NZARES

Conference
"On-farm impacts of environmental policy"

28 – 30 August 2013 at Lincoln University, Canterbury

NZARES Contributed Papers 2013

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DairyNZ

Thursday 11.00 – 12.30 – Foyer

Contributed Paper Session I

Session Chair – Paul Dalziel

Land Use Modelling

Zack Dorner *- Changing Rural Land Use in New Zealand 1996 to 2008*

Rural land use in New Zealand is an important driver of economic activity, and has clear implications for our environmental performance, such as in the areas of biodiversity, climate change emissions and water quality. Rural land use is always changing, but change occurs very slowly. This paper looks into whether changing economic variables have any predictive power on changing rural land use in recent years. To do this I attempt to answer three questions: Do recent commodity prices have any predictive power on land use conversions? Is recently sold land more likely to change use? Does land which is marginal between uses have identifiable characteristics? I use the New Zealand Landcover Database version 3 (LCDB3), which has observations across all New Zealand for the years 1996, 2002 and 2008, the ANZ commodity price index and QVNZ land sales data, and control for land quality. By shedding light on these questions I hope to increase understanding of what drives rural land use changes in New Zealand, or perhaps what does not drive change.

Levente Timar *– The Land Use in Rural New Zealand Project: Spatial land use, land-use change and model validation*

Agricultural activities and forestry are significant in many (regional) economies and also have significant effects on environmental outcomes of public concern: greenhouse gases, water quality and demand, biodiversity and aesthetics. Having good information on current land use, the ability to create plausible projections of future land use and enough understanding of underlying land use drivers to simulate the potential impacts (environmental, economic and distributional) of different policy options helps inform decision making. The spatial distribution of land use and land use change is important for many decisions. Examples include issues of water quality and availability, planning of electricity and transport infrastructure, minimizing vulnerability and exposure to changes in climate and extreme weather events, pest control, food security, etc. The LURNZ model was first documented in 2007. Since that time the model has evolved in many ways and been used for a wide variety of purposes. We have now completed and documented a significantly improved version. This presentation describes the current model and presents validation of two key aspects: the spatial allocation of land use change and the spatial allocation of greenhouse gas emissions and removals.

Sean Hyland *– Rural Land Values and Commodity Prices: Research into Contingent Values and Future Land-use*

Existing models of rural land-use consider a structural mapping from land characteristics to future land-use based on absolute advantage. We suggest an alternative approach; examining the sensitivity of land prices to the set of commodity prices. Whilst informing the future of New Zealand's emissions profile, one benefit of this approach is that contingent valuations reflect the resilience to agricultural shocks. We develop a stylized theoretical framework to show that price sensitivity reflects the probability of future production across potential land-uses, over and above current land-use. Further, in the presence of a set of real world extensions price sensitivity remains a sufficient summary statistic for land suitability. To evaluate this approach we consider whether contemporaneous land price sensitivity differs across parcels who convert between uses in the future. We find suggestive evidence that the sensitivity of land prices with respect to forestry prices between 1996 and 2002 is

significantly increasing in the change in the share of forestry from 2008 to 2008, controlling for initial land-use. This suggests a reduced-form modelling technique provides an important check for or improvement over, current methodology.

Thursday 11.00 – 12.30 – C1

Session Chair – Brian Bell

Governance and Water Quality

Professor Frank Scrimgeour *– Governance and water pollution: an institutional ecological economics analysis*

This paper investigates the effect of governance on levels of water pollution by industry category in a sample of OECD economies. Using an institutional ecological economics conceptual framework, the effects of several measures of governance are empirically examined across specific industry groups. Our findings reveal that regulatory quality, government effectiveness, control of corruption and voice and accountability are negatively and statistically significantly correlated with water pollution in chemical and textile industry categories. We also find negative and statistically significant correlation of the rule of law with water pollution in the chemical and food industries. We conclude that governance matters for mitigating industrial water pollution.

Mark Christenson & Maree Baker-Galloway *– The Inconsistent Regional Management of Farming Effects on Waterways*

Carrots or sticks? Rules or management plans? Science or best practice? The debate and seeming reinvention of the wheels in each region over the management of farming effects on waterways is intensifying, and is in the context of increasing reforms of the overarching legislation the Resource Management Act, and increasing pressure and incentive from the government for agricultural intensification. Resource Management law in New Zealand is dynamic and under constant reform. It is also grappling with new and unprecedented issues previously not addressed, or not apparent, including the cumulative effect on lakes and rivers of farming activities. Some of the changes to the RMA are applauded while others face fierce criticism. Plans/policies are created by Central Government, regional councils and district councils. They all must fulfil their respective duties and obligations. Regardless of hierarchy every planning instrument must achieve the overarching purpose of the Act, sustainable management. And at the end of the day, these plans are increasingly having a direct impact on farming operations. Gone are the days when agriculture was largely untouched by regulation. Nutrient discharges in particular are the current focus of many plans, and it is becoming apparent that there is not one standard approach. Several regional councils have moved onto or are in the process of moving onto their second generation regional plans. Some of these like the Horizons One Plan have approached nutrient discharges by ensuring all new and existing intensive farming practices within identified nutrient management zones require resource consent to operate, with allowable nutrient discharges reducing over a 20 year period. Other plans such as The Waikato Regional Plan in relation to the Lake Taupo catchment sets nitrogen caps on all properties in the catchment based on the individual property's highest leaching rate between 2001 and 2005 in an effort to reduce nitrogen leachate into the lake to 2001 levels. The hearing committee on the Proposed Canterbury Land and Water Regional Plan is currently debating which approach it will take to managing nutrient discharges. In Otago the Regional Council has set nutrient discharge allowances in a permitted activity framework. In Southland the Regional Council has provided the maximum loading rate for agricultural/dairy effluent for permitted activities it also categorises soil types based on its drainage capacity, depending on where an activity is located dictates the discharge classification. Southland has also gone the extra step of making all new dairy farming activities

discretionary. Whichever approach is utilised it must demonstrate that it can achieve the purpose of the Act. This paper will describe the range of ways in which regions are attempting to regulate agriculture, in order to give effect to the RMA and keep pace with the ongoing reforms and increasing knowledge in this field.

Ronlyn Duncan *– A view from the farm-gate: farmers' perspectives on water quality*

Calls for a shift to 'best management practice' is a dominant message being sent from regional councils and industry groups to farmers across New Zealand to reduce nutrient losses from agricultural land use. It is also now enshrined in many regional plans. The research presented examines how farmers are interpreting these calls for change around nutrient management and water quality. The research is testing accepted wisdom which is currently focused on overcoming what is assumed to be a lack of desired behaviour by filling assumed gaps in farmers' knowledge. Science studies scholars argue that this 'deficit model' can not only miss the mark but can alienate the people to whom reforming messages are sent. If this is the case, the challenges for bringing about change across the agricultural sector to reduce nutrient losses are far greater than are currently anticipated. Drawing on science studies theory and a thematic analysis of semi-structured interviews with farmers across the Hurunui-Waiau region, this presentation provides farmers' perspectives on the relationship between land and water and illuminates the complexity of the tenuous links between knowledge and action.

