

**2017 Conference**

**“Trade in an Uncertain Future”**

**19 – 20 October 2017**

**Distinction Hotel**

**Rotorua**

**Panel sessions and Contributed Papers**

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|  | **Tawa Room** | **Miro Room** | **Rimu Room** | **Kauri Room** |
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| **Thursday morning** | **Animal welfare** | **--** | **--** | **Forestry** |
| ***Chairs*** | *Graeme Doole**University of Waikato* |  |  | *Richard Yao**Scion* |
| 11.00 – 12.30 | **Panel session** |  |  | **Panel session** |
| **Thursday afternoon** | **Trade I** | **Innovation and productivity** | **Biosecurity and biodiversity** | **Farms and rural society** |
| ***Chairs*** | *Darran Austin – Ministry for Primary Industries* | *Muhammad Siddique Massey University* | *Tony Schischka – Ministry for Primary Industries* | *Racheal Davidson**DairyNZ* |
| 1.30 - 2.00 | **Michael Lyne** | **Phil Journeaux** | **Tommy Robertson** | **Alison Bailey** |
| Stepping out of traditional cooperatives to add value: A case study in Papua New Guinea | Economic evaluation of stock water reticulation on hill country | Investing in interventions against pests – an analysis of choices made by decision makers under uncertainty | What really drives dairy production systems: Economic rationale or social and environmental responsibility? |
| 2.00 – 2.30 | **Sayeeda Bano** | **Glen Greer** | **Richard Yao** | **Utkur Djanibekov** |
| New Zealand and India trade in agricultural and manufactured products and determinants: An empirical analysis | The impacts of research in an era of more stringent performance evaluation | Does the economic benefit of biodiversity exceed the cost of conservation in planted forests? | Nexus of energy use, agricultural production, employment and incomes among rural households in Uttar Pradesh, India |
| 2.30 – 3.00 | **Ivan Luketina** | **Alexander Malherbe** | **Matthew Newman** | **Carla Muller** |
| Why does New Zealand export sawn timber to some markets and logs to others? | Principle-based cooperative law: Contrasting the Australian legislative environment | Economic impact assessment of Mycoplasma bovis in New Zealand | Management ability in farm systems modelling |

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|  | **Tawa Room** | **Miro Room** | **Rimu Room** | **Kauri Room** |
| 3.00 – 3.30 | **Sayeeda Bano** | **Mark Neal** | **Wei Yang** | **Wanglin Ma** |
| An empirical study of the employment effects of regional integration: A case study of ASEAN | Defining zones for pasture potential: How much profit could be in the paddock? | Consumer willingness to pay price premium for credence attributes of livestock products | Off-farm work, smartphone use and household income: Evidence from rural China |
| **Friday morning** | **Water quality and agriculture** | **Land use** | **Risk and farm systems** | **Climate and farming** |
| ***Chairs*** | *Sandra Barns**BoP Regional Council* | *Wei Yang**AgResearch* | *Mark Neal**DairyNZ* | *Pamela Boot**Landcare Research* |
| 8.30 – 9.00 | **Zack Dorner** | **Phil Journeaux** | **Graeme Doole** | **Mercy Kiremu** |
| A behavioural rebound effect: Results from a laboratory experiment | Drivers and barriers to land use change | The dynamics of a dairy business in a turbulent world | Hedging drought risk in Kenya with weather derivatives: The potential use of options |
| 9.00 – 9.30 | **Justin Connolly** | **Patrick Walsh** | **Katie Bicknell** | **Kendon Bell** |
| Understanding ‘wicked’ freshwater problems with causal loop diagrams | Valuing changes in New Zealand marginal land: Water quality, carbon and afforestation | Feed use intensification and technical efficiency of dairy farms in New Zealand | Empirical estimation of the impact of weather on dairy production |
| 9.30 – 10.00 | **Phil Journeaux** | **Stefania Mattea** | **Angie Fisher** | **Rachael Davidson** |
| Thoughts on the allocation of nutrients; the issue with natural capital allocation | Is the unobserved heterogeneity truly unobserved? An exploration of the individual and spatial sources of taste variations for landslide protection | Dairy progression pathways: Volatility and developing new operating structures | Key drivers of greenhouse gas emissions on New Zealand dairy farms |

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|  | **Tawa Room** | **Miro Room** | **Rimu Room** | **Kauri Room** |
| 10.00 – 10.30 | **Emma Moran** | **Bruce Greig** | **Muhammad Siddique** | **Alan Renwick** |
| Managing nutrient losses and profitability for 95 farms in Southland | A survey of New Zealand dairy farm debt | Measuring efficiency of NZ dairy farms with DEA and PCA using panel data | Enabling transformation in New Zealand’s bioeconomy |
| **Friday morning** | **Dairy futures** | **--** | **--** | **Trade II** |
| ***Chairs*** | *Alan Renwick**Lincoln University* |  |  | *Caroline Saunders**Lincoln University* |
| 11.00-11.30 | **Panel session** |  |  | **Caroline Saunders** |
|  |  |  | Perspectives on New Zealand agrifood trade |
| 11.30-12.00 |  |  | **David Evison**  |
|  |  | The influence of New Zealand’s monetary policy and regulations on export |
| 12.00-12.30 |  |  | **Shamim Shakur** |
|  |  | New Zealand’s trade prospects in an uncertain Trans-Pacific Partnership (TPP) environment: Results from gravity model |

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|  | **Tawa Room** | **Miro Room** | **Rimu Room** | **Kauri Room** |
| **Friday afternoon** | **Trade III** | **Rural Society** | **Food safety** |  |
| ***Chairs*** | *Ivan Luketina – Ministry for Primary Industries* | *Emma Moran* *Environment Southland* | *Kendon Bell* *Landcare Research* |  |
| 1.30 – 2.00 | **Mai Tran** | **William Kaye-Blake** | **Mai Ha** |  |
| Impact of energy consumption and trade liberalisation on the environment in Vietnam | Testing indicators of resilience for rural communities | The determinants of food safety risk perception in Vietnam |  |
| 2.00 – 2.30 | **Sayeeda Bano** | **Ben Wiercinski** | **Caroline Saunders** |  |
| An empirical examination of the J-curve: New Zealand’s bilateral trade with selected countries | Effects of education and gender on attitudes and behaviours in New Zealand | Consumer preferences for attributes in food and beverages for beef and wine in the US: Prelim. results |  |
| 2.30 – 3.00 | **Yangyuyu Luo** | **Pike Brown** | **Melissa Welsh** |  |
| Export performance and productivity of NZ firms: Evidence from a continuous treatment model | Preview of the 2017 Survey of Rural Decision Makers | Modelling NZ dairy production: The impact of traceability between the farm and the factory |  |

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| **ABSTRACTS** |

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| **Thursday 1.30 – 3.30 – Tawa Room**  |

