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Welcome!

The Australian and New Zealand Agricultural and Resource Societies welcome you to the 1999 Joint Conference in Christchurch, New Zealand. On the brink of a new millennium we will be addressing the fundamental question: "1900 to 1999 - A century of progress?" This theme allows contributors to reflect upon the dramatic changes that have occurred in agricultural and resource policy over the past one hundred years, and perhaps to speculate on the challenges that lie ahead.



Over the next few days an impressive array of invited guests from around the world will speak on the following topics: international agricultural policy and trade, China as a market and as a competitor, biodiversity, native title and biological innovation in agriculture. The programme also includes over 200 contributed papers from members around the globe, which will undoubtedly stimulate some interesting debate. In addition, the conference workshops will provide an opportunity for academics, professionals and policy makers to discuss current issues in teaching, research methodology, policy and trade.

So we welcome you to participate in a productive and exciting few days, where one of the biggest challenges will be choosing which papers to attend from a world-class list of topics and presenters.

Rob Fraser
President, AARES

Katie Bicknell
President, NZARES

Contents

Welcome.....	1
Conference Programme	2
Workshops.....	5
Social Events	7
Invited Speaker Abstracts.....	8
Contributed Paper Abstracts.....	13
Conference Participants.....	63

Conference Programme

Tuesday 19 January

9.00 – 5.00	Pre-conference workshops	<i>Lincoln University</i>
5.30 – 8.30	Registration	<i>Christchurch Town Hall</i>
6.30 – 10.30	Social Mixer	<i>Boater's Restaurant Christchurch Town Hall</i>

Wednesday 20 January

8.00 – 10.00	Registration	<i>Christchurch Town Hall</i>
9.00 – 10.00	Conference Opening	<i>Limes Room, Town Hall</i>
	Keynote Speaker: Hon John Luxton Minister for Food, Fibre, Biosecurity and Border Control	
10.00 – 10.30	Morning Tea	
10.30 – 12.30	Invited Speaker Session I	<i>Limes Room, Town Hall</i>
	<i>A Century of Progress in Agricultural and Food Policy</i>	
	Chair: Dr Caroline Saunders, Lincoln University	
	<ul style="list-style-type: none">• <i>A Century of Progress in New Zealand and Australian Agriculture and Food</i> Professor Ralph Lattimore, Lincoln University Dr David Godden, University of Sydney• <i>European Agricultural Policy: Where is it Going?</i> Professor Alan Buckwell, Imperial College at Wye University• <i>Agricultural and Resource Policy Prospects and Challenges: A North American Perspective</i> Professor Michele Veeman, University of Alberta	
12.30 – 1.30	Lunch	
1.30 – 3.30	Contributed Paper Session A	
3.30 – 4.00	Afternoon Tea	
4.00 – 5.00	Presidential Address	<i>Limes Room, Town Hall</i>
	<i>The State of Resource Taxation in Australia</i> <i>“An Excusable Folly for the Nation?”</i> Associate Professor Rob Fraser, University of Western Australia	
7.00 – 10.30	Conference Dinner	<i>The Grand Café Christchurch Casino</i>

Conference Programme

Thursday 21 January

8.30 – 10.30 **Contributed Paper Session B**

10.30 – 11.00 **Morning Tea**

11.00 – 12.30 **Invited Speaker Session II**

Native Title

Limes Room, Town Hall

Chair: Mr Rowland Woods

- ***Native Title and Associated Resource Issues: New Zealand***
Rt Hon Sir Douglas Graham
Minister in Charge of Treaty of Waitangi Negotiations
- ***Native Title and Associated Resource Issues: Australia***
Mr Allan Padgett, National Native Title Tribunal

China as a Market and as a Competitor

Breakout Meeting Rooms

Chair: Dr Colin Brown, The University of Queensland

- ***Supply, Demand and the Liberalisation of Agricultural Trade in China***
Professor Jikun Huang, Chinese Academy of Agricultural Sciences
- ***Market Emergence and Transition:***
Arbitrage, Transaction Costs and Autarky in China's Grain Markets
Associate Professor Scott Rozelle, University of California, Davis
- ***The Reform of Wholesale Food Marketing in China:***
Problems and Prospects
Associate Professor Fredoun Z. Ahmadi-Esfahani, University of Sydney

12.30 – 1.30 **Lunch**

1.30 – 3.30 **Contributed Paper Session B**

3.30 – 4.00 **Afternoon Tea**

4.00 – 5.00 **Annual General Meetings**

Breakout Rooms

6.30 – 11.00 **Social Night**

Lyttelton Harbour

Conference Programme

Friday 22 January

8.30 – 10.30 **Contributed Paper Session D**

10.30 – 11.00 **Morning Tea**

11.00 – 1.00 **Contributed paper Session E**

1.00 – 2.00 **Lunch**

2.00 – 3.30 **Invited Speaker Session III**

Biodiversity

Limes Room, Town Hall

Chair: Dr Robert Alexander, Massey University

- ***Endogenous Growth and Biodiversity:
The Social Value of Genetic Resources for R & D***
Professor Timothy Swanson, University College London
- ***Biodiversity Protection: Measurement of Output***
Dr Ross Cullen, Lincoln University
- ***Estimating the Value of Biodiversity Protection***
Associate Professor Jeff Bennett, The University of New South Wales

The Inaugural Allan Lloyd Address

Breakout Meeting Rooms

Chair: Professor Julian Alston, University of California, Davis

Biological Innovation and American Agricultural Development

Professor Alan Olmstead, University of California, Davis

3.30 – 4.00 **Conference Closure**

Limes Room, Town Hall

4.00 – 4.30 **Afternoon Tea**

4.30 – 6.30 **Incoming Council Meeting**

Conference Workshops

Pre-conference Workshops

19 January 1999

Practical Linear Programming: Tips, Tricks and Tactics

Presented by **Dave Pannell**

Agricultural and Resource Economics, University of Western Australia,
Nedlands 6907, Australia

A one-day hands-on training workshop on practical LP modelling skills, with software, textbook and additional notes included in the price. Topics covered include: transfer rows, degeneracy, infeasible models, (new methods to diagnose causes of infeasibility), modelling non-linear constraints, modelling risk and risk aversion, multiperiod models, traps and tricks with shadow costs and shadow prices, new systems for sensitivity analysis.

Border Security and Risk Analysis

Organised by **Hugh Bigsby**

Commerce Division
Lincoln University

The objective of the workshop is to provide a forum for discussing approaches for developing and implementing SPS regulations in a new trading environment. After reviewing the history of SPS regulations and discussing current issues for the SPS committee, participants will discuss how SPS risk can be incorporated into trade policy. A case study approach will be used in the afternoon to explore how SPS disputes have been handled in practice. The workshop will conclude with a panel discussion of current issues facing New Zealand, Australia and the United States.

In-conference Workshops

8.30 – 10.30 Thursday, 21 January

Teaching Workshop

David Godden and Rodney Beard

Topic 1: Teaching Decision Making over time to Undergraduates.

Topic 2: Panel Discussion: the potential for Cooperative Graduate Education Programmes in Agricultural and Resource Economics in Australia and New Zealand.

In-conference Workshops, Continued

11.00 – 12.30 Thursday, 21 January

Whole-Farm Modelling Discussion Group

Convener: **David Pannell**

This session will be an informal meeting of modellers to share experiences, information and ideas on whole-farm modelling and related issues. Following a valuable meeting at the 1998 conference, we have decided to make it a regular event. The session will consist of three brief talks to act as discussion openers (strictly 5-10 minutes), with general discussion in between. Discussion openers will be: Lisa Brennan (CRC for Sustainable Sugar Production), "Experiences with whole-farm modelling in a CRC". Steven Schilizzi (UWA), "Modelling costs of salinity abatement in MIDAS". Kate O'Brien (Victorian Institute for Dryland Agriculture), "Assessment of strategies for managing herbicide resistance".

Social Functions

Tuesday 19 January

Pre-Conference Social Mixer

The pre-conference social mixer starting at 6.00 pm in the Boater's Restaurant provides an early opportunity to catch up with colleagues and friends. The Boater's Restaurant, located in the Christchurch Town Hall, offers indoor-outdoor seating in a relaxed atmosphere beside the Avon River. A buffet dinner will be available from 7.30 pm.

Wednesday 20 January

Annual Conference Dinner

The annual conference dinner will be held at the Grand Café in the Christchurch Casino. Gary McCormick, popular kiwi entertainer and TV personality, will be the featured after dinner speaker. Please note that the dress code (no jeans, track pants or sandals) and the age limit (no one under 20 years) will be strictly enforced.

Thursday 21 January

Social Night

The social evening will feature a 3-hour cruise around Lyttelton Harbour aboard the historic steam tug Lyttelton. The evening will include hors d'oeuvres, and drinks, as we cruise out of Port Lyttelton to Port Levy, where we will anchor for dinner. Guests will also be free to inspect the fully restored coal-driven steam engines and boiler stoking in the engine room.

Invited Paper Abstracts

Invited Speaker Session I

A Century of Progress in Agricultural and Food Policy

European Agricultural Policy Where is it going?

Professor Allan Buckwell

*Department of Agricultural Economics
Imperial College at Wye*

To understand where European Agricultural policy might be going for the first decade of the 21st Century, we have to understand its origins and present state. The history of the Twentieth Century in Europe could, crudely be summarised as a game of two halves: war followed by the European Union. The history of agricultural policy in the same period could, equally crudely, be characterised as protection (1880s to 1930), more protection (1930-1968), common protection (1968 to 1995), slowly declining protection (1995 to 2006). The European Community's common agricultural policy was a necessary accompaniment to a common market, and it was bound to be protectionist given its antecedents. Economic analysis was successful in predicting the ultimate unsustainability of the 1968 CAP based on commodity price supports. Since 1992 the emphasis of support has switched from price support to direct payments of farmers. This will be entrenched by Agenda 2000 which is expected to operate until 2006. It is more difficult to predict the longer term endurance of this policy because it is less obviously economically distortive. Its survival is therefore less a matter of economics than politics. Despite this difficulty, it will be argued, somewhat normatively, that the post Agenda 2000 CAP is also not sustainable, and that it will slowly transform itself into a more integrated rural policy.

Agricultural and Resource Policy Prospects and Challenges: A North American Perspective

Professor Michele Veeman

*Department of Rural Economy, Faculty of
Agriculture, Forestry and Home Economics
University of Alberta, Canada*

In keeping with the Conference theme, the policy making process in Canada and the United States is briefly overviewed and compared, as is the general direction of previous and current agricultural and resource policy in both nations. The different stances toward trade policy are noted, as are the bases for these. Challenges likely to face North American agricultural and trade policy in the next decade are assessed. The increasing economic integration of North American agricultural and food sectors, which in turn has encouraged trade conflicts and tensions, is discussed as are associated effects on Canada's domestic and trade policy for agriculture. The role of regional and multilateral trade agreements in reducing trade conflicts between these two nations is considered. The prospects for the forthcoming multilateral trade negotiations are a major focus of the paper and the influences that may favour, or discourage, a substantial round are explored. Finally, possible implications of those negotiations for some contentious facets of national agricultural policy in North America are explored.

A Century of Progress in New Zealand and Australian Agriculture and Food

Professor Ralph Lattimore

*Commerce Division
Lincoln University*

Dr David Godden

*Department of Agricultural Economics
University of Sydney*

Separate papers will be presented for Australia and New Zealand. Both papers are economic histories of agriculture within the context of the rest of the economy and the global environment. The paper on Australian agriculture (Godden) explores key relationships between production and natural resource processes, marketing systems, trade, physical and social infrastructure and inter-sectoral linkages. Four time slices are

used: 1900-1930, Peace War peace, 1930-50 Depression War and Recovery, 1950-1970, Good Times Plateau, 1970-1999, On The Slippery Slope. The New Zealand Paper (Lattimore and Hawke¹) uses three time slices: before 1882, colonisation, 1882-1970, recolonisation, 1970-1999, decolonisation. The NZ agricultural history is discussed around five themes: the people of the land, the land, technology, market led growth and policy.

Invited Speaker Session II (1)

Native Title

Native Title and Associated Resource Use Issues: Australia

Allan Padgett

Co-ordinator, Future Act Unit

National Native Title Tribunal, Australia

This paper will briefly describe the history and intent of the Native Title Act 1993; survey outcomes flowing from its implementation, especially in reference to economic implications of agreements between parties; and consider future prospects, particularly by reference to the amended legislation which came into force on 30 September 1998. The use of case studies will illustrate a highly varied range of positive outcomes, which might be seen as revealing a new willingness on the part of Australian society generally to engage positively with Aboriginal people and Torres Strait Islanders on a scale not envisaged prior to the High Court's Mabo decision in 1992. The paper considers the participation of the broader community and the acknowledgment of existing rights and interests, and includes reference to the issues of willingness and good faith on behalf of parties and government.

It will be argued that the Native Title Act 1993 is driving a process of reconciliation through the forging of new relationships, understanding and respect; awakening the country to opportunities for partnerships between Indigenous and non-Indigenous Australians; and generally providing a force for economic recovery and independence

¹ The New Zealand paper is coauthored with Professor Gary Hawke, School of Economics and Finance, The Victoria University of Wellington

from social welfare among Indigenous communities. Among other matters, the amended legislation promotes new opportunities for dealing with land and resource management issues in regional or area settings. Such Indigenous Land Use Agreements (ILUAs) have the potential to become broadly-used instruments for ensuring that native title and resource development become more closely related in terms of long-run regional partnerships deriving from an agreements culture, rather than being viewed as onerous matters to be dealt with – or avoided – according to the letter of the law. Reference will be made to an emerging literature on native title and resource management.

Invited Speaker Session II (2)

China as a Market and as a Competitor

Market Emergence and Transition: Transaction Costs, Arbitrage and Autarky in China's Grain Markets²

Associate Professor Scott Rozelle

Department of Agricultural and Resource Economics

University of California, Davis

In this paper, estimation of arbitrage rates, transaction costs, and autarky rates from a parity-bounds model of inter-regional grain trade in China, informed by detailed knowledge of trade flows, policy changes and regional differences, has made possible a rich characterization of market emergence during transition. Our results highlight the dangers of simple attribution of observed outcomes to one factor alone, such as trade barriers, and of regional aggregation without a sensitivity to regional differences.

The development of the market has been uneven over time, with periods of liberalization punctuated by periods of retrenchment. But market development and institutional change, especially in southern China, may have matured to a point that traditional policy interventions are less effective and more costly to be attractive.

² Professor Scott Rozelle's paper is coauthored with Albert Park, Hehui Jin, and Jikun Huang

Supply, Demand and the Liberalisation of Agricultural Trade in China³

Professor Jikun Huang

Director of Center for Chinese Agricultural Policy

*Chinese Academy of Agricultural Sciences
Beijing*

China's emergence as modern country raises many questions. Its rapid development will have an uncertain, but significant, impact on the nation's and the world's food security. The goal of this paper is to help establish a comprehensive, transparent, and empirically sound basis for assessing the future growth of China's food supply and demand balances. A partial sector-wide equilibrium model is developed, which includes a series of important structural factors and policy variables, such as urbanization and market development on the demand side, and technology, agricultural investment, environmental trends, and institutional innovations on the supply side.

The projections show that, under the most plausible expected growth rates in the important factors, China's grain imports will rise steadily throughout the next decade. Increasing grain imports arise mainly from the accelerating demand for meat and feed grains. However, after 2010, grain imports are expected to stabilize, as demand growth slows due to increasing urbanization and declining population growth rates; and supply growth is sustained with the on-going recovery of investment in agricultural research and irrigation. China's dynamic economy and rapidly changing structure may cause changes in the historic patterns of food trade. It could be in 2010, for example, that China imports rice, and that by 2020 it is nearly self-sufficient in wheat and one of the world's largest importers of maize. While there are a few scenarios where projected levels of imports are somewhat large, from both the view point of China's own domestic needs and relative to the size of current world market trade, there are factors which may keep China from becoming too large of the player in world markets.

The results tended to confirm the benefits from sustained public investment in research and irrigation development that could significantly

improve the global competitiveness of Chinese agriculture. Further, with policies in the right direction, China could well manage the transition to and benefit substantially from a more open trade regime. On the basis of the results presented in this paper, it appears that China will neither empty the world grain markets, nor become a major grain exporter. It does seem likely, however, that China will become a more important player in world grain markets as an importer in the coming decades.

The Reform of Wholesale Food Marketing in China: Problems and Prospects

Associate Professor Fredoun Z. Ahmadi-Esfahani

*Department of Agricultural Economics
University of Sydney*

One of the significant developments in China's post-reform era appears to be the expansion of wholesale food markets. This article seeks to analyse the evolving nature and structure of wholesale food marketing in China by studying a number of key wholesale markets including those in Beijing, Nanjing, Shanghai and Shenzhen. To that end, three marketing models of pre-reform, post-reform and that expected to emerge in the first quarter of the new century will be portrayed. The central argument of the article is that the Chinese wholesale markets are pivotal to the structure and conduct of food marketing in China's future development. The exposition will reinforce the notion that these markets are only in their earliest stages of development, and have been derived from varied stages of ownership and development, exhibiting different focuses and diverse levels of managerial prowess. However, they do generally display all the features of a developing centralised wholesale market in a capitalist country. The policy implications of the analysis for the further reform of wholesale food marketing in China will be explored.

³ This paper is coauthored by Scott Rozelle and Mark Rasegrat

Invited Speaker Session III (I)

Biodiversity

Endogenous Growth and Biodiversity: The Social Value of Genetic Resources for R&D

Professor Timothy Swanson

*Economics, School of Public Policy and
CSERGE*

University College London

The value of genetic resources for use in research and development (R&D) activities has been the subject of a literature modelling the activity as one where individual firms engage in optimal search. Here we develop a more generalised framework in which genetic resources are used in R&D at the base of an industry that is crucial to the maintenance of continued growth in society. The R&D process is one in which firms are engaging in a contest of innovation against a background of both creative destruction (Schumpeterian competition) and adaptive destruction (natural selection and adaptation). This framework generates the search model as one of its implications, but demonstrates the important differences between individual firm valuation of genetic resources and the social value of genetic resources for use in this contest of innovation.

Estimating the Benefits of Biodiversity Protection

Associate Professor Jeff Bennett

*School of Economics and Management
The University of New South Wales*

What are the benefits of biodiversity protection? **Why** should those benefits be estimated? **When** should they be estimated ... now or across future generations? **Where** should the benefits be estimated ... locally, nationally or internationally? And, of course, **how** can they be estimated, if at all?

This sequence of questions forms the basis of this paper. The specific benefits associated with the provision of biodiversity protection are firstly defined. The role of benefit estimation in the process of making decisions regarding the future

use of ecosystem resources is then briefly reviewed noting the importance of biodiversity benefits in that process. The “extent of the market” for biodiversity protection is considered with respect to the beneficiaries across both time and space. Some technical issues arising from the choice between alternative non-market benefit estimation techniques are analysed along with a discussion of the techniques’ collective capabilities to perform the task. References to selected case study results, generated from recent applications of the Choice Modelling technique, are used to illustrate the arguments involved.

As a conclusion, it is suggested that research effort should be directed to the task of benefit estimation to determine priorities for the protection of biodiversity.

Biodiversity Protection: Measurement of Output

Dr Ross Cullen

*Commerce Division
Lincoln University*

Significant expenditures are directed toward biodiversity protection both nationally and globally, and there are many proposals for further conservation action, each certain to result in further cost. Expenditures require justification, and evaluation of the output resulting from biodiversity protection. Search of the literature reveals that there are a large number of articles on biodiversity protection, but far fewer which report empirical research on that topic. This paper focuses on conservation protection, and reviews approaches to measurement of output from those actions. A number of output measures have been devised and used in economic research, but few articles report measurement of conservation output achieved. Versatile, widely useful techniques for measuring output are required to determine what is being achieved, and to aid future decision making on biodiversity protection. Choice of output measure seems at present to be very limited. Further testing of a new output measure Conservation Output Protection Years (COPY), is recommended

Invited Speaker Session III (2)

The Inaugural Allan Lloyd Address

**Biological Innovation and American
Agricultural Development**

Professor Alan L. Olmstead

*Director, The Institute of Governmental Affairs
University of California, Davis*

The standard treatment of American agricultural productivity argues that during the 19th and early-20th centuries mechanical changes vastly increased the productivity of labor, but that there were few important innovations that increased land productivity. This all changed after WWII when biological innovations led to dramatic increases in the productivity of land. This paper challenges the accepted view arguing that both the stylized facts and the underlying theory are flawed. The 150 years before 1940 in fact witnessed spectacular biological and other land-augmenting innovations that were essential to the nation's agricultural development. Such changes occurred in most sectors including the specialized crops grown in California, the major staple crops such as wheat and cotton, animal husbandry, and post harvest operations. These findings suggest the need for a wholesale rethinking of the sources of American agricultural productivity growth.

Contributed Paper Abstracts

As the following pages reveal, a record number of contributed papers have been submitted to the conference this year. To accommodate over 200 presentations, the contributed papers have been organised into sessions based on subject area. Each paper has been allocated a total 24 minutes. Contributors are asked to limit their presentations to 18 minutes, which will leave some time for questions and for moving between sessions. Chairs for each session have been instructed to adhere strictly to the timetable so that the sessions remain 'synchronised'.

Contributed paper sessions will be held in Breakout Meeting Rooms 1 – 7, located on the first floor of the Convention Centre, and the Limes Room, located across the street in the Town Hall. The presentation timetable can be found as a separate enclosure in your conference satchel. Note that the timetable will be updated each day to accommodate last minute withdrawals and substitutions of papers.

More empirical evidence on the adoption of chick peas in Western Australia.

A. Abadi, M. Burton and D. Pannell

This paper presents econometric analysis of the adoption of chickpeas in Western Australia, using a number of alternative models. Data is available on both whether farmers have adopted, and for those who have, the intensity of adoption. Traditionally, analysis of such data has focussed on the probability of adoption (using Probit/Logit models), or assumed that intensity and adoption are determined by a single process (Tobit models). However, an alternative specification, which is not commonly used in adoption studies, is to allow for two processes, one determining adoption, the second intensity, and estimate these jointly (i.e. Double Hurdle models). In the first half of the paper, traditional Probit and Tobit estimates are reported, with an emphasis on comparing the significance of the explanatory variables across different specifications. We also present alternative measures of the sensitivity of the probability of adoption and intensity to changes in those explanatory variables. In the second part of the paper, alternative two stage models are presented. This includes the simple Heckman model of incidental truncation, but also a more general "Double Hurdle" model, which is essentially a composite of the Probit and Tobit specifications in a single framework.

The Structure of Production and Investment in Australia's Pastoral Zone

Frank Agbola

This paper develops a dynamic model based on the optimal intertemporal investment theory of the firm and the adjustment cost hypothesis to analyse the structure of production and investment in Australia's pastoral zone. The dynamic model is applied to pooled cross-sectional and time-series data obtained from ABARE farm surveys for the period 1979 through 1993. Empirical results provide strong statistical evidence to indicate that quasi-fixity of

inputs of labour, capital, sheep numbers and cattle numbers are characteristic of the agricultural sector in the pastoral zone. Results indicate that it takes about two years for labour, a little over three years for capital, and a little over two years for sheep flock and cattle herd inventories to adjust toward their long-run optimal levels. The results also indicate substitution between labour-capital and sheep-cattle pairs. Empirical results provide evidence to indicate that output supply and input demand responses are price inelastic in the pastoral zone both in the short and long run.