Thursday 11.00 – 12.30 – C2

Session Chair – Kathryn Bicknell

Consumer Preferences for Food

Nic Lees *– What food should we eat? Local, safe or environmentally sustainable food*

What food should we eat? Local, safe or environmentally sustainable food. Consumers throughout the world are demanding greater variety and quality in the food they eat. They require a consistent supply of high quality, safe food at an affordable price. They also want food that aligns with their own personal values. This includes such things as environmental sustainability, animal welfare, fair trade as well as such things as local and organic production. At a national level governments want to achieve food security, support local agricultural development and address issues environmental issues such as climate change. Within an increasingly globalised and complex food system these issues are often conflicting and not easy to resolve. This paper focuses on a case study of how Waitrose supermarket in the United Kingdom addresses these issues within their lamb supply chain. Waitrose are able to ensure that their customers have a twelve-month supply of quality lamb meeting the highest standards of animal welfare and environmental sustainability. They also support the livelihood of their farmer suppliers through premium prices and improvements in farm productivity. This is achieved in the highly competitive United Kingdom supermarket environment and this strategy provides Waitrose with a sustainable competitive advantage.

John Saunders *– Consumer attitudes towards and willingness to pay for NZ food attributes in the UK, China and India and the impact on NZ producer returns*

The value that consumers place on different food attributes is likely to differ between countries and commodities. Thus, understanding consumer preferences and attitudes in different countries towards food is important in meeting their requirements and enhancing both market access and the value of food exports. This study aims to examine these preferences and attitudes towards a number of food attributes and origins, alongside consumer's willingness to pay (WTP) for food certified for these

attributes. The study concentrates on China, India and the UK, being three important export markets for New Zealand's food exports. The study further assessed the economic impact of the WTP for food certification in each of these countries on New Zealand (NZ). The study utilised two web-based surveys undertaken in each country, stratified by social class or income. A choice experiment was used to elicit consumers' WTP for food products certified for several attributes. The partial equilibrium Lincoln Trade and Environment Model (LTEM) was then used to calculate the economic impact on NZ for food product's certified for food safety, animal welfare and biodiversity enhancement from the various WTP results. This study found that consumers in China, India and the UK valued environmental, social and basic attributes in food products positively. Consumers were willing to pay up to 77 per cent extra for food products certified for various attributes. In many cases, Indian and Chinese consumers valued these attributes more than consumers from the UK, especially for environmental quality, animal welfare and recyclability. Projections showed the impact on NZ producer returns was significant, with the highest returns for food safety certification of NZ produce. Results from this study will allow NZ farmers and growers to better determine and interpret market signals and align them with on and off farm practices, for the benefit of higher returns from agricultural exports.

Peter Tait *– Decomposing the value of New Zealand's 'Clean-Green' brand in food exports: a choice experiment valuation of environmental sustainability attributes of lamb and dairy food products in India and China*

Concerns about the state of the environment have spurred growing consumer demands for food products that have sustainability attributes including information on the environmental impact of production processes. For New Zealand, assessing the role of the 'Clean-Green' brand in export market consumers purchase decisions is of crucial strategic importance. In a series of choice experiments concerning lamb and dairy product purchase decisions, this study estimates willingness to pay for environmental sustainability attributes in India and China alongside animal welfare and food safety, and tests for differences according to the country of origin. Results indicate that environmental sustainability attributes significantly influence consumers' purchase decisions for both products in both countries; however food safety and farm animal welfare are found to be valued more by both Indian and Chinese consumers. Respondents are more likely to purchase lamb and dairy products from New Zealand that have production processes that enhance biodiversity and minimise water pollution. These results support primary sector initiatives to improve environmental performance and aid stakeholders in identifying which elements of the 'Clean-Green' brand influence product choice.

Thursday 11.00 – 12.30 – C3

Session Chair – Geoff Kerr

Understanding Environmental Trends

Adam Jaffe *– Diffusion of Environmentally Beneficial Technology*

It is widely agreed that the long-run mitigation of many important environmental problems will require widespread diffusion of new technologies and practices. The phenomenon of technology diffusion has been studied in various ways in distinct important contexts: agriculture; buildings and household appliances; industry; transport; power generation. In each of these sectors, it is clear that diffusion of new technologies is not instantaneous, and multiple contentious debates have arisen regarding the extent to which slow diffusion of apparently superior technology results from market failure, and the extent to which it represents users' optimal investment decisions under uncertainty. This paper analyzes the extant modelling and empirical evidence across these multiple sectors, and

describes the features that are common across sectors and those that are sector-specific. It then discusses the implications for environmental policy of explicit incorporation of technology-diffusion impacts.

Mohan Gurung *– Economics REDD+ Underlying causes of deforestation and proximate causes of forest degradation: Evidences from the Terai Arc Landscape of Nepal*

[Note: this paper is a late addition to the programme; an abstract was not available at press time.]

Suzi Kerr *– Consuming carbon in New Zealand*

Per capita emissions are usually created by taking total Kyoto emissions and simply dividing by population. However this focuses on (a subset of) emissions associated with production within New Zealand. From the point of view of an individual, these are not the emissions they control, and hence can mitigate. Individuals can calculate their 'carbon footprint' but tools to do this focus on a few categories of emissions (mostly electricity and direct fuel use) and emissions footprints are not available for a wide range of households so cannot be used for comparative analysis. This paper explores how the carbon emissions related to the consumption categories of households in New Zealand vary with household characteristics. We use product consumption data from the 2007 Household Economic Survey. Consumption within each category is linked to a carbon intensity multiplier (tons of CO2/dollar of consumption) which is derived from: the official 2007 input-output table of 106 industries produced by Statistics New Zealand; energy data on CO2 per PJ of fuel in each industry from the Energy Data File provided by MBIE; and the Energy Greenhouse Gas Emissions Report provided by the Ministry of Business, Innovation & Employment. Previous literature has used similar methods to calculate the incidence of a carbon tax (e.g. Creedy et al 2004). This paper uses these methods in order to study which sectors of household expenditure offer the greatest opportunities for mitigation and how these opportunities vary with household characteristics such as income decile, region and household composition. This requires that we apply emission factors to imports and exclude emissions associated with exports.

Thursday 1.30 – 3.30 – Foyer

Contributed Paper Session II

Session Chair – Matthew Newman

DairyNZ Special Session

***Sam Howard** – Methodology for assessing the impact of reducing N leaching – Case study Canterbury dairy farm*

Regional councils have requirements under the National Policy Statement for Freshwater Management to set water quantity and water quality limits for their respective regions. Limits to nitrogen leached from farmland are one policy tool that regional councils are increasingly becoming interested in using to help meet water quality outcomes. DairyNZ has been working to help inform regional councils of the on-farm implications of various policy options as policy processes develop. This paper will introduce the methodology that DairyNZ has been using to assess some of these potential outcomes, and will present a case study for a Canterbury dairy farm.

