainty equivalent measures. We hypothesize that shifting planting date increases the mean yield, reduces risk (i.e. variance-reducing) and decreases the downside risk (i.e. skewness-increasing). These hypotheses are tested and confirmed using a unique data set that includes planting date response, input and output data, soil field characteristics, and weather data from cereal production in selected provinces in Norway from 1993 to 2014. Some policy implications are discussed.

Rola-Rubzen, Maria Fay; Murray-Prior, Roy; Das, Kalyan K; Kumar, Ujjwal; Datt, Ram; Magar, Dinesh B. Thapa; Adhikari, Surya; Rasyid, Mamunur; Anwar, M; and Maharjan, Sofina

IMPACT OF CONSERVATION AGRICULTURE AND SUSTAINABLE INTENSIFICATION (CASI) TECHNOLOGIES IN THE EASTERN GANGETIC PLAINS

Session 1E: Friday 8.30 am – 10.30 am

The Eastern Gangetic Plains (EGP) of South Asia is home to some of the world's poorest. The region is also facing climate change-related issues, with consequent effects on food security. In response to these challenges, the Governments of Bangladesh, India and Nepal, in partnership with Australian and international agencies, have in recent years trialled various conservation agriculture and sustainable intensification (CASI) technologies. Using mixed methods research incorporating qualitative and quantitative analysis, we examined the effects of CASI technologies on smallholder farm-households in the EGP. Qualitative data from interviews of men and women, and economic analysis of quantitative farm-level data from participant farmers from rice-based systems in eight districts across the three countries of the EGP, were utilised. The effect of CASI on South Asian farm households was significant and encompassed improvements in farm outcomes as well as household welfare. In the farm, the most common positive effects included a reduction in farm labour requirement and labour costs, a reduction in production costs, an increase in farm yield, and higher farm income. The impact, however, goes beyond the farm. Women remarked that benefits derived from CASI technologies allowed them to send their children to better schools, provided better nutrition for their family, reduced the drudgery of their work, and gave them more time to do other productive tasks or led to more leisure time. Men, similarly, indicated that adoption of CASI led to higher incomes, better education for their children and better livelihoods for their family.

Rolfe, John; and Gregg, Daniel

USING CHOICE EXPERIMENTS TO IDENTIFY HOW SUGARCANE FARMERS CHOSE FERTILIZER RATES WHEN SEASONS ARE UNCERTAIN

Session 15A: Wednesday 10:30 am – 12:30 pm

Excessive rates of fertilizer application underpin high rates of dissolved nitrogen entering the Great Barrier Reef. It appears that farmers apply high rates in case above-average rainfall occurs or because of concerns that nutrients might decline over successive ratoons in the crop cycle. This means that high rates of application are an insurance against the chance that these outcomes might occur. To evaluate this, a sample of sugarcane farmers have completed a series of experiments that identify combinations of returns given low, medium and high rates of fertilizer applications and chances of low, medium or high rainfall. Each farmer completed 20 choice sets per experiment, so that the relationship between uncertainty over weather events and the application rates for fertilizer could be identified. The experiments demonstrate a very different approach to choice modeling where outcome uncertainty is demonstrated through a matrix of potential farm outcomes, in comparison to more standard approaches where outcome uncertainty is ignored or identified as a separate attribute. The results demonstrate that higher rates of fertilizer application are partly an optimising response in the face of uncertainty about weather events. The implications of the work are that models that reflect expectations and uncertainty may be more useful in explaining farmer behaviour than standard agronomic models of average farm conditions.

Rupa, Jesmin; Ahmed, Sharmina; Umberger, Wendy; Zeng, Di; and Sim, Nicholas

ANALYSING THE ASSOCIATION BETWEEN RURAL FARM HOUSEHOLD HEALTH AND ECONOMIC SHOCKS AND FOOD SECURITY IN BANGLADESH: A CONSOLIDATED APPROACH OF MEASURING FOOD SECURITY

Session 1H: Thursday 8:30 am – 10.10 am

This study examines the relationship between health and economic shocks and food security using survey data collected from a nationally representative sample of 3,448 rural farm households in Bangladesh. We construct a consolidated food security index (FSI) using a suite of food security indicators: food consumption score (FCS), food expenditure share (FES) and livelihood coping strategies (LCS). Using an Ordered Probit Model (OPM) with village-level clustered standard errors, our baseline results show that household health and economic shocks are significantly associated with food security. However, the magnitude of the impact of each shock varies with the degree of household food insecurity. We find that marginal and small farming households are more vulnerable to food insecurity when health and economic shocks impact their households. Our approach provides a better approximation of the impact of negative health and economic shocks versus other covariates on household food security. This insight will be useful when designing timely measures to lessen the impact of shocks on household food security for the targeted population.

Rust, Steven; and Moravek, Tim

INCORPORATING FINANCIAL RISK IN PRIVATE BENEFIT-COST ANALYSES: AN INVESTIGATION OF SUGARCANE CROPPING IN MACKAY

Session 10C: Friday 8:30 am – 10:30 am

Achieving agricultural practice change in catchment areas adjacent to the Great Barrier Reef (GBR) is critical to reaching government conservation targets for the reef. In sugarcane cropping, economic analyses in relation to practice change are currently undertaken using the Farm Economic Analysis Tool developed by the Queensland Department of Agriculture and Fisheries. This tool establishes the private net benefits of practice change via comparative statics between 'before' and 'after' scenarios for the farm. However financial risk is an important factor in determining farmers' decisions regarding trialling and adoption of technology. In particular, when capital investment is required, the private benefit is assessed over consecutive years, and the inherent sugar price volatility over this period creates a risk that substantially effects on the realised value of investing. In this study, we use data from the World Bank GEM commodities database to develop a time series model for the international price of sugar (i.e. Inter-Continental Exchange contract no. 11); and combine this with the existing FEAT tool to undertake a stochastic appraisal for a typical sugarcane farm in the Mackay region. While many factors ultimately combine to create uncertainty in farming, including climate conditions and fluctuations in input prices, providing advice to farmers that is cognisant of investment risks is an important element in bridging the gap between extension and implementation in the GBR catchments, and will contribute towards finding a functional balance in commercial land use decisions in the region.

Sanglestsawai, Santi; Rodriguez, Divina Gracia; Rejesus, Roderick; and Yorobe Jr, Jose

STOCHASTIC PRODUCTION FUNCTION ESTIMATION WITHIN A DAMAGE ABATEMENT SPECIFICATION: SKEWNESS EFFECTS OF BT CORN

Session 1G: Thursday 1.15 pm – 3.15 pm

A number of studies have investigated the impact of using Bt technology on the mean and variance of yields. Yet, many of these studies have not looked at its impact on yield skewness and its damage abating nature. Using a stochastic production function estimation approach that allows for examining the skewness effects of Bt within a damage abatement specification, we examine the production risk effects and welfare implications of single-trait Bt corn adoption in the Philippines. Our results indicate that Bt corn has a statistically significant yield increasing, risk-increasing (i.e., variance-increasing) and downside risk-reducing (i.e., skewness-increasing) effects. Based on risk premium, certainty equivalent, and loss probability welfare measures, Bt corn farmers in the Philippines are better-off (in absolute terms) relative to non-Bt farmers given Bt corn's dominant yield increasing effect and lower probability of profit loss. But note that this welfare difference is not statistically strong.

Sayekti, Apri

LABOUR DEMAND IN LABOUR-INTENSIVE FARMING: CHILI PRODUCTION IN INDONESIA

Session 1C: Thursday 8:30 am – 10.10 am

Employment opportunities are important in rural development in developing countries given the rapid structural transformation and migration of agricultural labour to non-agricultural sectors. In Indonesia, an important focus of agricultural development strategies is to increase chili productivity. Hybrid seeds, as genetically modified ones can produce higher and more stable crop yields, lower losses due to pests, diseases and adverse weather conditions and higher profitability. However, labour could be one constraint of the hybrid varietal adoption given the labour-intensive nature of chili production. Existing literature has been inconsistent in labour usage of hybrid crop varieties. Most studies only focus on total demand for labour and neglect the different demands between family and hired labour, male and female labour, and among specific production activities. These heterogeneities and related wage differences are, however, important. Therefore, testing labour demand, particularly demand for family and hired labour by gender for each production activities based on varietal choices, is important. A case study of chili farming in Indonesia presented here illustrates how hybrid seeds impact on different gender labour demands by different production activities. This study will test these possible heterogeneities using a unique household survey of 257 chili farmers from West Java. Disaggregation of production activities will be able to more accurately reflect labour demand that influences farmers' decision management, and the welfare impacts will go beyond technology adoption per se and influence rural development at large.