Trade Elasticities: The Significance of Trade Barriers, Multinationals and Market Structure

Fredoun Z. Ahmadi-Esfahani and Glenn M. Anderson

The elasticity of price transmission measures the extent to which changes in world prices will be passed through to an importing country, with an elasticity of less than one being attributed to trade barriers. However, recent research highlights the role that multinational trading companies may play in impeding price transmission. Further, in markets characterised by monopolistic competition an estimate of the partial elasticity of demand may be of limited practical value if no account is taken of the reaction of competitors. This paper considers the potential of formulating and applying a procedure for estimating elasticities of export demand which may be more attuned to the needs of policymakers and agribusiness firms. These ideas are applied to the export demand for Australian food products in the East Asian market.

Constant Market Share Analysis: Uses, Limitations and Prospects

Fredoun Z. Ahmadi-Esfahani and Glenn M. Anderson

Constant market share (CMS) analysis compares the actual export growth performance of a country with

the performance that would have been achieved if the country had maintained its exports relative to some standard. The approach was first applied to international trade in the 1950s and has generally been used to analyse trading patterns and policies. However, constant market share analysis has not been without its critics. Recently, the approach has been revised to meet objections concerning the measurement of CMS effects. Further objections include its usefulness as a diagnostic tool and the models of international trade which underlie such measurement. CMS analysis is applied to Australia's export performance in the East Asian food market to illustrate its prospects for description and diagnosis.

Murray-Darling Basin Commission: The Pilot InterStates Water Trading Project

Jacqueline Allan

In March 1994, the Murray-Darling Basin Ministerial Council approved a water market reform timetable that was consistent with that agreed by the Council of Australian Governments (COAG) on 24 February 1994. Council later approved the establishment of a pilot project that would introduce permanent interstate water property rights trade in the Mallee region of the Basin.

The aim of the pilot project was to facilitate the permanent interstate trade of water within the Murray-Darling Basin. By doing so this would assist the irrigation industry become more environmentally and economically sustainable by facilitating the movement of water from current irrigation activities to higher value irrigation developments that would be subject to rigorous environmental clearances.

The pilot project was subsequently approved by Council in 28 November 1997 and commenced on 1 January 1998. Since that time, administrative and legal arrangements have been put in place to assist permanent interstate trade occurring under the auspices of the Pilot Project. Six trades have taken place with over one gigalitre of water moving to higher value enterprises in different States. The intention now is to monitor the impacts of the Pilot Project (to ensure that no negative environmental impact occurs) and to address key issues so that consideration can be given to expanding the pilot project.

Research Returns Redux: A Meta-Analysis of the Returns to Agricultural R&D

Julian M. Alston, Michele C. Marra, Philip G. Pardey, and T J Wyatt

A total of 294 studies of returns to agricultural R&D (including extension) were compiled and these studies provide 1,858 separate estimates of rates of return. This includes some extreme values, which

are implausible. When the highest and lowest 2.5 percent of the rates of return were set aside, the estimated annual rates of return averaged 73 percent overall 88 percent for research only, 45 percent for research and extension, and 79 percent for extension only. But these averages reveal little meaningful information from a large and diverse body of literature, which provides rate-of-return estimates that are often not directly comparable. The purpose of this study was to go behind the averages, and try to account for the sources of differences, in a meta-analysis of the studies of returns to agricultural R&D. The results conform with the theory and prior beliefs in many ways. Several features of the methods used by research evaluators matter, in particular assumptions about lag lengths and the nature of the research-induced supply shift.

A Globally Flexible Model of the Effects of Generic Advertising of Beef and Pork on U.S. Meat Demand

Julian M. Alston, James A. Chalfant, and Nicholas E. Piggott

Specification error resulting from the choice of an incorrect functional form can lead to biased estimates. A new demand system, the Nested PIGLOG (NEP) model, is used in this paper to evaluate the effects of functional form choices on the estimated effects of beef and pork advertising on the demand for meat in the United States. The NEP model nests all of the previously existing demand systems that are consistent with PIGLOG preferences, and five new models. In this paper, we estimate the NEP demand system including advertising variables, using U.S. meat consumption data, and test the appropriateness of the sets of parametric restrictions in the NEP model that define its nested special cases. We also evaluate the statistical and economic significance of advertising effects, given each of the functional form restrictions.

The value of European Union Voluntary Export Restraint Agreements to New Zealand

Richard Amor and Caroline Saunders

The United Kingdom's (UK) accession into the European Union (EU) in 1973 resulted in New Zealand's butter, cheese and lamb exports being subject to voluntary export restraints. A theoretical framework is outlined illustrating how voluntary export restraints generate economic rent to the exporting country. This framework is then used to estimate the rents that accrue to New Zealand from butter and cheese exports to the UK over the period 1973 to 1992 and to the EU over the period 1993 to 1997. This is done using two empirical approaches. The first method assumes that the opportunity cost to exporting butter and cheese to the EU is the world market. The second approach uses a dynamic,

multi-country, multi-commodity, partial equilibrium trade model that allows the opportunity cost to change in response to changes in world dairy production and trade. Preliminary results suggest that quota rents are more sensitive to EU price changes than world prices.

The Relationship between Energy Consumption, Energy Prices and Economic Growth: Time Series Evidence for Energy-Dependent Developing Countries

John Asafu-Adjaye

In the past two decades numerous studies have dealt with the causal relationships between energy consumption and economic growth. In some of these studies economic growth has been proxied by either Gross National Product (GNP) or aggregate employment. The direction of the causal links between energy consumption and economic growth has important implications for policy makers. For example, if it is the case that there is unidirectional causality running from GNP (or employment) to energy consumption then it may be implied that energy conservation policies may be implemented with little or no prospects of an adverse effect on economic growth (or employment). On the other hand, a finding of no causality in either direction, the 'neutrality hypothesis', would imply that energy conservation policies do not affect economic growth (or employment). This paper estimates the causal relationships between energy consumption and income for India, Indonesia, the Philippines and Thailand, using cointegration and error-correction modelling techniques. The results indicate that, in the short-run, unidirectional Granger causality runs from energy to income for India and Indonesia, while bidirectional Granger causality runs from energy to income for Thailand and the Philippines. In the case of Thailand and the Philippines, energy, income and prices are mutually causal. The study results do not support the view that energy and income are neutral with respect to each other, with the exception of Indonesia where neutrality is observed in the short-run.

A Multilevel Economic Analysis of the Wheat Market in Pakistan

M Ashfaq

Government price policy in Pakistan affects both supply and demand of this staple food. The wheat market has been established in a particular idiosyncratic manner in Pakistan, and a thorough appraisal of policy needs to take this into account. Hence, to analysis various policy interventions, this study develops a multi-level wheat market model. After considering the real world aspects of the wheat marketing chain, the conceptual framework is developed involving five market levels. This is then translated into a multi-equation econometrics model. The model is based on secondary time

series data from 1971 to 1996. It consists of equations representing supply, demand, stock holding, importing and price formation. The model is used to estimate changes in consumer surplus, producer surplus and government expenditures resulting from the policy changes.

Canada's Net Income Stabilization Accounts

A Asselstine

After several different agricultural assistance programs in the 1980's, Canadian farmers and governments decided to reexamine how the sector is assisted. It was farmers who put forward the idea of using government assistance to encourage farmers to save during good times in order to have funds available in their account to help them out in bad years. From this idea the Net Income Stabilization Account or NISA program was developed. The first accounts and deposits were established in 1992. As deposits and withdrawals are based on farm net income each farmer must submit farm income and expense data annually to the NISA administration. This data provides a great deal of information on NISA participants and how they are using their NISA accounts to stabilize their income. This paper looks at this data and what it tells us about NISA participants' deposits, withdrawals and income. The current *farm income* crisis provides the first real test of the NISA program and so this paper will end with a look at how NISA is performing in this crisis.

Adjustment to Salinity in Irrigation Regions: Ex Post Evaluation of the Tragowel Plains Plan

Catherine Baird and Oliver Gyles

An early-mid project evaluation of the benefits and costs of the Tragowel Plains Salinity Management Plan estimated the net cost after six years at A\$ 5.5 million. The cumulative cash flow for the water transfer, drainage and halophyte programs were all positive with benefit to cost ratios (BCRs) of 3.2, 1.3 and 1.1. Inclusion of estimated future benefits and costs to year 30 gave BCRs of 13.7, 1.3 and 4.0 with net present values (NPVs) of A\$ 18.8 million, 2.5 million and 0.4 million respectively. Net costs for other integrated programs including salinity survey, whole farm planning, facilitation of structural adjustment, revegetation and coordination of implementation reduced the NPV of the first six years of implementation to A\$ 12.1 million. The water transfer program NPV was comparable to the market value for water right over the period. Only a small proportion of water right was transferred to land outside the plan area, indicating that the Tragowel Plains remained competitive for resources.

Chinese Pastoral Land Tenure Reform: Outsiders' Myths and Local Realities

Tony Banks

With respect to China's grasslands, it is commonly implied by researchers and government officials that 1) rangeland has been formally allocated to individual households and that 2) a defacto open access situation persists in reality. This paper, based on in-depth research in three pastoral communities in northern Xinjiang, challenges both suggestions. It illustrates the diversity of formal and informal institutional arrangements that have emerged at the local level since decollectivisation in 1984. Though the findings shouldn't be generalised beyond northern Xinjiang, the potential for outsiders to misconstrue local reality serves as a caution for all.

The Marginal Value of Conservation

Jane Barnett, Peter Clough, Stephen Gale

Following review of literature on economic valuation of conservation and its non-market attributes, this paper argues that conventional approaches to non-market valuation of specific sites or species have limited use in informing policy makers on the marginal value of conservation activity. A more revealing use of techniques for eliciting public preferences, such as contingent valuation and con-joint analysis, could be devised to address public willingness to pay for particular marginal choices about the mix of conservation activities or the level of conservation quality obtained, expressed as changes in future states or as the probability of achieving specific conservation outcomes at specific future dates. A prerequisite of such valuation is an estimate of the supply side costs of achieving those outcomes, so that net benefits can be compared to establish an optimal mix of conservation activities. An approach to such marginal valuation is described with specific reference to conservation in New Zealand.

A Future for Wool? – the Role of R,D&E.

A. Bathgate and R. Kingwell

Sustained low prices for wool have resulted in a prolonged decrease in the profitability of wool production. The extent of the decline has led some farmers to question whether wool has a viable future on their farms. In many regions growers have substantially increased their area of crop and reduced their commitment to wool production. Stock numbers have declined appreciably and there is concern amongst some that the wool industry may not recover.

This paper uses Western Australia as a case study for investigating the future of wool. In particular the nature and role of R,D&E in the industry is

examined. The success of R,D&E is reviewed and the directions and likely impacts of future R,D&E on farm are discussed.

The Optimal Season Length for a Sugar Mill in the Australian Sugar Industry

Rodney Beard and Mal Wegener

The productive capacity of the Australian sugarcane industry has expanded rapidly in recent years by areal expansion and by intensification of production. It is no longer possible to crush all of the cane available in a 20-23 week harvesting season. While longer seasons are attractive economically to mills they disadvantage growers because cane harvested late in the season when CCS levels are declining will achieve lower yields in the subsequent ratoon crop. In this paper we present a model of the optimal season length for sugarcane harvesting. The approach taken is to view the optimal season length problem as an optimal stopping problem for both the Mill and a representative grower. We formulate the optimal stopping problems for both mill and grower based on "real option" theory using Ito calculus. Because the interests of the Mill and growers do not coincide this results in a stochastic differential game of optimal stopping. We solve the model numerically using a modified version of the finite difference algorithm.

Numerical Optimal Control in Bio-Economic Simulations: An Example of a Multi-Species Fishery

S Bear and R Bell

A multi-species fishery is a dynamically complex environment. In many fisheries, a number of different species may be taken with each gear type. The selectivity of a particular gear type may not coincide with the relative value of the fish species being caught. The relative value of an individual species reflects both its market price and its capital value as a part of the reproductive biomass of the fishery. The problem becomes more complex as fish populations may be competing for limited resources or exhibit predator-prey relationships. The catch composition of alternative fishing methods and interactions between species in a fishery has the potential to create a range of externalities. From a management perspective, the ability to target individual species improves the efficiency of management instruments such as ITQs. A number of options are available to improve the targeting of fishing effort including gear modifications and more knowledge about the location of target species. These alternatives may impose costs and it is important to have some indication of the potential benefits of improved targeting.

An optimal control framework is developed in which the individual or collective economic incentives for resource use are embedded within a model which specifies the evolution of the resource through a set of differential equations. Genetic search algorithms are used to derive a solution to the numerical optimal control problem. A series of simulations were conducted in order to examine how the ability to target species influences optimal management strategies and returns in a multi-species fishery.

Alternative Strategies for the Pricing of Irrigation Water

R Bell and S Beare

There is pressure in Australia for water management reform to ensure an efficient allocation of resources between productive uses and to provide adequate conservation of the environment. The establishment of water markets and trade has been seen as the primary mechanism for improving the efficiency of water use in the in Southern Murray Darling Basin. However, with the existing administrative systems of determining annual allocations, water trade can only improve water allocation within a season. Individuals do not hold property rights that allow them to manage the variability in water demand and supply between seasons. The objective of the study presented in this paper was to establish the order of magnitude of the benefits of property rights which allowed for inter-seasonal arbitrage in water markets.

A stochastic optimal control model was developed for the Murrumbidgee catchment, which integrates agronomic, economic and hydrologic aspects of farm irrigation. The modelling framework allows consideration of the impact of alternative strategies for the pricing of water released from storages, when there exists uncertainty in both water availability and demand. The current allocation system adopted in the Murrumbidgee valley has the price of water largely determined at the start of the irrigation season according to allocation levels. The impact of this strategy on water use and farm incomes is compared with that which would arise from a system of property rights which would allow trade of water held in storage within and between seasons. It would be expected that rigidity associated with an annual allocation system would result in both lower farm incomes and a lower rental value of water, relative to that which could be achieved under a more flexible market regime. It is unclear whether the benefits of inter-seasonal water trade would be large enough to warrant the transaction costs associated with establishing the necessary system of property rights.

A Threshold Value Analysis of Proposed Forest Reserves

Jeff Bennett

Threshold Value Analysis (TVA) may be a useful input into natural resource decision making when non-market values are involved. The decision rule under a TVA is to protect a natural resource if the (non-marketed and unquantified) benefits so arising are deemed to be greater than a threshold value defined by the (marketed and quantified) developmental benefits foregone. In this paper, threshold values are calculated for a range of forest protection options being considered under the Regional Forestry Agreements being negotiated in New South Wales. A static analysis is first undertaken. This is then enhanced by the incorporation of factors that affect the alternative streams of value through time. Extensive sensitivity testing to demonstrate the impact of assumption variations is reported. To put into context the threshold values so calculated, the benefit transfer approach is used to provide estimates of forest protection values.

Consumer Taxes in the World Wine Market: A Quantitative Assessment

Nicholas Berger and Kym Anderson

Virtually all countries tax the consumption of wine (and other alcoholic beverages). However, the rates of taxation, and the tax instruments used, vary enormously between countries. This paper details for all OECD and some other countries the consumer tax rates as of 1996, showing specific or ad valorem excise or wholesale sales taxes, import tariffs, export subsidies and value-added or goods-and-services taxes. It also aggregates them into an ad valorem consumer tax equivalent (CTE) at various wine price levels (since many are specific taxes and so their CTE varies with the price). The consumer tax equivalent tends to be lower the greater a country's per capita production of wine, especially for premium wine. Australia and New Zealand are shown to have relatively high consumer taxes, especially when VAT/GST taxes are ignored. These estimates will be an input into an empirical model of the world wine market that is currently under construction (to be used both for market projections and for analysing potential reforms to producer, consumer and trade taxes and subsidies).

Toward Controlling Nonpoint Source Pollution of Groundwater: A Hierarchical Policy Formulation Game

Mahadev G. Bhat, Robert R. Alexander and Burton C. English

An integrating approach to formulating agricultural policy instrument levels is suggested for controlling groundwater quality deterioration from agricultural

chemical-use, while reconciling the conflicting goals of primary interest groups in the farm policy process. The paper develops a Stackelberg game-theoretic model of public policy formation that simultaneously determines endogenous price supports and nitrogen-use quota, as well as the optimal permissible water contamination. The analysis distinguishes between the private and social opportunity costs of producing agricultural crops and using groundwater as a repository for nitrate leachate from agricultural sources. It is recognised that the social benefit of using nitrogen in agriculture is less than the private benefit to producers. Private and social benefits, as well as optimal production and pollution solutions, will vary as the relative weights which policymakers attach to different social constituents change. The method developed in this paper may be applicable to any policy process in which policymakers exercise indirect influence over industrial production decisions through economic instruments.

Valuing Remnant Vegetation Using Choice Modelling: An Application to the Desert Uplands of Central Queensland.

Russell Blamey, John Rolfe, Jeff Bennett and Mark Morrison.

The Desert Uplands is a biogeographic region in central-western Queensland that lies within the rangelands area of Australia. In the region, many pastoralists are clearing the scrub and woodland vegetation in order to improve production for cattle grazing. Only limited production gains are possible because of the low rainfall and infertile soils relative to many other areas of Queensland. To assess whether such developments are economic and desirable, a first step is to value the environmental implications of alternate management regimes. A stated preference choice modelling study was undertaken so as to provide estimates of these values. Attributes included in the experiment pertain to reductions in the population size of non-threatened species, the number of endangered species lost to the region, and changes in regional income and employment. A nested (multinomial) logit model was used to model the data. The welfare implications of several different policy options regarding levels of tree retention are estimated. Differences in WTP across different population segments are also considered.

Policies For Controlling Prawn Farm Effluent In Australia

Donna Brennan

The environmental consequences of shrimp farming in Asia have caused widespread public concern. One of the main environmental impacts is the high nutrient load that is discharged from ponds, as part of the management routine aimed at maintaining pond water quality. In Australia, where there is a

high level of community awareness of the problems associated with eutrophication, the Environmental Protection Agencies are faced with the task of determining effluent control policies for the emerging prawn industry.

The nature of the pollution problem and the options for reducing the nutrient load from prawn farms are described, and the costs of alternative options are quantified. The pollution control policies for encouraging adoption of cleaner production practices are then examined. The policies considered include both direct (effluent based) and indirect (input or output based) controls. It is concluded that the high cost of monitoring and enforcement will mean that it is impractical to use direct controls on this point-source pollution problem. A number of indirect controls are examined, including feed taxes and financial incentives for investment in effluent treatment ponds. The efficiency implications of targeting pollution from prawn farms while ignoring non-point source pollution from agricultural industries are also highlighted.

Breeder Demand for and Utilisation of Wheat Genetic Resources in Australia

J.P. Brennan, D. Godden, M. Smale, E. Meng

As part of an ACIAR-funded project on genetic diversity in wheat in Australia and China, Australian wheat breeders were surveyed to assess the importance of genetic diversity to breeders. This paper reports the findings of that survey, and identifies the key issues that concern wheat breeders. The issues addressed included the breeders' attitude to diversity and the diversity in their current gene pool. The sources of materials that breeders use to maintain and/or increase diversity in their programs were also identified. The ways in which diversity influences breeding decisions are also examined. More importantly from the policy view point, changes over time in the environment in which breeders operate on the extent to which they can enhance diversity, particularly the impact of funding constraints, are shown to influence the extent to which breeders can utilise genetic diversity. The paper raises some important issues for the future genetic diversity of Australia's wheat industry, and the extent to which economic problems can arise in future.

Variety Choice by Australian Wheat Growers and Implications for Genetic Diversity

J.P. Brennan, D. Godden, M. Smale, E. Meng

Genetic diversity in agricultural systems relies on both the supply of diversity through varieties produced by breeding programs, and the demand for that diversity, through farmers' usage of varieties. Variety choice by farmers is demonstrated through

the mix of varieties that is grown in a given region. In this paper, the conceptual issues relating to the supply of and demand for genetic diversity are explored. An empirical analysis of the varietal demand, based on the varieties grown in the Temora Shire in southern NSW over the post-War period, is undertaken. Changes over time in the choice of varieties by farmers are analysed, and some implications for genetic diversity are discussed.

Economic Issues in Assessing Research Priorities in Feed Grains Nutrition

John P. Brennan, Rajinder Pal Singh and Inder Pal Singh

Researchers have abundant technical opportunities to select various options for improvement of nutritional characteristics of feed grains. Choosing between those opportunities is a difficult issue for research funding organisations. In this paper, an attempt to address those research resource allocation issues is reported. The approach to use in analysing improvements in the feed quality of grains is discussed. By defining the problem as a cost reduction for the livestock industries, the impact of improvements in grain nutrition can be defined by their impact on the least-cost feed rations for different livestock categories. Using that approach, the benefits of improved feeds can be evaluated, and research priorities can be determined on the basis of which have the greatest overall benefits. On the basis of this preliminary analysis, conclusions are drawn as to the likely direction for future research in these areas.

Improving Competitiveness of the Australian Sugar Industry by Analysing Cane Supply Arrangements Across the Value Chain

L.E. Brennan, R.C. Muchow, M.K. Wegener and A.J. Higgins

The term "value chain" describes the collection of activities that are performed to design, produce, market, deliver and support a product. The Australian sugar industry value chain has a number of distinct stages involved in the transformation of the cane crop into raw and refined sugar and other manufactured products. These stages include production, processing and distribution functions. Despite its linear direction, a critically important feature of the sugar industry value chain is that it is not a collection of independent activities but a system of interdependent activities. In the Australian sugar industry, there remains a significant degree of segregation in the organisation of growing, milling, and marketing activities, despite the fact that these sectors are linked. These linkages reflect the need to coordinate activities between growers, millers and marketers, and do not appear to have been fully exploited in the way that a more vertically integrated industry would. A key

question is what opportunities exist to manipulate the whole value chain to enhance industry profitability and competitiveness? This paper uses value chain analysis as a framework to review the competitive position of the Australian sugar industry. It is concluded that there is a need to examine novel options that could achieve further efficiency gains across the entire sugar industry value chain. This will involve going beyond traditional measures of competitiveness and focussing on improving the organisational efficiency of the industry.

Factors Influencing Most Profitable use of Limited Irrigation Supplies – A Case Study of the Bundaberg District.

L.E. Brennan, S.N. Lisson, N.G. Inman-Bamber and A.I. Linedale

The high cost of supplementary irrigation means that growers need to make well-informed decisions about the best way to use this resource. A range of biophysical and financial factors, such as the likely crop response to available water, the price of sugar and the cost of irrigation, significantly impact on the economic benefits from using supplementary irrigation. Where water supplies are limited and/or costly, there is a critical lack of information to help farmers decide the likely pay-off from supplementary irrigation, what proportion of water to apply to younger or older crops, whether to favour plant over ratoons, whether to apply small amounts of water frequently or whether to apply more water in less frequent irrigations. In the Bundaberg district, the difficulties of allocating water on farms have been exacerbated by the recent spate of dry seasons. Research tools are being developed in a multi-disciplinary environment to allow for the assessment of the economic benefits and risk associated with using supplementary irrigation. This paper takes the recent Bundaberg situation as a case study and develops arguments for best use of limited water based on current economic and biophysical modelling capability, and the use of farm productivity records. The influence of soil type, crop age and class, trash management, and irrigation strategy, in terms of amount and timing of application, on cane production is explored in a whole-farm economic framework. This research highlights the importance of an improved understanding of the crop response to varying quantities of supplementary irrigation water applied under different biophysical circumstances.