**TRADE I**

**Stepping out of traditional cooperatives to add value: A case study in Papua New Guinea**

*Mwayawa, N, Lyne, M, Lees, N, & Trafford, S.*

This research was motivated by renewed support for cooperatives in Papua New Guinea, and the government’s intention to introduce new cooperative policy and legislation. Of concern is that the proposed policy changes do not address weak institutional and governance arrangements that constrain value-adding in traditional marketing cooperatives. This study highlights problems that warrant attention by contrasting two producer-owned organisations established to process and market commodities produced by smallholders in Papua New Guinea. These organisations, a cocoa cooperative and a rubber company, differed markedly in their value-adding performance despite similarities in their patron-shareholders and markets. Propositions relating performance to institutional and governance arrangements were tested by analysing and comparing data gathered in case studies of the two organisations. The low-performing cocoa cooperative took on all of the investor-unfriendly institutional arrangements that characterise a traditional cooperative, denying its patron-shareholders the opportunity to realise capital gains or to benefit in proportion to their investment. At the same time, its de facto governance arrangements prevented the cooperative’s directors from holding management accountable for bad decisions. By contrast, smallholders were able to realise capital gains on their investments in the high-performing rubber company, and also benefited from dividends proportional to their investment. Most importantly, these investor-friendly institutional arrangements were extended to a strategic partner that contributed capital, marketing contracts, and expertise to the company. The analysis did, however, identify a governance problem that posed a looming but avoidable threat to the company’s future. Key policy recommendations were to legalise and promote investor-share cooperatives, to establish a code of good conduct for strategic partners, and to provide the same level of initial support to producer organisations regardless of their juristic status.

**New Zealand and India trade in agricultural and manufactured products and determinants: An empirical analysis**

*Bano, S & Scrimgeour, F*

Since the 1970s growth in world trade has been remarkable, not only for its pace and increased diversity, but by a marked change in emphasis away from the traditional inter-industry patterns of exchange of goods. A large body of literature has examined, measured and tried to explain the changing patterns and development of trade. This study attempts to use and extend the existing literature, applying it to the New Zealand-India case study. This study examines and presents a model of manufactured and agricultural exports, from New Zealand to India and the world, and from India to New Zealand. It presents an analysis of the responsiveness of manufactured exports and agricultural exports to GDP of the two economies, world income, the exchange rate and FDI. In addition, we test hypotheses drawn from trade theory to identify the key determinants of agricultural and manufactured exports. Our findings show that country’s population, GDP, GDP per capita and exchange rate are important causal factors that influence both New Zealand’s and India’s agricultural and manufacturing exports.

Our results suggest New Zealand manufacturing exports are highly elastic with respect to the changes in average population, GDP per capita, and inelastic with respect to average FDI. Our findings also demonstrate that New Zealand agricultural exports are highly elastic with respect to average population, showing that a one percent increase in the average population/or market size can increase NZ agricultural exports to India by six percent. This is contrary to the conventional wisdom about low elasticity pessimism with respect to agricultural products. These results have policy implications in the context of trade negotiations between New Zealand and India at the bilateral level and the RCEP in which both NZ and India are participating. The agriculture sector is as one of the key challenges for participating members.

This study will inform ongoing attempts to foster trade and investment relations between New Zealand and India, especially those initiatives consistent with an ongoing Commercial Alliance in Agribusiness a joint initiative by the Government of India and the New Zealand.

**Why does New Zealand export sawn timber to some markets and logs to others?**

*Luketina, L.*

New Zealand’s annual log harvest has increased rapidly from 2009 to 2017. This increase in harvest has been mostly exported as logs, rather than being processed in New Zealand into sawn timber and other products. Previous industry strategy studies have identified the need for the sawn timber processing sector to be internationally competitive, as it is both an important processing industry, and a supplier of residue to downstream manufacturers.

Studies that compare New Zealand’s export log and sawn timber markets have shown that most markets import either sawn timber or logs, but rarely an even mix of both. However, most export logs are processed into sawn timber or plywood at the destination. This research uses econometric analysis to identify the drivers of these differences in market behaviour.

A seven-country export demand panel model was used to analyse the effects that different variables had on demand for sawn timber and logs. Real GDP and real prices were used to explain demand for log and sawn timber imports from New Zealand. Variables for tariffs and tariff wedges (the difference between the tariff for a processed good and the tariff for its raw material), non-tariff barriers (NTB), competition effects, and local resources were used to test their effects on demand.

Tariff wedges and the local harvest of softwood timber were found to have a significant negative effect on demand for sawn timber, while only a softwood harvest was found to negatively affect demand for logs. The presence of tariff wedges was found to be negatively correlated with the sawn timber demand, but did not fully explain the difference in demand between logs and sawn timber. Research suggests that NTBs have a large impact, but they are difficult to measure and therefore analyse in this context. The existence of a softwood timber resource was found to be negatively correlated with demand for softwood imports. There was no significant negative effect found for competition effects.

**An empirical study of the employment effects of regional integration: A case study of ASEAN**

*Bano, S, & Tabbada, J.*

The growth and output effects of ASEAN integration have been extensively explored in the literature. Relatively less attention has been paid to the equally important issue on how ASEAN integration has affected employment or unemployment in the member countries. This study aims to determine whether membership in ASEAN for selected members has had a positive (or negative) impact on employment among the ASEAN member-countries for which data are available. In theory, the expansion of the export industries resulting from the reduction or removal of barriers to trade result in increased employment or reduced unemployment in the member-countries. This study applied econometric methods and other approaches including the Synthetic Counterfactual Method.

The results show that integration has led to a reduction in unemployment in the majority of the ASEAN member-countries. The largest s gain in terms of reduced unemployment goes to Thailand and the three new members of ASEAN (Lao PDR, Cambodia and Myanmar). The sole exception is Indonesia, where actual unemployment has been higher than the counterfactual since 1997. The Philippines and Singapore show mixed results, although towards the end of the period (2014) actual unemployment is much lower compared to the counterfactual.

The study also evaluates the impact of selected variables, which include, difference between actual unemployment and the counterfactual, export performance, degree of openness to trade, foreign direct investment, institutional and governance indicator. The results and analysis are potentially useful for addressing immigration and employment.

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| **Thursday 1.30 – 3.30 – Miro Room**  |

**INNOVATION AND PRODUCTIVITY**

**Economic evaluation of stock water reticulation on hill country**

*Journeaux, P.*

This project used a case study approach whereby 11 hill country farms across New Zealand were evaluated as to the costs and benefits they had incurred/received following the installation of a reticulated stock water scheme.

The analysis showed a very strong economic return from the system, with a generalised pattern of; install water scheme, increase subdivision, improve grazing management, improve pasture utilisation/improve animal performance.

Farmers also reported a range of non-financial benefits, particularly ‘peace of mind’ especially with drought management. The stick water/subdivision also directly assisted in achieving environmental goals, particularly around implementation of farm environment plans.