Scheufele, Gabriela; and Bennett, Jeff

ESTIMATING MARGINAL COSTS OF PRODUCING THE ENVIRONMENTAL SERVICE BIODIVERSITY

Session 10B: Wednesday 10:30 am – 12:30 pm

A Payment for Environmental Services (PES) scheme that involves setting a 'pseudo market price' requires the estimation of demand and supply. This paper presents the estimated marginal costs of anti-poaching patrols designed to enhance biodiversity in the Phou Chomvoy Provincial Protected Area, Lao PDR. This supply information was used in conjunction with environmental production functions and estimated demand for biodiversity to determine the 'price' paid per patrol. Marginal costs were estimated through uniform-price procurement actions: Teams of local people from eight villages interested in being part of the PES scheme bid for the number of patrols they would like to provide in response to a range of offered prices. The auction process generated a sequence of well-behaved price-quantity pairs that track the individual marginal cost function of each bidding team accounting for both fixed and variable costs. The marginal costs vary across bidders. These variations can be explained by differences in competing employment and income opportunities across bidders, village locations and seasons. The results provide evidence of heterogeneous opportunity costs of supply and suggest an efficiency loss in assuming homogeneity.

Schilizzi, Steven; and Iftekhar, Md Sayed

BIDDING FOR CONSERVATION CONTRACTS WITH UNCERTAIN COSTS: IS IT EVEN WORTH IT?

Session 10B: Wednesday 10:30 am – 12:30 pm

Partly due to the fact that most of auction theory has focused on selling rather than buying (or reverse) auctions, the issue of uncertain costs, relevant to environmental conservation programs, has mostly been swept under the carpet. Such costs may relate to conservation works, opportunity costs, and transaction costs. With funding from an ARC-Discovery Project grant, we have designed an experimental program to investigate this question. This paper presents our first findings of what happens when we do not assume away such uncertainties. In particular, bidder participation can no longer be taken for granted. But less than full as well as uncertain participation throws a spanner in the works of both auction theory and auction implementation. Results suggest that some well-established ideas may have to be revisited.

Scrimgeour, Frank

PRIVATE CONSERVATION INVESTMENT IN NEW ZEALAND

Session 10B: Wednesday 10:30 am – 12:30 pm

Private land owners in New Zealand invest significant resources in conservation activities in order to protect environmental assets. A widely-used approach is the registering of land covenants with the QEII National Trust. This paper reports on an analysis of QEII reports, a survey of covenant holders, and face to face interviews with a limited number of covenant holders to identify how the practice of covenanting has evolved and the level of investment by covenant holders. It reports investment in terms of initial establishment costs, maintenance costs and the opportunity costs borne by covenant holders.

Sinclair, Stewart; Pascoe, Sean; and Coglan, Louisa

A VIABILITY ANALYSIS OF THE QUEENSLAND EAST COAST OTTER TRAWL FISHERY

Session 7A: Thursday 1.15 pm – 3.15 pm

Sustainability in fisheries is a complex concept and one that has attracted a rich history of research over time. The basic concerns of sustainability are how to reconcile ecological, economic and social requirements within the perspectives of intra- and inter-generational equity. Therefore, maintaining these requirements simultaneously is critical to achieving a perennial system and avoiding so-called “crisis” situations. It is contended that viability theory, which is a relatively new area of mathematics, rigorously captures the essence of sustainability. Using viability theory, this study develops a viability model for selected components of the Queensland East Coast Otter Trawl Fishery to examine the feasibility conditions under which a regulator can achieve sustainability in the fishery. In the model, the set of constraints representing the “good health” of the system are characterised using managerial priorities identified in the literature. Then, the viability kernel, which is the largest set of initial states for which there are controls that result in inter-temporal trajectories satisfying all the constraints, is approximated numerically. The viability kernel serves as an important policy tool, which provides the regulator with meaningful reference values and indicators for desirable or undesirable states of the fishery.

Smart, Jim; Hasan, Syezlin; Fleming, Christopher; Curwen, Graeme; Burford, Michele; and Volders, Adrian

MODELING THE FEASIBILITY OF NITROGEN-TRADING MARKETS FOR SUGARCANE CATCHMENTS OF THE GREAT BARRIER REEF

Session 10C: Friday 8:30 am – 10:30 am

Runoff from sugarcane production is regarded as one of the major sources of nitrogen impacting water quality in the GBR. Current methods to reduce nitrogen runoff use an A-B-C-D voluntary best management practice framework. Despite considerable effort and expenditure, these approaches have produced only modest changes in runoff rates and limited improvements in water quality. Nitrogen trading is an alternative management approach which could potentially deliver nitrogen load reductions more cost effectively. This paper synthesises findings from current research on the cost and at-source effectiveness of practice-based N-abatement measures and catchment-based N-mitigation measures to produce a heterogeneous grid cell model of a catchment scale N-trading market. ‘Smart’ market performance is simulated using linear programming,

following the methods outlined by Prabodanie et al. 2010. Results suggest that differences in spatial setting and current management will likely influence market operation and efficiency. Market implementation and governance should therefore be tailored to suit the on-ground setting to facilitate efficient and effective market-based N-management for improving water quality in the GBR Lagoon.

Soriano, Franklin; Villano, Renato; Fleming, Euan; and Battese, George

WHAT'S DRIVING INNOVATION IN SMALL BUSINESSES IN AUSTRALIA? THE CASE OF THE FOOD INDUSTRY

Session 13A: Thursday 1.15 pm – 3.15 pm

Innovation is a primary driver of a nation's economic growth. As Australia continues to compete in the global economy, Australian businesses need to be innovative to increase performance. Employing almost half of the workforce in Australia, small businesses are believed to be the driver and the real "job creators" in the economy. But, are they strong innovators too? This study examines the association between collaboration, the use of science, technology, engineering and mathematics (STEM) skills, the use of information and communication technology (ICT) and innovation. The analyses cover three aspects of innovation – the propensity of businesses to innovate, the dimensions of innovations (goods and services, organisational process, operational process, marketing methods) and innovation persistence. We use the case of the Australian small sized firms in the food industry to explore and establish the key drivers of innovation among small Australian businesses. Two panels of data collected through the ABS Business Characteristics Survey (2008/09 to 2012/13 and 2009/10 to 2013/14 Australian Bureau of Statistics' Business Longitudinal Database Confidential Unit Record File (ABS BLD CURF)) are used in the empirical analyses.

Star, Megan; Rolfe, John; and Waterhouse, Jane

PRIORITISATION IN THE GREAT BARRIER REEF

Session 10C: Friday 8:30 am – 10:30 am

The health of the Great Barrier Reef is an important policy issue in Australia, as summarised in the development of the third Great Barrier Reef scientific consensus statement (SCS) in 2016. There is growing focus on prioritisation of issues to address; the SCS outlines the need to develop priorities for basin specific pollutant reductions. There are 36 basins within the seven catchments adjacent to the reef which have a mix of industry, diverse geographical features and different areas of influence on the reef. Likewise, across the reef there are different ecosystem characteristics and resilience factors. Yet developing a prioritisation approach consistent with an economics view of resource allocation and marginal improvements is challenging. This paper demonstrates the approach of linking the marine and the land based management together to identify the scope for change and subsequent cost implications. The method involves developing a function which incorporates marine risk, pollutant load, adoption, risk of failure, efficacy, and costs to allow different catchment and basins to be ranked. The results highlight the complexity of the issues and the further need for improved understanding regarding where a marginal improvement will have the largest marginal benefit to the reef ecosystem.