***Brian Bell** – Regional impacts from dairy farms meeting the N leaching requirements of the Horizons One Plan*

DairyNZ has partnered with Nimmo Bell, Market Economics and Horizons Regional Council to conduct a more robust cost-benefit analysis (Section 32) to determine the impacts of the One Plan for the dairy sector in the Horizons region. The objective of this project was to develop an economic model which is capable of analysing the different One Plan implementation pathways, the council may take in order to meet the Environment Court decision. The analysis involves modelling on-farm efficiencies, mitigation actions to reduce N leaching and their associated economic costs for dairy farms in the priority zones. The Economic assessment will determine the impact for the industry at a sub-regional, regional and national level. The modelling will assess the impacts of farms meeting the requirements of the Restricted Discretionary Consent, through Good Management Practices (GMP) as well as the unrealistic scenario of all farms meeting the targets, i.e, all farms achieving consent via the Controlled Activity pathway. This session will discuss the project to date, including determining implementation pathways, dairy farm analysis including a cost benefit analysis conducted by AgFirst to determine the impacts of a farm moving to a higher input system, cost benefit analysis and regional economic modelling plus present any results available.

***Darran Austin** – Waikato Joint Venture to estimate the impacts of improving freshwater quality*

The Waikato Joint Venture Project (WJVP) has been created to provide analysis on the trade-offs around managing water quality and quantity as part of the Government's Fresh Water Reform. This work is a joint effort involving the Ministry for the Environment [1], Dairy NZ, Waikato Regional Council (WRC) and the Waikato River Authority (WRA). The Total Economic Value (TEV) approach identifies and quantifies (where possible) all direct use and non-direct use values of water and the impact of water policy limits on these values in terms of environmental, economic, social and cultural costs and benefits. This session will discuss the Joint Venture to date, including the framework, processes, methodologies, results for the Upper Waikato dairy farm economic modelling project, and Upper Waikato catchment level modelling undertaken in stage one.

Dan Marsh *– Experimental Economics Lab*

DairyNZ is committed to ensuring that dairy farming is sustainable economically, environmentally and in terms of how it affects people and communities. As part of this commitment DairyNZ is funding research that makes use of the newly developed research facilities at the Waikato Experimental Economics Laboratory (WEEL). Regional councils throughout New Zealand are in the process of drawing up plans to enable them to meet the requirements of the Resource Management Act and the National Policy Statement on freshwater. Some councils are working on targets for nutrient leaching at the catchment level and are considering alternative approaches to ensuring these targets are achieved. The aim of this paper is to describe the methods that will be used to investigate the farm level effects of agricultural policies by employing the methods of experimental economics and "test bedding" alternative proposals for farm and catchment level regulations aimed at improving water quality. The initial focus is on understanding the effect of alternative approaches to allocation of nutrient discharge allowances and rules governing trade or exchange of these allowances. The researchers will assess nutrient allocation and trading mechanisms using experimental economic methods to assess how people are likely to behave if such policies are implemented. This data on people's behaviour will then be used to identify allocation and trading mechanisms that best meet the needs of the dairy industry and the wider community.

Thursday 1.30 – 3.30 – C1

Session Chair – Murray Doak

Water Availability

Gael Price *– Drying out: Investigating the economic effects of drought in New Zealand*

We investigate the macroeconomic impact of drought on the New Zealand economy. We find, as expected, that real activity falls immediately following a drought. However, this is followed by some unexpected effects, including a large increase in world dairy prices – so large that export values and nominal GDP eventually increase following a drought. We use climate data collected from NIWA weather stations, aggregated with attention to the relative importance of different regions for agricultural production. This data is used in a standard, open economy, structural vector auto regression (SVAR) model that identifies drought shocks.

Mario Fernandez *– Decadal climate variability: economic implications in agriculture and water in the Missouri River Basin*

Economic research on climate and productivity effects of ocean phenomena has mostly focused on interannual cases such as the El Niño Southern Oscillation. Here Decadal climate variability (DCV) refers to ocean related climate influences of duration from seven to twenty years. The specific phenomena analyzed here are the Pacific Decadal Oscillation, the Tropical Atlantic Gradient and the West Pacific Warm Pool. Their positive and negative phases, occurring individually or in combination, are associated with variations in crop and water yields. This dissertation examines the value of DCV information to agriculture and water users in the Missouri river basin using a price endogenous agricultural and non-agricultural model that depicts cropping and water use. The model is used to evaluate the welfare gains and adaptations given various levels of DCV information. The analysis shows the value (for a 10-year average) for a perfect forecast is about 5.2 billion dollars, though 86% of this value, 4.55 billion dollars, can be obtained by a less perfect forecast based on already available data in the form of the prediction of DCV phase under transition probabilities. The results indicate that forecasting any DCV state is important because of differential responses in the acreage of major crops plus water use adjustments by residential, agricultural and industrial users.

Upananda Herath Paragahawewa *– Economics of Supply Reliability of Irrigation Water*

In this study, we have assessed the economic impact of potential increase in supply reliability of irrigation water in the Hinds Plains Area in the Ashburton district. The Hinds catchment has a number of irrigation schemes namely, Rangitata Diversion Race (provide water for Mayfield Hinds and Valetta Schemes), Barrhill Chertsey, Eiffelton and Lynford Schemes. All these schemes have varying supply reliability which approximately ranges from 40% to 80%. First, we estimated the relationship between water availability and pasture growth using experimental data. We then employed this relationship to estimate the potential incremental pasture growth with assumed increased supply reliability (95%) at farm level. We estimated the farm level benefit of increased pasture production in terms of saved costs in supplementary feed. These farm level estimates were used to assess the catchment level farm income gain. The catchment level income gain was then employed to assess the regional level economic gain (GDP and employment) by the socio accounting matrix input-output model (SAMI-O) simulation. Income gain at catchment level is estimated to vary from $16 to $17million. This implies an additional gain in regional level income (GDP) of $85 to $91million and additional employment of 137FTE to 207FTE. The study indicates the importance of an increase in irrigation efficiency at farm level for the local and regional economy and also discusses the potential environmental impacts of increase irrigation efficiency at catchment level.

Bryan Jenkins *– Progress of the Canterbury Water Management Strategy and some emerging issues*

In Canterbury the two most significant implications of environmental policy for farms are water availability and nutrient management. The implementation of the Canterbury Water Management Strategy was predicated on increasing water availability through the provision of storage and increased water use efficiency while addressing environmental flows, and, the reduction of nutrients from land use intensification. Some progress is being made in relation to the provision of storage, water use efficiency, environmental flow restoration and setting nutrient limits. This is occurring through an interesting mix of private sector initiatives, collaborative processes, and, statutory decisions regional plans. This paper provides a summary of progress and some of the emerging issues from these developments.