The Effects of Agricultural Policy Reform on the Distribution of Household Incomes in Turkey

Jonathan Brooks and Aysen Tanyeri-Abur

In this paper, we develop a Social Accounting Matrix (SAM) to assess the effects of agricultural policy reform on the distribution of household

incomes in Turkey. Our disaggregation of the agricultural and food sectors of the economy, and the differentiation of different categories of agricultural and non-agricultural households, necessitates the reconciliation of two detailed cross-sectional databases. One is the 1990 Input-Output Survey, the other is the 1994 Income and Expenditure Survey.

The initial SAM incorporates current policy. We then simulate the effects of the following reform scenarios: (i) The removal of all existing policies, including price supports, input subsidies and import controls; (ii) The removal of all policies, together with the introduction of direct payments to households, which return the incomes of households to the levels as those obtained under existing policy; (iii) The removal of existing policies, together with the use of targeted direct payments.

A key aspect of our analysis is the computation of income multipliers. These multipliers indicate the extent of the potential linkages between different accounts in the SAM. We are concerned primarily with the linkage from government transfers to the incomes of agricultural households, and also the linkages between different categories of household. The latter indicate the extent to which the benefits of agricultural support reach households other than the direct beneficiaries.

Our research on the distributional effects of policy reform complements other studies of the efficiency of Turkish agricultural policy. Given the strong case for decoupling on efficiency grounds, the equity impacts of price reform are obvious interest. The SAM not only points to the effects of price reform on the distribution of income, it may also serve as a basis for the formulation of a system of targeted direct income payments.

Land Reform, Household Specialisation and Rural Development in China

Colin Brown and Kai Chen

Recent land reforms in China have sought to address fundamental problems with the Household Production Responsibility System such as land fragmentation. Primarily the reforms sought to improve land productivity and grain output. However, the reforms have had a much broader effect on rural development as they have allowed a degree of household specialisation in non-grain activities both on and off the farm, and in non-farm activities. Based on information from Shandong Province, this paper reports on some of the impacts of land reform on productivity, household specialisation and rural development.

Risk Management for Agricultural Compounds and Veterinary Medicines

Bruce Burdon

In early 1999 new legislation will seek to control agricultural compounds and veterinary medicines. The purpose of the Agricultural Compounds and Veterinary Medicines Act 1997 is to manage risks from the use of agricultural compounds to trade in primary produce, animal welfare and agricultural security. It also ensures that the use of agricultural compounds and veterinary medicines do not breach domestic food residue standards. The Agricultural Compounds and Veterinary Medicines Act is not a stand alone piece of legislation. It is primarily responsive to international trading arrangements and to standards and outcomes set under other legislation (Meat Act 1981, Dairy Industry Act 1952, Biosecurity Act 1993, Animals Protection Act 1960, and Food Act 1960). It is overlaid by the Hazardous Substance and New Organisms Act 1996, which has the purpose of managing environmental and human health risks. The task for those administering the Agricultural Compounds and Veterinary Medicines Act is to ensure that its objectives are met efficiently without compromising or duplicating the outcomes of other statutes. A risk management approach has been used to make recommendations on the extent of regulation required, if any. Some cost benefit analysis and minimum cost techniques are also used to keep the bureaucrats honest.

A Semi-parametric Estimator of Willingness-to-Pay for Dichotomous Choice Contingent Valuation Data.

Mike Burton

The use of dichotomous choice questions (Are you willing to pay \$x?) has been advocated as superior to open ended questions (What would you be willing to pay?) in contingent valuation studies of non-market goods. A supplementary dichotomous choice question, raising or lowering the bid price depending on the initial response, gives increased precision. However, a problem with these methods is that identifying the mean willingness to pay is more complex, and often conditional on making a distributional assumption. This paper will present a semi-parametric method for estimating WTP without invoking any such assumptions, using the interval inherent in the double bounded format, and based on estimating the underlying hazard function for the distribution of WTP. An advantage of the approach over other non-parametric methods is that it allows one to include respondent characteristics as determinants of the individual decisions.

Measuring the Value of Agroforestry in the Presence of Land Degradation

Oscar Cacho

Agroforestry has been identified as an activity which can help prevent land degradation while allowing continuing use of land to produce crops and livestock. A problem with the evaluation of agroforestry using long-run static models and traditional discounting techniques is that the present value of the forestry enterprise is generally much lower than that of other production activities. This problem is common with native species which may have a high environmental value but a low market value.

This paper presents an economic analysis of an agroforestry operation in land prone to degradation and in the presence of positive externalities provided by trees. The value of the land is estimated based on the present value of expected returns in perpetuity under optimal management. Simulation analysis is used to evaluate the loss in land value caused by dryland salinity. A nonlinear programming model is developed and used to study the effects of timber prices and forest planting costs on optimal forest area and the level of salinity. Elasticities of relevant variables with respect to prices and costs are derived and policy implications of results are discussed.

Valuation of Indigenous Rights to Fish Resources

David Campbell

The Mabo [no. 2] 1992 High Court decision and consequent judicial and legislative actions resulted in a quantum shift in the recognition of Indigenous rights in Australia. The Croker Island 1998 decision verifies the existence of native title rights to the foreshore and marine environment. These ongoing changes create circumstance in which the transfer and trade in rights to fish resources between Indigenous and non Indigenous people can be beneficial to both parties.

The valuation of indigenous rights under existing institutional conditions is examined in this paper. As Indigenous rights are inalienable rights, transfer is restricted to situations involving compensation. Further, unlike those for non-Indigenous uses of fish resources, the methodologies for Indigenous uses are poorly developed. This is because the legal and institutional framework for Indigenous rights are ambiguous and because this area of economic concern has received minimal attention from economists.

History, Statics and Options: Transaction Costs in Institutional Change for Water Resources

Ray Challen and Steven Schilizzi

Institutions for use of natural resources, including water resources, typically encompass assignments of property rights to various levels of government, private entities and common-property organisations. Institutional reform often involves a change in these property rights, such as devolution of property rights from governments to private resource users.

In institutional economics it is generally accepted that institutional change occurs to reduce transaction costs incurred in economic exchanges and regulatory actions. In many situations, including reform of institutions for use of water resources, there are two additional parameters that affect, or should affect, decisions for institutional change. These are (i) constraints arising from institutional history; and (ii) option values associated with some institutional structures under conditions of uncertainty about the future. In this paper, a transaction-cost framework is used to incorporate these parameters into decision-making for institutional change. Institutional reform for water use in the Murray-Darling Basin is used as an illustrative example.

A Review of Economic Issues for Sustainable Shrimp Farming in the Mekong Delta, Vietnam

Helena Clayton

In recent years, the growth and intensification of shrimp aquaculture in Asia has been explosive. Asia reportedly produces nearly eighty per cent of the world's total farmed shrimp output. With strong demand and high world prices, along with declining wild shrimp stock, shrimp aquaculture in Asia, particularly in coastal regions, is becoming an increasingly important source of income and employment. In Vietnam, shrimp aquaculture is now one of the most important aquaculture practices in terms of area, production, employment and foreign exchange generation. In the coastal regions of the Mekong Delta, where most of the shrimp aquaculture is practised, saline intrusion in the dry season often limits rice production to just one wet season crop per year. The adoption of shrimp culture as a second crop has brought significant income gains for farmers in the region.

The sustainability of shrimp aquaculture, however, is under question. This paper reviews and contrasts the key sustainable development challenges facing shrimp aquaculture in Asia, as a background for understanding the specific issues in the Mekong Delta. Particular attention is given to the nature of the environmental impacts associated with shrimp farming. The application of economics to shrimp farming has been, in the main, limited to financial

analysis. In this paper, the application of economics is investigated as a tool for addressing the environmental issues and guiding solutions to the sustainable development challenges facing shrimp aquaculture development.

A New Approach to Dichotomous Choice CVM - A Recent Application to Minesite Rehabilitation in Victoria

Darron M Cook

This paper considers the application of the contingent valuation method to unsatisfactory minesite rehabilitation, with particular reference to the abandonment of open pits following small-scale gold mining operations. The results indicate that community welfare loss associated with permanent alteration of the landscape is significant, and is far greater than the cost of such operations to the mine administrators. A group of tests and modifications to the traditional dichotomous choice contingent valuation model were applied, with varying results.

Economic Evaluation Of Genetic Traits In Macadamia

Chris Coverdale, Malcolm Wegener and Craig Hardner

The objective of plant improvement is to maximise profitability of commercial production systems by producing genotypes with improved performance. The prioritising of genetic traits is a critical step in the breeding process as it defines how genotypes are selected. The efficiency of the breeding program can be increased with an ability to quantify the relative effect of each trait on the profitability of the production system. The calculation of economic weights allows plant breeders to make objective predictions about how genotypes with differing performance may contribute to farm and industry profitability.

An economic model of a typical commercial macadamia orchard in Northern New South Wales was developed to enable economic weights for several genetic traits to be calculated. The economic weight of a trait is defined as the change in Net Present Value (NPV) resulting from independently increasing the level of a specific biological traits by one unit. Biological traits such as tree canopy diameter, kernel recovery, yield of nut-in-shell (NIS) and proportion of whole kernels have been ranked in order of their economic weight or economic significance.

The scope of previous economic models of macadamia production systems has been extended in two ways. Firstly, the economic model allows the change in orchard profitability from variations in biological traits to be simulated. Secondly, the model includes a price formula that expresses

price/kg NIS as a function of kernel recovery and proportion of whole kernels.

The economic model acknowledges the time value of money, using discounted cashflow analysis over a planning horizon of twenty years. Important parameters in the model such as the cost of capital, production cost and managerial plan were developed in consultation with the industry.

Farewell to Producer Boards - Welcome to the Future

JR Coxon and EM Hurley

Agricultural reform has been an ongoing process in New Zealand since the change of government in 1984. Reform of the domestic agricultural sector preceded the world-wide reforms of agriculture introduced at the GATT Uruguay round by almost a decade. Despite persistent calls by sectoral interests within New Zealand for reform of the Producer Board system and despite recent changes to the legislation that governs the Boards, their operations have continued much as previously.

However changes have been signalled - within New Zealand by both governments and segments of the producer community; internationally the World Trade Organisation is under pressure to regulate for reform. Without protective legislation the Boards will be exposed to competition from other marketing organisations. This paper proposes that the benefits of the Producer Board system are available without protective legislation provided industry participants wish to be flexible and innovative.

Some Observations on the Nature of Government Intervention in Natural Resource Management

J. Crean, P. Pagan and C. Curthoys

The objectives of government in relation to natural resource management in agriculture have changed significantly over time. Similarly, the process that government employs to develop natural resource management policy has also evolved. In the past, policy has been developed centrally, while more recently there has been greater effort to involve the community in this process.

There are clear linkages between changes in natural resource management objectives and changes in the policy development process. The implementation of the NSW Government's Water Reforms is used as a case study to consider these linkages and to examine the advantages and disadvantages of moving to a more community based approach to natural resource management. The implications of this approach for economists, in terms of their ability to contribute to the policy process, are also explored.

Balancing Trade-Offs in the Provision of Environmental Flows in the Snowy River.

J Crean. and S Davenport

The NSW, Victorian and Commonwealth Governments are in the process of corporatising the Snowy Mountains Hydro-electric Scheme. As part of this process a water inquiry was established to assist in the determination of the environmental operating conditions of the new business, Snowy Hydro. The Inquiry's principal task was to examine the range of environmental issues arising from the current pattern of water flows caused by the Scheme and to develop a comprehensive range of costed options to address these issues.

Central to the Inquiry's deliberations is the re-allocation of water from irrigated agriculture and electricity generation to the Snowy River catchment. This paper focuses on trade-off issues associated with such a re-allocation and the difficulties involved in achieving a balance that improves net social welfare. The findings of the paper suggest that further work is required if optimal decisions are to be made and highlights a need for an on-going process to manage resource use conflicts over time.

The Asia Pacific Rice Trade: A Preliminary Investigation

Brian Davidson and Nanette Esparon

Rice is a vital food crop to a vast majority of the world's population. With the forecasted expansion in the world's population and with the added concerns of the Asian Economic Crisis, the pressure is on to create another green revolution to meet the growing food needs. Under such a scenario, it has been argued that new higher yielding varieties of rice need to be produced to feed more people. Given the importance of rice to many countries, especially in Asia, governments have instituted policies that promote greater self-sufficiency. Consequently only four per cent of the world's total production of rice is traded across national borders. The approach of promoting self-sufficiency by restricting trade is not beneficial to either the country that imposes the policy or to exporting countries. The aim in this study is to investigate the pattern of rice production and trade in the APEC region and to estimate the effects selected restrictive trade policies have had on that trade. To achieve these objectives requires both an assessment of the political economy of the industry, so that the political processes are understood, and the construction of a trade model, so that the effects of policies can be estimated. A simple trade model is developed to simulate the effects of relaxing these policies.

Olive Oil - Make It For Market

Gerry Davies and Venton Cook

There has been an average annual (compound) growth rate of olive oil imports of around 15% over the past ten years but it seems reasonable to assume that the growth rate of demand will start to level off. There is a slowing of total olive oil imports to around 22,000 tonnes by 2006, of which about 4,500 tonnes will be virgin olive oil. It is this smaller premium market which the majority of growers are targeting. This paper considers marketing needs of olives from an industry rather than an individual business perspective. As more groves come into production, there is a new set of challenges that may be better dealt with on a collective basis.

The growth in interest in olive oil production is driven by the high prices (\$22 to \$65/ litre) which are currently being achieved by some locally produced oils. The 'import parity price' is set by lower quality imported oils, mainly from Spain and Italy, which are retailing at \$8 to \$12/ litre in supermarkets. This implies that the import price is around \$4/ litre or less.

A model of the olive oil market chain shows that it is possible for Australian growers to put olive oil on supermarket shelves at a price comparable to the majority of current imports. Strategies to help ensure long term profitability are suggested.

Community Action and Pest Control

Rex Davis and Steve Harrison

Several authors have recognised pests as a negative common property resource. As a common property issue, there are often benefits to be gained in regional coordination of pest control activities. Entomologists have also recognised the potential benefits from regional coordination programs and have encouraged areawide Integrated Pest Management (IPM) strategies. However, despite the acknowledgment of differences between individual and regional economic thresholds, studies have not been conducted into the conditions that ensure or prevent collective action in pest control. This is surprising given the vast amount of literature on collective action theory and practice that has accumulated since the work of Mancur Olson. This paper discusses pest control and eradication issues that are likely to generate differences between individual and regional economic thresholds. In situations where community action is likely to bring positive benefits, the paper examines the likely success of community coordination and possible hindrances. Australian collective action pest situation examples are provided.

Is the concept of an economic threshold useful for the optimal control of pests of livestock?

Rex Davis and Clem Tisdell

The economic threshold is a concept that has been interpreted widely in the fields of economics and entomology since its introduction by Stern and others in 1959. Moreover, the concept of the economic threshold is an essential component of decision-making in integrated pest management schemes. Considerable debate has followed over the definition of the economic threshold, in particular over whether it is the pre-application pest population which will grow to a population causing economic damage above the cost of treatment or the profit maximising post-application pest population. This paper examines the issue of the economic threshold and questions its overall effectiveness, particularly in terms of its applicability in the control of pests to livestock. Apart from the definitional divergences mentioned above, the applied economic threshold literature is dominated by cropping situations which have functional forms which are considerably different from those for livestock. In particular, the economics of livestock control requires a greater focus on the importance of fixed costs and application costs in specification of the economic threshold. The relationship between the pest control costs and the costs of management practices and the control of other pests, will have a major implication for the point at which control is undertaken. The paper concludes with a discussion of control of the cattle tick in Queensland and the wider implications of the general form of the economic threshold discussed in this paper.

The Role of Economists in Formulating Australian Agricultural Policy, 1930s And 1940s

Laurel Dawson

This study considers the formulation of agricultural policy in the pre-war and war years, 1930s and 1940s, and in particular the role played by professional economists in this process. Policies put in place at this time were highly regulatory. The experience of the depression had influenced this.

The backgrounds and contributions of various economists who were the major players in the development of policy at that time, are examined. The divergence of views held within the economic profession regarding the efficiency and appropriateness of various policies are analysed and interpreted.

The role of economists in influencing Australia's agricultural economic policy since the 1930s has been considerable. Agricultural economists have also made important theoretical contributions to the policy debate over this period. In the immediate

post war period, Australian agricultural policy was based on support for the expansion of export industries and the level of industry assistance in agricultural industries was extensive.

Considerable progress was made in agricultural economics during these years but by 1950 there was still much to be done. The rate of growth of analytical agricultural research needed to be increased in both the Bureau of Agricultural Economics and the State Departments of Agriculture, and at the universities, in order to make Australian agriculture efficient by world standards and to meet the inevitable competition of the future.

The role of gender and ethnicity in household decision-making: Evidence from rural Nepal

D. Devkota, G.P.Rauniyar and W.J.Parker

Gender disparity in household decision-making is a common phenomenon in developing countries. In Nepal, it varies by ethnicity, culture and geographical location. Household decision-making processes were examined with a primary focus on gender roles in the context of three distinct ethnic communities (Brahmin/Chhetri, Gurung and Tharu) in the Chitwan district of Nepal. A combination of four research techniques including participatory rural appraisal (n=6), gender analysis (n=6), key informant interviews (n=14) and a household socio-economic survey (n=123) was used for data collection. At the household level men and women were interviewed separately. Women's involvement in economic activities was quite high but differed substantially between the ethnic groups and by type of household economic activity. Proportionately fewer Brahmin/Chhetri women were engaged in livestock husbandry compared to other two ethnic groups. Men and women jointly decided the allocation of family labour to on-farm and marketing, but there was a large variation across the ethnic groups (e.g. 43% in Gurung vs. 90% in Tharu communities). Overall, the findings suggest that more women are involved in household management and family well-being related activities than men in all ethnic groups, with the highest participation rates occurring amongst the Tharu women. The study implies that rural development strategies and projects should be sensitive to gender roles and ethnicity in alleviating rural poverty and thus household sustainability.

Price Asymmetry and Market Power in the Philippine Retail and Manufacturing Food Industry: Preliminary Evidence

Larry N. Digal and Fredoun Z. Ahmadi-Esfahani

Most applications of price transmission models assume perfect competition and use price asymmetry as an indication of market power. This

paper adopts a price transmission model under imperfect competition. A dynamic version of the model is also employed to account for the nature of pricing at the retail level, indicating that market power can exist under symmetric price transmission. Using industry and firm level data, the model is applied to the Philippine food industry to test the market power of retailers and manufacturers in the output and input markets. Results have important implications for the proposed Philippine retail trade liberalisation.

Economic and Social Impacts of a Large Agricultural Processing Plant Locating in a Rural County

Gerald A. Doeksen

In 1994, a large pork processing plant located in Texas County, Oklahoma. In addition, many ranchers built large pork confinement facilities. The county was sparsely populated with 16,320 residents. The largest community, Guymon, had a population of 8,350 residents. These activities have changed the community and the objective of this paper will be to (1) review the social and economic changes that have occurred since 1994, and (2) to project social and economic changes from 1998 to 2003.

Many growth pains have occurred since 1994 and a discussion of social and economic data will clearly exemplify positive and negative changes. Economic data, which includes employment and income data and demographic data, will demonstrate the growth in the economy. Social data, such as crime rate, child abuse, and school enrollment, will demonstrate how selected community services have been impacted. A simulation model employing input-output is used to project changes to 2003. The model projects demographic and economic data. Then, based on these data, infrastructure and community service estimates are made. Example estimates include such items as housing, school enrollment, water needs and physician needs.

In summary, the paper will discuss how the county has changed since 1994 and project how it will change from 1998 to 2003. The simulation results will be used by local decision makers as they plan on how they will provide community services and plan infrastructure needs.

Sources of Stress in Farm Families: Some Preliminary Findings

Brendan Doyle, Geoff Kaine and Jean Sandall,

The levels and the nature of stress among farmers in Australia is largely an unquantified phenomenon. Overseas research suggests that a higher proportion of farm families are experiencing high levels of stress than are non-farm families. Research

conducted at the Rural Development Centre into occupational hazards facing farmers found psychological stress ranked in the top three hazards. Further, research into task division among farm family members identified patterns of task loads indicative of stress. These findings were used as the basis for an investigation of stress levels on farms in south eastern Australia. This paper presents preliminary findings arising from this study.

David and Goliath again? Wine exporters meet the Liquor Control Board of Ontario.

B Dyack. and E Goddard

The market for wine in Ontario provides an interesting case study of both demand and supply. On the supply side, wine is produced in Ontario and wine is imported while all wine sales are controlled by the provincially-owned monopoly, the Liquor Control Board of Ontario (LCBO). Currently, the retail environment is in a period of change with sales by Ontario wine producers now being made increasingly at private retail outlets. Recent price and tax changes are intended to remove the traditional pricing discrepancy between domestic wine and imports. However, it may be the case that the LCBO protects the domestic industry through the evolving retail structure.

On the demand side, as elsewhere in the world, there has been a change in the consumption patterns of Ontario consumers towards red table wine. There has also been a trend towards consumption of premium wine produced in Ontario. Given that the LCBO is the single largest purchaser of wine in the world, the factors affecting the pattern of LCBO purchases is of interest to wine-producing regions.

We are using a demand systems framework to estimate the impact that commercial advertising and health-related information have had on the shifting pattern of demand for red, white, imported and domestic wine in Ontario. Initial estimation results will be presented.

Trade Liberalisation and Environmentalism: Impacts on Least-cost Ways to Increase Food Supplies.

Geoff Edwards

Three ways for a country to increase food supplies are: (a) a subsidy on production of food; (b) a subsidy on food imports, and ; (c) investment in agricultural research. An attempt is made to assess the way the most efficient balance between the three methods is affected by developments such as the Uruguay Round Agreement on Agriculture, or the international adoption of more environmentally friendly ways of farming.

Biodiversity Policy and Regional Agricultural Land Use Decisions

Geoff Edwards, Iain Fraser and Phillip Hone

Australia's terrestrial biodiversity is widely held to be under serious threat due, at least in part, to commercial farming, grazing and forestry activities. The threats facing ecosystems normally found in bioregions dominated by grazing and farming activities are particularly acute because these regions tend to have few substantial conservation reserves. In this paper we explore the economics of using land retirement on a large scale as an environmental policy tool to reduce the risks to biodiversity in these grazing and farming-dominated bioregions. The regional nature of this problem creates problems of particular economic interest. We suggest that the expected real national cost of extending a regionally targeted conservation reserve system is unlikely to be high, and conclude that larger-scale land retirement schemes merit closer consideration in Australia.

State Water Pricing Policies: The Economic Cost of Inconsistent Reform.

Mark Eigenraam and Gary Stoneham

Australian State and Federal Governments have embarked on a program of microeconomic reform in the irrigation sector. The process has been involved a complex range of activities aimed at replacing highly regulated control mechanisms with market based approaches including: changes to water pricing arrangements, clarifying property rights, establishing water market infrastructure, and restructuring of water business enterprises. The objective of these activities has been the establishment of an efficient market for irrigation water where trade is permitted between regions and states. This paper examines the consequences of a deregulated market for irrigation water under inconsistent water pricing arrangements across regions. A spatial equilibrium approach has been used to determine the impact of implicit regional subsidies for water on the level and direction of water trade. Estimates of the economic costs associated with the subsidies are presented and discussed.