Steen, John; Ahmad, Shabbir; and Verreynne, Martie-Louise

ECONOMETRIC METHODS OF MEASURING SMALLHOLDER'S FARM PRODUCTIVITY: AN EVIDENCE FROM DEVELOPING ECONOMY

Session 3A: Friday 8:30 am – 10:30 am

This paper proposes novel econometric methods to investigate the relationship between innovation, productivity and profitability of smallholders. We decompose smallholders' total factor productivity (TFP) into its various components such as managerial practices (technical efficiency), innovative practices (technology), and mixed and scale effects, which are associated with scale and scope economies. Scope economies occur through changes in input and output mixes in response to changes in input and output prices; these importantly motivate productivity because small growers cultivate a variety of crops by using varying input mixes. Further, we also aim to explore - what are the technological, institutional and capacity constraints that inhibit the development of smallholders' productivity? We generated a unique dataset of 850 small farmers, which had been collected from different agro-climatic zones in Pakistan. Our survey data focused on the horticulture

sector including mangoes, citrus, and vegetables. Our preliminary findings suggest that farm-level productivity is mainly affected by scale-mix effects. In other words, crop diversification increased the smallholder's productivity significantly. Moreover, financial constraints (such as credit availability), market access and lack of extension services appear to be main factors impeding the farm-level productivity. The wide variation in farm management practices (i.e., technical inefficiency) was the largest source of low productivity. The bottom 10% of farmers needed to improve their technical efficiency by about 35% in order to catch up with top 10% performing farmers. The findings suggest that improved farming practices create significant gains in productivity, which should be facilitated by training and education programs.

Stern, David; and van Dijk, Jeremy

ECONOMIC GROWTH AND GLOBAL PARTICULATE POLLUTION CONCENTRATIONS

Session 16A: Wednesday 10:30 am – 12:30 pm

PM2.5 is a local pollutant that is very hazardous to human health and potentially an important source of radiative forcing. We estimate the effect of economic growth on changes in PM2.5 pollution in a global panel of 158 countries between 1990 and 2010 using a newly developed approach that addresses several of the shortcomings of the environmental Kuznets curve (EKC) literature. We find that economic growth has positive, though relatively small, effects on pollution concentrations when we control for other relevant variables. Contrary to the EKC hypothesis, there is no in-sample income turning point after which growth reduces pollution concentrations. The EKC was originally developed to model the ambient concentrations of pollutants, most subsequent applications focused on pollution emissions. Yet previous research suggests that it is more likely that economic growth could eventually reduce the concentrations of local pollutants than emissions. Our results throw further doubt on the idea that economic growth can eventually reduce environmental impacts, including climate change.

Tam, Mia; Kandulu, John; and Connor, Jeff

AWM OF QFLY USING SIT: THRESHOLD BENEFIT-COST ANALYSIS IN SOUTH-EASTERN AUSTRALIA

Session 9A: Friday 8.30 am – 10.30 am

The Queensland fruit fly ('Qfly') poses a threat to the economic viability of Australia's horticulture industry, limiting market access and increasing control costs. Area Wide Management ('AWM') using the Sterile Insect Technique ('SIT') has been used to control a different species of fruit fly, the Mediterranean fruit fly, in Israel, Guatemala and parts of Australia. A SIT factory is under construction in Port Augusta, South Australia. To support effective use of the technology, a research project is identifying best management practices and guidelines for the use of SIT as part of an AWM program. AWM using SIT for Qfly is less understood than Medfly, increasing the challenge of determining the economic impact of implementation. We estimate the current cost of Qfly and potential benefits of control in south-eastern Australia. Three regions are chosen for our case study, each with differing baseline Qfly population levels, market conditions, crop mix, and pest area-status. We address uncertainty in SIT cost and implementation outcomes using sensitivity analysis for defined scenarios to identify threshold AWM using SIT costs. Threshold values represent the maximum cost of a Qfly control program before the costs of the program outweigh the benefits.

Tapsuwan, Aditi Mankad; Capon, Tim; and Zahedi, Maxime

THE ECONOMIC, SOCIAL AND INSTITUTIONAL FACTORS THAT AFFECT FARMERS' PARTICIPATION IN AREA-WIDE MANAGEMENT OF FRUITFLIES

Session 9A: Friday 8.30 am – 10.30 am

Area-wide management (AWM) is a long-term solution to coordinate farmer's activities to fight against pests and diseases in a delimited geographical area. The aim of AWM is to minimize the risks of infestation of crops through means of cost effective alternative strategies that are respectful of the environment. It includes several strategies, such as prevention of invading population, containment, suppression and eradication. In South East Australia, the incursion of Queensland fruit flies (QFly) is causing significant impact on fruit yield and market access. The implementation of AWM could potentially be a cost-effective solution. AWM could also could potentially reduce pesticide use with benefits for the environment, health and safety, and backyard fruit and

vegetable production. These measures could also benefit the regional economy by giving growers the option to sell fruit into more markets, domestically and internationally, and by reducing the costs of treating and processing fruit. However, an AWM program requires a high level of coordination, and requires input from all stakeholders (e.g. government, growers, community). Funding mechanisms need to be sustainable and appropriate to the region. However, we have very limited knowledge whether Australian farmers are willing to support or pay for AWM, and what are the factors that have affect their participation. The objective of this paper is to provide a summary review of the literature on the AWM for QFly, and other related pests and diseases, specifically around the economic, attitudinal and social factors that have an effect on growers' willingness to participate in AWM.

Tavva, Srinivas; Nasery, Halim; Richkowsky, Barbara; Rizvi, Javed; and Saharawat, Yashpalsingh

IMPACT ASSESSMENT OF COMMUNITY PARTICIPATED ALTERNATIVE SYSTEM OF ANIMAL HEALTH SERVICES: CASE OF AFGHANISTAN

Session 1E: Friday 8.30 am – 10.30 am

The livestock sector, which contributes 50% of Afghanistan's agricultural GDP, has been dwindling and showing insignificant growth in the post-conflict period. Continued disruption of Veterinary services in rural areas is posing a serious threat to already declined populations with increased mortality and abortions. This provided an opportunity for IFAD funded Dairy Goat project, implemented in Baghlan and Nangarhar provinces, to introduce an innovative alternative animal health care system to deliver comprehensive and sustainable services from 2010 to 2015. All 1,410 families who were restocked with two project goats each since 2010 participated in this system, which included annual vaccination and deworming campaigns providing 48,000 and 23,000 doses of different vaccines and deworments respectively to about 80% of small and large ruminants; activities to build the capacity and increase awareness of the community about the system available at cheaper and affordable cost; establishing a Veterinary Facility unit managed by trained paravet, etc. This paper presents the costs incurred, benefits accrued and impacts on livelihoods of households adopting this system, estimated using partial budgeting approach. An impact indicator survey conducted in 2015 revealed that none of the project beneficiaries reported mortality and abortion cases while non-beneficiaries reported 16 and 15.4% respectively. It is estimated that by 2020 this system produces net benefits with present value of USD 1.86 million on present value of project investment of USD 0.74 million resulting in benefit-cost ratio of 3.52 with an internal rate of return of 92%. As a result of improved livelihoods, communities accepted and adopted this alternative system.

Thamo, Tas; Hertzler, Greg, Greg; Bowden, Bill; and Gilkes, Robert

PRECISION IN VARIABLE RATE APPLICATIONS OF FERTILISER: LESS THAN MEETS EYE?

Session 3A: Friday 8:30 am – 10:30 am

Although championed as a way of improving the viability and sustainability of cropping systems, few farmers are applying spatially-variable rates of fertiliser in response to variation in crop requirements. A possible explanation is that current technologies do not allow differences in fertiliser requirements to be addressed in a sufficiently precise and spatially-intensive manner. To test this possibility, we created a model to examine the contributions that different levels of information, such as spatial intensities of soil testing, might make to the economics of variable applications of nitrogen, phosphorous, and potassium to wheat. Results show that increasingly precise approaches to variable applications require increasingly accurate, and, hence, likely increasingly costly spatial information, and that there are diminishing marginal benefits from this increased precision because of the 'flatness' of payoff-curves around the ideal rate. Simpler approaches that focus on addressing major differences in fertiliser requirements, but which require less accurate information, may often still capture a large proportion of the potential benefits. Consequently, technological developments that allow more precise approaches are unlikely to greatly increase the benefits of variable applications unless differences in fertiliser requirements are large and spatially unrelated. Variable applications may help manage seasonal uncertainty, by allowing spatial variation in seasonal risk to be managed, though there will also be diminishing gains for increasingly precise approaches to this. Interestingly, cost/price pressures did not make variable applications more lucrative, but higher grain prices did. 'Flatness' in payoff-curves may also afford opportunities for farmers to pursue other goals, like environmental benefits.