**The impacts of research in an era of more stringent performance evaluation**

*Greer, G, & Kaye-Blake, B*

The New Zealand National Statement of Science Investment launched an era of more stringent performance evaluation across New Zealand’s Science and Innovation System, and Crown Research Institutes are increasingly required to demonstrate the impact of their research to Government funding organisations. Previous economic evaluation of agricultural research in this country and others has generally involved case-study analysis of specific projects or econometric analysis of macroeconomic data series. Both of these approaches have limitations. Case-studies, while useful in some contexts, may be seen by some stakeholders as ‘cherry-picking’ good stories. A further failing is that case study-based assessments cannot be scaled up to organisational, sector or innovation system levels. Econometric analysis is not currently feasible at the level of individual research organisations because the data required are not available. Recently an economic evaluation was undertaken for Plant and Food Research (PFR) examining the impacts of its research on the economic performance of five key sectors. A combination of quantitative data analysis and qualitative workshops was used to estimate the value of changes in the economic performance of each sector between 2000 and 2015 and allocate the value to five key drivers of change: industry initiatives, the market, Government, PFR research or a “wildcard” to account for changes driven by other factors. The methodology used has a number of limitations. In particular, it did not capture the contribution of PFR research to offsetting reductions in economic performance as a result of other factors or to protect continued performance. However, the approach developed provides a novel approach to empirical estimation of the economic contribution of agricultural research to New Zealand’s primary sector, and provides a repeatable framework for evaluating the impacts of research on other sectors.

**Principle-based cooperative Law: Contrasting the Australasian cooperative legislative environment**

*Malherbe, A, Scrimgeour, F & Clark, D.*

In this paper, we examine the New Zealand and Australian dairy co-operative legislative environment for evidence of the International Co-operative Alliance (ICA) seven principles of co-operation. This is important as co-operative laws form the foundational governance layer for members. If these laws are not principle-based, it is likely that the governance mechanisms that protect the members interests could be compromised. This paper employs a framework based on guidelines for co-operative law (SEGCOL, 2015; Henry, 2012; Münkner, 2013; Fici, 2012) to analyse the New Zealand and Australian dairy co-operative legislative environment.

Many regions refer to the ICA principles in their co-operative laws, however, noticeable deviation from the pure principles is found. The Dairy Industry Restructure Act (DIRA, 2001) in New Zealand has seemingly hindered the evolution of the co-operative legislation. The ICA principles are included in the state-based Australian co-operative legislation though the linkage between the principles and the specific provisions within the Acts is not apparent. Furthermore, other laws and regulations in New Zealand and Australia impose corporations type supervision which could disadvantage co-operatives. Additionally, there is evidence of a significant reliance on replaceable rules or constitutions within both regions.

**Defining zones for pasture potential: How much profit could be in the paddock?**

*Neal, M, & DelaRue, B.*

Pasture is a key input into the dairy farming production system directly related to profitability, measured by economic farm surplus per hectare or return on assets. However, there is more variation between farms than can be explained by fixed factors such as climate and soils. This implies a gap between the amount of pasture and crop harvest actually achieved, and the potential. In discussion with local experts, some alternative approaches were devised to select the peers from which a potential could then be determined. As an example, within the Bay of Plenty region, a median gap of 1.5 t was estimated, with a value to the region of up to $100 million per annum.

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| **Thursday 1.30 – 3.30 – Rimu Room**  |

**BIOSECURITY AND BIODIVERSITY**

**Investing in interventions against pests – an analysis of choices made by decision makers under uncertainty**

*Soliman, T, Robertson, T, & Inglis, GJ.*

The significant gap between the costs of invasive species management and the limited public funding available to undertake it means that there is a need for robust mechanisms to prioritize expenditure on biosecurity interventions. Decision-makers must evaluate the benefits of intervention against the costs of inaction for a broad range of invasive species. These may include impacts on primary industries, human health, natural environments and social amenity. However, the criteria used to guide prioritization and their relative importance are not often transparent. In this study, we use a discrete choice experiment to understand the implicit judgements that experts make when they consider the merits of intervention against invasive species that have different potential risks. Three groups of criteria were considered in the analysis that represent: (1) the management action, including its cost and likely effectiveness, (2) the potential benefits of intervention, including losses to biodiversity and primary production that will be avoided, and (3) the level of certainty surrounding each of these outcomes. The aim of our study is to examine how intervention decisions against economic and environmental pests are weighted in the context of uncertainty over their long-term benefits. We will use the identified criteria and their relative weightings to develop a multi-criteria decision-making framework for invasive species management.

**Does the economic benefit of biodiversity exceed the cost of conservation in planted forests?**

*Yao, R, Scarpa, R, Harrison D, & Burns, R.*

The study aims to evaluate a proposed programme that would sustain and enhance the provision of ecosystem services in planted forests. We focused on the evaluation of the benefits and costs of the conservation of the brown kiwi (a New Zealand iconic yet threatened bird species) which inhabits planted forests. Yao et al. (2014) found that a sample of 209 New Zealand households would, on average, financially support a programme for conserving the brown kiwi in NZ planted forests. We extend that study using a proof of concept that integrates economic, ecological and spatial approaches. We undertake this in five steps: 1) we supplement a previous choice experiment survey by interviewing more than 900 additional georeferenced households; 2) we estimate household-specific means of marginal willingness-to-pay (WTP) values; 3) we then use spatial econometrics to explore WTP determinants; 4) we aggregate the public benefits of biodiversity at the regional and local levels; and finally 5) we identify 12 ecologically and economically feasible ecosystem-service sites (ranging from 5,000 to 11,500 hectares) and calculate the average annual costs of a conservation programme at each site. We found that the value of the proposed biodiversity conservation initiative at the regional level can be several times higher than the overall cost of the programme. To prioritise intervention of this initiative, we also identify the planted forest site that would produce the highest net economic benefit from the enhanced provision of ecosystem services.

**Economic impact assessment of Mycoplasma bovis in NZ**

*Newman, M & Davidson, R.*

Mycoplasma bovis was found in a herd of dairy cows in South Canterbury during July 2017. Mycoplasma bovis is a bacterium that causes illness in cattle, including udder infection (mastitis), pneumonia, and arthritis. The implications for this herd, the surrounding farms and New Zealand cattle industries are still being examined. MPI, the impacted industry bodies and veterinarians will determine what actions should be taken to control the disease, restrict its spread and possibly eradicate the disease. Some of these decisions require economic analysis to determine the possible impacts.

The aim of the analysis was to provide a ‘most likely’ economic impact assessment of the various options using a cost-benefit analysis framework. Utilising expert knowledge to determine the key percentage of herds impacted and number of cows and calves within a herd, a Net Present Value (NPV) calculation of the economic impact was calculated over a 10-year timeframe. This information was used to support response decisions by DairyNZ and MPI.