The Benefit of APEC Trade Liberalization in Agriculture

T Feridhanusetyawan; M Pangestu and Y Riza

Since the Bogor Declaration there has been rapid progress in trade and investment liberalization through the Asia Pacific Economic Cooperation (APEC). APEC members have been lowering tariff rates and reducing the incidence of Non-Tariff Barriers. The trade reforms are mostly unilateral and voluntary in nature, but the scheduled tariff reductions have been consistent with the goal to

have free trade area in Asia Pacific in 2020. However, there is not much progress on agricultural trade liberalization through APEC. In contrast, other trade liberalization schemes, such as WTO (World Trade Organization) and AFTA (ASEAN Free Trade Area), have incorporated tariff reduction in agricultural commodities. The objective of this paper is to measure the potential benefit of agricultural trade liberalization in Asia Pacific through APEC. This study utilizes a global computable general equilibrium modeling called GTAP (Global Trade Analysis Project), which models the world economy in interconnected markets, regions, and economic sectors. The result of this study would provide more precise estimates of the benefit from trade liberalization, which could be used by the policy makers in Asia Pacific to formulate a scheme for agricultural liberalization through APEC.

Sense and Non-sense in Dairy Farm Management Economic Analysis

Alexandria Ferris and Bill Malcolm

The standard analytical approaches and methods of farm management economics are simple, sensible and powerful. Still, examples of inappropriate nonsensical, approaches to farm management economics questions proliferate. In this paper, the focus is on some inappropriate, nonsensical, approaches to so-called management analysis of dairy farming operations. Included in the analytical eccentricities which abound are such things as: trying to evaluate farm performance and changes but not distinguishing between cash (financial feasibility) and profit (economic efficiency) nor considering the time value of earning of capital invested; trying to estimate the cost of pasture; trying to lift productivity on one family farm by having a good hard look at the average of other farms; and the folly of inventing measures of performance such as Economic Farm Surplus that are designed and adjusted to facilitate comparisons between farms, and then trying to use such measures for farm management analysis. It is as easy to get it right as it is to get it wrong; so more sense and less non-sense is the call.

An Application of Data Envelopment Analysis to Irrigated Dairy Farms in Northern Victoria, Australia.

Iain Fraser

In this paper DEA is used to assess the technical efficiency of a sample of irrigated dairy farms in Northern Victoria, Australia. It is proposed that DEA is a useful tool in helping to benchmark the dairy industry, which is continually striving to improve its productive efficiency. DEA takes a system approach in that it takes account of the relationship between all inputs and outputs simultaneously. DEA yields a more consistent

measure of efficiency than the more frequently reported partial indicators of farm efficiency. In addition DEA yields a relative measure of efficiency and it identifies those inputs and/or outputs that are being under-utilised. From an extension perspective this is extremely useful information as it can assist in identifying industry best-practice.

Do Royalties: “Have A Disincentive Effect On Production”?

Rob Fraser and Hild Rygnestad

This paper analyses the impact of royalties in the context of a bilateral monopoly bargaining process. It is shown that the bilateral monopoly model is characterised by two distinct forms which are distinguished by the shape of the seller's marginal cost function, and that the view that royalties have a disincentive effect on production is unfounded for one of these forms. It is argued that the forms of bilateral monopoly can be differentiated by identifying the direction of the observed correlation between movements in traded prices and quantities. This proposal is investigated in the context of the Australian iron ore and coal industries, and it is suggested that, in the case of iron ore, royalties do not have a disincentive effect on production.

Frameworks for Evaluating Responses by Grain farmers to Seasonal Forecasts and Pricing Opportunities

James Gaffney

Cropping adjustment and pricing options arise throughout the year for farmers in Australia's north eastern grain belt where both summer and winter cereals, pulses, oilseeds and cotton are grown. The paper outlines stepwise processes for analysing these decisions. Modelling the crop adjustment decisions relies on long-term annual cropping plans to identify the timing and context of the possible adjustments. The 'with and without' principle, and the irrelevance of sunk costs, lead to reliable partial budgeting frameworks for estimating option payoffs. Yields and prices are then varied according to prevailing prospects to capture relative riskiness.

Modelling the pricing problem involves capturing possible participation in the market from the time of sowing until well after harvest. The recurrent decisions faced are assessment of prices, and for those judged acceptable, deciding how much to commit. The model by Young et al (cited in P. J Barry (ed) 1984, Risk Management in Agriculture, Iowa State University Press, Iowa, p. 37) using the simple decision rule "hold a stored crop as long as the risk adjusted expected net gains from storage are positive" is the key.

The Effects of Changing the Asset Tests for Australian Farm Families Seeking Austudy

John Gardiner and Brian Davidson

AUSTUDY is a scheme operated by the Commonwealth Government to provide assistance to students who have insufficient means to avail themselves of secondary and tertiary educational opportunities. Eligibility for the scheme is tested on the basis of a family's income and asset levels. In the asset test family farm assets are currently discounted by 50 per cent. This asset test has been criticised as it excludes 'asset rich but income poor' farm families from assistance, and so reduces the opportunity for education for some farm children. Rural and farm family lobby groups have called for the abolition of the asset test. As a compromise in the 1996 election campaign the Australian Government promised to lift the discount rate allowed for farm assets on the asset test from 50 per cent to 75 per cent. The purpose in this study is to estimate the effects of raising that discount rate to 75 per cent on the number of families that become eligible for AUSTUDY.

The data was provided by Australian Bureau of Agricultural and Resource Economics who survey 1360 farm families, 560 of whom had school aged children. Using Head Count Ratios and Income Gap Indices, and the adjusted measures of assets and income used by AUSTUDY eligibility, it was found that 38 per cent of farm families would have been denied AUSTUDY in 1994/95 solely on the basis of their asset levels. Further, by raising the discount level to 75 per cent would have made only 65 per cent of those families eligible for assistance.

How Fast Do Urban Migrants Change Their Diets?

John Gibson

Rapid urbanization is a major cause of structural change in food demand. In West Africa, urbanization is associated with a switch from coarse grains to rice and wheat, in Melanesia the switch is from root crops to rice and wheat, while in much of Asia the switch is away from cereals (and within cereals to wheat). Although reasons why urban diets differ from traditional rural diets are well known, the rate at which recent arrivals from the countryside switch their diet has not been estimated. Evidence on the speed of this dietary change can help to show whether studies of urban food demand need to control for cohort effects and may also help producers forecast the size of their future urban markets. This paper uses cross-sectional household survey data from urban areas of Papua New Guinea to estimate the rate at which migrant household's

switch their diets from traditional root crops to imported rice and wheat products.

Calorie Demand Elasticities with Noisy Measures of Household Resources

John Gibson

Many studies suggest that changes in household economic resources have almost no material effect on various problems that affect the life chances of individuals. Amongst the most important of these problems that are seemingly unresponsive to incomes are inadequate calorie intakes and child malnutrition in developing countries. This paper examines the impact that errors-in-variables have on inferences about the importance of household incomes to the calorie and protein demands of households and to the risk of stunting amongst young children. Results are based on a new household survey from Papua New Guinea, with repeated observations on households during the year. These repeated observations allow regression estimates to be corrected for the differing reliabilities of the explanatory variables.

Managing Herbicide Resistance: Should You Conserve Or Exploit Your Herbicides?

Marta Giesbertz

Over the last decades herbicide resistance has become a serious problem in dryland agriculture. In Australia this situation resulted from the widespread and profitable increase in herbicide use for weed control, adoption of minimum and no-tillage systems, and decline of pasture in favor of continuous cropping rotations. Repeated application of herbicides without the traditional weed control provided by cultivation and grazing has led to a high selection pressure on weed species. This particularly applies to annual ryegrass (*Lolium rigidum*) which, given its characteristics, has developed multiple resistance to a wide range of commonly used selective herbicides.

In this paper a dynamic model of herbicide resistance in ryegrass is used to identify the best management strategies when only a limited number of shots of selective herbicides are left to use before resistance develops. Two different timing scenarios for herbicide application are hereby analyzed for both a continuous wheat-lupin rotation and a cropping sequence including a pasture phase. Conclusions are drawn on how the best integrated strategy and the economic payoff change when choosing to conserve herbicides rather than rapidly exploiting herbicide effectiveness.

Optimal Liming Strategies for Acid Soils in Western Australia

N.A. Glenn and M. O'Connell

Soil acidification is increasingly recognised as a major issue in agricultural resource management. Farmer usage of lime to reduce acidity is increasing, but decisions about liming are often difficult due to the slow onset of the problem, difficulty in observing and detecting the problem, and lags in the effects of treatment. For example, if lime is applied too late, there will be a number of years in which yield is depressed before the lime takes full effect. In the case of subsoil acidity which is difficult to identify, lime may be applied unnecessarily, or not applied even though it should be.

In this paper we use a bio-economic model to investigate the profitability of different liming strategies for management of soil acidity for a range of conditions in Western Australia. The model combines biological responses with long term benefits and costs of managing soil acidity. Questions addressed include: when to lime; when not to lime; and how much lime to apply. Sensitivity analysis is conducted in order to investigate a range of situations and to facilitate explanations for optimal strategies.

Private Property And Economic Efficiency: A Study Of A Common-Pool Resource

RQ Grafton, D Squires, and K Fox

The British Columbia halibut fishery provides a natural experiment of the effects of "privatizing the commons". Using firm-level data from the fishery two years before private harvesting rights were introduced, the year they were implemented and three years afterwards, a stochastic frontier is estimated to test for changes in technical, allocative and economic efficiency. Despite some improvement in short-run measures of cost efficiency, overall the fishing fleet still remains well below the best practice frontier. The relatively few short-run efficiency gains are attributed to deficiencies in the property right and the possibility that fishers may require several years to optimize their operations. By contrast, the results indicate an immediate and significant increase in producer surplus and unit rents which are directly attributable to the privatization. The results suggest that if the full benefits of privatization are to be realized, careful attention must be given to properly specifying all the characteristics of the property right.

Property Rights For Common-Pool Resources: Achieving The "Right Mix"

RQ Grafton

Under what circumstances will private, community or state rights be preferred to mitigate the problems associated with the exploitation of common-pool resources? In contrast to the literature which emphasizes "privatizing the commons" or protecting and encouraging community rights, the paper describes how state rights can perform a useful role in the management of some common-pool resources. Using a four-dimensional framework, the paper suggests that, in many cases, common-pool resources should be managed by a mix of property-rights regimes. The "right mix" of regimes will depend upon the nature of the resource and the institutions in which the property rights exist.

Linear Programming and Future Landuse Scenarios: An Irrigated Catchment Case Study

Oliver Gyles and Olive Montecillo

Potential for change in the mix of irrigated enterprises was estimated for a catchment in the Shepparton irrigation region using linear programming. The model allocated resources to maximise net income in each of the next five decades as if the catchment were one farm. Change was driven by price trends and productivity and constrained by water resources, land capability and investment capital. On the basis of the assumptions implicit in the model and sensitivity testing carried out, it appears more likely that there will be a rapid decline in irrigated cropping and pasture based meat production in conjunction with a significant increase in irrigated dairying in the first two decades, followed by an interchange of resources between dairying and new horticulture with the catchment dominated by horticultural enterprises by year 50. A workshop has demonstrated the usefulness of the approach for assisting catchment management agencies and policy makers understanding the implications of different price, productivity and irrigation water allocation scenarios for sustainable economic growth and natural resource management. While improvement to the model is readily achievable, the marginal utility of complex sophistication is questionable.

Economics of Reduced Water Allocations: Estimating Impacts on the Northern Victorian Dairy Industry

Oliver Gyles and Catherine Baird

Water use efficiency data was used to estimate the impact of reducing sales water allocations on a range of irrigated dairy farms categorised according to intensity of water right. The expected deficiency in available water was estimated for each farm

category on the basis of historical demand for sales and the potential production loss estimated. The cost of substitution through management options of purchasing 1) water right (with associated sales), 2) temporary sales water, or 3) feed supplements as grain or hay and silage was calculated. Purchase of water right was found to be the cheapest option and the regional transfer volume required estimated at 93 GL of water right valued at A\$ 60.7 million. The average transfer requirement was estimated at 31 ML per property, or A\$ 20,000 in capital expenditure. The estimated cost of the transfer requirement for a large low security farm was A\$ 240,000. Current water policy activity is seeking instruments to reduce industry impacts. Given the operation of a market since 1991/92, options which redefine water property rights and enable re-allocation of sales entitlement have potential to be inequitable for irrigators already using prudent risk management strategies for water security.

Irrigation Infrastructure Refurbishment in the MIA : A Modelling Framework

Ahmed Hafi and Mike Bryant

Most irrigation systems supplying water to farms are in an unsatisfactory state and suffer from transmission losses. This paper reports the work undertaken in developing a modelling framework for the evaluation of options for irrigation infrastructure refurbishment in the MIA.

A prototype model was developed using indicative data for the Stanbridge system in the MIA, which covers 18 kilometres of channel/pipe and 47 farms each of which draws water at a different point from the system. Choices from a number of options of refurbishment for each segment of the supply lateral and a mixture of crop enterprises and different types of water conservation technologies by farms are endogenous in the model. The capabilities of the model are demonstrated by using it to evaluate infrastructure refurbishment options for the Stanbridge system.

A reduction in transmission losses with refurbishment resulted in more water available for use in downstream reaches leading to an increase in the area of irrigated broadacre cropping in downstream farms. At a system level, refurbishment of infrastructure resulted in an increase in total water use by crops and the overall efficiency of water use. Without refurbishment, the opportunity cost of water increased with the distance from source due to transmission losses. Infrastructure refurbishment resulted in reducing the opportunity cost differential between farms within the system.

Matching Cotton Grower's Perceptions of the Value of INGARDTM Cotton with Economic Analysis Based on Same Farm Paired Comparisons of Performance.

Wayne Hancock

The genetically modified INGARDTM cotton product was released on Australia in 1996 and was greeted with high expectations and enthusiasm within the cotton industry. INGARDTM contains the Cry 1A© gene from the soil bacteria *Bacillus thuringiensis var kurstaki* for the biological control of *Helicoverpa armigera* and *H. punctigera* pests in cotton. These are the most serious pests of cotton and account for the majority of insecticide applied to cotton in Australia. Significant environmental and economic benefits were claimed at the time of release through the reduction in pesticide usage, and management and production advantages from easier management systems.

Grower attitudes and perceptions relating to INGARDTM were followed over two seasons through grower surveys. An economic analysis was undertaken on growers' actual insecticide cost and yields for paired varietal comparisons through partial budgeting. This was matched to grower's perceptions of the value of the INGARDTM product and the price of the license fee. The analysis of INGARDTM Vs conventional cotton supports the grower's perceptions of high price/erratic performance and the desire for a lower license fee based on the 1997/98 season.

A Modelling Framework to Assess the Economic Potential of Plantations Investments: A Case Study for Australia

Allan Hansard, Kevin Burns and David Walker

This paper details the methodology and preliminary results of a project evaluating the economic potential of plantation and farm forestry investments in various regions of Australia. While past studies have assessed the biological suitability of plantation species within regions, or examined the economics of representative plantation investments, this study assesses the economic potential within a region by spatially calculating the potential returns from plantations and comparing these to existing agricultural land values. In doing so, many of the regional characteristics, which determine economic potential can be included, such as biological suitability and productivity, the availability of cleared agricultural land, existing and potential infrastructure and opportunity costs.

A linear programming model is used to calculate the potential plantation returns and determine the optimal area of various plantation regimes within a region. The potential plantation land values are calculated using a residual pricing method assuming a given industry and market structure, and the optimal plantation area is determined by

maximising the aggregate land values in the region (both potential plantation values and estimated agricultural values) within the land and processing capacity constraints. In addition, preliminary results for industry development scenarios and the possible use of the model in exploring the implications of carbon trading and regional plantation development will be discussed.

Multiple Objectives on NSW Dairy Farms: Assigned Importance and Related Satisfaction.

Jennifer Harrison and Dennis O'Brien

Dairying is a major rural industry in New South Wales (NSW) that contributes significantly to local economies through farm level activities and by generating substantial downstream employment and value adding through processing. In recent years dairy farm management has become increasingly complex with a need to balance numerous, perhaps conflicting, objectives. Farmers must reconcile their own private goals with those of society. They face intense pressures to expand, reduce production costs and increase product quality while simultaneously conserving natural resources, maintaining lifestyle and achieving other personal objectives. The extent to which these objectives are mutually achievable may have implications for both the importance attached to them and related farmer satisfaction. Using survey data from two hundred NSW dairy farms, this study examines the importance farmers assign to a selection of objectives and the satisfaction farmers feel in terms of achieving these objectives. Results of analysis indicate both conflicts and concurrence in the weights assigned. The findings have implications for farm management, the assessment of farm performance and the operationalisation of sustainability.

Productivity Differences Across NSW Rice Farms: Links to Resource Quality

Scott Harrison and Lisa Chapman

Best practice technology - with respect to variable input use - was identified for rice production in the Murrumbidgee and Murray valleys of New South Wales and cotton production in northern New South Wales using Data Envelopment Analysis (DEA) techniques. Productivity indices for individual farms sampled in each region were then calculated. Mapping the location of these farms revealed distinct geographical patterns of productivity. Overlaying maps reflecting various measures of the quality of land and water resources suggested that the difference in measured productivity could largely be explained by differences in the quality of regional land and water resources. The productivity indices were then used in a second stage regression analysis to identify the variables which would explain the differences in productivity indices

across farms. Specific attention was paid to the role of differences in the quality of land and water resources in explaining variations in productivity indices.

Management Strategies for Giant Clam Mariculture in Solomon Islands

Robyn L. Hean and Oscar J. Cacho

Giant clam mariculture is undertaken by coastal village farmers in Solomon Islands as part of a research and development project of the International Center for Living Aquatic Resources Management (ICLARM). The production technology is simple and does not require a large capital investment. The main inputs are clam seed and husbandry labour. These inputs interact through their effect on clam growth rate and solving for their optimal combination is not a trivial matter. In this paper, a bioeconomic model is used to explore the impact on village farmer profits of alternative management strategies for these inputs. The model highlights the importance of environmental factors and husbandry in explaining clam growth and survival, and illustrates the mechanism through which seeding and husbandry interact. The management strategy recommended by ICLARM is described and compared to the optimal management strategy identified by the model. Estimates of possible gains and losses to village farmers as a result of adopting different management strategies are presented.

Estimating Costs of Pest Damage Through Simulation

Susie Hester and Oscar Cacho

Optimal apple orchard management requires an understanding of the many physiological and horticultural factors that influence tree growth and fruit production, including the management of pests. During its lifetime, an apple orchard will be prone to attack from a wide range of pests that will influence the health and productivity of the trees and the quality of their fruit. The biological and economic costs associated with pest management strategies is a major influence on orchard profitability.

This paper uses a dynamic simulation model to investigate the long and short term effects of pest infestations on apple orchard profitability. The pest-host interaction is incorporated into an existing bioeconomic model that contains detailed information on tree physiology and apple production. Details of the economic costs of pest infestations is used as a guide to assess the possible benefits of research in this area. Examples of this research include investigations into the effect of reduced pesticide use, the search for alternative pesticides when resistance is a potential problem, and the breeding of pest resistant apple trees.

Cost of Ignorance - Evaluating a Land and Water Management Plan

Christine M Hill

This paper outlines the impacts of ignoring the costs to the community of increased rural waterlogging and salinity. It identifies the cost of no further action, and the costs and benefits of undertaking a land and water management plan. The processes of developing and evaluating the plan are explained. Difficulties in obtaining data, both for the community and the economist, are discussed. Data availability then shapes the range of costs and benefits that can be evaluated. The paper looks at the process and results of a case study of a Land and Water Management Plan for an irrigation district in central New South Wales. The case study demonstrated all the complexities of community and professional conflict, difficulties in data availability, budget and time constraints and a rigorous review process. Also discussed are the implications of recommendations of this Land and Water Management Plan Economic Evaluation for the community and government.

A Bayesian Methodology for Promotion Efficiency with Application to Australian Meat and Livestock Corporation Expenditures

G Holloway

Theory and procedures are developed to show how the solution to the promotion problem--the problem of locating the optimal level of advertising in a down-stream market--can be derived empirically, simply, and robustly through the application of Bayesian resampling techniques. The (posterior) distribution of the optimal (dollar) level of promotion is identified from a non-linear transformation of parameters in the natural-conjugate, normal-linear model. Results obtained from an application to time-series (1978:2 - 1988:4) on red meats advertising by the Australian Meat and Live-Stock Corporation suggest that additional dollar allocations would not have benefited lamb producers.

An Analysis of the Technical Efficiency of Cotton Farmers in the Punjab Province in Pakistan.

Muhammad Sajid Hussain, Tim Coelli and Dr Phil Simmons

In this paper we analyse the technical efficiency of cotton farmers in the Punjab Province in Pakistan. Technical efficiency is measured relative to a stochastic frontier production function. The estimated model includes a function in which technical efficiency is made an explicit function of

firm specific factors (involving the levels of education and experience of farmers and other factors). Technical efficiency is also estimated using data envelopment analysis methods. Preliminary results indicate that the two methods provide similar technical efficiency estimates, with mean technical efficiency found to be approximately 50 per cent.

This study suggests considerable room for productivity gains for the farms in the sample through better use of available resources. Gains in output through productivity growth have become increasingly important to Pakistan because there is almost no opportunity to bring more land under cultivation.

Farming Options for Ameliorating Acidifying Soils in South-Eastern Australia: An Economic Assessment

Q. Islam, J.D. Mullen, J.P. Brennan, G. LiI, and K.R. Helyar

Acid and acidifying soils occur extensively in Australia. Currently, some 90 million hectares of agricultural land in Australia is considered to be acidic and around 35 million hectares are considered to be highly acidic which is both a serious agricultural and environmental problem. The nature, impact, and causes of soil acidification vary across Australia, as do farming systems and the institutional and socioeconomic issues relating to land management. In high-rainfall areas of south-eastern Australia, managing acid soils is particularly difficult in permanent pasture systems. In this paper, an economic analysis is made of the results of a long-term trial (MASTER: Managing Acid Soils Through Efficient Rotations) aimed at finding the most profitable farming options for the farmers to address the amelioration issue. Data from four basic treatments (with and without lime) such as annual pastures, annual pastures/crop, perennial pasture and perennial pastures/crop were analysed. We used average crop yields and wool cuts during 1992 to 1997 and calculated gross margins for the options. Using discounted cash flows, the economic benefits of the different treatments were examined. The implications for farmers in those regions are identified and explored.

Cost-Benefit Analysis of Bee Brood Disease Management Options in Queensland

Ian Jarratt and Mary Ann Franco-Dixon

American Foul Brood disease (AFB) is a bacterial disease of honey bees which causes significant economic losses in Queensland and other Australian states and many other countries, including New Zealand.

This study:

- reviews several previous applications of Cost-Benefit Analysis (CBA) to AFB control/eradication programs
- emphasises several key methodological issues arising in the use of CBA to evaluate disease control/eradication programs
- uses CBA to assess a range of alternatives to the present AFB control program in Queensland.

The Role of Institutions in Policy Making

Robin Johnson

There has developed in recent years some concern about the effectiveness of government policy, especially concerning its implementation and the agencies responsible for it. Institutional economics and transaction cost economics provide a number of pointers to the evaluation of past policy aims which appear pertinent. More broadly, the paper pleads for wider application of the structure/conduct/performance paradigm to given policy implementation. Some case studies are discussed and suggestions made for future application.

The Contribution of Agriculture to the National Economy of New Zealand

Robin Johnson

The agricultural sector tends to get a bad press and low priority from NZ Treasury due to the falling share of GDP. On the other hand, the agricultural sector in NZ shows up highest in the OECD total factor productivity studies! Is not the efficient use of resources the main factor Treasury should be taking into account and not the declining share of GDP? Further, is there some economic truth in the argument that production activities are the basis of the economy and are needed to create the real wealth for the rest of the economy? Is there some point where the service economy falls in on itself and the proliferation of service jobs cannot feed on itself for ever? This paper will try to assess the place of agriculture in a strategic plan for future growth and prosperity and put NZ Treasury in their place.