Umberger, Wendy; Malek, Lenka; and Goddard, Ellen

UNDERSTANDING DRIVERS OF INCREASING VEGETARIANISM IN AUSTRALIA

Session 8A: Thursday 1.15 pm – 3.15 pm

Prevalence of vegetarianism has increased in recent years, with 2016 data showing that 11.2% of Australians are consuming a vegetarian or mostly vegetarian diet. From an economic perspective, several questions are of relevance regarding farm animal welfare. In particular, if animal welfare is a driving concern for the trend toward a vegetarian or vegan diet, will improvements in animal welfare lead consumers to return to eating meat? This question will be analysed and discussed based on the results of an online survey of a representative sample of 297 Australian meat consumers and 82 meat avoiders conducted in July 2016. Large shares of our representative Australian meat consumer sample reported making changes to their consumption of beef (83%), chicken (68%), pork (62%) and lamb (61%) during the previous 12 months. The overall focus of the survey is on understanding reasons for recent changes in meat consumption; and identifying the importance of animal welfare as a reason for vegetarian status relative to health and food safety; environmental concerns; desire to exhibit different social preferences and behaviour; religion; and culture, among other reasons. The results of the analysis are used to suggest whether members of this group are likely to change behaviour in the future as animal welfare standards improve, or whether they will become large consumers of vegetarian products. From a sustainability and health perspective, it is worth knowing whether these other drivers of behaviour are becoming more important across time, perhaps eclipsing animal welfare as a driver of vegetarian preferences.

Vanzetti, David

BREXIT: IMPLICATIONS FOR AGRICULTURAL EXPORTERS

Session 17A: Friday 8:30 am – 10:30 am

Citizens of the United Kingdom have voted to leave the European Union. The question remains, what effect Brexit, once implemented, will have on the United Kingdom, the European Union and third countries. In this paper, we focus on the potential impacts on agricultural exporters. Many countries have preferential trading arrangements with the European Union, and hence the United Kingdom. As a lapsed member of the European Union, the United Kingdom could remove these preferences and impose MFN rates on all WTO members, or it could remove its tariffs altogether, allowing non-ACP countries to compete with preference beneficiaries. This would allow, for example, Brazil, Thailand and Australia to supply sugar to the United Kingdom in competition with Mauritius, Zimbabwe, Fiji and several other developing countries. This would have a negative impact on these countries. Similar concerns apply to beef and dairy products. Although the terms and condition of exit have not yet been negotiated, the potential effects are quantified with a global general equilibrium model. The impacts of third countries depend on the approach taken by the United Kingdom.

Velarde, Sandra J.

OVERCOMING THE 'VALLEY OF DEATH': PATHWAYS FOR BUILDING CRITICAL MASS FOR BIOFUEL PRODUCTION

Session 1G: Thursday 1.15 pm – 3.15 pm

Lack of economic profitability is one of the main barriers to establishing a new biofuel supply chain. However, once this barrier is addressed, policy, markets and the interests of different stakeholders will play an important role in the development of a supply chain and building critical mass. This research discusses potential pathways to build a critical mass of landholders to supply tree biomass to a hypothetical bio-ethanol plant in the Central West region in New South Wales, Australia. The proposed pathways integrate knowledge obtained through literature, a landholder survey, a biomass supply curve and break-even analysis and discussions with other researchers and industry experts. These pathways outline how bioenergy production from biomass could emerge from the 'valley of death' to the market. These pathways are likely to be more effective if they are interlinked, though one may be more dominant. The interlinked pathways are: (i) Direct and indirect policies, (ii) Bottom-up: Locally driven, and (iii) Top-down: Corporate driven. The findings suggest that none of these pathways would work on their own, but they need all actors to sit at the table combining their resources, capabilities, demonstration or pilot experiences from growers and trials on bioenergy plants. Given the large level of investment needed, it is argued that corporates may be the main actors with access to resources at all levels (federal and local governments, and local industry) and resources to invest in developing new bioenergy value chains.

Waldron, Scott; Luong, Pham Van; Smith, Dominic; and Hieu, Phan

THE ASIAN LIVESTOCK EVOLUTION

Session 1E: Friday 8.30 am – 10.30 am

The "International Livestock Revolution" (ILR) literature has documented a significant increase in livestock production in developing countries over the last 40 years, although production has not kept pace with consumption, leading to increased prices and trade. These alignments are modelled to increase into the future, with important implications for development, agribusiness and policy in developing countries. The ILR paradigm is used in this paper as an entry point for an in-depth analysis of developments in the beef sector in China and Southeast Asia. Based on input from a network of beef industry representatives throughout the region, the paper incorporates revised aggregate statistics, data on informal trade flows, and various country surveys. An important aspect of the analysis is change and integration in real beef prices and the factors behind lagged production responses. Findings of the study confirm that that the trends observed and modelled in the ILR literature for developing countries generally apply to the China-Southeast Asia region, but have been accelerated in some countries (China), are barely recognisable in others (Timor Leste), with Indonesia somewhere in between.

Walisinghe, Buddhini Ranjika; Rohde, Nicholas; Ratnasiri, Shyama; and Guest, Ross

HOW CLIMATIC VARIATION HAMPERS LOWLAND RICE CULTIVATION IN TROPICAL ASIA: EMPIRICAL EVIDENCE FROM SRI LANKA

Session 1F: Wednesday 10:30 am – 12:30 pm

We study the responsiveness of rice production to climatic variation using a recent panel data set from Sri Lanka. Output per farm is modelled as a non-linear function of temperature and rainfall (and other standard controls) using fixed effects equations. We find that both climatic variables have concave, non-monotonic effects upon production, which implies that variations in growing conditions are likely to have negative effects. Monte Carlo simulations are used to model these impacts under various climate change scenarios and we find that increasing temperatures will adversely affect rice production much more than varying rainfall, although the effects of a small ceteris paribus rise in temperature are positive. As rice production is a key component in economic output for Sri Lanka and other developing countries, our results have implications for output growth and poverty rates in the future.

Walsh, Patrick; Newbold, Stephen; Massey, Matt; and Hewitt, Julie

USING META-REGRESSION TO ESTIMATE A WATER QUALITY VALUATION FUNCTION FOR BENEFIT TRANSFERS

Session 15A: Wednesday 10:30 am – 12:30 pm

Benefit transfer is commonly used to estimate the value of environmental improvements in benefit-cost analyses. In recent years, meta-analysis benefit transfers have emerged as a favoured approach. However, the majority of meta-analysis estimating equations do not satisfy theoretical requirements for internal consistency. For example, many past meta-analysis benefit transfer models produce a higher benefit estimate for the same environmental change split into smaller parts, so that f(0.5(Q2-Q1) + 0.5(Q2-Q1)) > f(Q2-Q1). These models provide decision makers with artificial trade-offs that are solely the result of functional form assumptions. We present an alternative formulation that satisfies the adding-up condition, which is a key requirement for theoretical validity (Diamond 1996). This is achieved by estimating a marginal rather than total willingness-to-pay (WTP) function. We use summary results from 51 previously published stated preference studies to estimate a meta-regression model following our recommended approach, and we compare our results to an alternative non-structural approach. We examine the quantitative importance of imposing the adding-up constraint in our case study by performing some illustrative calculations of WTP for hypothetical water quality improvements using both models. In a secondary methodological contribution, we use a step-wise regression approach to select a sub-set of variables for inclusion in parsimonious specifications for both the semi-structural and non-structural models based on maximizing out-of-sample predictive accuracy, which is a natural criterion for benefit transfer functions. We use a bootstrap approach to estimate consistent standard errors accounting for both the model selection and estimation stages.

Wang, Yangjie; Huang, Jikun; Wang, Jinxia; Findlay, Christopher

MITIGATING RICE PRODUCTION RISKS FROM DROUGHT THROUGH IMPROVING IRRIGATION INFRASTRUCTURE AND MANAGEMENT IN CHINA

Session 1B: Thursday 1.15 pm – 3.15 pm

This paper investigates the roles of local irrigation infrastructure on improving farmers' ability to respond to drought through changing irrigation and its effectiveness on mitigating the drought risk in rice production in China. The analysis relies on a moment-based specification of the stochastic production function capturing mean, variance, and skewness effects. Based on field survey data, we jointly estimate farmers' adaptive irrigation decisions and their effects on rice yield and production risk. Our econometric analyses show that irrigation infrastructure in villages contributes to enhance farmers' irrigation capacity in adapting to drought. Irrigation leads to a significant increase in mean yield and a significant reduction in the exposure to risk as well as downside risk in rice production. Hence, we stress the role of irrigation as a means of managing drought risk. In terms of policies, our findings suggest that the government should mainstream the investment in irrigation infrastructure into climate change adaptation plan, and thereby improve rice farmers' adaptive capacity to respond to drought through changing irrigation and reduce their exposure to drought risk.