**Consumer willingness to pay price premium for credence attributes of livestock products**

*Yang, W.*

The production process of livestock products, such as dairy and beef, has increasingly been regarded to be resource-intensive and involved with animal welfare and environmental concerns. As a result, consumer awareness of these issues has led to an increasing demand for products with high quality attributes that could not be directly experienced or identified, namely credence attributes (CAs). Up till now, an abundance of empirical studies have attempted to estimate consumers’ willingness to pay (WTP) for CAs representing an additional of the value placed on the benefits that they derive. However, there are significant differences in the estimated values of WTP mainly because consumers’ perceptions of CAs may vary and the estimations are conditional on the particulars of a single study. To our knowledge, so far no study has systematically identified the value of price premium associated with credence attributes of livestock products. In an effort to understand this issue this study conducts a meta-analysis to examine consumers’ WTP for different credence attributes of livestock products based on a systematic review of relevant studies. Meta-regression models are used to control for the heterogeneity of WTP estimate and investigate factors that affect the estimation of WTP. 555 estimates were derived from 94 papers reporting WTP. Meta-regression results established the presence of systematic WTP variation associated with types of products, CAs, and locations, yet also indicate that WTP is subject to systematic variation associated with study methodology. While results are promising with regard to the ability of research to provide insight regarding WTP for CAs, they also suggest that researchers should consider the potential for methodological effects when conducting empirical WTP analysis.

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| **Thursday 1.30 – 3.30 – Kauri Room**  |

**FARMS AND RURAL SOCIETY**

**What really drives dairy production systems: economic rationale or social and environmental responsibility?**

*Bailey, A & Perrier, T.*

There is a growing commitment in the Primary Sector to ensure a sustainable production base characterised by having long-term mutually reinforcing and beneficial effects on: food production, natural resource stewardship, environmental protection, and farming livelihoods. In the context of changing internal and external pressures on agriculture it is important to determine whether the dimensions of sustainability - economic, social, environmental - can be integrated successfully at the farm level. Having this knowledge is critical if we are to more fully understand the social and environmental consequences of changes in agricultural management. By understanding both the rationale of farmer’s decisions, and their logical consequences, more effective management practices can be formulated. This paper summarises the approach to and results from interviews that were conducted with individual dairy farmers across the North and South Islands. These interviews were designed to determine attitudes and behaviour in terms of financial and environmental management, and social responsibility. The results show that farmers work in agriculture because of their passion for the farming world and wider environment, the challenge and the satisfaction the job and industry provides, and the opportunity of running their own business. Profitability is the key driver of a farmers’ business. Social responsibility is also a key factor to success, encompassing both an individual’s own work-life balance and the management of employees. Protecting the environment is a necessity understood by farmers. In allocating 100 points between financial viability, work-life balance and protection of the environment, financial viability came out as the most important factor, followed by work life balance and environmental management, each given equal weighting. In commenting on their allocation, farmers stated that if there is no business, then it becomes harder to focus on the other pillars of sustainability. However, many stated that in the long term, these priorities must change in order to consider all these issues with the same importance.

**Nexus of energy use, agricultural production, employment and incomes among rural households in Uttar Pradesh, India**

*Djanibekov, U.*

This study analyzes the nexus issues of energy use, agricultural production, income and employment among heterogeneous and interdependent rural households in Uttar Pradesh, India. We use an agricultural household dynamic programming model that includes two types of households differentiated by their socio-economic characteristics and that are linked through agricultural contracts. Households are also differentiated by their membership in terms of men, women and children. The model simulates the effects of policies such as state subsidies for the purchase of solar panels, improvement in non-agricultural employment opportunities, and combinations of the two, as they are suggested to improve energy supply and reduce trade-offs in energy use. The model results indicate that households improve energy use patterns by using solar panels; yet, adoption of such technology is conditional on state subsidy levels of 50% and 80% for the purchase of solar panels for farming and domestic purposes respectively. Subsidies for solar panels together with improvement of off-farm work increases off-farm employment levels and income of the poorer household, however, this does not improve energy use and agricultural production is reduced. In addition, the wealthier household incurs losses from improvement in non-agricultural employment opportunities due to reduced labor availability for farm operations.

**Management ability in farm systems modelling**

*Muller, C, Newman, M, & Neal, M.*

Farm systems modelling is widely used to understand the relationship between nitrogen leaching and operating profit. This use of farm systems modelling has increased as regional councils set nitrogen loss regulations under the National Policy Statement for Freshwater. One particularly contentious area in farm systems modelling is how much management ability can improve to help offset the cost of mitigating nitrogen leaching. This management ability is often represented by a proxy of milksolids production per cow.

Farm systems modelling often uses a reduction in stocking rate and fertiliser as mitigations for nitrogen leaching. If management ability, through production per cow, is held constant, these mitigations reduce operating profit. However, if the management ability, and production per cow, can increase, the cost of mitigating nitrogen leaching reduces. One argument for holding management ability constant is that if farmers could produce more per cow, without increasing inputs, it would be logical to do so.

Understanding the extent to which management ability can change and the associated cost of changing management ability will provide clarity for systems modelling. This paper seeks to explore this issue and to stimulate debate to help improve farm systems modelling in the future.

**Off-farm work, Smartphone use and household income: Evidence from rural China**

*Ma, W, Renwick, A, Nie, P, & Tang, J.*

This paper assesses the impact of participation in off-farm work on smartphone use, using an endogenous switching probit model and a survey of 493 rural Chinese households. The joint impacts of off-farm work participation and smartphone use on household income are also analyzed using a control function method. The results show that participation in off-farm work increases the probability of smartphone use significantly. Furthermore, we find that the household heads who engaged in off-farm activities and who were smartphone users earned 3,430 Yuan and 2,643 Yuan more per capita annual income, respectively, compared to their full-time farming and smartphone-free counterparts.

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| **Friday 8.30 – 10.30 – Tawa Room**  |

**WATER QUALITY AND AGRICULTURE**

**A behavioural rebound effect: Results from a laboratory experiment**

*Dorner, Z.*

The rebound effect is the increase in consumption due an increase in energy efficiency and can be modelled as a result of simple income and substitution effects (Chan &#38; Gillingham, 2015). Evidence around the rebound effect to date is largely from secondary field data, with a focus on estimating the size of the rebound effect and not on behavioural drivers (Gillingham et al., 2016; Sorrell et al., 2009). This paper investigates two potential behavioural drivers of the rebound effect. First, a behavioural rebound effect where pro-environmental behaviours are reduced after an improvement in energy efficiency. Second, moral licensing may increase the behavioural rebound effect if individuals who buy an energy efficient product subsequently give themselves psychological licence to reduce their pro-environmental behaviours even further. I develop a novel laboratory experiment to investigate these mechanisms, which can be cleanly isolated in the laboratory without the many confounds potentially present in the field, such as other motivations to reduce energy usage like saving money. Subjects much decide how to allocate their effort, in a real effort task, between earning money for themselves and reducing damages to a tree planting charity. I find evidence for a behavioural rebound effect, which is estimated to be 31% in this laboratory setting. Moral licensing also occurs, increasing the size of the behavioural rebound effect, and it is strongest among subjects with a higher level of pro-environmental orientation of their attitudes and beliefs. The main driver of pro-environmental effort is shown to be beliefs about social norms. This paper extends the core model of the rebound effect, and the findings can help inform policies to encourage pro-environmental behaviours within the context of constantly improving environmental efficiency of technology.