Agricultural Knowledge and Information Systems: A Network Analysis

Geoff Kaine, Brendan Doyle, Ian Reeve, and Jim Lees

Many reasons have been put forward to explain why the adoption of new ideas and techniques by producers is often slower than might be desirable. Rŕling and others argue that research and extension should not be seen as separate processes involving distinct institutions which must somehow be linked. Rather, scientists, specialists, extension workers,

consultants and producers should be seen as participants in a single agricultural knowledge and information system (AKIS). This perspective on research, extension and adoption as activities that occur within a network offers new insights into the way in which technology transfer occurs, and new ideas as to how to increase the rate of adoption of new ideas and techniques in farming. In this study, we use network management theory and applied network analysis to operationalise the concept of an AKIS and to test the relationships between system characteristics and the effectiveness of technology transfer. The research is based on the analysis of the networks associated with five regional research locations in the temperate high rainfall zone of south-eastern Australia. The results indicate that network structure and the performance of individual network members have a significant impact on the ability of an AKIS to facilitate technology transfer.

Determinants of Off-Farm Income in Rural Nepal

P Kayastha, G P Rauniyar and W J Parker

Stagnant agricultural productivity and low returns in farming have led rural residents to look elsewhere for alternative or supplemental income opportunities. Off-farm income has therefore grown in importance in sustaining rural households in developing countries, although the factors influencing this have not been well documented. The purpose of this study was to describe and explain how off-farm incomes are generated and what roles they play in rural households of the eastern Nepal. The research was carried out in two ecologically different districts (Morang and Dhankuta) of eastern Nepal. The participatory rural appraisal workshops (n = 6), key informant interviews (n = 9) and household socio-economic surveys (n = 150) were used to gather data. The lack of productive land resource, increased household size and higher educational attainment of household members were all positively associated with household members being employed off-farm and thus also increased off-farm (and household) income. The off-farm income opportunities and earnings generated were substantially lower in the Hills compared to the Terai region. Furthermore, off-farm income opportunities were relatively fewer for women compared to men in both districts. Policy measures to boost off-farm income opportunities should be specifically targeted to the hill regions and women in order to improve household sustainability.

Economics in Technical Models of Farm Systems - Better none than some.

Hugh Kelly and Bill Malcolm

Decisions about dairy farm management involve consideration of human, technical, economic, financial, risk and institutional aspects of the farm

system. Models of technical parts of farm systems have proliferated over the past decade. Ironically a common failing of these models, from the perspective of farm management decision analysis, is not that they *don't* take into consideration the economic aspects of the decision problems - but that they attempt to do so. The difference in the information deriving from the flawed farm management economic analysis of a technical model, and the results derived from the same model re-analysed using standard farm management tools, is demonstrated using a case study. An understanding of farm management economics is needed if the appropriate perspective and tools are to be applied in the unique circumstances of the problem at hand.

Alternative International Management Arrangements for the Southern Bluefin Tuna: Results from a Bioeconomic Model of the SBT Fishery

J Kennedy, L Davies, and A Cox

By the 1980's the stock of southern bluefin tuna was considered to be seriously depleted after years of heavy fishing, primarily by Australia and Japan. From 1994 to 1997 annual harvests have been set by the Commission for Conservation of Southern Bluefin Tuna, under an agreement between Japan, Australia and New Zealand.

The agreement is now in abeyance. Destabilising factors have been: the higher estimates of sustainable annual harvests made by the Japanese scientists compared to those made by the Australian and New Zealand scientists; and the emergence of Korea, Indonesia and Taiwan as significant harvesters in recent years. Questions arise about the feasibility of finding incentive systems to maximise joint rents from the fishery, or even to ensure the survival of the species.

The paper describes a multicohort bioeconomic model of the fishery, allowing for strategic interaction between three groups of harvesting nations, for helping to answer these questions. The groups are: Australia and New Zealand; Japan; and Korea, Indonesia and Taiwan. The model is used to determine cooperative and non-cooperative harvesting schedules over twenty year periods, allowing for the Korea, Indonesia and Taiwan group to be characterised as either a strategic player or a competitive fringe.

Optimal Strategies for Regional Cultivar Testing for Various Crops

Ross Kingwell

Before a variety is released for adoption by farmers in a region it is subject to comparative field testing. An economic issue is how extensive and prolonged should be this field testing within the region; over

how many locations, years and with what number of plot replications should testing occur? This paper addresses this issue for the main broadacre crops grown in Western Australia and shows through sensitivity analysis how robust are the findings for each crop type. Findings are contrasted with those already published for southern New South Wales.

The Valuation of Biodiversity

M K Krausse and R R Alexander

This paper explores the affect of an individual's knowledge of biodiversity on the nature of their preferences for its preservation. Previous research suggests that individuals have a limited understanding of the concept of biodiversity and that some may be unwilling to trade-off changes in biodiversity against income.

We hypothesise that the way in which individuals understand biodiversity is such that meaningful preferences for biodiversity preservation can only be expressed for large scale non-marginal changes (i.e. a regional or greater scope geographically and at a genus or greater scope genetically). Similarly we suggest that individuals can express preferences for different management regimes or policies at a large scale but are limited by a lack of technical expertise at the species or site scale. Many of the methodological constraints relating to non-market valuation of biodiversity at the species or genetic scale, are less critical at the larger scale. Similarly the degree of uncertainty about functional relationships at the species level are less critical when considering an individual's willingness to pay for an aggregate measure of biodiversity preservation.

A discrete-choice contingent ranking valuation study is proposed with the intention of identifying willingness to pay to preserve biodiversity and preferences for different management strategies. The study will address the value of indigenous biodiversity in a lowland ecosystem in one region of New Zealand.

Spatially-Based Sustainability Assessment of Irrigated Farm Enterprises

Dailin Kularatne and Mike Morris

Development and application of effective resource management and investment policies in agriculture depend on detailed understanding of spatial distribution of biophysical and economic resource base of individual farm enterprises. Most of the analyses available are based on regional or district averages and unsuitable for effective policy development. By providing enterprise and farm level resource based analyses, it is possible to make a considerable input to the sustainable development of irrigated agricultural enterprises.

This paper presents an integrated approach for evaluating and presenting the suitability status of different land use options in irrigated agriculture. The economic and GIS analyses provide an effective tool for comparative assessment of economic outcomes at a lower level of aggregation. The analytical framework links farm biophysical and financial data to evaluate and spatially present the suitability levels of irrigated agricultural enterprises according to a number of scenarios. This allows resource managers and policy analysts to examine and visualise the likely effects of their policies on farm profitability and natural resource management of different farm enterprises in a given area.

Preliminary results of an application of the analytical framework to target areas to enhance beneficial structural adjustment in the Shepparton Irrigation Region of Victoria Australia are also discussed.

An Application of Bioeconomic Modeling to the Analysis of Bovine Tuberculosis Control Policy

NR Lambie and KB Bicknell

Restrictions on the movement of livestock from infected herds is a common feature of livestock disease control policy in many countries. Under New Zealand's latest strategy for bovine tuberculosis (Tb) control, new Tb classification systems and tighter movement control regulations are intended to provide cattle producers who have infected herds with incentives to reduce infection levels in their herds. The incentives comprise higher market valuations for cattle, and reduced Tb control compliance costs for herds, with low risk of infection. However, very little is known about how individual producers are likely to respond to these incentives. A bioeconomic model is used to gain insight into the important trade offs confronting a representative beef cattle producer in a Tb vector risk area and the implications of their behaviour for Tb control policy objectives. Numerical results disclose that a perverse incentive may exist for risk neutral producers to purchase cattle from infected herds and thereby allow the transmission of Tb into their herd. An implication for Tb control policy is that the price discount for cattle from infected herds may need to be transformed from an incentive into a disincentive if infection levels in these herds are to be reduced.

Economic Analysis of Deer Control on Conservation Land

Ross Lambie, Ross Cullen, Graham Nugent

Deer are a pest on conservation land. The New Zealand Department of Conservation is responsible for the control of animals which threaten conservation assets. Budget constraints limit the

extent of deer control which DoC can provide, and it must prioritise areas for control, and search for most effective ways to achieve that objective. Deer are also a resource for commercial and recreation hunters. The private supply of hunting effort may be sufficient in some regions to suppress deer population densities below ecologically determined threshold levels.

This paper analyses the supply of deer hunting effort by commercial firms and by recreationists to determine best means by which DoC can increase the supply of effort. It also considers in which regions will private hunter effort be acceptable to DoC as the principal means of deer control. Policy conclusions are drawn on the most appropriate actions for DoC to pursue to achieve deer control objectives at various conservation sites.

A Structural Model of the World Wool Market

Bruce Layman

Traditionally, research and development conducted at Agriculture Western Australia (AgWA) has been directed at improving the on-farm productivity of farmers in Western Australia (WA). In the past, evaluation of such research has been handled by the so called “marginal profit” approach. However, in recent years there has been an increasing push towards marketing and processing research, broadly categorised as “off-farm” research.

This change in direction has been especially prevalent in AgWA’s Wool Program. Off-farm research now involves increasing the efficiency of processing wool types common in Western Australian wool production and the forming of strategic relationships with processing sectors in certain countries.

The Western Australian World Wool Model (WAWWM) was built for the purpose of calculating the economic benefit to Western Australia of off-farm research, to assist managers in allocating research dollars efficiently between on and off-farm investment within the program. The model is a comparative static structural model, constructed within the GEMPACK software. Features of the model include: production separated by country/region; the inclusion of nine different qualities of raw wool; separate woollen and worsted processing sectors; and processing and consumption separated by country/region.

This presentation will give a broad overview of the construction of the model, as well as giving a practical demonstration of it’s capabilities using an example.

Prospects for Public Plant Breeding in a Small Country: A Research Agenda

Bob Lindner

The biotechnology revolution is being fuelled by the convergence of an explosion of knowledge about molecular biology on the one hand, and on the other by legal and policy developments that have dramatically expanded the scope of intellectual property rights in plant genetic resources. Due to a series of landmark patent decisions in the USA, comprehensive intellectual property protection not only applies to genetically engineered life forms, from microorganisms to plants and animals, but also to many of the “building blocks” needed to engineer transgenic organisms. New property rights create the basis for new markets, and new commercial biotechnology companies have proliferated rapidly during the last twenty years. Concurrently, the opportunities arising from scientific discoveries have unleashed competitive forces that threaten to transform the production of new plant varieties. Much of the ownership of intellectual property rights in plant genetic resources is now concentrated in the hands of a small number of very large life sciences companies, and they are investing huge sums in research and development. Some commentators believe that public sector plant breeding and research organisations will be overwhelmed in the process.

The potential implications for the generation and commercialisation of biological research, and for the evolution of agriculture in Australia are momentous, but poorly appreciated. Questions, which need to be addressed, include the following: How does the division of benefits between farmers and holder’s of IP impact on the rate of adoption of new varieties? How serious are compliance and enforcement issues for alternative appropriation mechanisms, such as seed royalties, end-point royalties, closed loop marketing contracts, or other material transfer agreements? What are the possible effects of international treaties on intellectual property protection on the management of genebanks, and on the supply of germplasm from CGIAR centres such as CIMMYT (cereals), ICRISAT (pulses), and ICARDA (pulses and pastures)? Will owners make key intellectual property available to public and/or private locally owned plant-breeding efforts in Australia, and if so on what terms? Should the Australian PBR legislation and/or the recent extension of patent law to protect new knowledge embodied in life forms be modified? Is there still a role for public sector plant breeding research to complement that taken over by the private sector?

Stated Preference Surveys of Remnant Native Vegetation Conservation.

Michael Lockwood and David Carberry

Improving the conservation status of remnant native vegetation on private property (RNV) has a number of economic benefits. RNV can contribute to on-farm productivity through provision of unimproved grazing, timber products and stock shelter. It may contribute to enhancing the productivity of downstream properties through amelioration of land degradation associated with salinity, water quality decline and soil erosion. The Australian community might also place value on certain attributes of RNV such as its scenic amenity and contribution to biodiversity conservation. Where these community values can be expressed in terms of trade-offs between RNV conservation and other things of value such as personal disposable income, they can be assessed using economic methods. It is these community values which are the subject of this paper.

Economic values held by the community for RNV conservation are nonmarket in nature. Since they are not revealed directly in the market place, and cannot be indirectly recovered through surrogate market techniques, they can only be assessed using stated preference methods. The most widely research stated preference method is contingent valuation (CV). Concerns about the validity of CV data have limited their use in environmental policy development, especially in Australia. The relatively new technique of choice modelling (CM) may offer a means of addressing such concerns. In addition, CM can enable more detailed exploration of participants' preferences across different quantities and qualities of the good being valued. We used both CV and CM to assess the nonmarket economic values of RNV in two study areas - the northeast Victorian catchment and the Murray catchment of NSW. Results from the two methods were not significantly different. However, the CM models have the advantage that they can be adjusted to take into account different policy options, and the associated welfare estimates also have narrower confidence intervals than those derived from CV models. Using the best CM model, aggregate compensating surplus for improved conservation management of RNV in the southern Riverina of NSW and northeast Victoria were estimated to be \$53 million and \$36 million respectively.

ACIAR Economic Impact Model - An overview.

G Lubulwa and S McMeniman

This paper discusses the ACIAR Economic Impact Model which can be used in ex-ante and ex-post evaluations of projects. The model is a traded good model which estimates changes in producer and consumer surplus as a result of a supply or demand shift.

The model includes modules to allow the user with the required data to estimate cost savings for each one of the following situations: a supply shift for an annual crop, a supply shift for a perennial crop, a supply shift for livestock commodities, a supply shift for aquaculture, a supply shift due to changes in post harvest wastage rate cost, a demand shifts due to changes in product quality or consumer preference.

The paper shows how the model can be used and mentions examples where the model has been used in project evaluations.

Issues In Modelling The Australian Dairy Industry, Including Joint Products And Market Power

T G MacAulay, K M Owen., and C J O'Donnell

This paper reports on an expanded and revised version of the spatial equilibrium model of the Australian dairy industry developed by MacAulay (1997). In the expanded version there is demand for five manufactured products. The transformation from bulk milk to final product is modelled by considering milk and dairy products in terms of their primary components, milkfat and protein. For market milk, a variable element was added to the margin to replicate the effects of market power in the processor to retail chain. Some implications for the de-regulation of the Australian dairy industry are noted.

Determining Public Welfare Values in Land Allocation: A Case Study of the Sugar Industry in Northern Australia

Thilak Mallawaarachchi and John Quiggin

This paper presents a modelling framework to determine the joint economic and environmental net benefits of alternative land allocation strategies. The trade-offs between environment and agriculture are analysed using Australian sugar industry as an example. We examine the feasibility and usefulness of a mathematical programming model to generate preferences for policy alternatives. The model combines the marginal physical productivity of cane production and environmental values estimated through a multiattribute choice experiment. The regional analysis employs allocation rules based on resource attributes that differentiate land parcels of varying productivity and environmental quality. Technological options to augment land quality under different states of nature are modelled using a dynamic formulation under alternative assumptions for sugar price and mill quota. The model captures the interdependency between area expansion and intensification of production, as a behavioural response of canegrowers to an increasing demand for cane output. The model provides a robust tool to demonstrate how spatial and temporal dependence

of externalities in production impacts on allocation decisions under full information, and how economic instruments can be used to guide efficient resource management.

Measuring Community Values for Environmental Protection: A Choice Modelling Study Of A Cane Farming Catchment In North Queensland

Thilak Mallawaarachchi, Russell Blamey, Mark Morrison, Andrew Johnson and Jeff Bennett

Loss of environmental values in cane growing areas is an issue of controversy in Australia. Clearing of natural vegetation for cane growing reduces the habitat of a number of threatened and non-threatened species. Society has to match the economic benefits of sugarcane expansion with the potential environmental losses resulting from land clearing. Lack of information on the non-use value of environmental benefits makes the allocation decisions open to controversy and increases the likelihood of sub-optimal resource use. Choice modelling offers a robust approach to estimating the non-use values of environmental services with multiple attributes. In this paper, results are reported of a choice modelling experiment conducted in the Herbert River District of North Queensland to estimate community values for environmental protection. In each of a series of choice sets, respondents were asked to choose among a set of three discrete alternatives. The alternatives in each choice set were described by four attributes, pertaining to levels of environmental protection, regional income from cane production and an environmental levy. The responses are analysed together with socio-economic data using a discrete-choice model. This model enables the estimation of community willingness-to-pay for the protection of natural vegetation in areas suitable for cane expansion. The survey results are to be used to provide input to a regional model of the sugar industry that evaluates alternative options for mitigating externalities in sugar production.

Farm Business Planning in Kazakhstan

Dan Marsh

The agriculture sector in Kazakhstan has undergone rapid change over the last 10 years. In the first stage state owned farms were transformed into producer cooperatives owned by their former employees. Central provision of essential inputs was rapidly withdrawn while product prices were initially held down to protect urban consumers. Faced by rising input prices, escalating tax demands and disappearing product markets the cooperatives sold much of their livestock and built up unsustainable levels of debt. In the latest stage of the process, bankruptcy procedures have been used to write off debts and reorganise the cooperatives into private farms. Against this background the

paper describes an attempt to assist three farms to draw up business plans for the next seven years. The business plans focus on how the farms should make profitable use of improved irrigation systems provided under a government credit scheme.

Economics and Participatory Environmental Governance

Graham R. Marshall

More and more environmental economists are finding themselves working within the uncharted territory of participatory governance. Yet many have not appreciated that the shift from progressive, or 'technocentric', governance to participatory governance signifies a corresponding departure from the modern worldview underpinning their theory. This paper has two aims. The first is to contribute to an economic explanation of this worldview shift. The intention here is to help overcome the "disciplinary arrogance" and "close-minded adherence to ... ideological convictions" that Sandra Batie, in a presidential address to the American Agricultural Economics Society, identified as "our own worst enemy" when contributing to debates over how to realise sustainable development. The second aim is to highlight some of the exciting challenges and opportunities that arise once economists come to embrace this worldview shift.

Using Action Research to Advance Dairy Farming Knowledge and Technology

Claire Massey and Evelyn Hurley

The New Zealand dairy industry views itself as having a progressive approach to research and the acquisition and adoption of technology. It is also accepted that, in order to remain competitive in international markets, technological improvement is a necessity. In each component of the industry/system - producer (farms), processor (co-operatives, manufacturing), researchers, extensionists/consultants and marketers (NZ Dairy Board, statutory authority) - practitioners deal regularly with issues requiring solutions. However each has a different W (world view) and successful outcomes for one are not necessarily so for the others.

For producer practitioners the management issue may be one of seeking solutions to problematic situations by adapting known technology to their own circumstances. The dairy industry model for this process is the research-consultant/extensionist-producer system. Their view is that this process has been effective in "transferring" only some of the technologies which are important for the survival and development of the industry.

The paper reports on a project in which a group of dairy-farming women worked with two researchers

on a particular technical problem. Using action research as a framework the group devised a problem-solving process that was structured around three elements; consultancy advice, research findings and self-directed learning. The paper describes the model that was developed, where action research (AR) provided a framework for client-centred research and consulting. The authors suggest that this model may contribute to the growth of the dairy system in a way that builds on the respective strengths of consultants, researchers and producers.

Agency Perceptions of Alternative Salinity Policies: Are They Measuring Transaction Costs?

Laura McCann

Economics has looked at the decision process of politicians but the decision process of agency staff has primarily been the purview of sociologists. Agencies affect the final form of regulations, they may enforce or ignore regulations that exist, and they provide information to the political process. Policies recommended by economists for non-point source pollution control are seldom implemented by agencies.

This study examined the relation between preferences for a particular policy and the perceived farmer cost, farmer resistance, efficacy in salinity reduction, and administrative costs. The latter were included to find whether transaction costs of implementing policies affect preferences and whether this could help explain the existence of current policies.

To test this hypothesis, a survey of people working on the salinity issue was conducted. Contrary to what one might expect, perceptions of farmer cost and farmer resistance were not highly correlated. When preference was regressed against farmer cost, farmer resistance and administrative costs, only farmer resistance was significant. When effectiveness was included as an explanatory variable, it was highly significant and the coefficient was quite large. Including perceived effectiveness greatly improved the explanatory power of the model.

Induced Institutional Innovation in Response to Transaction Costs: The Case of the National Native Title Tribunal

Laura McCann

The theory of induced innovation says that technological innovations which economize on relatively scarce inputs will be invented and adopted. Ruttan has hypothesized that this model also holds for institutional innovations. Williamson suggests that economic organization, such as vertical integration, is the result of transaction cost

minimization. Coase discusses the transaction costs of negotiation versus the court system to solve externality problems.

These various threads of the literature are brought to bear on the issue of innovations over time in relation to the National Native Title Tribunal. Mining companies have developed guidelines for negotiation with Aboriginal claimants. In Western Australia, regional agreements have been created which have the potential to greatly reduce transaction costs compared to negotiations between individual claimants and other agents such as mining companies. In addition to the reductions in transaction costs from a negotiated settlement rather than litigation, there are other advantages of negotiation, whether bilateral or regional. These include improved "quality" of settlements, improved relations between the negotiating parties, and more timely resolution.

The New Zealand Farm Woman; Secondary Income, Unpaid Work and Farm Business Survival.

Heather McCrostie Little

The paper explores the role of contemporary New Zealand farm women and their economic influence on the farm business. Historically farm women contributed unpaid labour and to a lesser extent direct financial inputs, to their farm businesses. There was scant acknowledgement either within the family or amongst external advisors, formal or informal, of these contributions. The necessity, beginning more than a decade ago, for farm families to seek secondary income outside the farm business raised the profile of farm women as earners of non-farm income that could and did protect the farm from household drawings, and frequently became the farm families 'means of survival'. The author describes the three and sometimes four roles these women regularly maintain that contribute directly to the financial health of the farm business. The author suggests that changed societal and individual expectations have resulted in farm women today expecting ownership status and shared financial and management decision making that reflects their position within their farm businesses.

Farm Succession, Dinosaur or Dynamic ? The Inter Generational Transfer of the Farm Business.

Heather McCrostie Little

Farm succession is a process whereby the traditions, skills and capital of farming are passed from one generation to the next. As well as describing the process of succession, the authors identify the major steps that must be taken by farm families to ensure its success. Families face the option of selling up, or transferring the farm between generations. Succession is still the most likely method for new

generations to gain entry to a farm business. The roles played by all members of the farm family and external advisors, in the business, in succession planning and in succession decision making are explored. The paper proposes that in today's uncertain agricultural economy succession requires long term management strategies that sit in tandem with farm business management plans. It is never too early in the farm cycle to initiate the succession management process.

Should the Thai Shrimp Industry Continue to Expand Despite Environmental Costs?

Thamrong Mekhora

Shrimp production in Thailand has historically been undertaken in the saline and brackish waters of coastal mangroves. In recent years rising demand and prices for shrimp and falling productivity of mangrove areas have motivated an expansion of shrimp production into the fresh-water margins of river estuaries that were previously used for rice cultivation. This has resulted in environmental problems of nutrient pollution of waterways and salinisation of soils.