Wegener, Malcolm; and Teixeira, Maria Daniele

EFFICIENCY OF PUBLIC INVESTMENT IN LOW-EMISSIONS AGRICULTURE: COMPARISON BETWEEN AUSTRALIA AND BRAZIL

Session 6A: Thursday 8.30 am – 10.10 am

Agriculture is the economic sector of the economy most directly affected by climate change, and while exposed to its impacts, agricultural activities also have a strong impact on climate change. Given the economic importance of the agricultural sector in countries like Australia and Brazil, and the need for substantial investment to meet targets set at COP-21, this paper attempts to verify the efficiency of investing in low carbon agriculture. In this sense, it uses a comparative analysis between public investment in mitigation strategies in Australia and Brazil, specifically analysing the results available from the first three auctions held under the Emissions Reduction Fund in Australia and the ABC program in Brazil. Preliminary results, where available, will be analysed in terms of environmental, economic, and social impact.

Wegener, Malcolm

WILL TECHNOLOGY IMPROVE THE EFFICIENCY OF MARKETING AGRICULTURAL PRODUCE IN DEVELOPING COUNTRIES?

Session 13A: Thursday 1.15 pm – 3.15 pm

Somewhat reminiscent of Australian agriculture over 50 years ago, agriculture in developing countries is characterised by large numbers of small producers wanting to sell undifferentiated produce at harvest time. They tend to be at the mercy of merchants and traders in possession of superior market information and obliged to accept discounted prices in order to generate cash flow to repay creditors or institutions that advanced them seasonal working capital.

White, Benedict; Polyakov, Maksym; and Zhang, Fan

OPTIMAL POLICY TO MANAGE URBAN NON-POINT SOURCE NUTRIENT EMISSIONS IN THE CANNING RIVER

Session 10B: Wednesday 10:30 am – 12:30 pm

The Swan-Canning catchment is highly valued as an ecosystem and as a focus for recreational activity for the Perth metropolitan area. In common with other urbanised rivers in Australia, the Swan-Canning has been degraded by nitrogen and phosphorous emissions from agriculture and urban land use. This paper presents a policy analysis of least cost abatement strategies for the Canning River catchment. The optimal policy is a mixture of capital investment to extend the mains sewage system to remove septic tanks and construct wetlands, as well as to modify fertiliser applications on public open space and engage in changing household behaviour. The optimal policy depends on whether capital investment, such as septic tank infill and constructed wetlands, generate an additional non-market benefit. The taxpayer costs of achieving target levels of nutrient

emissions depends on the set of policies that are currently considered acceptable and mean that the optimal solution may need to include relatively high cost investments to achieve emission limits. Lower cost solutions would become available if schemes were introduced to reduce nutrient emissions from gardens and sports fields either through land use change or banning some fertilizer types.

Windle, Jill; Pascoe, Sean; and Rolfe, John

INCORPORATING THE ECONOMIC (NONMARKET) VALUE OF RECREATIONAL ACTIVITY INTO AN AQUATIC HEALTH REPORT CARD

Session 10D: Wednesday 10:30 am – 12:30 pm

The complexity of aquatic ecosystems has limited the ability to evaluate the performance and relative success of resource management policies on the bio-physical as well as the socio-economic environments. The use of report cards is becoming an increasingly common assessment and communication strategy but only recently have advances been made to incorporate socio-economic objectives into the reporting system. In 2014, a range of cultural, social and economic indicators were incorporated into the first annual aquatic health report card for the Gladstone Harbour on the Queensland coast in Australia (Pascoe et al. 2016). Gladstone is an industrial region, in a highly sensitive environment, with part of the harbour area located in Great Barrier Reef Marine Park and World Heritage Area. This paper is focused on the assessment of the economic value of recreational activity in the harbour area as an economic indicator in the report card. Three components of recreational value were assessed (beach recreation, other land-based recreation and recreational fishing) using the Travel Cost Method in a primary valuation survey of community respondents. Satisfaction ratings were applied as a measure of the quality of the experience. The results (from three years of annual assessments), as well as the challenges encountered in applying non-market values in a standardised report card framework, are discussed in this paper.

Wittwer, Glyn

TERM-H2O MODELING OF DROUGHTS IN AUSTRALIA AND CALIFORNIA

Session 3A: Friday 8:30 am – 10:30 am

The dynamic, multi-regional CGE model TERM-H2O has put water policy into perspective. Drought resulted in economic hardship, whereas legislated water buybacks under the 2007 Water Act provided farmers with an adjustment option. TERM-H2O predicted with reasonable accuracy the impact of abnormally dry or wet years on irrigation water prices within the Murray-Darling Basin.

Yamazaki, Satoshi; and Kiyama, Shoichi

HOW DID SMALL-SCALE FISHERS RESPOND TO STOCK DECLINE? INSIGHTS FROM THE MAIZURU BAY CLAM FISHERY IN JAPAN

Session 7A: Thursday 1.15 pm – 3.15 pm

Small-scale fisheries contribute significantly to the development of rural fishing communities in both developed and developing countries. The sustainable development of small-scale fishing communities around the world, however, face a major challenge of declining fisheries resources. For the implementation of effective resource management systems, as well as development policies, understanding fishers' behaviour in response to the declining environment is imperative. In this paper, we use the Maizuru Bay clam fishery as a case study to examine: (i) entry-exit behaviour of small-scale fishers in response to the collapse of the fishery; and (ii) how the distribution of technical efficiency among the fishers changed over the periods of pre-collapse to post-collapse of the fishery. We find that, as the fishery declined, fishers changed their behaviour in a way that, instead of continuously participating in the fishery, they stayed for one or two years only and repeatedly exsted and re-entered to the fishery. However, those who continuously stayed in the fishery operated at a higher level of efficiency than those who sporadically participated in the fishery; and furthermore, this learning-by-staying effect led to an increase in the mean efficiency in the fishery in the post-collapse period. Lastly, we show that, as the clam fishery collapsed, the fishers rebalanced their composition of target species over time so as to maintain the total revenue from fishing at a constant level. Overall, this behaviour resulted in an increase in the physical capacity of vessels (length, tonnage and engine power) operating in the area.

Yang, Xin; Burton, Michael; and Zhang, Anlu

EXPLORING HETEROGENEOUS PREFERENCE FOR FARMLAND NON-MARKET VALUES IN WUHAN, CENTRAL CHINA

Session 15A: Wednesday 10:30 am – 12:30 pm

The research question for this study is estimating the public's willingness to pay for the public goods generated by farmland, and exploring respondents' heterogeneity in their preferences for these goods. The approach used is a choice experiment, using respondents from the city of Wuhan, China. Six attributes representing public good values (farmland area, farmland fertility, water quality, air quality, species richness, and recreational value) and the level of private cost are selected in this study. A heteroscedastic conditional logit model is used to analyse the respondents' willingness to pay for improvements in these public goods, accounting for systematic heterogeneity in public preferences. The results show the public are willing to pay to preserve the non-market values generated by farmland, with air quality valued most, followed by farmland fertility, farmland area, water quality, species richness and recreational value. In addition, respondents with higher incomes, and who are aware of the non-market values of farmland and have a willingness to pay for it, have a smaller error variance, i.e., these respondents are more consistent in their choices. This study may help decision makers improving more differentiated farmland protection policies.

Yargop, Rohan; Malek, Lenka; Nelle, Susan; and Umberger, Wendy

A STUDY OF DRIVERS FOR INDUSTRY GROWTH AND INNOVATION IN THE SOUTH AUSTRALIAN FOOD AND AGRIBUSINESS SECTOR

Session 13A: Thursday 1.15 pm – 3.15 pm

Innovation is a relative term, and often used loosely to associate with breakthroughs in science and technology. It can be argued that sciences do not deliver innovation, they deliver ideas; and that innovation occurs when these ideas are transformed by the industry by exploring opportunities to develop. What underpins innovation is the question of how do you keep moving forward? And the answer is to find ways to develop opportunities. In that light, we see innovation as a solution-seeking process. A need for an ongoing interaction driven by the industry to understand and explore value-adding opportunities. In South Australia, it is vital for the key players in the food and agribusiness industry to stay well connected and to act as a 'hub' of innovation by connecting industry players with opportunities. Therefore, the aim of the present research is to identify the critical drivers, growth constraints and success factors of the South Australian food and agriculture industry. The resulting insights will inform the development of a strategic framework for growing the value of the South Australian food and agriculture industry through collaboration and co-innovation. Innovation in this context is understood to be value-adding to existing products, development of new markets and identifying opportunities for collaboration.