**Understanding ‘wicked’ freshwater problems with causal loop diagrams**

*Connolly, J.*

Freshwater resources are coming under increasing pressure across New Zealand and there is both an increasing desire and need for policy to be developed more inclusively with stakeholders. Yet in reality, this is difficult, due to scarce resources (especially data and time) and the highly complex nature of the issues being addressed.

This paper reports on the results of research that investigated the use of causal-loop diagrams (CLDs) that were developed with stakeholder groups and whether this increased the shared understanding of freshwater issues by a group. CLDs are a qualitative tool that seek to identify the interdependency between elements of a system, the direction of these relationships and how this causes a problem or issue.

They are straightforward to generate and can provide insight into the underlying causes of suboptimal behaviour in complex, dynamic environments. A simple two step workshop process was used. The first to map out the groups understanding of causal relationships, the second to reflect on analysis of the system map, consider insights gained and discuss possible intervention points.

This presentation will report on the experience of participants in the process, assessed using a mixed methods approach. These were: self-reported quantitative and qualitative findings via ex-post participant survey; and a thematic analysis of qualitative data from ex-post semi-structured interviews.

Results indicate very high levels of participant satisfaction with the process and an increase in the group’s shared understanding of the issues. The thematic analysis identified four broad themes: that there was a desire for a different approach to decision-making; that the process was a refreshing change; that the process built both a group AND a group model; and that, while useful, it also did not provide enough detail for decision-making on its own.
Active involvement of participants in the process, independent facilitation and the fact that it was participant-led were important findings of the research. While not a panacea for solving freshwater problems, this is a useful tool for the ‘toolkit’, best used at the problem definition stage of a project. It also has the potential to increase alignment on what potential, more detailed, numerical modelling may be required to develop policy.

**Thoughts on the allocation of nutrients; the issue with Natural Capital Allocation**

*Journeaux, P.*

This paper principally discusses the concept of the “natural capital” approach to nitrogen allocation under the aegis of council water quality plans. It notes that a definition of natural capital is not readily available, with most people relating it to the productivity of the land, based on Land Use Category classification.

It discusses the relationship between LUC classification and factors which affect nitrogen leaching, noting that the relationship is tenuous. LUC classification is directly related to land productivity, and the paper also discusses the impact of technology on improving land productivity, which is not included within the LUC classification.

The paper outlines some of the economic implications of such an allocation system, which essentially transfers the right to leach nitrogen from high leaching systems (e.g. dairy, intensive vegetable growing), to low(er) nitrogen leaching systems, e.g. forestry, horticulture, and drystock. This is basically a transfer of wealth, with the high likelihood of significant economic and social disruption.

Part of the argument for a natural capital-type allocation is that it will result in an incentive for the “highest and best use” of land. The paper discusses the wide range of drivers for land use, and concludes that while nitrogen allocation will affect land use and land use change, it will not be sufficient on its own to drive “highest and best use”.

The paper also touches on the need for nutrient trading – if a constraint is to be applied (i.e. the allocation), then trading is a necessity to allow for flexibility of the use of the nutrient within the constraint and to deliver economic efficiency over the longer term.

**Managing nutrient losses and profitability for 95 farms in Southland**

*Moran, E, Pearson, L, Couldrey, M, Eyre, K, Burtt, A, Sluys, C, Fung, L, Pearse, T, Newman, M, Muller, C, Mathers, D & Halliday, A.*

Farming is a balancing act between inputs and outputs to produce food efficiently and profitably, and fresh water is a vital component across the production system – for water takes and nutrient losses. Many farmers now adopt good management practices to manage their nutrient losses, but fewer go beyond this point because it usually impacts on farm profitability. Farmers generally have to absorb changes in profitability because they have little ability to influence product prices. This paper presents a summary of the results of research done by industry groups on the relationship between managing nutrient losses and farm profitability for Southland’s agriculture sector. The findings have implications for assessments of productivity and sustainability.

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| **Friday 8.30 – 10.30 – Miro Room**  |

**LAND USE PROTECTION**

**Drivers and barriers to land use change**

*Journeaux, P, van Reenen, E, Manjala, T, Pike, S, Hanmore, I, & Millar, S*

Land use change has been a feature of the New Zealand primary sector since European settlement, and has been a strength of our farming system.
There are a wider range of factors which act as both drivers and barriers to change; biophysical, economic, technological, societal, and personal. All of which interact in an infinite degree of permutations. Of these, the usual main 2 factors are biophysical and economic.

In recent decades societal pressure to address externalities of land use and land use change have been manifest around regulations affecting water takes, discharges of contaminants into water, and greenhouse gas emissions. This is just starting, but has a significant potential to affect land use change.

The paper discusses these factors and the possible implications of them

**Valuing changes in New Zealand marginal land: Water quality, carbon, and afforestation**

*Walsh, PJ, & Soliman, T.*

There are several active policy debates on the use of marginal land in New Zealand. A range of ecosystem services could be produced by properly managing marginal land, and environmental valuation represents an important input into the discussion by illustrating tradeoffs across options. However, there are gaps in the local valuation literature which prevent robust analysis. This paper uses a policy scenario on marginal land afforestation to illustrate these tradeoffs, while focussing on water quality and carbon valuation. To develop a realistic scenario, a range of quantitative geographic, biological, and economic models were integrated. Several sensitivity analyses are used to highlight current challenges and make suggestions for future research. Given the focus on environmental valuation in current national policy statements (particularly on freshwater), as well as regional policy statements, these results should be particularly useful in upcoming policy discussions.

**Is the unobserved heterogeneity truly unobservable? An exploration of the individual and spatial sources of taste variations for landslide protection**

*Mattea, S.*

On August 4, 2017, again a massive landslide killed people and brutally destroyed a hamlet in a mountain valley of the Dolomites, Italy. The public concern for undesirable consequences of landslides is rising since there have had an increase in the frequency of events in the last thirty years.
As part of a PhD research that addresses the public preferences for landslide mitigation programs, the present work is an attempt to explore the sources of preferences’ heterogeneity, with a special focus on its spatial determinants. Through the use of high-quality data at individual and spatial levels, it extensively analyses observable taste variations to avoid to misleading classify it as unobservable heterogeneity. The context of the study is peculiar in that it offers the possibility to combine observables in terms of conventional individual socio-economic covariates as well as geographical information relating to itineraries and municipality of residence. The remaining portion of unobserved is further investigated using spatial models at the municipality level.
From models’ comparisons, it is possible to conclude that not all the unobserved heterogeneity is indeed unobservable. Good-quality data can capture multiple sources of observable heterogeneity that leads to further insights into how benefits and costs of policies are distributed across the beneficiaries. Additionally, the results indicate that incorporating spatial dimensions into the model significantly enhance our understanding of the sources of heterogeneity with relevant policy implications.

**A survey of New Zealand dairy farm debt**

*Greig, B, Nuthall, P, & Old, K.*

New Zealand dairy farmers strive for profitability and creating wealth. Debt financing has been a key strategy in attaining these goals. Concerns have been expressed about the high debt levels of some farmers and its impact on economic stability and sustainability.
There have been some dramatic changes in the dairy farming landscape over recent years.