This paper describes a comparative economic analysis of shrimp and rice production. It was found that rice production is characterised by constant returns to scale, and shrimp production by increasing returns to scale. On this basis it was concluded that shrimp production will continue to expand in the fresh-water areas, displacing rice production and exacerbating environmental problems. Further investigation will examine trade-offs between the returns from shrimp production and the costs of environmental degradation. This will have implications for optimal regulatory policies.

Measuring Crop Genetic Diversity From Gene Banks to Farmers' Fields: Concepts and Applications to Australian and Chinese Wheat

E. Meng, M. Smale, R. Hu, J. Brennan and D. Godden

The increased interest in understanding the role of genetic diversity in production and consumption choices has prompted attempts to obtain an analytical representation that can be used in economic models. These models can be used to determine more accurately the factors influencing the existence of genetic diversity and to assess its contributions to production systems. However, successful economic analysis of issues related to the diversity of crop genetic resources requires that the concept of diversity utilized be well defined and that the measurement technique be appropriate to the type of analysis and its objectives. Each concept describes or classifies diversity differently, and none can be deemed correct or incorrect a priori. The appropriateness of the concept is largely a function of the objectives of the study and of the

level at which the analysis takes place. Given the wide spectrum of potential research questions, the use of more than one concept of genetic diversity may be feasible or even appropriate. Nevertheless, the representation of diversity needed to assess the viability of farmer-level participation in on-site conservation or collaborative breeding programs is distinct from that used to examine the effect of diversity on crop productivity and stability at an aggregate level. A fundamental difference also exists between the concept of diversity and the measurement tool: the measurement tool is the mathematical construct that enables a given concept of diversity to be incorporated more conveniently in an analytical model.

This paper discusses some of the most commonly used means, drawn from ecological, agronomic, and economic literature, of conceptualizing and categorizing diversity, as well as indices associated with their use. Using data collected in China and Australia, we construct several indices that represent different concepts of diversity (e.g., spatial, temporal, latent, apparent). We then discuss the role and interpretation of these concepts and indices in the context of the economic models being estimated to address questions regarding the presence and effect of wheat genetic diversity in China and Australia.

The Feasibility of Farm Revenue Insurance in Australia

Miranda P.M. Meuwissen, J. Brian Hardaker and Ruud B.M. Huirne

In this paper, the question on the feasibility of farm revenue insurance in Australia is broken down into four parts. The first part discusses why insurance gets our attention. The second part examines the concept of farm revenue insurance and compares revenue insurance with schemes that insure price and yield separately and schemes that cover net income. Issues are illustrated by means of a simulation model and experiences from other countries are taken into consideration. The third part of the article focuses on the question whether there is a case for farm revenue insurance in Australia. Prerequisites for such schemes to work properly are discussed and attention is being paid to the question whether such schemes would be attractive for commercial insurers at one hand and individual farmers at the other hand. The fourth element of the paper considers why there is a role for the government and in what way a private/public partnership could be shaped.

Economics of Dam Failure at Hume Dam

Bryony Mika

Hume Dam is one of four major storage's, sixteen weirs and five barrages involved in the regulation of the Murray River. Hume Dam is situated just below the junction of the Murray and Mitta Mitta Rivers

on the New South Wales and Victorian border. Water from Hume Dam is released to satisfy environmental, domestic, urban, stock and irrigation needs downstream to NSW, Victoria and South Australia. Hume Dam is also a venue for a variety of recreational activities attracting a large number of tourists.

In 1996 Hume Dam suffered from significant movement and subsequent cracking of the concrete core wall. To ensure adequate and timely dam maintenance subsequent to the rehabilitation a risk assessment is being performed to aid decision makers in further improving the level of socially acceptable risk associated with Hume Dam.

This paper reviews the theoretical and conceptual economic issues involved in undertaking a Consequences Assessment of Hume Dam failure and incorporating risk into a Benefit Cost Analysis. An existing methodology for assessing loss of life is also discussed in this paper.

Plant and Animal Health Regulation: Some Competition Policy Issues

N Milham and S Davenport

Since the Competition Principles Agreement was signed in 1995, state, territory and Commonwealth governments in Australia have been committed to a process of legislative review to minimise the anti-competitive impacts of regulation. Where the subject legislation is industry focused and involves obvious and direct impediments to competition, such as price controls, application of Competition Policy principles (at least in a theoretical sense) is relatively straightforward. Experience indicates that the winners and losers, and the fundamental objectives of this type of legislation, can be readily identified. This does not appear to be the case, however, for legislation dealing with the management of animal and plant diseases.

Based on the NSW case, this paper canvasses issues in (i) clarifying the policy objectives underpinning such legislation, (ii) determining how these legislative instruments impact on competition, and (iii) identifying and assessing their benefits and costs. Inferences are drawn in relation to the appropriate roles of government (state and Commonwealth) and the market.

Evaluating the Benefits of Conserved Crop Germplasm in PNG

M. Milne, D. Godden, J. Kennedy, R. Kambuou

The principal difficulty in evaluating germplasm investment decisions is assessing the future value of the germplasm material. This research investigates methods of estimating the past and potential future benefits, both domestic and international, of existing crop germplasm collections in Papua New Guinea

(PNG). The analysis concentrates on PNG's more important subsistence plant food crops: banana, sweet potato and taro, together with aibika. It builds on previously reported model frameworks for estimating the benefits of plant germplasm collections. The paper documents the movement of germplasm in the food crops both within PNG and to international collections. Curators of and breeders using PNG germplasm material were surveyed concerning the future usefulness of this material, and their responses are reported and evaluated.

Ex-Post Evaluation of the Community Surface Drainage Program in the Shepparton Irrigation Region

Olivia P. Montecillo

The Community Surface Drainage (CSD) Program aims to provide a cost-effective and environmentally sensitive method of enhancing the existing regional drainage in Victoria's Northern Irrigation Region through the cooperation between landholders and the State, Commonwealth and Local Governments. This economic evaluation which covered the CSD Program in the Shepparton Irrigation Region and two case study schemes aimed to determine whether improvements in productivity are being achieved in a cost-effective way and to identify the physical changes in the catchment after the drains were constructed. The Murray Darling Basin Commission's Drainage Evaluation Model was used in the analysis.

The results showed that the CSD Program was achieving its objectives. The CSD Program, the Lukies Road CSD Scheme and the Ferguson Road CSD Scheme registered positive NPV and BCR of more than 1:1 at 5% discount rate over 50 years. The agriculture benefits were achieved mainly through the farmers' initiative to invest in farm works to improve productivity.

Recommendations for further research: modify the Drainage Evaluation Model to enable an *ex-post* evaluation of the CSD Program, establish a method to improve the calculation of the benefits to the road system, and analyse the impact of accelerated surface drainage program on regional development.

Distance Function Estimation and the Inclusion of Undesirable Outputs: A Case Study of Victorian Dairy Farms Australia

M. G. Nanere and I. M. Fraser

Analysis of agricultural production generally ignores the undesirable outputs (such as nitrate or pesticide contamination of water) that are jointly produced with desirable, marketable outputs. This paper presents the results of research integrating physical farm level data for undesirable outputs of nitrate leaching and phosphorous run-off with

conventional data for dairy farms. Using a multi input and output representation of the production technology an output distance function is estimated. Estimation of the output distance function as an efficiency frontier allows for the derivation of shadow prices of undesirable outputs that can be interpreted as the marginal abatement costs of each producer. A stochastic econometric approach was used to evaluate 50 Victorian dairy farmers between 1994 and 1996. In undertaking this analysis we are able to consider and discuss issues relating to data collection, scale and spatial resolution of potential applicability, methodological constraints and weaknesses in interpretation.

The Performance Appraisal and Valuation of Cooperative Organisations: The Example of the New Zealand Dairy Board

Derek L Newman

The performance appraisal and valuation of any organisation which has as its *raison d'être* the minimisation of its net operating income presents a problem for analysts and valuers alike. Supply cooperatives aim to minimise net operating income by minimising sales revenue; marketing cooperatives aim to minimise net operating income by maximising their cost of sales. When the value of a business is based on the capitalisation of its net operating income and its performance is judged on relationships dependent upon the effective computation of net operating income such as asset turnover, return on assets or interest coverage, the lack of an effective basis for such determinations leads to a wide range of opinions as to their values.

In recent times there have been a number of studies purporting to indicate the relative performance of the New Zealand Dairy Board. However, without the effective resolution of its income statement, in a form that is of use for the appraisal purpose, the outcomes of such studies must be regarded with suspicion.

This paper uses the case of the New Zealand Dairy Board to demonstrate the nature and impact of the difficulties faced in determining the performance and value of a firm without knowing its net operating income. It demonstrates that while comparisons with corporate structured firms in the same industry may shed some light on the problem, there is no way to effectively model aspects such as the notional dividend without addressing a circular reasoning problem.

Balancing Food Grains, Feeds and Livestock With Rising Populations in West and Central Asia / North Africa: Implications for Exporters to the Region.

T. Nordblom and F. Shomo

With the notable exceptions of Kazakhstan and Turkey, countries of the West and Central Asia / North Africa region are net importers of food grains. Human population growth is rapid throughout the region and pressure on the natural resource base is rising; fresh water is the scarcest resource. Rangelands continue to be heavily exploited yet provide declining shares of all feeds as livestock populations rise and use of crop residues, feed grains and agro-industrial concentrates (wheat bran, sugar beet pulp, and oil meals) increase. Though the majority of these countries have low to medium incomes, our country-by-country analysis suggests the region will import increasing quantities of food grains, feeds and livestock products, given the limited resource base and projected population growth to the year 2025.

Cheese Imports in Asia: The Importance of Product Heterogeneity and Market Structure

B Norman and E Goddard

In 1996 Australia produced 8.71 billion litres of milk, of which 30.8% was made into cheese. Australia produces more cheese than is consumed domestically therefore much of it is exported. Since 1973, Asia has been very important for Australian dairy exports typically accounting for more than 80% of total exports. Cheese exports have a large effect on the profitability of Australian cheese producers, and ultimately on dairy farmers. Producers and exporters need market information to be able to determine the optimal quantity, quality and type of cheese to sell on the export market, both for the short-term profitability and long-term growth of the industry.

Very few studies have been done on international cheese flows. Until recently, many countries have had heavily regulated domestic dairy production and imports. The recent movement towards trade liberalization plus the possibility of further trade liberalization in the next WTO Round make this analysis even more important. The purpose of this paper, is to establish the economic determinants of Australian cheese exports by destination in order to: a) discover and characterize any impediments to Australian cheese exports, and b) determine the influence of real or perceived product heterogeneity by exporter on Australia's export position. A two stage demand system will be used to estimate the market demand characteristics, by country of origin (including domestic), for cheese in Japan and Singapore.

Managerial Ability - Its Assessment and Modification (The Forgotten Resource)

P L Nuthall

Survey information in most countries shows very clearly that farmers achieve a wide range of profitability levels. Some of the variation will be due to farmers having different goals and objectives, but a significant proportion will also be due to variations in managerial skill. If even modest skill improvements can be achieved the resource efficiency payoff will be significant and at little cost relative to many physical research programmes - this goal is worth seeking. Managerial skill improvement has received little attention in the past.

Standard teaching mods can probably help to a certain extent, but many skills may be deeply imbedded thus requiring different methods. Evidence from cognitive therapy papers suggests basic traits can be modified, so why not managerial attributes similarly? This paper reviews the work on cognition and personality that may be helpful, and also considers the competencies that constitute the components of good management. It is clear from the work on the psychology of decision making and judgement that many biases in a range of decision areas are common. The opportunity for exploring ways of removing these biases and improving managerial ability would seem to be ripe for the picking. This will involve developing psychometric tests for each competency and the development of competency enhancement programmes.

The work on personality assessment and change will be reviewed to assess whether the same principles can be used in the management area. The paper contains more questions than answers, but will provide considerable food for thought.

Profitability of Intensifying Cropping in the Mallee Region of Victoria

Kate O'Brien

A whole farm linear programming model, PRISM, was used to investigate the profitability of adopting a more intensive crop rotation in the central Mallee region of Victoria (annual rainfall 300-350mm). The model was optimised for farm profit with different amounts of working capital so that optimal proportions of a wheat-field pea-wheat-lupin rotation and a pasture-pasture-wheat rotation were included in the enterprise mix. Based on average yields from a 10 year rotation at the Mallee Research Station, Walpeup, increasing crop intensity from 33% of the farm to 77% of the farm increased annual profit by 38%. When the model was run again using typical input costs and average yields achieved in the region, intensification of cropping decreased annual profit by 86%. Average crop yields and wheat growing costs in the region

were 20% lower than the Mallee Research Station, Walpeup. The analysis indicated that the profitability of more intensive cropping in this region is highly dependant on crop yields.

Estimating the Value of Information From Soil Acidity Research in Western Australia

M. O'Connell, N.A. Glenn and A.D. Bathgate

The soil acidity research and extension program in Western Australia is made up of a number of projects, all of which are working towards the overall aim of developing information packages to help farmers manage or reverse acidification throughout the agricultural areas of Western Australia. In this paper we present estimates of the value to farmers of this information.

A bio-economic model is used to calculate the profitability of liming for a range of situations, and a framework based on Bayesian Decision Theory employed to estimate the value of information generated by soil acidity research. Three scenarios are considered. The first is the adoption by farmers of a broad based liming strategy. This reflects current practice in Western Australia where most lime is applied at 1 tonne per hectare. In the second case we consider the adoption by farmers of one of a range of broad based strategies. This is better than the first case, but not necessarily optimal. Finally we consider the case where a farmer is able to use soil test results to refine a liming strategy on a paddock by paddock basis and apply an optimal amount of lime. For each scenario the value to farmers is estimated for: a) information about acidification rates and lime leaching rates, b) less acidifying farming systems, c) avoidance of negative effects of liming, d) enhancing the rate of lime leaching into acid subsoils, and e) acid tolerant crop cultivars.

Marketing Margins and Market Power in the Australian Dairy Processing and Retailing Sectors

C.J. O'Donnell

We develop a marketing margins model based on the assumptions that output demand functions are linear in prices, input supply functions are linear in the squares of prices (a special case of a normalised quadratic supply function), the production technologies of market intermediaries exhibit constant returns to scale, and all inputs are normal (ie. increases in outputs are associated with increases in all inputs). Each of these assumptions can be relaxed, although in many cases the resulting margins model becomes highly nonlinear. Maintaining these assumptions means it is possible to derive linear industry marketing margins equations from the first-order conditions for profit maximisation by individual firms. Margins equations for carton milk, whole-milk powder

(WMP), butter, cheese and skim-milk powder (SMP) are estimated using state level data. Nonlinear least squares is used to impose a number of inequality constraints implied by economic theory. Results suggest that carton milk processors have monopoly power in the sale of carton milk, and monopsony power in the purchase of market milk. Butter processors also appear to have market power in the purchase of manufacturing milk. It would seem that no other market intermediaries possess market power in either input or output markets.

What do we Know of Consumer Preferences in the Island Countries of the South Pacific?

K M Owen

Governments in developing countries have tended to focus on the production end of their food systems. However, there is increasing recognition of the need to understand the nature of post-harvest marketing and consumers' behaviour in order to develop effective policies for food marketing initiatives and nutrition security.

This paper presents an examination of the available research into consumer preferences in the South Pacific region and the contexts in which the research was conducted. Of particular interest is the methods employed to obtain consumer preferences. Consideration is given to the benefits of this type of research in the Pacific and to the issues which might arise in identifying a conceptual framework and methodology.

Issues and Opportunities for Improving the Management of Technologies in NZ Agriculture

MS Paine

This paper discusses some possibilities for improving the way organisations work together to develop technologies that improve the competitive performance of agricultural industries. A recently developed model of professional practice is introduced and compared with a popular knowledge based model of technology. This comparative investigation is empirically based using three case studies of technology development in the NZ dairy industry. Each case study was selected for the attributes of the technology and the types of organisations involved in the development work. These studies identified the factors responsible for the formation of 'clubs' of professionals that enabled diverse disciplines to work on common development problems. Early involvement of users in the development programme avoided subsequent constraints to development. Learning by trial and error was a typical feature of these case studies where previous experiences were often inadequate for solving contemporary development problems. Mediating activities were identified as a particularly

vital role in development programmes. This mediation work was traditionally the domain of extension agents and systems researchers who have now become rare breeds of workers in the restructured science system of NZ. The case study comparisons concluded that the model of professional practice provided new insights for formulating policy on technology development. The paper concludes with recommendations to policy and research managers

Why is the Adoption of Sustainable Farming Systems Often Slow or Low?

David J. Pannell

In past studies, many factors have been identified as potential contributors to the problem of low or slow adoption of farming innovations. Factors likely to be particularly important for "sustainable" farming practices include: (a) a lack of profitable options, (b) negative spillover affects from one farmer to another ("externalities"), (c) high "transaction costs" involved in negotiations between farmers, (d) uncertainty about the available farming options, and (e) the great difficulty and low value of conducting small-scale trials to test some of the options. I argue that there are limits to the circumstances where extension can be effective, and that the efficiency of Landcare could be improved substantially if efforts were made to identify these limits and operate within them. Outside these limits, other approaches such as R&D or regulation may be used alone, or they may help to change the adoption problem such that extension can become effective. Of the five key factors listed, extension appears to have a very limited potential to reduce the problems of lack of profitable options, externalities and long time scales. This is not a criticism of Landcare, just a recognition that different tools have different uses. The appropriate role for Landcare extension is discussed.

Factors Effecting the Implementation by Landowners of Riparian Management Policies

TG Parminter, JA Moore, T Soboleva, and BS Thorrold

This project was intended to provide riparian management policy developers with an understanding of farmer decision making processes. Farmers attending workshops in Taranaki were surveyed in April 1998, to identify the criteria they used to select their preferred riparian policies and reject others. Farmer use of decision criteria was analysed using the Analytical Hierarchy Process and comparing its results with their likelihood of using the policies. The Analytical Hierarchy Process enabled the researchers to combine financial and non-financial data in a form of cost benefit analysis. The riparian management policies included in the study were: permanently excluding livestock,

planting timber trees, planting conservation trees, excluding fertilisers, excluding chemicals, or doing nothing distinctive.

The farmers most preferred planting conservation trees in riparian areas to other policies. Their policy preferences were highly correlated ($r = 0.76-0.96$) with policy benefits, but appeared unrelated to the results of the cost benefit analysis. Further research is needed into farmer decision making before a decision model can be developed that satisfactorily explains farmer behaviour.

Why Foreign Aid?

Ian Patrick

It is no surprise that the total ODA from developing countries is declining. There are many reasons for this. This paper considers the hypothesis that a decline in ODA is caused partly by governments being forced to provide aid predominantly for humanitarian and moral imperative reasons. Evidence of this is that the Simons Review (1997) titled their report – One Clear Objective: Poverty Reduction through Sustainable Development. Governments, including Australia, are being forced to be altruistic, a characteristic not normally associated with government.

This paper outlines the motivations and the history of aid in Australia and how government responds to society's demand for redistribution to a foreign country. The paper concludes that as governments continue to be forced to focus on poverty reduction as the major motivation, the level of ODA will continue to decline. The alternative is, that if governments were allowed to return to their traditional commercial, trade and political motivations, ODA may well increase.

The Technical Efficiency of Smallholder Cattle Producers in Eastern Indonesia.

Ian Patrick and Tim Coelli

The Government of Indonesia (GOI) implements cattle distribution programs in order to improve the welfare of smallholders in the less arable areas of Indonesia and increase the supply of beef to the growing urban markets. At present the GOI has no means of evaluating the success of the program or the individual factors that influence success in the different environments.

An AusAID sponsored survey including 145 farmers and their cattle at nine sites in the eastern islands of Indonesia over a three year period was undertaken to determine the factors influencing the productivity and efficiency of cattle production. The study uses stochastic frontier production functions and maximum likelihood estimates to determine the relative efficiencies of individual farmers with regard to their utilisation of land,

labour and feed resources and identify the major factors that influence the efficiency of production.

While no general strategy that will improve farm productivity across all sites could be suggested due to the diversity of people groups, management systems, resource availability and data collection issues the analysis has been able to confirm and support *a priori* expectations.

There are important interactions between available resources, management systems and efficiency. When encouraging cattle production in Nusa Tenggara it is necessary to ensure that smallholders are: aware of the appropriate feeding practices for their conditions, have available labour, and are able to build the cattle (with appropriate herd size) into the farming system. The implication from this analysis is that while factors such as the specific site characteristics, the importance of cattle in the farming system, feeding system and experience with cattle are important influences on efficiency, factors such as education, use for ploughing and farmer age are less important.

The Impact of Noosa National Park Within the Regional Economy: A Working Paper

Leonie Pearson, Iean Russell, Guy West and Keith Woodford

Noosa National Park (NNP) is one of the central attractions for the town of Noosa, in the Sunshine Coast holiday region of Queensland. Due to this high profile the Department of Environment and Heritage nominated NNP as a case study to investigate (i) how to 'measure' the importance of National Parks, and (ii) what impact does NNP have upon the regional economy of the Sunshine Coast.

All previous studies investigating national parks and their impacts have focused upon 'discrete parks' or areas where the only reason you would be visiting would be to see the park. Due to these previous studies there is a recognised approach and method that is applied in these cases, this type of trip is called a *single destination single benefit* holiday and input-output method is used. Noosa however has many other aspects to attract tourists apart from NNP, including; beach, cafés, community and nature, as such it is classified as a *single destination multiple benefit* holiday and there is not an approach or method that has been designed to deal with the multi-benefit aspect.

Considering this lack of approach and methods available to fully estimate NNP's impact upon the regional economy, my presentation will display these gaps and then ask for suggested ways in overcoming some of the problems. Firstly, I will discuss the regional input-output table used, then some of the results will be presented. A discussion on the limitations and there impact upon the results will following, lastly I will be asking for advice and suggested ways forward in refining the issue of

multi-attribute single destination expenditure allocation.

The “Double-Dividend” Effect of Carbon Taxes in a Kaleckian Model of Growth and Distribution

Neil Perry

Greenhouse warming is said to occur due largely to the use of carbon-emitting energy sources. During conventions on climate change in Rio in 1992 and Kyoto in 1998 targets were set for desired greenhouse gas emissions. Some countries have introduced a tax on carbon emissions to assist in the reduction or slowing of greenhouse gas emissions. Other countries, such as Australia, have successfully lobbied for targets that would not require a carbon tax for fear that this would cause job loss and a reduction of economic growth in the country. The “Double-Dividend” effect comes in many forms but, in a general sense, it is the notion that both the state of the environment and the employment level of the country can be improved with a specifically designed fiscal package that incorporates a carbon tax of some form but has a neutral effect on the fiscal position of the country. The conclusions on a Double-Dividend effect are mixed with most authors suggesting that it does not occur. This argument then becomes one of a more general Environment-Employment Tradeoff that is theorised to exist. The literature on the Double-Dividend effect and the Environment-Employment tradeoff has come solely from a Neo-Classical perspective of the economy. This paper provides a Post-Keynesian interpretation of the Double-Dividend effect of carbon taxes and the more general Environment-Employment tradeoff. When applying a Kaleckian model of growth and distribution it is found that a Double-Dividend exists, in various forms of the notion, when the carbon tax is accompanied by tax concessions on, and government research and development in, renewable energy-using technology. Returning funds to low-income workers and funding for labour retraining would also assist in the achievement of the double-dividend. This suggests that policies can be designed to eliminate the Environment-Employment Tradeoff. Summaries of the existing literature, along with critiques and development of the Post-Keynesian interpretation are presented.

This research fits into a broader research program in which the suitability of Post-Keynesian economic theory to environmental issues is being assessed with the view to advancing a Post-Keynesian Environmental Economics.