Zander, Kerstin; Garnett, Stephen; and Meyerhoff, Jürgen

PREFERENCES FOR CONSERVATION INTERVENTIONS FOR AUSTRALIAN BIRDS THREATENED BY CLIMATE CHANGE – IS THERE A DIFFERENCE IF THE GOVERNMENT WAS TO PAY OR INDIVIDUALS?

Session 15A: Wednesday 10:30 am – 12:30 pm

Climate change is demanding novel conservation interventions, such as assisted colonization of species outside their natural range. While conservation managers are cautious about radical interventions, the view of the general public is more accepting. Here we present results of two choice experiments undertaken with the general public in Australia through a web-based survey about preferred conservation options for Australian birds threatened by climate change. One choice experiment included a price attribute, which was a personal contribution into a bird conservation fund, the other was similar but we dropped the price attribute and we phrased the accompanying question differently. Instead of asking if respondents would be willing to pay personally for one of the given conservation options, we asked which conservation option they would prefer if the government was to allocate tax money to its implementation. The price attribute is of particular importance in choice modeling and research comparing answers to choice design with and without prices are rare and suggest that the inclusion of the price attribute can change the underlying choice behaviour and the rankings of the attributes. We found that, when respondents were asked to contribute their own money, they would

rather birds were maintained in the wild, and were less likely to find acceptable keeping them in zoos or moving them (assisted colonization). When the government would pay for the conservation intervention, respondents were happy for all the options, conservation in the wild, in zoos and assisted colonization.

Zeng, Di; Huang, Zeying; Xu, Ying; and Wang, Jimin

ONE SIZE FITS ALL? CONTRACT FARMING AMONG BROILER PRODUCERS IN CHINA

Session 1D: Thursday 8:30 am – 10.10 am

Contract farming has increasingly been found to benefit smallholders in developing countries, yet much less is known about its role in the poultry industry where economies of scale could be more prominent. This study aims to narrow this gap by analysing the choice of contract farming among Chinese broiler producers using a nationally representative survey. Simple cost-benefit analysis and multinomial logit regression modeling are jointly employed to explain contract farming decision making, especially among small producers. In contrast to many recent studies, we find that small producers, though not passively excluded, usually opt out of contract farming due to limited profitability when large producers are coexistent. Therefore, contract farming may not help achieve higher welfare goals for small broiler producers who should seek alternative market opportunities that better realise their comparative advantages.

Zhang, Jing; Brown, Colin; and Waldron, Scott

CASE STUDY ANALYSIS ON HOUSEHOLD ATTITUDES TOWARDS WEATHER INDEX CROP INSURANCE IN RURAL CHINA

Session 2A: Thursday 8:30 am – 10.10 am

The study extends on the literature assessing China's current "policy-oriented" agricultural insurance crop system to understand and to investigate the factors influencing the relative merits and potential demand for weather index crop insurance as a means for individual farmers in rural China to cope with weather-related production risks. Using the case of Huojia County in Henan Province, an empirical analysis is conducted of information collected from households' survey and interviews with local village leaders. The key finding is that there is a significant potential demand for weather index crop insurance product as households seek time-efficient risk management strategies, although this demand is influenced by generally poor awareness of insurance, small areas, and relatively low profitability of crop production.

Zull, Andrew; Carey, David; Taylor, Heather; and Deuter, Peter

BIOECONOMIC-GIS ANALYSIS OF SWEETCORN PRODUCTION ACROSS SOUTHERN QUEENSLAND

Session 1A: Wednesday 10:30 am – 12:30 pm

Sweetcorn is produced in many Australian regions, with varying planting times due to climatic conditions. Although a summer crop, unmarketable corn cobs may result when temperatures are ≥35^{O}C for ≥4 consecutive days during silking. We investigated continuous (Aug 14-April 16) and split-season (Aug 14-Oct 2 and Jan 8-April 16) plantings for Gatton and St George (1997-2014). Using a sweetcorn bioeconomic model, estimated median yields of 1039, 1000, and 810 (18-litre) cartons/ha resulted for Gatton (continuous) and St George (split season and continuous), respectively. This resulted in median gross margins of $5022/ha, $3312/ha and $1742/ha, respectively. Although the yields between Gatton and St George (split-season) are similar, the gross margins for the latter are lower due additional transportation costs. Using regression analysis combined with GIS mapping across southern Queensland, the benefits of split-season planting exists west of Inglewood for median years. Under the best-case scenario (low heat-stress years), there is little benefit in split-season planting east of St George, but under the worst-case scenario (high heat-stress years), there may be advantages for split-season planting as far east as Gatton. The GIS maps provide a visual estimation of yields and gross margins under different climatic conditions across southern Queensland. If results appear favourable to farmers in their region, they can use the full sweetcorn bioeconomic model with their personalised data to estimate yields, financial returns and risk at the farm scale. The results indicated that there may be potential benefits to growing sweetcorn in many parts of southern Queensland.

POSTER ABSTRACTS

Barua, Suborna; and Valenzuela, Ernesto

CLIMATE CHANGE IMPACTS ON GLOBAL AGRICULTURAL TRADE PATTERNS: FIVE DECADES ASSESSMENT

Climate change variability alters the specialization and portfolio of production and trade in agricultural markets. Previous studies suggest that climate change has a negative impact on economic growth and production patterns; in particular, climate variability may significantly affect yields and commodity prices. This paper investigates the impact of climate variability on agricultural trade using detailed estimates of temperature and precipitation for more than 70 countries over a period of 50 years. The study uses, as control variables, estimates of national income, comparative advantage in land, climatic zone differences, and estimates of national agricultural rates of assistance and trade membership. The estimation framework utilizes panel data regressions, including Driscoll-Kraay and Prais-Winsten techniques, and produces estimates for the world and aggregate geographical and economic-level regions. Findings suggest that variations in temperature and precipitation over the period considered have a significant impact on total and agricultural exports at global and regional level. This paper provides evidence that agricultural exports patterns are vulnerable to variations in climatic conditions. These estimates could be used in future projections considering climate change as a determinant of agricultural production and trade patterns.

Bavorova, Miroslava; Bednarikova, Zuzana; and Ponkina, Elena

OUT-MIGRATION OF YOUNG EDUCATED PEOPLE FROM RURAL AREAS IN RUSSIAN SIBERIA

Out-migration of rural youth is typical for all agricultural regions of Russia. This tendency is evident also in Altai Krai, located in southwestern Siberia. Our paper analyses factors that can motivate rural agriculturally educated youth to migrate from their parental municipality or to return home after finishing university. Data on migration motivation was collected by means of questionnaires given to students at the State Agricultural University in Barnaul. Migration motivation of students was analysed using a logit regression model. Their migration intention was studied in relation to personal background, employment expectations, quality of life and personal background with a deeper focus on relation to agriculture. Results show that stronger relationships to agriculture in the form of parental support to study agriculture, family ownership of agricultural land and intention to work or run a business in agriculture, decreases an intention for out-migration. Also, gender plays an important role. Women are more likely to intend to migrate than males. Probability to migrate from parental village increases as respondent´s satisfaction with the life increases.

Camus, Antoine; Davis, Katrina; Burton, Michael; Rogers, Abbie; Possingham, Hugh; and Rhodes, Jonathan

CONSIDERING ECOLOGICAL AND PRODUCTION VALUES IN MARINE SPATIAL OPTIMISATION

In a spatial optimisation modelling process, achieving conservation targets while minimising impacts on production activities is a key goal for marine managers. Moreton Bay, located in South-East Queensland, is an important site for biodiversity and supports significant economic activities, including commercial and recreational fisheries. We incorporate ecological and market values for the Bay into a spatial optimization model to determine how they can be maximized through different management decisions. Optimal management was evaluated for a range of scenarios. First, we only considered ecological values (habitat cover and species' presence or absence). Second, we added recreational fishing expenditure into the model. Finally, we incorporated commercial fisheries revenues. Thus, both the production and conservation values of the site were taken into account. Results indicate the optimal spatial allocation of Moreton Bay that maximizes its overall value. This study is novel in incorporating commercial and recreational fishing data into an optimal planning process: to date such analyses have mainly focused on ecological data. This methodology allows explicit trade-offs to be made between conservation and production goals, and can be used as a decision-making tool in future optimal resource planning.