This paper presents the results of a postal survey conducted in 2015 to determine factors associated with dairy farm debt. According to the survey the mean debt of dairy farmers is $4,694,580 which is 28.8% of total farm assets, or $13.97/ kg milksolids. Servicing this debt through interest payments required on average 18% of their farm income. These results differ from those reported in the annual DairyNZ Economic Farm Survey.

Survey respondents also reported that 83% of their farm loans are interest only and the majority of this debt finance was used to finance land and buildings. These farmers consulted professionals with regard to their finance and debt affairs for 36.4 hours/ annum. The lowest equity level experienced by farmers in the survey was 33% during their 34 years of farm ownership.

Rapid changes have occurred in the New Zealand dairy sector and this propensity for change will continue. Dairy farming is a highly technical and capital intensive endeavour. In the future farmers will need to be innovative to face the challenges they face in a globalised trading environment to remain competitive.

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| **Friday 8.30 – 10.30 – Rimu Room**  |

**RISK AND FARM SYSTEMS**

**The dynamics of a dairy business in a turbulent world**

*Doole, G, & Romera, A.*

The management of a farm is challenging. Farmers seek to maintain sufficient drawings, while building wealth. However, this is difficult due to volatile prices and production. Additionally, expensive farm assets inflate debt repayments across time. Equity also fluctuates, as farmers smooth consumption by tactically paying down or drawing on debt. These dynamics between durable, financial, and natural capital are seldom considered together. Yet, they are central to the analysis of farm businesses. The development of a framework for the analysis of farm viability across time in a stochastic environment is described. The application focuses on the business dynamics of a New Zealand farm for which price, production, and capital gains vary across time. This work highlights the importance of considering the impacts of time and variation when evaluating business strategies and the impacts of policy on farms and farm viability. This has broad implications for the design of policy to reduce the environmental footprint of agricultural firms.

**Feed use intensification and technical efficiency of dairy farms in New Zealand**

*Ma, W, Renwick, A, & Bicknell, K.*

In recent years, the dairy sector in New Zealand has shown an increasing trend towards intensifying pasture-based dairy farming through the use of imported supplementary feed. A number of possible reasons for this trend have been identified such as to enhance dairy productivity, overcome pasture deficits and improve body condition of milking cows. However, there is a lack of knowledge as to how this structural change affects technical efficiency of dairy farms. This paper fills the research gap by analyzing the impact of imported feed use on technical efficiency of dairy farms. A one-step stochastic production frontier analysis is applied to a balanced panel of 257 dairy farms for the 2010-2013 periods. The empirical results show that the average technical efficiency is estimated at 92.6 per cent for dairy farms in New Zealand, and that efficiency is positively and significantly influenced by the imported feed use, farm location and milking frequency.

**Dairy progression pathways: volatility and developing new operating structures**

*Fisher, A.*

Low milk prices have been a factor in dairy farmers changing operating structures to cope with reduced milk income and profit margins.
Almost one-third of farm businesses have sharemilking or contract arrangements with progressing farmers being responsible for the daily farm operation. The traditional pathway to farm ownership of herd owning sharemilking (50:50) has been in decline for 20 years - does this mean farm ownership is unattainable for younger farmers? This paper discusses how sharemilking has changed over the past 20 years. It will consider recent alternative operating structures and goals for progressing farmers.

**Measuring efficiency of NZ dairy farms with DEA and PCA using panel data**

*Siddique, M, Tozer, P, &Shadbolt, N.*

Since 2006, a great deal of price variability and volatility has been observed in global dairy trade prices as well as New Zealand farm gate milk prices. Milk price, on average, has an increasing trend but a great variation can also be observed. This higher milk price can lead to higher income and profits if New Zealand dairy farmers respond to these price changes accordingly and adjust their input costs. Therefore, the prime objective of this paper is to know how farmers react to volatile prices during this period and this can only be done by analyzing farmer responses over a period of time using panel data. Data envelopment analysis (DEA) was executed on a balanced panel of 54 dairy farms over eight years to (i) to estimate technical (TE) and scale (SE) efficiencies of these farms and (ii) to compare and analyze the behavior of these farms based on their TE and SE during this time. However, for a wider audience from other fields of studies such as management where DEA is not very common, Principal Component Analysis (PCA) was used to measure financial and technical performance from financial and physical key performance indicators (KPI’s) that serve as a latent construct for financial and technical performance with the help of PCA. The results from the panel data of revealed that there were 15 farms that were both technical and scale efficient, 22 farms were scale efficient only, 5 farms were technical efficient only, and 12 were inefficient farms. Farms that were both technical and scale efficient did not change the three inputs (land, labor, and number of cows) and these farms slightly adjusted inputs to find optimal point of their production. Majority of the farms that were only scale efficient suddenly increased or decreased these three inputs irrespective of price fluctuations. Usually a trend of increasing peak cows milked and land can be seen in these farms, however, several farmers also decreased these inputs. The farms that were technically efficient only did not respond to price changes significantly but flexed within the system by slightly changing the inputs. A great variation in terms of peak cows milked, area and labor can be seen in all the inefficient farms. Irrespective of price fluctuations, these inefficient farms keep increasing or decreasing inputs and ended up in low technical and scale efficiency.

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| **Friday 8.30 – 10.30 – Kauri Room**  |

**CLIMATE AND FARMING**

**Hedging drought risk in Kenya with weather derivatives: The potential use of options**

*Kiremu, M, Scrimgeour, F, & Hewa-Wellalage, N.*

This paper examines the viability of Index Based Weather Derivatives as a drought risk management tool for maize farmers in Western Kenya. Option contract prices were estimated using rainfall and SPEI indices during the growing period. Burn analysis and the equilibrium pricing models were used to characterize the challenge. The study finds that farmers would have benefitted if they had consistently hedged against drought using option contracts. Further, pricing option contracts using the SPEI index and the equilibrium pricing model gives an indication of the frequency the option contracts would have saved farmers from significant economic losses. Ongoing research is recommended to explore alternative ways of utilising SPEI data in the design of option contracts.

**Empirical estimation of the impact of weather on dairy production**

*Bell, K.*

The vast majority of the land used in agriculture supports livestock systems, with the vast majority of this land in pasture. Due to concern about the environmental effects of changing land uses, and expected future demand increases for animal products, it is crucial to understand how these systems will react to future climate change. Using data on the production and quality of milk produced in New Zealand, this paper estimates the nonlinear relationship between weather and dairy production. I estimate models both restricting response functions to be the same throughout the dairy season and allowing for heterogeneity by time-of-year. I find large and negative impacts of moderate to high temperatures in summer months and large and positive impacts of moderate temperatures during winter months. I give suggestive evidence that allowing for seasonality in responses results in less pessimistic projections of the response to future climate change in this context. I find statistically, but not economically, significant negative impacts of rising temperatures on milk quality.