The Role of Expected Protein Levels in Determining the Impact of Protein Payments

E.H. Petersen and R.W. Fraser

This paper investigates the role of expected protein levels in determining the impact of protein payments on firstly, a grower's income stream, and secondly, a grower's willingness-to-pay for a forward contract. The impact is examined for a range of expected protein levels (9%-13%). When considering a grower's income stream, for expected protein levels less than approximately 10.2% expected income, $E(I)$, and the variance of income, $Var(I)$, decrease, and $E(I)$ is the dominating effect causing an overall decrease in expected utility (EU). There exists a small protein window (approximately 10.2%-10.3%) where $E(I)$ and $Var(I)$ decrease and the $Var(I)$ effect is dominant causing an overall increase in EU . For expected protein levels greater than 10.3%, $E(I)$ increases and $Var(I)$ decreases, both working to positively affect EU . Hence, growers with low expected protein levels are disadvantaged by the scheme. A sensitivity analysis is conducted on key parameter values to understand their impact on this relationship and it is found that although the window changed slightly in size and level, it did not significantly alter this relationship.

Expected protein levels also have a significant role in determining the impact of protein payments on a grower's willingness-to-pay for a forward contract. This paper shows that in the presence of protein payments growers with expected protein less than approximately 10% are willing to pay more for a forward contract, and growers with expected protein greater than approximately 10% are willing to pay less for a forward contract. A sensitivity analysis conducted on key parameter values did not significantly modify this relationship.

Information Needs of Organic Farmers

Karen Petersen and Evelyn Hurley

Information is a key input into all conventional and organic farming systems. There is a variety of routes by which information flows into farming systems, varying between farmers and industries.

Organic production systems are low-input and intensive, requiring a thorough and detailed knowledge of the farming system and of organic production methods. Research leading to new practices with wide applicability may, therefore be of little relevance to individual organic systems. The viability of the industry is likely to depend on the development of methods of information flow which are appropriate for both the producers and their systems.

This paper compares the processes involved in information flow into organic and conventional farming systems and argues that the adoption-

diffusion model of technology transfer is even less appropriate for organic producers than conventional. Models of a participatory or interdependent nature are likely to be more useful.

Walrasian and Marshallian Stability: An Application to the Australian Pig Industry

Tim Purcell, Rodney Beard and Stuart McDonald

The Global Correspondence Principle of Samuelson states that global comparative static results hold even in the absence of an initial stable equilibrium. This principle has been applied in recent studies of international trade with variable returns to scale to resolve paradoxical results with respect to the Rybczynski and Stolper-Samuelson theorems. Takayama and Ide have shown that the principle may only apply if the initial equilibrium is Marshallian stable. This has implications for econometric forecasting, in that forecasts of prices and quantities may only be valid in the presence of Marshallian stability. We estimate a Vector Error Correction Model of the Australian pig industry and examine the stability of the model in both the Walrasian and Marshallian sense. We find that prior to the introduction of imports in 1990 the farm gate market was characterised by both Walrasian and Marshallian stability and after 1990 it was unstable in both senses. This suggests that market forecasts since 1990 need to be viewed with more than the usual caution.

National Competition Policy and its Effects on Rural Australia: A Comparative Analysis of Three Industries.

Tim Purcell and Rodney Beard

In this paper we review some recent studies of the impact of National Competition Policy on rural Australia. National Competition Policy has tended to assume that both domestic and international deregulation of industry leads to a shift from a noncompetitive to a competitive industry structure. Due to the well known efficiency properties of competitive industry structures deregulation is justified as a means to generating greater efficiency in resource allocation. Whilst little can be said about the long-run evolution of market structures, in the short and medium term a competitive industry structure may not develop due to spatial, institutional and intertemporal imperfections. If these imperfections are ignored the costs of reform may be higher than necessary and the reform, as implemented, may not lead to the desired efficiency gains. We compare a series of studies of the Australian wheat, pig and sugar industries that have used a variety of methodologies to analyse the impact of deregulation on rural Australia. These studies are all consistent in that they suggest that the costs of deregulation could be reduced if increased emphasis were placed on understanding industry

structure and a staged approach to reform were followed.

The Effect of Imports on the Australian Pig Industry

Tim Purcell and Steve Harrison

In 1990 the Australian Government relaxed restrictions on the importation of pigmeat from Canada. In response to declining producer prices and their consequent effect on profitability, the Australian pig industry raised concerns with the Australian Government that the decline in producer price was due to lower priced imports from Canada and this was seriously injuring the industry. This paper attempts to identify the factors affecting changes in the market equilibrium of the pig industry in Australia. The results suggest that prior to 1990 pig producer prices were relatively stable and producers could be confident of being able to predict market movements. After 1990 there is a structural break which has induced volatility in pig producer prices, not only making producer decisions more difficult, but removing any long-run equilibrium relationship. Unlike previous studies, this report has found a significant relationship between import volumes and import prices and domestic production and domestic prices at all levels of the marketing chain except retail prices. The results indicate that import volumes and prices do not have a negative effect on retail prices. This implies that the assumed benefits of trade liberalisation, resulting from a reduction in consumer price, have not occurred.

Forecasting Marketing Margins in the Australian Pig Industry

Tim Purcell

The apparent divergence between producer and retail prices in the presence of a marketing chain is a common facet in agricultural industries. There is evidence to suggest that changes in producer prices are not passed on fully to changes in retail price, especially in the situation where producer prices are in decline. In the presence of market power reductions in producer prices are not reflected in reductions in retail prices but increases in producer prices are immediately reflected in increases in retail prices. Asymmetric price transmission will result from situations where firms are facing different elasticities for their inputs and outputs. This paper looks at the Australian meat industry, in particular pigmeat, and attempts to identify whether the presence of marketing margins results in asymmetric price transmission between producer and retail prices. Error correction models suggest that the speed of adjustment of retail prices to changes in producer prices is very slow, indicating that market power in terms of intertemporal price averaging exists. When close substitutes, such as beef, chicken, and lamb are taken into consideration

it seems that retail prices of pork are sensitive to changes in those retail prices, specifically changes in retail beef prices. The speed of adjustment of the retail price of pork is particularly fast when retail prices of beef are taken into consideration. This implies that pork is competitive with beef at the retail level, indicating horizontal competition exists but not vertical.

Asia-Pacific Food Markets in 2005: The Influence of Livestock Productivity Convergence on Trade in Livestock Products and Grains

Allan N Rae and Thomas W Hertel

The ongoing trend towards livestock product consumption in many Asian countries has been accompanied by growth in some countries' imports of feedgrains for their domestic livestock sectors. It has also put pressure on available grain supplies for human consumption. With regard to China, this contributes to the ongoing debate over future levels of her grain imports. Yet published projections often pay too little attention to developments in livestock production. In other Asian countries, livestock self-sufficiency targets are becoming more difficult to achieve due to policy reforms, resource constraints and environmental issues, and imports of livestock products have been growing more rapidly than those of feedgrains. Our objective is to evaluate the impacts of productivity convergence and technological catch-up in livestock production on trade in livestock and grains products among countries in the Asia-Pacific region. Production per animal unit is used as a proxy for productivity. Tests are conducted of the hypothesis that productivity levels in the Asia-Pacific region are converging and there exists 'technological catch-up'. Projections of livestock productivity are made and incorporated in a modified GTAP model in which feedstuff substitution is permitted. The consequences for global trade in grains and livestock products, as well as the specific implications for China's production and trade balance in these sectors are explored.

Methodological Challenges in Rural Development Research in Developing Countries

G Rauniyar

Data quality and reliability in developing countries tend to be poor and use of such data in rural development project design have led to limited success of development projects. The problem is further aggravated by discounted value of formal surveys, which are increasingly replaced by participatory rural appraisals and learning analysis. The paper analyses merits and limitations of research methods adopted in developing countries and contends that qualitative research method(s) should not be used to substitute quantitative

method(s). Qualitative method(s) should be used as the initial step(s) in research process while quantitative method(s) as the subsequent follow-on steps. The outcomes from such approach are likely to be of greater value to policymakers in formulating rural development strategies. The efforts need be directed towards developing capabilities in researchers to appreciate the complementarity in the two approaches. In this endeavour, development agencies and tertiary institutions would have major roles to embark upon.

Longitudinal Analysis of Dairy Farm Income and Expenditure in New Zealand

G P Rauniyar and W J Parker

The cost-price squeeze in dairy farming has forced farmers to become more competitive in the market place. This has primarily occurred through increased herd size and productivity gains associated with labour-saving technology. The cost and revenue structures and changes in the contribution of key dairy production inputs to total production costs per cow over the 1976-1996 were analysed. Data were taken from the annual publications of the Livestock Improvement Corporation and the New Zealand Dairy Board. The relative contribution of major input costs to returns per cow was also examined. Implications for the future growth of dairy farms and the industry are drawn from the analysis.

Valuing Victoria's Parks

M Read, J Sinden and J Branson

Travel-cost models were specified for the repeatable measurement of the economic value of recreation in Parks. Concurrent valuations of recreational use have been undertaken for approximately 35 National Parks and 30 metropolitan parks. Zonal models were used and the distance ranges for each zone were set as parameters in a spreadsheet model. The distance from each postcode in Australia to the park was calculated using the longitude and latitude for the particular park, and for the centroid of each postcode. This specification enabled us to observe that the choice of distance ranges for each zone can have a substantial impact on the goodness of fit, the prediction of visitor numbers at zero fee and on the implied level of consumer surplus per visit. A range of functional forms for the travel-cost model were compared and the strengths and weaknesses of each are discussed. A database describing attributes of each park was compiled with the intention of examining how different attributes affect the recreation benefit at parks, and to enable specification of a model for the purpose of benefit transfer.

Intra-Household Modelling of Farm Household Systems

Fay Rola-Rubzen

In recent years, there has been increasing evidence of differential impacts of policy interventions within the household. While governments strive to combat poverty and improve the living conditions of people, some policies have unwittingly resulted to a decline in welfare of some members of the household. For instance, emphasis on cash cropping, in some circumstances, have led to negative effects on food nutrition of household members.

The problem is that most rural development policies and programs are assumed to be gender neutral. That is, there is an (often implicit) expectation that they will have equal impacts on both men and women. Unfortunately, this assumption is not necessarily true. It is, therefore, important to closely examine the processes that go on within the household, if the aim is to design effective rural development policies. A model that would allow decision makers to look at differential impacts of policy interventions on household members may therefore be a useful aid in decision making.

In this paper, a conceptual model of a farm household system that takes into consideration intra-household aspects is developed and presented. The model incorporates facets of household relations that are commonly ignored in conventional farm household models. These include consideration of preferences of household members, gender roles and assignments of tasks, allocation of productive activities within the farm household system, productive resources available to household members and their access and control over the use of resources.

An empirical model of a farm household system is then developed for a dryland mixed crop-livestock farming system in a developing country. Using the farm household framework, a mathematical programming model was constructed in which production, consumption and time allocation decisions and intra-household aspects are incorporated. The model reflects rigidities and flexibilities in work roles of men and women and includes crop and animal production activities as well as household activities. The model also explicitly takes into consideration both the risk behaviour of the decision maker and the riskiness of farming.

The model offers an alternative framework for analysing farm household and intra-household impacts and understanding differential effects of external stimuli, such as technology and public interventions, on individual household members and on the farm household as a whole. It would, therefore, be useful in designing policies that are cognisant of differential preferences of household members and hopefully aid in the formulation of sound rural development policies.

Testing for Learning and Fatigue Effects in Choice Modelling Environmental Valuation Studies?

John Rolfe, Jeff Bennett and Jordan Louviere

Choice modelling (CM) is a developing non-market valuation technique that provides a rich data set to the analyst. In addition to parameter estimates for the influence of attributes, labels and respondent characteristics, models also provide information about, (and are sensitive to), the error terms implicit in choices that respondents make.

Among the influences that drive error terms are the consistency with which respondents evaluate choice alternatives according to the underlying attributes. It is possible that this consistency varies according to the number of multiple choice alternatives presented to respondents. If the error component associated with choice falls (particularly after the initial choice sets), then learning effects may be present. Alternatively, if error terms rise, fatigue effects may be present.

A series of disaggregation exercises have been performed on CM experiments dealing with rainforest valuation to determine where learning and fatigue effects might be present. Because the experiments focus on a subject (international rainforest conservation) that is relatively unknown and complex for many people to evaluate, the error component in individual choices may be high. The focus of the tests is to determine firstly if variations in error components are statistically significant for different segments of choice experiments, thus identifying whether learning or fatigue effects are present. Secondly, comparisons of welfare estimates are made to determine if any learning and fatigue effects identified have significant influences on model results.

Competition and Exit in the Meat Processing Industry: A Queensland Case Study.

John Rolfe and Russ Reynolds

Queensland is the largest meat producing state in Australia, has the largest processing capacity and is the major meat exporting state. The processing sector is under substantial pressure for change, with current utilisation rates of 70% or below being sub-economic. There are a number of possible reasons for the decline in the profitability of this sector, including the loss of supplies through the live cattle trade, increased physical capacity and throughput, changed industrial relations and a move to enterprise bargaining agreements, and the impost and structure of government regulations.

Of particular interest are the extent to which the low utilisation rates are the result of competitive forces within the processing industry. The development of

excess capacity is predictable behaviour in a declining industry where survivor firms position themselves for increased market share. As well, intense competition on price may also be a facet of competitive behaviour designed to hasten exit of rival firms.

In October 1998, the Queensland Government committed \$20 million to the restructuring of the processing sector to achieve viability and sustainability goals. Determining the effective focus for restructuring will require a clear understanding of competitive forces within the processing sector, and the extent to which overcapacity is exogenous to the sector.

Economic Analysis of Honey Bee Disease Management Strategies for the South Australian Apiary Industry

Glenn Ronan and Elena Petrenas

A range of honey bee disease management options were evaluated on disease prevalence and economic criteria as part of an SA Government appointed Apiary Task Force to select and implement a 'best' strategy for industry and government. Importantly, the terms of reference specified that the strategy should also lead to greater self-reliance in disease control by the apiary industry in the next two years.

Three economic 'screens' were applied to aid program evaluation - market failure, public:private benefit and benefit:cost analysis. 'Quality assurance' (QA) had the best benefit:cost ratio (BCR) at 9.0, but a poor apiary operation disease prevalence (AODP) of 50 percent by 2002. 'Eradication' had the best AODP projection (7 percent) but the worst BCR (1.0). A mandatory disease control strategy (BCR=1.8; AODP=20%), which includes QA, has been recommended by the Task Force to wind-in the current 32 percent AODP before considering QA as a stand-alone strategy.

Market failure, due to negative externalities (infection from diseased apiaries to disease-free apiaries) is at the root of the industry's disease management problems and provides grounds for government intervention. Information gaps about disease diagnosis and management are a contributing factor.

A public:private benefit split of 10:90, when government has been the principal fund provider, is a case for improving funding alignment under present agency policy. In the context of a relatively small primary industry with a low capacity to pay the evaluation adds challenge to implementation of the new strategy, especially the transition to greater self reliance in funding disease control programs.

The apiary industry and government are considering coordination of efforts in various states into a national honey bee disease management program.

Cost-Effective Control of 1080 Bait Shy Possums

J.G. Ross, K.B. Bicknell and G.J. Hickling

The brushtail possum (*Trichosurus vulpecula*), introduced to New Zealand in 1858, has been identified as a significant conservation pest and a major vector of bovine tuberculosis (Tb; *Mycobacterium bovis*) which they transmit to farmed deer and cattle. Consequently, central and local government spend more than \$30 million every year on possum management activities. The current objective of this control is selective, sustained control to eliminate the transmission of Tb to domestic livestock (requiring a 60% kill) and to protect areas with high ranking native flora and fauna that are most at risk from possums (requiring a 80% kill).

Previous simulation studies have suggested that regular aerial 1080 control is the most cost-effective possum control strategy. However, there is a growing awareness that the survivors of 1080 (sodium monofluoroacetate) operations can develop "bait shyness"; this factor can seriously influence the efficacy of future 1080 control operations but has not been considered in previous simulation studies. We therefore constructed a possum control simulation model that incorporated density-dependent possum immigration and bait shyness to fast acting toxicants such as 1080. The objective of this simulation study was to investigate the most cost-effective control strategy, to achieve a sustained population reductions of 60% and 80%, given bait shy behaviour and rapid population recovery due to immigration.

Our simulations suggest that it possible to achieve either a sustained 60% or 80% reduction in possum numbers using a 1080-based control strategy, provided 90% of susceptible possums are killed in each 1080 operation. The chronic acting toxicant brodifacoum (Talon®) will kill the majority of any 1080 bait shy survivors and its occasional use provides a cost-effective way of reducing a possum population to a low density following 1080 control. Sensitivity analysis indicated that the most important variable influencing the overall success of a control strategy is the maximum rate of re-colonisation following control. With the high rates of immigration, that are sometimes observed in small forest reserves, it was not possible to maintain a sustained 80% kill using any combination of toxicants. In these small reserves expensive, permanent bait stations may be required to minimise the effects of immigration.

Organic Farming Industry in New Zealand: Current and Future Prospects

Caroline Saunders

This paper examines the past and current development of the organic industry in New

Zealand. Organic farming in New Zealand has changed and grown rapidly over the last 10 years. This increase has mainly been due to the development and targeting of niche markets overseas. A review of the literature on the development and future prospects for organic products predicts continuing increases in demand in most of the main markets, many of which New Zealand has the potential to target.

However problems still exist in the NZ organic industry, these include problems of a lack of supply and information; infrastructural impediments both internal to NZ and overseas. A further problem which may affect the expanse of the industry is often only one or two crops in a rotation are sold as organic and attract a price premium. Development of the industry is also inhibited by the lack of consistent and coherent data on the market for organic produce, both domestically and internationally. The paper reviews existing studies on market trends and reports the results of a survey in the South to determine attitudes towards organic food and consumers WTP a price premium for organically produced food. The results of this study show a third purchase organic food and, on average these were WTP a 20% price premium. The main reason stated by those who do not purchase organic food was lack of availability although on average the extra this group were WTP for organically produced food was only 8 per cent. A survey of retailers indicated they would like to expand their range and size of organic products, apart from the meat sector, but that (except for the larger retailers) source of supply was a problem.

The review of literature and results of the analysis indicate that there growth potential for the organic industry in New Zealand. This may not jut be restricted to organically produced products but also food produced under low input or environmentally friendly farming systems this may become more important for continuing access into high value export markets. However, further analysis is necessary to overcome some of the problems not least the lack of information.

Deciding Between Economic Development and Nature Preservation: A Way out of the Impasse?

Steven G.M. Schilizzi

Most environmental policy issues involve conflicts between some form of nature conservation and some form of economic development. The economic rationale behind deciding among alternative options is predicated on some form of benefit-cost analysis (BCA). In this context, the key issues to date have been the valuation of non-market goods and services, the effectiveness of the precautionary principle or safe minimum standard, discounting, and the way BCA results relate to the decision making process. To date, no satisfactory decision process seems to have been found that

reconciles conflicting interests with social welfare, the Hicks-Kaldor criterion falling short. I argue that this is because BCA has been conceived of and implemented within a technocratic process, which impinges on all aspects of benefit-cost definition and BCA results, leading to economically arbitrary and socially indeterminate outcomes. An alternative model is proposed, applied to discrete, partly excludable, non-rival but congestible public goods. It is based on mechanism design theory, leading to a democratic, rather than technocratic, social choice mechanism. BCA and optimal mechanism design are combined in a way that renews provision and distribution of information and revelation of social preferences. The role of stated preference techniques, such as contingent valuation, is redefined, particularly with respect to multiple constituencies. The model is illustrated with an Australian case of mining in a National Park.

An Economic Model to Determine the Socially Optimal use of Irrigation Water and of Waste Disposal in the Dairy Industry.

Carmel Schmidt

The Lower Murray flood plains in South Australia comprise 20 reclaimed swamps (5,200 ha), utilised as irrigated dairy pasture. Currently, most farmers on the swamps utilise the government owned flood irrigation scheme. However, the ownership of the scheme, its state of repair and problems associated with nutrient losses from drainage into the Murray River are currently under investigation.

Excess irrigation drainage water from dairy pastures is returned to the river. However nutrients contained in the drainage have an unacceptable impact on the River Murray, and contribute to the outbreak of blue green algae in the Lower Murray. When algae outbreaks occur there is a significant drop in tourism to the region. Thus the income from tourism and that from the dairy industry are interrelated through the algal bloom, and are modelled together in this analysis.

This paper examines the economic and environmental implications of management options for privatisation and rehabilitation of the lower Murray Dairy swamps with particular emphasis on: the market and non market costs associated with rehabilitation; the most cost effective option for the farmers and the community; and appropriate cost-sharing arrangements.

Farm Dams - Are they an Option for the Queensland Sugar Industry

Mark Schuurs and Malcolm Wegener

Sugarcane farms are the single biggest user of irrigation water in Queensland. Recent drought and

unreliable rainfall patterns in areas traditionally reliant on rainfall for crop production has resulted in increasing interest in, and adoption of, supplementary irrigation to underpin production. As a result, demand for irrigation water now exceeds supply from surface and underground sources and growers who are not able to access irrigation schemes are considering other water supply alternatives. A simple spreadsheet model has been developed to accept simulated crop yield, storage yield, and irrigation application data from APSIM (Agricultural Production Simulation Model) and evaluate investment options in storage and reticulation. The analysis indicates that growers should consider the construction of on-farm storages as a viable source of irrigation water.

Economic Implications of Regulations to Preserve Native Woodland on Private Property: A Case Study in the Hunter Valley of New South Wales

Robert R Scott and J A Sinden

Australian policies to preserve native vegetation on farms rest on mandatory regulations without compensation, whereas policies in most OECD countries rest on voluntary conservation with incentives. In New South Wales, the Native Vegetation Conservation Act 1998 restricts farmers from clearing native vegetation on their own freehold land. It may therefore impose opportunity costs on the farmers. These opportunity costs are estimated, by linear programming, for a case study property in the Hunter Valley. They are found to vary between 5 and 10 per cent of annual income, depending on livestock prices. They are also estimated under various kinds of regulations (by type of woodland and type of country), and in terms of their effects on land values. Overall, the present value of the opportunity cost is some \$200 per preserved hectare.

A Century of Export Agriculture in New Zealand

Frank Scrimgeour

Throughout the 20th century export agriculture and horticulture has been an important component of the New Zealand economy. The major industries are apples, dairy, kiwifruit, meat and wool. This paper presents information on New Zealand agricultural and horticultural exports in the first and last decade of the century and documents the changing pattern of production through the century. Information is provided on export volumes, export values and exports as a proportion of GNP. These patterns are interpreted in the light of changing prices, institutional changes (particularly those relating to statutory marketing boards), international political trends and events (including the Great Depression, World Wars, Britain's entry to the European Community), and domestic political trends and

events (including urbanization, competitive land uses, and the era of subsidies and the subsequent era of deregulation).

Financial Indicators of Sustainability

Nicola M Shadbolt

A business analysis framework has been developed that enables the financial cost of farm management practices over time to be assessed. It enables a better assessment to be made of how well a farm business is balancing viability with sustainability. It utilises a combination of environmental accounting and value based management techniques. The use of this technique at both the farm level and for policy makers for better decision making will be discussed. The ability of these indicators to contribute to a better understanding of the complex linkages and feedbacks between level and variation in farm financial resources and environmental impacts, the cause and effects of such impacts and the responses by farmers, policy makers and society to changes in agri-environmental conditions will be explored.