Thursday 1.30 - 3.30 – C2

Session Chair – Rod Forbes

Policy Design and Evaluation

David Keenan *– Optimal compensation policy for reporting of Bio-incursions*

The literature on bio-incursions focuses extensively on how diseases spread and what the appropriate actions are to deal with incursions once they are established. When the focus is on how a disease enters an area then analysis generally equates marginal cost of prevention to the marginal benefit or prevention with analysis of trade policy rather than farmer actions. So far little attempt has been made to analyse the incentives farmers are subject to with respect to compensation policy when they discover a new or recurring bio-incursion. This Honours project uses game theory to develop optimal compensation policy and compares the incentives for farmers to report under both optimal and current compensation policy in New Zealand. Current policy fails to internalise the externalities of poorly controlled incursions to the surrounding area and consequently is inefficient. Analysis suggests that policy could be improved under ideal conditions although results vary in the presence of imperfections such as imperfect and/or asymmetric information.

Lesley Hunt *– Turning farms into businesses: Some unexpected consequences of neoliberalism for New Zealand farmers*

A recent part of the transdisciplinary study of New Zealand farming carried out by social scientists from the Agriculture Research Group on Sustainability (ARGOS) was a retrospective interview of all ARGOS sheep/beef, dairy and high country farmers, and kiwifruit orchardists. In this interview their responses to 'shocks' over the past forty years was explored in order to examine farmer resilience and pathways to sustainability. What was apparent was how the 'good farming' model followed by New Zealand farmers and orchardists was expanding to include the notion that it was culturally acceptable to think of farming as a business. This change, which could be attributed to the influence of the environment of neo-liberalism in the policies of the New Zealand government since the 1980s, was freeing up farmers and orchardists to think of themselves and their role in new ways that provide unexpected and exciting possibilities for the resilience and sustainability of the agricultural and horticultural sectors in New Zealand. This paper illustrates some of the unexpected consequences of Government policy, showing how long it can take for policy to result in identity change and how closely identity is linked to practice.

William McGimpsey *– An evaluation of New Zealand's regulatory framework to support the reputations of horticultural products in export markets*

The New Zealand Horticulture Export Authority Act (HEA Act) has been in place since 1987. The HEA Act provides an enforcement mechanism for industry-imposed quality controls on horticultural products. Individual firm reputation, and the collective reputation of a group of industry participants, can be an important determinant of price for fresh fruit and vegetables. This is because, for these products, it can be difficult to assess quality before consumption. Any individual firm faces incentives to extract value from the collective reputation of a group. This may be particularly true for exporters deciding the destination markets for horticultural products. However, if all participants cooperate in supporting a reputation for high quality, the group may be better off in the long-term. The HEA Act aims to support the reputation of smaller horticultural based industries in international markets through mandatory minimum quality standards. This paper describes the HEA Act regulatory framework and outlines its key features, and its benefits and costs for New Zealand's horticulture based industries. The paper then assesses the effectiveness of the framework and the performance of those regulated industries over the last two decades.

Ann Yang *– An Evaluation of Self-governance in the New Zealand Bluff Oyster*

The use of self-governance as a fisheries management tool is increasing in New Zealand and elsewhere. Researchers argue that in theory self-governance can lead to improved outcomes, but evaluating actual benefits is difficult because of the need to distinguish self-governance impacts from other influences on fisheries performance. An indicator system was developed in this paper to evaluate the contribution of self governance to the performance of the Bluff Oyster fishery (OYU5), which is also managed under New Zealand's Quota Management System. There is evidence that self-governance makes a positive contribution to economic efficiency, institutional effectiveness and resource preservation in the Bluff Oyster fishery.

Thursday 1.30 – 3.30 - C3

Session Chair – Tony Schischka

Developing Countries – Agriculture and Trade

***Michael Lyne** – Efficiency and equity impacts of the rental market for cropland in Vietnam and sources of transaction costs impeding the market*

This research investigates the efficiency and equity impacts of the cropland rental market in rural Vietnam and attempts to identify the determinants and importance of transaction costs impeding this market. To achieve these goals, a generalised ordered logit model with shifting thresholds accounting for effects of transaction costs associated with market participation was specified and estimated using pooled data (for the sub-sample of rural households that farm, or that have farmland) extracted from the Vietnam Household Living Standards Surveys of 2004 and 2008. Overall, the findings show that the cropland rental market reduced imbalances in factor endowments at the household level, transferring cropland to more effective users (i.e. those more willing and able to farm) allowing them to specialise in agricultural production. Equity advantages were also revealed as cropland transferred from relatively land-rich to relatively land-poor households, allowing young prospective farmers to 'scale the agricultural ladder' and widow-headed households to earn income by renting out land that they could not farm themselves. However, the findings also reveal significant transaction costs that prevent the cropland rental market from functioning effectively. Importantly, the results highlight sources of transaction costs that effect lessors and lessees differently, and signal the relative importance of their impacts. It is recommended that the Vietnamese government should complete its land registration programme and consider relaxing restrictions on the use of wetlands to grow crops other than rice. It should also focus on improving access to all-weather roads as this encourages participation on both sides of the rental market whereas better access to communications infrastructure was found to promote only the supply side of the market.

***Kolawole Ogundari** – The paradigm of African Agricultural Efficiency, 1967-2012: What Does Meta-Analysis Reveal?*

Agriculture remains the main trust of many African countries, as the principal source of food and livelihood, making it a critical component of programs that seek to reduce poverty and attain food security in the continent. But in recent years, food insecurity has become a serious concern in the region, which is reminiscent of the same issue in Asia for decades earlier. And, improvement in agricultural productivity and efficiency has been identified as a major component of agricultural total factor productivity (TFP) growth that needs to be explored to effectively address food insecurity problem in the region. Given the significance of efficiency of agricultural production, the aim of the study is to understand the development of African Agricultural efficiency and its drivers over the years based on agricultural efficiency literature, covering 1984-2013.In this case, a total of 382 frontier studies were considered, which yielded 535 efficiency estimates because some of the studies reported more than one efficiency estimate. All the sub-regions in the continent viz. West, Central, South, East, and North Africa were equally represented in the selected studies. And for the empirical analysis, we employed meta-regression analysis (MRA) using fractional regression model to regress average efficiency scores on year of survey (from1967-2012) and other control variables such as functional form and type of data used among others in the primary study. Therefore, the regression result shows that the efficiency estimates from the selected case studies decreased significantly as year of survey in the primary study increases. Apparently, this result shows that negative efficiency change characterized the development of African agricultural production over the years as reveal by previous studies. Furthermore, the reviewed studies show that 41% identified education as a major driver of efficiency level over the years. This was followed by year of farming experience (27%), age (22%), extension (20%), household size (15%), and credit (16%). Given this, we suggest that policies

that prioritize investment in human capita development by encouraging young and educated people into farming coupled with improvement in extension services and activity should be seen as important recipe to increase efficiency and productivity of subsistence farmers that dominate agricultural production in the region.