**Key drivers of GHG emissions on New Zealand dairy farms**

*Davidson, R & Newman, M.*

The agricultural sector accounts for almost 50 percent of New Zealand’s gross carbon dioxide equivalent GHG emissions, with biological GHG emissions from livestock (cattle and sheep) the main source. From 1990 to 2014 GHG emissions from agriculture rose by 15 percent, linked to the expansion of the dairy industry. New Zealand is required to reduce emissions under the Paris Agreement, with biological GHG emissions from agriculture a key area for reductions.

This paper presents the findings of a GHG analysis project, identifying the key drivers of GHG emissions on New Zealand dairy farms. Physical and financial data in DairyBase and environmental data in Overseer for over 400 farms nationally were analysed. Statistical analysis and multivariate regressions were conducted for a range of physical, financial and environmental parameters to analyse and test relationships between farm inputs, outputs and GHG emissions. The aim of this analysis was to improve the current understanding of what a ‘typical’ GHG footprint looks like, the variation in GHG emissions across regions and the key on-farm drivers of GHG emissions for New Zealand dairy farms. With the linkages between the drivers of GHG emissions and water quality from dairy farms, 41 Southland farms were used to investigate the impacts on GHG emissions when applying on-farm mitigations to reduce nitrogen leaching to water.

**Enabling a transformation in New Zealand’s bioeconomy**

*Wreford, A, Bayne, K, Edward, P & Renwick, A.*

The 2009 OECD call for a global transition towards a bioeconomy has resulted in a number of nations adopting national or regional strategies to develop their bioeconomy. New Zealand’s large biological resource base and a well-established cultural heritage in farm production, especially a global dominance in livestock production, should make it well-positioned for bioeconomy-based wealth creation. However, ecological and societal limits require the current economic farming model to be re-evaluated. Using a transformation lens, in conjunction with a bioeconomy framework, this paper discusses what is required for New Zealand to transform into a fully functioning bioeconomy. The paper identifies several critical elements of a bioeconomy that are either not fully developed in New Zealand, or are clearly lacking, most notably finance and governance, and the need for public engagement in policy. It concludes that to enable New Zealand to realise the potential opportunity the bioeconomy offers, a more integrated and cohesive primary sector model is required that goes beyond tweaking the existing (livestock and primary-based) regime towards supporting and developing new niche production sectors, based on a clear vision jointly conceived with wider society.

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| **Friday 11.00-11.30 – Tawa Room**  |

**TRADE II**

**The influence of New Zealand’s monetary policy and regulation on export competitiveness**

*Evison, D, & Turner, D.*

One of the justifications for the deregulation of the New Zealand economy in the 1980s was to improve export competitiveness. Export competitiveness can be measured by the real exchange rate, which combines the effects of two key determinants of competitiveness – the currency exchange rate with key trading partners and the relative inflation rates between New Zealand and each of those trading partners.

The data show that New Zealand’s competitiveness has declined dramatically since economic deregulation. The data also show that other small open economies – Chile and Singapore have not experienced the same decline in competitiveness, over the same period. This indicates there may be some difference in their monetary policy settings, to avoid this situation. The direction of real exchange rates and their volatility are both important to New Zealand exporters and importers.

The Reserve Bank‘s single-minded focus on inflation has been broadened by recent changes in legislation. However the New Zealand currency is anomalous in the amount of trade that occurs, and most of that trade is not driven by demand for the currency for trade in goods and services. It is suggested that changes in regulation may improve this situation for those who are contributing to New Zealand’s wealth through exports of goods and services.

**New Zealand’s trade prospects in an uncertain Trans-Pacific Partnership (TPP) environment: results from gravity model**

*Shakur, S.*

This paper applies a modified gravity model to assess trade patterns between New Zealand and its major trading partners, including potential TPP members using annual pre-agreement data for the period 2000-2015. Although the Agreement, in its current form, cannot enter into force without the US participation, the remaining members have reaffirmed their commitment to TPP. The assumptions of the traditional gravity model that economic size would positively affect bilateral trade flows between countries while distance would negatively affect this outcome was tested. Results from this research suggest that New Zealand tends to trade more with larger countries and having free trade agreement with major Asia-Pacific countries will enhance New Zealand’s merchandise trade, especially exports of agricultural products.

At another level, trade intensity index (TII) and the revealed comparative advantage (RCA) between New Zealand and potential TPP members were also calculated in this research. When applied to potential TPP countries, calculated TIIs show that there is not enough evidence to suggest that TPP would necessarily improve New Zealand’s trading relationship with member countries, yet it would reinforce the existing trade patterns. Calculated RCAs in this research indicate that the trade creation effects are likely to be larger than trade diversion effects. Generally speaking, the TPP countries are sharing different RCA in different product groups. Although the status of TPP remains uncertain at this time, this study could provide some useful predictions about the likely trade effects on New Zealand merchandise trade after some variant of the TPP become a reality.

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| **Friday 1.30-3.00 – Tawa Room**  |

**TRADE III**

**Impact of energy consumption and trade liberalisation on the environment in Vietnam**

*Tran, M, Gan, C, & Hu, B.*

This study provides a quantitative assessment of the impact of trade openness on Vietnam’s environment and the amount of CO2 emission over a period of 29 years from 1985 to 2013. An Auto-regression Distributed Lag (ARDL) model is applied to estimate the impact of trade openness on CO2 emission. The study found a significant negative long-run equilibrium between economic development, trade openness and energy use on CO2 emission in Vietnam. Trade liberalisation exhibits negative impact on CO2 emission. More specifically, a 1% increase in trade openness leads to 0.19% increase in CO2 emission in the long-run elasticity; and a 1% increase in trade openness leads to 0.15% increase in CO2 emission in the short-run elasticity. The empirical results show that the long-run relationship between economic development and CO2 emission in Vietnam can be expressed in an inverted U-curved function. In term of energy consumption, the results show that energy usage negatively affect CO2 emission. A 1% increase in energy usage leads to 1.39% in CO2 emission in the long-run which strongly indicates the inefficiency of CO2 treatment of energy use in Vietnam. Thus the environment quality in Vietnam can be improved with cleaner technology and stricter regulations on environmental protection incorporated into international economic at the policy level in Vietnam.

**An empirical examination of the J-Curve: New Zealand’s bilateral trade with the selected countries.**

*Bano, S & Hassan, G.*

This study examines the J-Curve and New Zealand trade. The J-curve hypothesis suggests that the devaluation or depreciation of a country’s currency worsens the trade balance in the short run before improving in the long run. Using econometric methods and other standard approaches including cointegration, unit root tests, and error correction modelling (ECM), this study investigates the short run as well as long-run effects of the nominal exchange rate changes on the bilateral trade balance between New Zealand, Australia, USA, UK, China, India, Japan and Singapore. The study used disaggregated quarterly data from 1990Q1 to 2014Q4 period for the analysis.

The results show some evidence of J-curve effects in the case of New Zealand and China and New Zealand and Japan. Findings provide no evidence that supports J-curve effects in the case of New Zealand and other trading partners. However, diagnostic tests suggest that there are some omitted variables existed in the models suggesting that the bilateral exchange rate is not a key determinant in explaining the variations in New Zealand’s trade balance with selected trading partners.