Chen, Yangqing; and Matsuda, Hirotaka

THE DIFFERENCE OF SEED MARKET BETWEEN LATIN AMERICA AND ASIA

It is needless to say that seed is vital to agricultural production and is a fruit of agricultural R&D. Middle income countries in Latin America and Asia are playing a significant role for taking the initiative in agricultural production for world food security. Multinational seed companies, such as Monsanto, Syngenta and so on, are major providers of seeds in both regions. However, these two regions differ in seed industry substantially. It has been found that Genetically Modified Organisms (GMO) seed is frequently sold by multinational seed companies in Latin America, while hybrid seed in Asia. This study aims to identify factors that differentiate the seed industry between Latin America and Asia. The history of the seed industries in Brazil and Argentina in Latin America is compared with India, Indonesia, and Thailand in Asia. This study also uses financial data of multinational seed companies as supply side. In addition, demand side of seed industry is analysed from the perspective of farmers' behaviour. The result shows that the key factor in companies' decision-making is profit. Intellectual Property Rights (IPRs) system protects companies' profit from free riders. However, the IPRs system in Asia is less effective and preventing multinational seed companies from selling GMO seed. IPRs system in Latin America is more mature due to its longer history. Farmers in Asia, that are rather small-scale, tend to purchase the hybrid seed instead of GMO seed because of cost, while in Latin America, farmers that are large-scale tend to choose the GMO seed because its benefit surpasses cost.

Gowen, Rebecca; and Rolfe, John

THE ECONOMICS OF GRAZING MANAGEMENT OPTIONS TO REDUCE SEDIMENT EMISSIONS INTO THE GREAT BARRIER REEF

Reducing sediment emissions from grazing is a major target of measures to improve water quality into the Great Barrier Reef, with the Australian and Queensland Governments setting ambitious targets of up to a 50% reduction in total suspended sediments in key catchments by 2025. The focus of programs to date has been to search for win-win management changes with beef producers that deliver both improved profitability and reduced sediment emissions. Yet achieving widespread adoption of better management practices is proving difficult. Potential reasons include barriers such as capital constraints and risk perceptions. In these situations producers do not necessarily view the management change as an adjustment to an existing farming system, as captured by a standard farm production model, but as different options for farm management that involve more complex management and behavioural factors. This research reports in-depth case study analysis of beef producers in the Fitzroy and Burdekin catchments of central Queensland to identify and analyse whether standard production systems or more complex production options frameworks are appropriate to understanding the management choices made by producers.

Houk, Eric

THE IMPACT OF LAND FALLOWING FOR WATER TRANSFERS ON AQUIFER LEVELS AND THE ECONOMY IN NORTHERN CALIFORNIA

Southern California imports more water than any other place in the world, and much of this water comes from the northern part of the state. As a result of increased water demands and the ongoing drought, there has been more pressure placed upon northern California farmers to transfer their water and fallow their land or increase groundwater pumping. However, in some regions of California, local measures prohibit increasing groundwater pumping and farmers must fallow land and reduce production if they transfer surface water. Although water is already being transferred from northern California farms and land is regularly fallowed, the impact of these land fallowing decisions are often not well understood. This study examines a set of land fallowing scenarios by first identifying the impact on agricultural production (including regional impacts), and then estimating the impact of land fallowing on aquifer levels. IMPLAN was used to estimate the indirect and induced impacts on the regional economy, and the United States Geological Survey's (USGS) Central Valley Hydrologic Model (CVHM) was used to estimate the impact that land fallowing will have on aquifer recharge and the depth to aquifer. The results indicate that land fallowing can negatively impact the regional economy and increase the depth to the aquifer which can impose additional costs on groundwater users. The impacts

on the regional economy are decreased when farmers receive compensation for their water, but the shift from agricultural production income to water transfer sales income effects how these costs are distributed throughout the economy.

Ienaka, Yumi; Akahori, Hirokazu; Sawauchi, Daisuke; and Yamamoto, Yasutaka

DEMAND FOR FUNCTIONAL FOODS IN THE TEA BEVERAGE MARKET

Although consumers' interest for functional foods increases, the knowledge regarding the demand for these products is limited. This study analyses the demand for functional beverages sold in the sugar-free tea beverage market using Japanese household scanner panel data.

Iftekhar, Sayed; Pannell, David; Boxall, Peter; and Shandal, Monica

FACTORS AFFECTING PROFESSIONAL DECISION MAKING IN ENVIRONMENTAL AND NATURAL RESOURCE MANAGEMENT

The decision-making process in environmental and natural resource management is complex, and the outcomes from natural resource management projects are often unpredictable and uncertain. Uncertainties about the consequences of natural resource management mean that managers are required to make difficult judgements. Research in other fields (such as the judicial system and the financial sector) has found that, in making decisions, professionals are influenced by various internal and external factors, some of which involve biases that could reduce the quality of decision making. In this paper, we present results from a survey of environmental professionals engaged in decision making in Australia and Canada. The results help us to understand what factors influence their decision making, what tools (e.g., benefit-cost analysis, involving external experts, etc.) they use to support decision making and provide insights into how we might improve decision making. The results have implications for decision makers themselves, and also for the design of governance systems within which they operate.

Laird, Victoria; and Delbridge, Timothy

A RECORD KEEPING AND ENTERPRISE BUDGETING TOOL FOR THE SMALL FARM

For a small diversified farm, record keeping is a costly and time-consuming activity. Although central to the decision-making and management of a successful business, most small farms find it difficult to collect, organize, and analyse sales and cost data. A lack of complete enterprise data can lead farm managers to make sub-optimal planting decisions, resulting in high costs and reduced sales. The goal of this project is to reduce the cost of data entry and analysis for small farming operations by providing an easy to use software solution for creating enterprise budgets and related analysis. We develop an Excel-based decision tool for a small agribusiness operation that aids in data collection, analysis, and managerial decision making. The system is designed to record both costs and revenues, then organize and analyse the data in an efficient and user-friendly way. This project outlines the design and intended use of the tool and then describes the roll-out of the tool to a small organic fruit and vegetable farm located on the campus of California Polytechnic State University. Potential extensions and additional uses are discussed along with challenges that can be expected as the software is disseminated to other diversified farming operations.

Manero, Ana

HOW CAN EQUITY OF IRRIGATION WATER SUPPLY HELP MITIGATE ECONOMIC INEQUALITIES? PERCEPTIONS FROM SMALLHOLDER IRRIGATORS IN TANZANIA

Irrigation development is recognised as a critical strategy for rural welfare through greater food security and reduced poverty, yet fundamental questions are being raised on the linkages between irrigation and equity. Equity of irrigation water distribution is rarely achieved, particularly within low-technology schemes, due to a complex combination of technical and human factors. Drawing from a combination of qualitative interviews and statistical analyses, this study investigates the mechanisms whereby inequalities in water supply may affect

economic disparities within two smallholder irrigation schemes in southern Tanzania. The results reveal that the vast majority of irrigators believe there are significant water and economic inequalities within their communities and that improved water distribution would be an effective way of narrowing the wealth gap. This could be achieved by benefiting the poor the most through greater yields, higher reliability, improved working conditions, lesser dependency on labour income and expansion of their irrigated area. These qualitative findings are consistent with the quantitative results from the land use and yield analyses, which indicate that farmers who are unsatisfied with their water supply tend to experience lower yields, greater financial losses, higher percentage of unproductive land and higher yield gaps, compared to irrigators who are satisfied with their supply. While growing economic inequality is a major issue for effective poverty reduction, this study identifies specific ways whereby adequate water distribution can contribute to more inclusive growth within smallholder irrigation communities, thus maximising social justice and promoting fair distribution of irrigation benefits.