Kenneth Msiska *– Establishing an Effective Phytosanitary Regulatory System: A Zambian Case Study*

Zambia, a landlocked country in southern Africa, imports plants and plant products. By virtue of its geographical location, traded plants and plant products also transit through the country. Importations and the transit of plants and plant products have the potential of introducing plant pests that affect agricultural production and limit access to export markets. Globally government institutions, especially National Plant Protection Organizations (NPPOs), play an important role in preventing the introductions of plant pests resulting from international trade. For this reason, Zambia requires an effective phytosanitary regulatory system. An essential component of such a system is an internationally acceptable Pest Risk Analysis (PRA) process. In this context, PRA is a systematic evaluation of the risks associated with the movement of plants and plant products in international trade. It is the basis on which scientifically based phytosanitary measures aimed at preventing the introduction of quarantine pests are developed. This paper highlights the essential elements of a PRA process and describes a critical assessment of Zambia's phytosanitary system and its capacity to undertake PRAs. Keywords: National Plant Protection Organization, quarantine pests, phytosanitary measures, Pest Risk Analysis, trade

Salil Bhattarai *– Factors Affecting the performance of Export-oriented Agribusiness Supply Chains from a Smallholder Perspective*

This study assesses the performance of the supply chains for two major export crops of Nepal (ginger and large cardamom) from a smallholder perspective. It aims to identify factors that constrain marketing choices available to smallholders, limiting the chain's robustness from their perspective. A model based on Transaction Cost Economics is used to analyse dyads between smallholders and their buyers. A qualitative case study method was used to analyse these chains and a cross-case comparison between two chains compared and contrasted the effects of exogenous attributes in dyads available to smallholders. Informal market trading was sole surviving dyad in both chains. However, there were evidences of failed relational contract in the ginger chain and the 'captive' relational contract in the large cardamom chain. A spot market trading or conventional contracting did never exist in these chains. Inability of these chains to sustain smallholder engagement in dyads other than informal market provided little opportunity to smallholders to select marketing channel based on different risk-reward trade-offs. Consequently, these chains are not robust from a smallholder perspective. Asymmetric information in long export chains could have constrained the development of a spot market. But, the underlying problem for farmers not being able to access a premium market was underinvestment in value-adding assets. It is recommended that marketing cooperatives are formed or restructured in line of new generation cooperatives to attract debt and equity capital required for local value-adding.

Friday 9.00 – 10.30 – Foyer

Contributed Paper Session III

Session Chair – Glen Greer

Farming – Practices, Attitudes and Influences

***Nan Jiang** – Cost Efficiency of Dairy Farming in New Zealand: a stochastic frontier analysis*

Historically NZ dairy farming has held a position as the lowest cost, non-subsidized producers of milk. Recently, this position has been eroded as a result of increases in labor and land costs, while other emerging countries, such as Argentina and Ukraine, have adopted lower cost production systems. This indicates a need to continually build competitiveness on efficient utilization of resources, both physical and financial. Literature on the efficiency performance of dairy farming in NZ is dearth and the focus to date has been on technical efficiency, which only reveals how well farms utilize the physical production process. This paper contributes to the empirical literature by examining the cost efficiency of NZ dairy farms. Simplified translog stochastic cost frontiers are estimated using an unbalanced panel of 824 dairy farms, observed during 1999-2005. Average cost efficiency is estimated to be around 83% for the North Island dairy farms and 80% for the South Island. Analysis of the relationship between inefficiency and farm characteristics suggests capital intensity, livestock quality and farm size all have significant associations with cost efficiency.

***Jill Greenhalgh and Philippa Rawlinson** – Beyond the tanker track: The social influence of dairying in Southland, 1992 to 2012*

The aim of this study was to investigate the social influence that the recent growth of dairying has had in Southland. Over 60 semi-structured and informal interviews were undertaken with a wide cross-section of organisations and individuals. Quantitative data was used to complement the qualitative data. The growth of dairying has provided sheep farmers with more farming options through dairy support and increasing their equity. It has created down-stream employment for dairy services and suppliers and, consequently, more employment opportunities. Rural communities are being revitalised through the influx of younger people. Primary schools are more multicultural and their roll decline has been arrested, but the transience associated with dairying creates problems. Community relationships have been affected by the different values of dairy farmers. Their occupational demands also affect their ability to participate in community activities. Southlanders perceive that dairying does impact on the environment with iwi recognising a loss of some traditional food sources. However, most participants believe environmentally-related compliance is improving. The overall finding is that dairying has revitalised an ailing Southland economy by creating a wider range of employment opportunities, drawing in a more youthful population, and generating a more diversified economic base. Key words: Southland, dairy farming, social influences, diversification, employment

***Daniel Gregg** – Complexity induced myopia: An analysis of a dynamic, situation-specific lottery experiment with graziers using cardinal utility*

We present a study which employed a computer-based dynamic, situation-specific lottery choice experiment to assess risk aversion, strategic thinking, and responses to complexity for a group of broad-acre rangelands grazing property managers. The experiment employed a design involving lottery-type choices over current farm income and future farm land condition to allow examination of respondents' risk preferences, treatment of uncertainty and their ability to trade current profits for savings (investments in land condition) as a driver of future profits. The land condition variable was specified as the driver of profit potential but it was made clear that the aim for respondents was to

maximise their 'profits' from the experiment. The complexity of the experiments, albeit far less complex than real-life decisions, meant respondents were unable to optimise over all possible choices due to: (1) Ambiguous uncertainty over future probability distributions, and; (2) Excessive calculation requirements for a priori optimisation even if future probability distributions were known. Nevertheless our analysis shows that the strategies employed by respondents indicated that some respondents employed strategies which allowed them to act as if they were strongly considering future options whilst some employed more short-term strategies. This paper focused on the estimation of myopia effects for a group of managers of broadacre grazing properties operating in the Australian rangelands – an area of high environmental variability and where significant private interests (grazing) coincide with significant public environmental values.

Friday 9.00 – 10.30 – C1

Session Chair – Phil Journeaux

Nutrient Trading – Policy and Modelling

Sarah Mackay *– Context, Commitment and compromises: Developing the Lake Taupo cap and trade scheme*

This paper explores the positions and contributions of the parties involved and affected, and the compromises made leading up to the successful implementation of a cap and trade scheme to protect Lake Taupo by limiting nitrogen into the lake. When scientific research identified deteriorating water quality, the community was to take on faith that a problem existed, and for farmers, that their activities were a major cause of the problem. The solution would affect all landowners in the catchment. Introducing regulation for diffuse nitrogen discharges challenged the long-held, presumed rights of New Zealand landowners, and risked being overturned by agricultural political forces. The journey to policy implementation was lengthy, yet despite these obstacles the process gave rise to individual and governmental leadership that carried the project to completion. Compromises were essential to successful implementation. These compromises would be important to the acceptance of the scheme by farmers, and the continuing viability of farming. A policy to reduce nitrogen discharges was implemented by creating a market and through the use of an independent publicly-funded trust to purchase allowances. To a large degree the objectives of the project have been achieved through a combination of government partnerships, the commitment of Ngati Tuwharetoa, sufficient scientific knowledge, and a series of innovative economic and regulatory actions designed to overcome negative economic outcomes.