**Export performance and productivity of New Zealand firms: Evidence from a continuous treatment model**

*Luo, Y, Scrimgeour, F, & Bano, S.*

Theoretically, two hypotheses are often used to explain the relationship between exporting and productivity. Recent micro-econometric studies show that exporting firms tend to be more productive than non-exporters, which points to the self-selection hypothesis. On the other hand, no consistent evidence of the learning-by-doing hypothesis has been found so far. One possible reason is that most studies are based on the difference in firms’ productivity growth giving their export status- used as a binary treatment variable. However, exporting is often not a simple decision but a continuous process that might be captured by firms’ export-sales ratios. This paper empirically investigates the export performance and productivity of New Zealand firms, applying the Generalised Propensity Score methodology. In doing so, the influence of different levels of export-sales ratio on productivity growth can be estimated. We find that New Zealand firms that switch from non-exporting to exporting achieve an increase in their productivity growth. However, there is a minimum export-sales ratio that exporters must exceed in order to benefit from learning-by-exporting. In addition, investment in R&#38;D improves productivity at firm-level.

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| **Friday 1.30-3.00 – Miro Room**  |

**RURAL SOCIETY**

**Testing indicators of resilience for rural communities**

*Kaye-Blake, W, Stirrat, K, Smith, M, & Fielke, S.*

The resilience of rural communities – their ability to adapt to change over time – is a concern in itself and for its effects on the agricultural sector. The present pilot study investigated the possibility of using official statistics for the purpose of measuring resilience, and in particular tested the possibility of identifying resilience thresholds for the indicators. The study used community workshops to investigate the drivers of self-reported resilience among residents of four rural communities in New Zealand, and then compared the self-reported ratings against indicators from official data sources. The self-reported ratings of overall community resilience tended to be more influenced by economic and institutional drivers than social, cultural, or environmental drivers. In addition, the overall self-reported resilience ratings tended to match estimations of resilience based on official statistics. It was therefore possible to identify resilience thresholds for these indicators, that is, values of indicators that reflect more and less resilient communities. Replicating this method in a larger study would provide policymakers with useful information about priorities for rural communities.

**Effects of education and gender on attitudes and behaviours in New Zealand**

*Brown, P, & Wiercinski, B.*

In survey research in economics, the effects of education on outcomes of interest are often analysed by looking at the level obtained or number of years completed, disregarding the field in which that instruction was focused. Similarly, sex is often analysed using the sex of the survey respondent, not taking into account intra-household decision making. Using the 2015 Survey of Rural Decision Makers, we define education not just by the level achieved but also by whether the field of study is relevant to the outcomes of interest (in this case, farming). We define sex not just by the sex of the survey respondent but whether the respondent is the sole decision maker on the farmer or whether he/she is jointly responsible for decision making with a spouse. Our main findings are that farm-relevant education increases the probability of implementing certain best management practices, adopting new technologies, accepting risk, and farming as a vocation rather than family tradition. Male sole decision makers have higher probabilities of adopting new technologies, accepting risk, and planning to intensify current land uses as well as converting to new land uses in the future

**Preview of the 2017 Survey of Rural Decision Makers**

*Brown, P.*

The Survey of Rural Decision Makers is New Zealand’s largest ongoing survey of the primary industry. It provides detailed information on ownership and business structure, management practices, water and irrigation, technology adoption, perceptions of climate change, native habitat and pest control, values and preferences, farming objectives, future planning, community participation, labour, demographics, and opportunities and challenges in the rural sector. More than 1500 commercial farmers responded to the survey in 2013, and more than 3300 commercial and lifestyle farmers responded to the survey in 2015.

These data have been used to conduct research on the relationships between networks and innovation; complementarities in practices for managing erosion and sedimentation; the effects of gender and education on values and farm outcomes; the interrelationship between successorship and investment; the values of adopters of best farming practices; and the effects of drought on expectations regarding climate change.

The 2017 Survey of Rural Decision Makers is currently in the field. As farming has evolved, so has the content area of the survey. This presentation will provide an overview of this unique data resource and will highlight some key preliminary findings.

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| **Friday 1.30-3.00 – Rimu Room**  |

**FOOD SAFETY**

**The determinants of food safety risk perception in Vietnam**

*Ha, M, Shakur, S, & Do, K.*

Extensive media reports of food safety incidents in recent years have resulted in consumers’ growing concerns about food safety, particularly vegetable safety in Vietnam. Previous consumer studies in Vietnam asserted that consumers’ confidence in food, particularly in vegetables was very low. However, the determinants of Vietnamese consumers’ perception of food safety risk and perception of food safety risk of vegetables have not been intensively investigated and quantified. This paper aims to investigate factors influencing consumers’ perception of food safety risk in general, and perception of food safety risk of vegetable, in specific. To this objective, we conducted a consumer survey that covered three representative socio-geographical areas of Hanoi including urban, semi-urban, and rural area. We found that perception of food safety risk was determined by the regional factor, number of food safety concerned issues, risk perceived of common food products, and information about food incidents. Perception of food safety risk of vegetables in specific was shaped by the level of trust in responsible institutions, information acquisition about food incident, whether the family grow vegetables, perceived knowledge, perceived control, and perceived consequence of potential hazards in vegetables. To reduce consumers’ anxiety about food safety and vegetable safety, a better risk communication which takes in to account the disparity between rural and urban region is required. In addition, stakeholders in the food chain and the government need to take urgent actions to restore consumers’ trust, this thereby would reduce risk perceived of vegetables.

**Consumer preferences for attributes in food and beverages for beef and wine in the US; preliminary results**

*Saunders, C, Tait, P, Dalziel, P, Guenther, M, & Rutherford, P.*

This study examined consumer attitudes towards attributes in beef and wine in the United States. It identified the types of products consumed and their frequency. The attributes assessed included basic attributes such as price and quality, but also extended to food safety and health benefits, as well as environmental and social attributes. The importance of factors affecting key attributes were examined in more detail. In addition, the research assessed the knowledge of New Zealand and the attributes associated with New Zealand products. The study used a panel survey with 800 consumers of beef in California as particularly relevant to New Zealand exports. The Our Land and Water National Science Challenge funded this research.

**Modelling New Zealand dairy production: The impact of traceability between the farm and the factory**

*Welsh, M & Marshall, S.*

Traceability is the capability to trace goods throughout the distribution chain. Traceability has become an increasingly important research area in recent years. It has always been an important aspect of production, but recent contamination events have highlighted its significance. The Fonterra botulism scare of 2013 in particular exposed a need for fast accurate product tracing in the New Zealand dairy industry.

We present a Markov chain model for the flow of milk through the early stages of the dairy supply chain. The state of the Markov chain is the value of product at each location in the production chain, in this case the milk tanker, factory reception or processing.

The model incorporates parameters for product testing and tracing upon arrival in each state of the model. By varying these parameters we are able to alter the precision of the traceability system, and gain an understanding of where and when traceability has the greatest impact. By analysing the results of simulations under various scenarios we are able to estimate the value traceability can contribute to the output of the production chain.