Molla, Md. Samim Hossain; Anwar, Md. Mazharul; Hossain, Md. Akhtar; Gathala, Mahesh Kumar; Tiwari, Thakur Prasad; Khan, A.S.M Mahbubur Rahman; and Dixon, John

ECONOMICAL AND BIOLOGICAL CONSEQUENCES OF RICE-MAIZE SYSTEM UNDER CONSERVATION AGRICULTURE IN BANGLADESH

Economical practices in crop production is an earnest desire to minimize cost, maximize production and reduce the disturbance on nature (soil, water etc.) for more sustainability, which are the major parts of conservation agriculture. From these views, on-station and on-farm trials were conducted during 2014-15 under Agricultural Research Station, Bangladesh Agricultural Research Institute, Rangpur maintaining RCB design with three replications. The experiments were comprised two broad spectrums, traditional agriculture (TA=whole plot tillage 2-3 times with power tiller) and conservation agriculture (CA=strip tillage). The CA method was also evaluated at on-station by providing 6 or 4 times of irrigation along with full or half doses of recommended nitrogen (RN)) while the TA method was received only 6 numbers of irrigation and full doses of RN. Higher total rice equivalent yield (REY) was obtained from CA method either 6 or 4 irrigations with full RN (14.63 and 14.40 t ha^{-1}, respectively) followed by TA (13.92 t ha^{-1}). Irrespective of irrigation and RN, the increment was observed in CA over TA regarding total REY (3.45-5.10%), biological yield (4.49-6.61%), residue incorporation (316.67-352.22%), carbon fixation (0.95-2.98%) and gross margin (11.94-33.00%). In contrary, the requirement was reduced in CA over TA regarding water (33.33%), nitrogen (20-50%) and total production cost (17.50-24.10%). At farmers' level, maize plant lodging decreased 15-25%, where grain yield (11.72 t ha^{-1}) and farm efficiency (2.49) was increased 6.45 and 33.87%, respectively under CA compared to TA. Thus, the CA method for rice-maize system was found economically viable, environmentally suitable, and agriculturally sustainable.

Owusu Coffie, Rebecca; Burton, Michael; Gibson, Fiona; and Hailu, Atakelty

MODELLING RICE FARMERS' TECHNOLOGY CHOICE BEHAVIOUR: A DISCRETE CHOICE EXPERIMENT APPROACH

Session 3A: Friday 8:30 am – 10:30 am

New agricultural technologies for rice farmers are vital to raising agricultural productivity and food security in Sub-Saharan Africa. However, adoption and diffusion of such technologies has been slow. Although previous studies have applied different approaches to examine poor adoption among farmers, characteristics of the technologies are also vital. In this paper, we apply a choice experiment approach to survey farmers in two rice production regions in Ghana to gain insights into their preferences for technology attributes that improve rice production. Specifically, we generate willingness to pay (WTP) estimates using willingness to pay space (WTP space) method and compare with values from the utility space (US) method. Our econometric analysis indicates that, on average, farmers' value higher yields and are negatively affected by higher risk of crop failure and quantity of labour needed. Our findings indicate a considerable level of heterogeneity in farmers' preferences that cannot be explained by any of the observable characteristics.

Sayekti, Apri

LABOUR DEMAND IN LABOUR-INTENSIVE FARMING: CHILI PRODUCTION IN INDONESIA

Session 1C: Thursday 8:30 am – 10.10 am

Employment opportunities are important in rural development in developing countries given the rapid structural transformation and migration of agricultural labour to non-agricultural sectors. In Indonesia, an important focus of agricultural development strategies is to increase chili productivity. Hybrid seeds, as genetically modified ones can produce higher and more stable crop yields, lower losses due to pests, diseases and adverse weather conditions and higher profitability. However, labour could be one constraint of the hybrid varietal adoption given the labour-intensive nature of chili production. Existing literature has been inconsistent in labour usage of hybrid crop varieties. Most studies only focus on total demand for labour and neglect the different demands between family and hired labour, male and female labour, and among specific production activities. These heterogeneities and related wage differences are, however, important. Therefore, testing labour demand, particularly demand for family and hired labour by gender for each production activities based on varietal choices, is important. A case study of chili farming in Indonesia presented here illustrates how hybrid seeds impact on different gender labour demands by different production activities. This study will test these possible heterogeneities using a unique household survey of 257 chili farmers from West Java. Disaggregation of production activities will be able to more accurately reflect labour demand that influences farmers' decision management, and the welfare impacts will go beyond technology adoption per se and influence rural development at large.

Schrobback, Peggy; Pascoe, Sean; and Coghlan, Louisa

QUANTIFYING THE ECONOMIC IMPACT OF CLIMATE CHANGE AND MARKET DYNAMICS: THE CASE OF AUSTRALIA'S SYDNEY ROCK OYSTER INDUSTRY

Climate change affects fisheries and aquaculture industries due to their reliance on renewable and natural resources. The aim of this study was to develop a framework to quantify the potential economic impact of climate change on an industry and to analyse the impact of market dynamics on its economic viability under changing climate. To achieve the aim, a model was developed that incorporates economic, spatial and biophysical variables. In this study, by way of empirical illustration, the focus was on Australia's Sydney rock oyster (SRO) industry. The findings from scenario analyses suggest that the negative effect of projected climate change on the industry's revenue may be moderate overall. However, some production areas may be more affected than others. Furthermore, the results suggest that market dynamics could have a larger impact on the future economic sustainability of the industry than direct effects from climate change. The study also highlights the need for collection of environmental data in order to monitor environmental change as the basis of quantifying economic implications for industries.

Tavva, Srinivas; Swain, Nigamanand; Sharifi, Mohammad Sharif; and Saharawat, Yashpalsingh

INTEGRATED CATCHMENT MANAGEMENT OPTIONS FOR IMPROVING LIVELIHOODS IN AFGHANISTAN

Session 1E: Friday 8.30 am – 10.30 am

Afghanistan, after a long-drawn unrest, is attempting to implement the watershed development program to enhance the livelihoods of the local communities. The Afghanistan watershed atlas identified 4000 micro watersheds that can be managed by adopting a participatory watershed management approach, reviving hopes of local communities for sustainable livelihoods. This requires research integrating science and socioeconomic aspects, which is lacking in Afghanistan. An attempt is made in this direction through an ACIAR-funded integrated catchment management project characterising dryland watershed sites, enhancing catchment productivity through improving water and land resources, bridging knowledge gaps on watershed management, and improving livelihoods with the participation of local institutions, such as watershed users association at six watersheds in Balkh, Baghlan, Kabul and Nangarhar. Among five water harvesting techniques tested, semi-circle catch pits gave good results in a 6x6m design in mild slopes of about 5-10%. Earthen check dams that were not more than 6 meters wide gave good results with gabion structures. Alternate land use with

Atriplex as an alternative forage crop, and Asa foetida (direct seed sowing) and Mulberry (sapling/twig) as economic plantation on hilly barren lands with catch-pit (nigarimes) were successful. One well and three ponds/storage structures (5692.80 m3) constructed benefited ground water and supported irrigation. Man-days created through watershed activities was worth 1.1 million Afs apart from long-term benefit from assets created and soft skills imparted. Pasture development in 23 ha (atriplex) and horticulture plantation in nearly 60 ha has a great impact on soil, water, environment apart from income and livelihoods.

Zhang, Bao

OVERGRAZING AND NET INCOME OF HERDERS WITH DIFFERENT SCALES OF GRASSLAND: THE CASE OF XILINGOL LEAGUE

Herders raise more sheep in order to maintain their living standards or increase their net income from animal husbandry, but this can cause overgrazing. Can overgrazing increase net income of herders with different scale of grassland? It is the question we would like to focus on. Research Objective: What is relationship between overgrazing and net income from animal husbandry of herders with different scale of Grassland. Hypothesis: Under different scale of grassland, there is positive correlation between overgrazing and net income, which means overgrazing can increase net income.

Zull, Andrew

AGMARGINS™: WEB DATABASE FOR REGIONAL GROSS MARGINS

Queensland DAF have developed AgMargins™, a web database of horticultural and broadacre crop gross-margins for growers, advisors, researchers and policy makers.

DAF has made gross-margins publically available through the Agbiz website. However, this requires manual updating of each gross-margin and with limited regional economists some gross-margins have dated (especially for prices) and seldom for all districts. Moreover, gross-margins are often generated in Excel© with little consistency between crops and no data sharing between spreadsheets and regions. AgMargins*TM* uses annual and perennial crop templates to generate regional gross-margins which reflects regional yields and farm practices combined with a price database and regional price weightings. For example, many crops use urea, and the regional price difference is primarily transportation. By updating just a single urea price ($/kg) and transportation cost ($/km) we have updated many crop nutritional costs. We aim to limit the price database (including commodities) to <500 items which are updated annually.

Gross-margins are available without logging into AgMargins™; however, registered users can generate pdf reports, save gross-margins as favourites and personalised inputs such as pesticides to reflect on-farm operations. Personalised AgMargins are saved within the user's profile (password protected). AgMargins™ reports also have yield and commodity price sensitivity tables per hectare and per mega-litre (for irrigated crops).

AgMargins™ has the capacity for other software such as R and APSIM to automatically retrieve gross-margins across Queensland to ensure prices and results are up-to-date. This feature, as well as the retrieval of standard or stored gross-margins aims to reduce research costs for many government research agencies including Queensland DAF, CSIRO and universities.