Sandra Barns *– Taupo cap-and-trade: Market update*

This presentation reviews the market functioning to date and examines the property rights characteristics of the nitrogen discharge allowances. It is now 2 years since the policy that introduced the Taupo cap-and-trade scheme became operational. The Lake Taupo Protection Trust has traded in the market to successfully achieve the 20% reduction of nitrogen emissions required to reach the cap. Trades between landowners have also occurred. The process that developed the Taupo cap-and-trade scheme introduced formal rights for diffuse nitrogen emissions (NDA). The attributes of the rights associated with the NDAs are identified and discussed in the context of their contribution to the efficiency and effectiveness of the policy.

Oshadhi Samarasinghe *– Economic and environmental impacts of nutrient reduction policies and their design at the catchment-level*

Regional councils in New Zealand are considering implementing policies to reduce nutrient loads from diffuse sources in an efficient manner. There is an on-going discussion in New Zealand on the relative merit of various command and control and market based approaches that can be used to achieve loading targets without putting unnecessary strain on the regulator and covered parties. This paper uses an catchment-level economic land use model, NZ Forest and Agriculture Regional Model (NZFARM), to assess the economic, environmental, and land use impacts for achieving proposed nitrogen reduction targets in the Hinds Catchment in Canterbury. The policies evaluated include requiring good management practices, imposing farm-level nutrient caps with allocation options (natural capital, grandparenting, averaging, auction, etc.), and implementing a cap and trade programme with the same allocation options as the farm-level caps. We then assess how these policies could affect the distribution of costs across different land uses, enterprises, and landowners.

Friday 9.00 – 10.30 – C2

Session Chair – Frank Scrimgeour

The Incidence of Environmental Policy

Suzi Kerr *– Allocation and cost sharing in agricultural greenhouse gas markets*

New Zealand is a world leader in considering how to efficiently and effectively regulate to take advantage of mitigation opportunities in livestock agriculture. The cost of climate change mitigation is typically lower than the potential transfer of wealth through the requirement to pay for emissions and the free allocation of emission allowances. The politically contentious issue of cost sharing is therefore primarily about allowance allocation. Finding an acceptable allocation method is critical to incorporating agriculture within the Emissions Trading Scheme and achieving the potential environmental and efficiency gains. The final incidence of cost may not however be immediately apparent from direct consideration of the free allocation mechanism. Farmers are heterogeneous and they are able to mitigate and pass on costs. Some of the final impacts on profits will be capitalised in land values so will primarily affect those who own land when regulation is credibly announced. We consider basic principles for cost sharing, briefly discuss the incidence of regulation, and use the LURNZ model, to simulate and empirically compare different methods for allocating permits among heterogeneous farmers when farmers can respond to regulation by changing land use, but cannot pass on costs. In particular, we pay close attention to impacts within the sheep and beef sector where there is large variation in geophysical and other attributes of the land.

Levente Timar *– Farm heterogeneity and the free allocation of nutrient discharge allowances in the Lake Rotorua catchment*

We use an updated version of the NManager simulation model to explore the incidence of costs across heterogeneous properties after mitigation actions and trade of allowances. We compare two approaches to the free allocation of nutrient discharge allowances: a grandparenting approach and a sector-based averaging approach. Land use and management practices are modelled via quadratic profit function in NManager; these implicitly define the marginal mitigation cost curve for each property. We parameterize the model to observations of farms in the Lake Rotorua catchment. Data on initial land use, nutrient loss and farming intensity come primarily from the Overseer files of benchmarked properties. Based on these data and building on previous research, we estimate the initial profit level and marginal mitigation cost curve of each benchmarked property. We account for non-benchmarked properties within the Rule 11 boundary and for those outside the boundary but

within groundwater catchment via separate representative farms. Our simulations suggest that meeting the final nutrient target of 256 tonnes N/year requires the conversion to forestry of many dry stock farms, and the implementation of farm management techniques similar to best practice on most dairy farms. For either allocation approach, costs vary significantly across properties. Aggregate outcomes at the sector-level are not affected by the manner in which free allowances are allocated, but within each sector, land owners with relatively high nutrient loss are better off under grandparenting, and land owners with relatively low nutrient loss are better off under the sector-based averaging approach – this follows from the definition of the allocation methods. In our simulations, the grandparenting approach leads to more equal final cost sharing within the dairy sector, but not within the dry stock sector.

Corey Allen *– Examining Patterns in and Drivers of Rural land Values in New Zealand*

This paper uses a national dataset from 1980 to 2010 of valuations and sales data by land use category from Quotable Value New Zealand to explore patterns in and potential drivers of values of rural land in New Zealand over time and space. Increasing our understanding of the drivers of rural land values will aid in informing how climate change and environmental policy may influence these values. Climate change brings with it an increased likelihood of extreme weather events, for example drought conditions and severe storms, which could plausibly influence the value of rural land through their impacts on the productivity of land. It is also likely to have profound impacts on global commodity prices. Efficient climate change policy could have significant impacts on the profitability of ruminant agriculture. Who bears the losses depends critically on how land values respond to the profitability of different land uses.

Friday 9.00 – 10.30 – C3

Session Chair – Richard Yao

Forestry

David Evison –*Monitoring Profitability of Forestry in New Zealand*

There are no public domain data on profitability of forest growing in New Zealand. This information would help inform land-use change decisions and should be provided on a regular basis. This paper reports on a pilot project to develop a model that will allow the profitability of forestry to be monitored annually. The proposed method uses existing public domain information and cost data provided from a survey of major forest owners and managers in the Nelson/Marlborough region, for 2011 and 2012. The pilot has shown the method to be feasible, and likely to provide reliable results cost effectively, on a regular basis. Some methodological issues are discussed, as well as issues associated with including the contribution from the sale of carbon credits.

Hugh Bigsby *– Productivity of heli-logging with the Sikorsky S61F, S-64E and S-64F in Sarawak*

Selection logging in the tropics is increasingly moving to systems that reduce the impact of harvesting operations on forests and soils. While much of the focus has been on modifying the tractor logging system using RIL principles, alternative harvesting systems have also been introduced. One of the alternative systems is the use of helicopters, which eliminates the need for skid trails and reduces the number of roads required. WTK pioneered helicopter logging in Malaysia when it started using the helicopter logging system in Sarawak in the early 1990's. Beginning in 2002, the company started using Sikorsky helicopters and since then has used three different models, including the Sikorsky 61F, 64E and 64F. While the use of helicopters creates a significant improvement in environmental impact

of logging, the operating cost of helicopters is also significantly higher. Given the cost of using helicopters, a key element of harvest planning is understanding the factors that influence productivity. This paper provides an analysis of logging productivity in the tropics for the Sikorsky helicopters using daily production data collected by WTK on three different timber licenses between 2002 and 2009. The regression results show that average hourly volume produced is a function of the average distance flown per turn, the weighted average number of logs carried per turn, and the type of helicopter. The results also show the importance of pre-harvest inventory and planning that ensures that helicopters are used productively.

Kadim Martana *– What is the economic impact of reduced-impact logging on the Berau Economy?*

A dynamic recursive CGE model for the Berau District East Kalimantan Province Indonesia was constructed, and was used to simulate a policy to implement reduced-impact logging (RIL) by inducing a seven percent raise in logging cost. Results suggest that agricultural-based households' welfare worse off (with forestry households are the most impacted) while non-agricultural households got better off. As the logging output declines, other agricultural outputs increase in which oil palm sector is the most significant. The policy signals that (i) agricultural households are the most effected by the policy, (ii) other agricultural productions expanding and (iii) log import increase. The last two indicate that there is a 'leakage' mechanism dampening the reduce emissions program; the former come from inside the Berau and the latter is from the rest of Kalimantan/Indonesia.

Friday 1.00 – 3.00 – Foyer

Contributed Paper Session IV

Session Chair – Dan Marsh

The Melting Pot

Stephanie McWhinnie *– Who Makes Fisheries Access Agreements with Whom?*

Fisheries access agreements allow fishermen from one country to harvest fish in another country's waters. They may involve direct financial compensation from the fishing country to the host or there may be indirect compensation such as building fisheries science or industry infrastructure or the agreements may allow bilateral access. In this paper we empirically consider the question of which countries make access agreements with each other and why. We combine datasets on access agreements and fish stock status with a dataset usually used to examine flows of international trade. This allows us to test the competing hypotheses of whether access agreements are made because of any difference between stock status in harvesting versus host country waters or due to countries being close – either geographically, historically or culturally. Preliminary results suggest that better stock status in the host country (as measured by mean trophic index or maximum fish lengths) is an important determinant of access agreements. Results on measures of closeness have interesting and differing impacts, for example, sharing a border increases the probability of an agreement but sharing a language reduces the probability.

Peter Tait *– Do consumers of manufactured cigarettes respond differently to price changes compared to their loose tobacco counterparts? Evidence for New Zealand*

Price based mechanisms are an important tobacco cessation policy tool in New Zealand and so measurement of smokers' reaction to price changes is crucial in determining efficacy of this approach. Although approximately two thirds of New Zealand tobacco demand is for tailored cigarettes and one third is for loose tobacco, previous price elasticity estimates have ignored differences between loose tobacco and tailored cigarette consumers. We employ a Seemingly Unrelated Regression econometric approach applied to quarterly data over the period 1991 to 2011 to estimate price elasticities of demand separately for tailored cigarettes and loose tobacco. Structural break testing procedures are used to explore the stability of elasticity estimates over the sample period. Estimate of price elasticity of demand for tailored cigarettes over the 1991 -2011 period is -1.22 and for loose tobacco -0.38. Quandt-Andrews breakpoint testing revealed evidence of a structural break in parameters around the year 2003. Interestingly this is the year when the Smoke-free Environments Amendment Act 2003 legislation was introduced to ban smoking in licensed premises and work places. Split sample estimates for manufactured cigarettes and loose tobacco for the 1991-2003 period are -1.23 and -0.29 respectively. For the 2003-2011 period these estimates are -0.47 and -0.89. These results suggest that there is significantly different price responsiveness across the two product types and that demand for loose tobacco has become more elastic over time, while the opposite is found for tailored cigarettes. These findings support the argument that pricing mechanisms may be more effective for reducing loose tobacco demand, than for manufactured cigarettes.

Terry Parminter *– Water quality in stakeholder consultation II: Facilitated review of policies and rules for a regional plan*

This paper continues an approach to stakeholder consultation about agricultural land uses and water quality in rural waterways that was begun early in 2012. From the results of previous consultation events the authors put together possible policies and rules that might be included in a future draft of the regional plan for Greater Wellington. These policies and rules only applied to rural landuses as

urban resource use was being addressed separately. The selected topics were: limiting livestock access to waterways, managing catchment nutrient loads and restrictions on livestock effluent disposal. A workshop was prepared in late 2012 to which a range of stakeholders were invited. The stakeholders considered the possible policies and rules and identified their strengths and weaknesses, as well as ways that they could be improved. In general, the participants supported the overall direction of the policies and rules and suggested ways that they could be made more practical for landowners by creating some exception conditions. The more exceptions to the general rules that were suggested the more that other participants wanted greater monitoring and enforcement so that environmental bottom lines were still going to be protected.

Daniel Gregg *– Resource augmentation: A restricted definition of production functions for agricultural production analysis*

Agricultural economics is credited with many important contributions to the theory of the firm and the theory of production in particular. Most of these contributions have originated from the examination of a range of functional forms which relate inputs to output either directly (the production function) or indirectly (cost, revenue and profit functions). Underlying these functional forms is a 'technology' which characterises the nature of production. Agricultural production is, however, largely based on the augmentation of natural production relations – i.e. the technology is an augmentative one rather than one upon which all matters of production rest. This paper presents a conjectural model of agricultural production linking economic production theory and population ecology theory which is shown to provide a deeper understanding of efficient agricultural production. The derivation and implications of such a model are explored analytically in this paper.

Friday 1.00 – 3.00 – C1

Session Chair – Charlotte Cudby

Farm Management and Mitigation

Pike Brown *– Trust, Goals and Management: Evidence from the Survey of Rural Decision Makers*

Scientists and governments increasingly seek ways to understand the complexity and outcomes of interactions between human agents and their environment. For example, how do rural decision makers obtain data? Which sources are trusted? How risk tolerant are farmers, foresters, and growers? What plans do they have for the future of their operations? While industry groups, councils, and scholars undertake surveys for specific land uses in specific regions, we take a different approach in conducting a survey of 1200 rural decision-makers across land uses and across New Zealand to highlight the diversity of the rural sector. We further identify characteristics that make rural decision makers more or less likely to adopt a wide variety of best management practices. We find that land use by itself is not a sufficient predictor of behaviour. Aspects that shape the behaviour of decision makers include demographics (e.g., age and gender), land characteristics (e.g., size), location, attitudes toward policy, the level of personal control they believe they have over their farm, social expectations, and the size of their social network. Conversely, a decision makers' tolerance of risk is not a sufficient predictor of behaviour.

Fraser Morgan *– Attributes, Networks and Behaviours: Building farmer agents using the Survey of rural Landowners*

Agent-based models of land use and land cover change rely on data to inform and shape the agents that emulate human decision-making processes. Obtaining these data would strengthen the analysis

and prediction of land-use change and adoption of farm practices, but the attributes and understanding how farmers might behave requires detailed information from empirical sources. Using the results from the recently undertaken Survey of Rural Landowners, this paper will outline the initial stages of transforming the survey results into farmer agents that will be embedded in a future version of the Agent-based Rural Land Use New Zealand (ARLUNZ) model. ARLUNZ links both a partial equilibrium economic catchment model and a spatially heterogeneous agent-based model to provide a more realistic representation of land use by taking into account the structure, networks and approaches to farming while also providing an economic foundation on which the farmer agents make land use and management decisions.

Stephen Murray *– Analysis of Agriculture Production Survey and Annual Enterprise Survey data: Findings and learnings*

In 2012 Statistics New Zealand added the Agriculture Production Survey (APS) data to their Data Laboratory. This means that it is now possible to match financial information, via the Annual Enterprise Survey (AES) from agricultural enterprises with associated farm-level information. These data sources were interrogated as part of a redesign of the Ministry for Primary Industries (MPI) Farm Monitoring programme. The APS dataset enables the complex structure of farms to be examined, including farming practices (e.g. fertiliser use), land use, stock numbers, business structure, and employee counts. Combined with the AES information a high-level summary of the primary sectors can be produced. There are two key purposes to the presentation. The first is to describe findings of these analyses. The second is to describe key learnings from the analyses that will inform other researchers who wish to conduct their own analyses.

Phil Journeaux *– Economic Analysis on the Value of Winter Housing for Dairy Farming in Tararua District*

The study examines the economic impact of a wintering barn facility on a dairy farm in the Tararua District, relative to its ability to reduce nitrogen leaching, as a means of achieving Horizon's proposed nitrogen discharge limit. It shows that the provision of a wintering facility had a significant impact in reducing nitrogen leaching, down to just above the required limit. The economic cost of this is significant, in the absence of the farmer intensifying the system to cover the cost of the facility. If the farm is intensified in order to cover the cost of the wintering facility, the level of nitrogen leaching rises accordingly. The study therefore indicates that the provision of a wintering barn as a means of reducing nitrogen leaching is problematic – while it can reduce leaching rates it is uneconomic, and in making it economic it results in increased leaching rates well above the proposed limits.

Friday 1.00 – 3.00 – C2

Session Chair – Brian Bell

Non-market Valuation

Tom Ndebele *– Consumer choice of electricity supplier: Investigating preferences for attributes of electricity services*

The retail electricity market in New Zealand is evolving as the government continues to encourage the development of a competitive and efficient market by promoting consumer switching through the "Whats My Number" campaign. Recent reports indicate that relatively few customers have switched supplier in the past two years despite potential average savings of NZ$165 per year per household. This suggests that non-price factors are also important determinants of switching behavior. We use choice experiments and discrete choice modeling to investigate residential consumers' preferences for

the attributes of electricity suppliers and the possible role of attitudes in explaining preference heterogeneity among the sampled respondents. Data required for the study was collected through a web survey administered to an online panel of bill payers in New Zealand. Willingness to pay (WTP) is estimated for attributes of electricity suppliers such as renewable portfolio, local ownership, discount rates, fixed rate plan, loyalty rewards and supplier type. Whilst WTP estimates indicate the importance of the attributes and hence provide guidance to suppliers in designing their service offers, knowledge of how attitudes influence switching behavior may inform future policy directed at stimulating competition in the retail market.

Richard Yao *– Testing a model that predicts the viability of future forest in New Zealand*

Scion has developed a spatial economic model called the Forest Investment Finder (FIF). The FIF model helps to identify land areas in New Zealand where new planted forests would likely be economically viable. The private market benefits (timber, carbon) have been mapped spatially for areas of New Zealand that would suit afforestation. In addition, the non-market value of avoided soil erosion from afforestation in New Zealand's future forest areas has been estimated, along with a framework for guiding land use policy in these areas. This study primarily aims to test the validity of the FIF model by using New Zealand spatial and economic data. If a high proportion of the profitable forest areas predicted in FIF are now under forest cover, then the model is validated. We started by locating new planted forests established between 2001 and 2008 using New Zealand Landcover Databases (LCDB2 and LCDB3). We then used productivity data, economic data, biophysical (e.g. climatic and slope) and biophysical data embedded in FIF to calculate for the profitability of each new forest. The study also aims to identify the factors that influence the establishment of new forests. We estimated limited dependent variable models (i.e. logit, probit) to determine those factors. Results show that 2,969 new forests were established in New Zealand between 2001 and 2008. Based on this sample of new forests, we found that FIF provides an accurate prediction of profitability for most new forests. However, we also found that FIF should account for other factors to further improve its predictive power. Preliminary estimates from the probit model suggest that several factors, which include on-site soil erosion and proximity to existing forests, influenced the establishment of new forests. These factors should be incorporated in the FIF model to provide better prediction of profitability of new forests.

Yvonne Phillips *– Latitude, Longitude and Attitude - A revealed preference analysis of freshwater recreation using an interactive mapping tool*

As part of a project to assess the non-market benefits of fresh water in the Waikato region we designed a web survey that invites participants to place markers on a map to indicate sites they have visited for recreational or cultural activities. The survey uses Google Maps API to generate a detailed satellite view of the area and then people are then asked to identify features of the river, stream, lake or wetland that they like or dislike. We also ask which sites they could consider as substitutes, in an attempt to define a consideration set for choice analysis. The data is used to conduct a revealed preference choice analysis using travel cost and time as the "price" of each site. In this paper we present the preliminary results and the advantages and disadvantages of the interactive mapping approach.

Sini Miller *– Scarcity of Canterbury's water: its multiple, conflicting uses*

Canterbury freshwater management is the focus of important decisions with significant challenges. Main issues centre on deteriorating water quality and increasing demand. This PhD research looks into the conflicting and multiple uses of this scarce resource and the need for protection of water ways. The focus is to study the attributes that are the cornerstones of policy making in New Zealand - environmental, economic, social, cultural values – and how Canterbury residents value these four elements of wellbeing. In particular, this study explores how cultural values relate to others. This is less explored in the stated preference studies in New Zealand; yet an important element in decision

making. The Choice Modelling approach was applied to rank these attributes and estimate willingness to pay. A Choice Experiment survey was mailed to 2000 residents throughout Canterbury in November 2012. Results indicate that people value all freshwater attributes considered here, with highest willingness to pay for environmental attribute followed by cultural and recreational values. The change in the number of the jobs in the region was valued the least of all attributes. Insignificant interactions with the socio-economic characteristics suggest uniformity of what Cantabrians want. This means that all these four elements of wellbeing matter, with preference ranking providing important insight for policy makers in prioritising decisions regarding freshwater management in Canterbury.