Successful Benchmarking Through Balanced Planning

Nicola M Shadbolt

Family business success is best measured by goal achievement. Not all goals of family businesses are of a financial nature and many are long term. Various approaches to planning will be explored to identify the necessary requirements of not only a successful planning process and plan but also the methods by which the right performance measures for each goal can be determined. A range of business tools such as the balanced scorecard approach will be presented and discussed. Similarly a range of traditional and new performance measures will be critiqued to determine their applicability for specified goals for a case study farm business.

The Economics of Extinction: A Case Study of Otago's Yellow-eyed Penguins

David W. Shields and Robert R. Alexander

The Yellow-Eyed Penguin is the oldest and rarest of the worlds penguins. It is found nestled in small populations in the southeast of New Zealand and on it's outlying sub-Antarctic islands. The penguin faces severe competition with man for terrestrial based resources, required for breeding. Populations are further threatened by predation from mustilids and feral cats. This paper examines the economic forces driving the pressure toward extinction of the species. This case provides a domestic case study of a more general model of endangered terrestrial species extinction. Particular emphasis is placed on

the importance of existence and tourism values and on the threat of predation.

Models of farming Development Using a Rhizoid Approach

Petrus Simons

Rhizoids are systems of hoards, stows, flows and transformations. Rhizoid theory is a tool that can be used in the analysis of a variety of issues both in resource economics and in the study of economic organisation. Part One of the paper outlines the key definitions and concepts of rhizoid theory. In the second part the various types of farming which developed after the feudal period are outlined such as the large estates in Prussia, the large-scale English farms and the co-operative approach developed by Denmark in the 18th and 19th centuries. New Zealand settlers have adopted the Danish rather than the English type of farming. Part Three of the paper examines these models of farming development by means of rhizoid theory, with particular emphasis on possible future developments in New Zealand. The current debate about statutory controls will be taken into account.

Measuring Productivity Change in Dairy Plants in India: A Non-Parametric Approach

Satbir Singh, Euan Fleming and Tim Coelli

This paper analyses total productivity change at the dairy plant level in the private and cooperative sectors in India using non-parametric approach. The DEA-Malmquist method is used to calculate total factor productivity and decompose it into technical efficiency change and technical change. It uses a balanced data set of 16 firms, comprising 13 cooperative plants and three private plants for a period of five years from 1992-1996. The Fisher index is also used to measure total factor productivity to supplement the DEA-Malmquist results. It uses the aggregate data of dairy plants from 1987-1994. The aggregate data of dairy plants for India, Punjab and Haryana are used to generate information per dairy plant on input and output variables. Total factor productivity change is observed using 1987 as the base.

There is a decline in technical change and total factor productivity in the three private plants. There is an increase in technical efficiency in the all cooperative milk plants in Haryana and a decline in technical efficiency in Gurdaspur, Mohali and Ludhiana milk plants in the cooperative sector in Punjab. The cooperative plants declined in total factor productivity except for Ambala but their position is slightly better than the private plants.

Total productivity indices reflect year-to-year variations. The index plunges below the base-year level in 1988, 1991 and 1992 in India, in 1991 and

1992 in Punjab and in all years except 1989 in Haryana. It touches its lowest level in 1992 in India, in 1991 in Punjab and in 1992 in Haryana.

Agricultural Development and Land Degradation in Haryana (India)

V.K.Singh and Jai Singh

Increase in area under 'High Yielding Varieties' (HYVs) of crops mainly rice and wheat following introduction of "Green Revolution" technology, have increased the use of modern inputs like chemical fertilisers, pesticides, insecticides and water, besides increasing food production manifolds. The cropping pattern and rotations have been changed to maximise farm production and agricultural income. The over exploitation of land and water resources and increased use of inputs have induced the problem of agro-ecological imbalance, thereby affecting the long term sustainability of agricultural system. This study tries to look at the changes in cropping pattern and causes and effects of variability in crop production by analysing the time series crop production data on area, production and yields of different crops and estimating various indices of crop diversification. The main findings of the study indicate that well developed agricultural regions are heading towards crop specialisation rather than diversification and is the major cause for inducing the land degradation problems in the region.

Analysing the Chinese Beef Cattle Distribution System Using a Spatial Price Equilibrium Model

Dominic Smith

This paper presents initial results from a spatial price equilibrium model of the Chinese beef industry. The model maximises producer and consumer surplus less cost of transport and transformation. The model specifications include the transformation of feeder cattle into slaughter cattle and beef over 20 regions. A number of different fattening systems and slaughtering types are included in the model. The model reports supply and demand prices and quantities, fattening and slaughtering locations and distribution channels. This paper reports analyses of Chinese policy changes that have been made using the spatial price equilibrium model. Policy changes analysed include; lowering of inter-regional trade barriers, removal of export quotas, increased government control of slaughtering and increased commercialisation of the industry.

Allocation of Resources to Control Weeds

James Soligo and Gary Stoneham

Weeds invade both private and public lands reducing the productive or community benefit derived from these lands. Responsibility for weed control is primarily a role for State governments and landholders but there is a range of legislation, funding strategies and initiatives across all layers of government. In an environment of limited funds and competing uses for these funds, it is important that government gains the greatest return from its human and financial investments. In this paper it is argued that the return to government weed control activities can be improved by selecting activities that generate high returns (either economic or environmental returns) but which are unlikely to be performed by the private sector. The incentives to control both environmental and agricultural weeds are examined and the need for alternative approaches to weed control on private marginal land discussed. Further, it is argued that in order to maximise the returns from public investment in the control of agricultural weeds that a contestable framework is needed for the allocation of resources between weed species and species control alternatives. This framework should have the ability to be used on a wider level to compare the relative returns from public expenditure on the control of agricultural weeds and other forms of agricultural research and development.

Where The Land Meets The Sea: Integrated Sustainable Fisheries Development And Artisanal Fishing

D. Squires, R.Q. Grafton, M.F. Alam and I.H. Omar.

Artisanal fishing communities include some of the "poorest of the poor". In the past 40 years, strategies that have targeted the harvesting sector of such communities have often failed to address their chronic problems of poverty. Using data from gill net fishers in Malaysia, the paper presents the first technical efficiency study of an artisanal fishery and finds that artisanal fishers are poor but technically efficient. The results from the study and the experiences of other artisanal fisheries are used to advance a development strategy for artisanal fisheries called integrated sustainable fisheries development (ISFD).

Determinants of Household Food Security in Rural Uganda: An Application of a Non-Separable Agricultural Household Model

Sarah N. Ssewanyana and Fredoun Z. Ahmadi-Esfahani

Using a static, non-separable agricultural household model, this paper seeks to examine the effect of changes in exogenous factors on food security of the

rural households in Uganda. Household level data used were those collected from a cross-section survey from February to July 1996, covering three districts. The results tend to suggest that household full income, food prices and women specific-variables such as education, age and time allocation influence household food security. Notably, the women-specific variables tend to indicate a slightly more significant impact than food prices. Arguably no single policy can be employed to effectively improve food security of rural households. Instead a mix of policies is suggested, explicitly addressing the issues that are central to raising the productivity of women.

Developing Dairy Farmer Business Management Competence Through the Preferred Future Workshop.

J Stantiall, W Parker and N Shadbolt

Despite the wealth of information freely available via a range of media, farmers lack both confidence and many of the capabilities to develop their own written strategic business plans. The fact that most farmers who do not have a formal strategic plan for their business is testimony to this. Information per se is unlikely to be constraining individuals in completing this task since it is widely available and has been promulgated by the extension agencies in the past. This suggests that the 'one-way' approach to technology transfer is inappropriate for developing business management capabilities amongst the farming community. Our aim was to test the effectiveness of a participatory workshop on farm business management to help individuals build and apply new knowledge and skills in strategic management, specifically planning and control. The workshop was designed to allow participants to develop their knowledge and skills by writing their own farm strategy. Adult learning principles were utilised in the workshop design. Participants were able to integrate and apply their existing knowledge and experience within a conceptual framework. The workshop exceeded the expectations of all of the participants. They gained greater confidence to plan for the future and in their own ability to learn.

Application of Auction Based Systems for Allocating Natural Resource Access Rights

Gary Stoneham, Vivek Chaudhri, David Goldsworthy and Jason Barker

Management of native forests is based on timber quantity licences and administratively set royalty payments. The key problems with current systems include: low return to public resource rents (royalties); risks largely born by government; cost averaging leading to poor resource allocation; and reliance on non-price incentives for value adding.

An improvement in forest management can be achieved by establishing a commercial environment

for timber activities such that revenue and costs from commercial timber harvesting intersect and by ensuring that risks are born by those that appropriate timber returns. The adoption of an auction based system approach to timber resource management can offer significant efficiency gains.

Agricultural RD&E: Is Government Intervention Appropriate?

Loris Strappazzon

Economic theory argues that government intervention is appropriate when markets fail. For agricultural research, development and extension (RD&E), the Industry Commission (1995) argued that state departments "should cost all externally commissioned research...to recover full costs unless additional social benefits not already subsidised are identified".

This paper takes a detailed look at the role of government in different agricultural activities including, inter alia, animal welfare, plant breeding and extension. The reasons why government intervention may or may not be needed are outlined. A rating system developed to rank projects according to who they benefit (the community, industry or private agents) is applied to the Victorian Department of Natural Resource and Environment's activities. The conclusion is that, generally, industry could bear a greater share of the RD&E burden.

Effects of East Asia's Growth Slowdown on the Gains From Uruguay Round Implementation: The Case of Indonesia

Anna Strutt and Kym Anderson

Assessments to date of the consequences of implementing the Uruguay Round of multilateral trade negotiations assume rates of economic growth in East Asia and elsewhere that now seem unsustainable. This paper compares one set of those estimates to 2005 with an alternative set involving slower economic growth, using the global, economy-wide GTAP model. Attention focuses on results for Indonesia, the worst-affected country in the region. An important consequence of the crisis is that Indonesia becomes more agrarian than it otherwise would have been, which should strengthen its support for the Cairns Group as we approach the next WTO Round of multilateral trade negotiations. Results also show that both income levels and the gains from the UR will be much lower at the completion of UR implementations in 2005. This should boost the interest by Indonesia (and other East Asian countries) in catching up through further unilateral, regional and global trade and investment liberalization.

Management of Sheep Grazing Annual Pastures in the Western Australian Wheat-Sheep Zone Under Risk Aversion

Toto Sugiharto, Dave Pannell and Steven Schilizzi

Pasture deferment has been recognized as an integral component of grazing management in the Mediterranean annual pasture systems. Optimal combination of length of deferment and stocking rate have been identified to vary depending on the variations in pasture system conditions over time, the price of animal products and the costs of production. The presence of risk in the management of sheep grazing annual pastures has been confirmed to have significant effects on farm managers' decisions about optimal stocking rate. Application of pasture deferment has been found to alter the optimal stocking rate in various ways. In this study, the effect of risk attitudes on the optimal combination of length of pasture deferment and stocking rate was examined. A stochastic dynamic programming model was used. It was combined with a biophysical simulation model of Pasture Growth and Animal Production (PGAP) which was used to estimate the required transition probabilities. These were generated for each of the possible states of the annual pasture resource and each possible combination of grazing management decisions associated with various risk attitudes. Results show that the effect of increased risk aversion alter the optimal combinations of stocking rate and length of pasture deferment.

How to Represent Regional Differences in a National Programme – Management of Endoparasites in New Zealand

I S Tarbotton and M S Paine

This paper reports on a programme to improve the consistency of information provided to farmers about endoparasites. A study identified how farmers viewed the management of endoparasites. This understanding was used to design new decision tools to assist farmers. Our paper will focus on a methodology for studying regional differences in farmers perceptions and management needs with respect to endoparasites.

Farmer focus groups were held in 9 selected regions. Each group performed several tasks. **Cognitive mapping** had farmers interactively constructing their views on the general management, regional issues, and information gaps involved in parasite management. **Surveying** the types of information and key people farmers use to make decisions. A paired comparison of key concepts in parasite management was included in the survey to compare across regions. **Transcript analysis** of group meetings enabled an analysis of farmers' reasoning that underpinned the construction of their cognitive maps. **Development of a regional information network** was achieved by asking farmers for other contacts who they

consider have a keen interest in the topic and working interactively with these contacts when trialling new decision aids.

This paper will discuss the way the methodology became part of the overall technology development strategy of the research team and suggest possible extensions to similar national programmes.

Alternative Enterprises on New Zealand Farms: Obstacles, Challenges and Potential

C. Nicholas Taylor and Heather McCrostie

Family farming remains the organisational platform for agricultural production in New Zealand. Since the early 1980s, New Zealand farm families have increasingly sought to diversify their sources of income away from the core farm business operation including off-farm employment and on-farm enterprises. Alternative farm enterprises are a response to economic restructuring and reflect an emerging private enterprise culture. These enterprises range across a number of sectors and a characteristic is their niche nature and the ability of the farm entrepreneurs to adapt to market demands and command competitive marketing strategies. The enterprises can be run separately from the farm operation having no connection with or influence on land use. Or, they can be integrated with existing or changed forms of land use. Unlike the farm operation, there is no distinct gender division of roles or for decision making, and the enterprises offer entrepreneurial opportunities for women. Obstacles are not so much capital, skills or flair, but lie in legislation and administration. Scale is important and requires decisions about growth and diversification of enterprises in relation to personal and family goals. Enterprise cultures at the farm level require supportive networks, awareness and proactive business policies.

Farm Labourer to Food Technologist - A Century of Radical Change in Farm Employment 1900-1999.

R Tipples

In the last hundred years the decline in the agricultural labour force begun by the Agricultural Revolution has turned to an exodus as new methods and new technology have radically changed farm production and the range of products produced and sold.

The few farm worker trade unions of the late nineteenth century have almost completely disappeared with the growth of individualisation of employment conditions. The types of jobs to be performed have changed radically, as has the composition of the farm labour force with the greater involvement of women. The commodity production of a former era has become the niche marketing of today. However, plants and animals

do not raise themselves and the need for a human input still continues, although much diminished.

This paper will focus on the changing and developing roles of the farm workforce, their education and training, and the future of what might be called farm employment relations. From a period of increased academic interest in the 1960s, a decline has followed as the economic pressures facing tertiary education have compounded with the effects of declining numbers of farm students in the 1990s. Suggestions are made on the place of employment relations in future farm management and rural economics courses.

Economic Impacts of Noxious Weeds, Other Weeds, and Tree Growth on Agricultural Production in the New England Tablelands, New South Wales.

J T Townsend and J A Sinden

The economic impact of weeds on farms in the New England Region of New South Wales is estimated from data from a cross-sectional survey. Weeds can be classed as noxious or declared plants, plants that the farmers perceived as weeds, and trees -- which many farmers also perceived as weeds. Variables were defined for several levels of intensity for each of these three classes of weeds. The impact of each these variables, on property income and stocking, was estimated through Cobb-Douglas production functions. Increases in the areas of all three kinds of weeds decreased both stocking and income.

Net Benefits From Liming Cropping Soils

L.N. Trapnell and L.R. Malcolm

This study was set in the mixed farming area of north-eastern Victoria and south-eastern New South Wales in the 500 mm to 650 mm average annual rainfall zone, where soils used for mixed farming are commonly acidic. Farm management budgets using break-even analyses and discounted cash flow analyses over a twenty year period were used to capture the economic and financial implications of liming on the management of whole farm businesses. The results revealed that under certain circumstances, there can be net benefits from liming acid soils for growing acid-tolerant crops in rotation with subterranean clover pasture. Greater net benefits become possible when acid-sensitive crops such as canola are substituted for acid-tolerant crops. Additionally, farm management budgets, like those used in this paper, have a major use in extension programs because they provide transparent information about the net benefits that farmers may derive from liming their acid soils.

Analysis of Indonesian and Malaysian Agribusiness Trade and Investment Impediments: Application of a Returns from Policy Research Framework in Light of the East Asian Crisis.

Ray Trewin.

Indonesian and Malaysian agriculture and agribusiness policies have changed markedly in light of the East Asian crisis. Often these changes have been in conjunction with investigations undertaken by domestic governments, multilateral and other aid agencies. Priorities in relation to these changing policies may differ from a domestic and international perspective, as well as from those suggested by application of a returns from research framework, for example in relation to self-sufficiency. Priorities may also be affected by available research expertise and other capabilities. In this paper, comparison of the priorities will be undertaken within a returns from research framework, drawing on policy analysis undertaken in earlier work.

Agri-Food Developments in Indonesia, Malaysia and South Korea in Response to Changing Economic Circumstances.

Ray Trewin and Brian Johnston.

Under a Supermarket to Asia project funded by the Rural Industries Research and Development Corporation, separate country reports of policies and developments in the agri-food sectors of Indonesia, Malaysia and South Korea in light of the crisis have been produced. These were based on mainly country background papers published separately. In this paper, comparisons across these countries, which have been affected differently by the crisis and undertaken different responses, are undertaken. Lessons can be learnt for various economies from such comparisons, in particular, which policies allow market-based responses to work and which ones inhibit adjustment and welfare.

Varying Protection Levels and Corresponding Policy Implications in Slovene Agriculture in an EU Accession Environment

Jernej Turk, Emil Erjavec and Miroslav Rednak

Slovenia is one of the very few European countries which has recently experienced augmented agricultural protection levels. PSEs were used in determining protection levels in Slovene agriculture over the initial period of transition - after the break away from Yugoslavia (1992-1995). A general increase in agricultural protection levels is mainly due to market price policy regime (price supports). PSE and NACp coefficients show that the highest

protection levels existed for sugar beet, milk and beef, while coarse grains and poultry meat had relatively low support levels. It is realised that a current tide of intensive agricultural price protection should be curtailed and gradually replaced by an effective budget support policy. This is especially important in the light to overcome the existing structural discrepancies in Slovene agriculture and, at the same time, to adjust to the reforming agricultural policy in EU, should Slovenia realise its aspirations to become its full member in a near future.

The Value of Fish 'n' Trips to Recreational Anglers in South West WA

Martin van Bueren

Recreational fishing is one of the most popular forms of outdoor recreation in Australia, involving approximately a third of the population. As such, the recreational sector is a significant user of fish stocks and coastal areas. Allocating resources fairly and efficiently between recreational interests, commercial fishermen, and other users has become a major issue in fisheries management. Because there is no market to signal the values of recreational fishing, there is a tendency for fish and access to beaches for recreation to be under-supplied. Managers are aware that recreational fishing provides substantial social and economic benefits, but do not have a good grasp of their magnitude or sensitivity to changing conditions. This paper presents the results of an empirical study which estimates the value of fishing trips made by a sample of shore anglers, together with their marginal values for several types of fish. Welfare estimates were obtained using a random utility model which infers values from anglers' observed choices of site and target species. The average consumer surplus from a day trip was estimated to range between \$33 to \$39, while improving catch rate by 50% increased the value of a trip by \$1.20 to \$2.40 depending upon the type of fish. Based on the average number of fish caught per trip, this equates to a marginal value of \$0.40 to \$1.44 per fish. This study demonstrates that the random utility model is a promising new technique for deriving non-market values and assessing policies that allocate natural resources between user groups.

Agro-Industrialisation and the Chinese Cattle and Beef Industry

S Waldron

The term translated literally as 'agro-industrialisation' is used both frequently and loosely by Chinese officials and academics to refer to a range of targets including agricultural integration and commercialisation. Support for the agro-industrialisation process has shifted the emphasis of agricultural policy to the extent that it now heralds the third wave of reform of the Chinese rural

economy since 1978 (the preceding two being the introduction of the household responsibility system and the growth of town and village enterprises). This paper draws on a literature review of Chinese material and on extensive fieldwork to discuss: a) what is meant by 'agro-industrialisation'; b) how agro-industrialisation measures are organised and implemented; c) how this reflects the characteristics of Chinese agriculture, and; d) the role of and implications for relevant actors (government, enterprises, rural households, co-operatives). Discussion relates to a number of agricultural sectors but particular emphasis is placed on the Chinese cattle and beef industry.

Influence of Remnant Native Vegetation on Rural Land Values: A Hedonic Pricing Application.

Sandra Walpole and Michael Lockwood

Much of Australia's native vegetation has been cleared or altered as a result of agricultural development. The native vegetation that remains on private land is highly fragmented and continues to be degraded and modified due to various land use and environmental pressures. One of the major concerns of landholders in retaining and managing remnant native vegetation (RNV) in the agricultural landscape is the lack of information and understanding about the potential benefits and costs associated with conservation of these areas. The contribution of RNV to changes in rural property values needs to be examined when considering future policy and management strategies to encourage private landholders to retain and conserve RNV within the agricultural landscape.

The northeast Victorian catchment and the Murray catchment of NSW were chosen to examine the effect of RNV on rural property values using hedonic price analysis. The hedonic price approach explores the relationship that exists between the price of a good and the bundle of characteristics (or attributes) which the good possesses, to explain variations in the prices of the differentiated goods under consideration. Land sales records for the past ten years were obtained for properties greater than two hectares within the catchment areas, and those containing areas of RNV were identified. The purchasers of these properties were interviewed to determine the characteristics that influenced their purchase decision. Using this information, multivariate regression models have been estimated to quantify the contribution to property values of different attributes including the presence and nature of RNV. Based on the results of this hedonic analysis, the property market does not appear to be a good measure of the economic value of RNV.

Assessment of the on-farm economic values of remnant native vegetation

Sandra Walpole, Carla Miles and Michael Lockwood

The widespread clearance of native vegetation has been identified as one of the major environmental issues facing Australia. Impacts of clearing include dryland salinity, weed invasion, soil erosion, soil structural decline and the loss of species. Development of effective policies to deal with remnant native vegetation (RNV) decline has been hampered by lack of detailed data on the economic benefits and costs of RNV conservation. This study measured the on-farm benefits and costs associated with RNV in the two study areas, the northeast Victorian catchment and the Murray catchment of NSW. Data were collected using landholder surveys. The most important economic benefits from RNV under current management regimes in the Victorian study area were productivity effects associated with prevention of land degradation, firewood production, and for the NSW study area, stock and crop shelter. The most significant cost in both study areas was weed management.

A proposed conservation management scenario that included fencing of the RNV, and limitations on grazing and firewood and post removal would negatively effect most of the survey participants. The differences between the net present value (NPV) of the current management regime maintained over a 40 year period, and the NPV of the proposed scenario were large and negative. For Victorian participants, the marginal effect of the conservation proposal was - \$2 million, and for NSW participants -\$15 million. In both study areas, the incremental economic costs of the scenario outweighed the incremental economic benefits for at least 89% of participants. This study confirmed that one of the major barriers to protecting RNV is the economic costs associated with conservation management. A large proportion of participants cannot expect a positive return from investing in RNV conservation. Any policy approach to achieve conservation objectives for RNV requires significant financial incentives for landholders to undertake conservation activities.

General Equilibrium Analysis of Rice Pricing Policy in Indonesia

Peter G. Warr

This paper studies the effects within Indonesia of subsidies on rice consumption. It does so using a general equilibrium model of the Indonesian economy, known as WAYANG, which distinguishes ten Indonesian households and is designed to give special attention to the income distributional impact of policy changes. The analysis shows how general equilibrium models like WAYANG can be used to derive the distributional effects of policy interventions as well as their

overall economic impacts and to show the detailed relationships between the rates of these interventions and their welfare effects under alternative assumptions about the underlying behavioural parameters.

Income Stabilization, Price Stabilization, and the Government Trade Policy

Taiji Watanabe

This paper investigates the Pareto optimal government roles in commodity price stabilization, primary producer's income stabilization, and trade policy. The paper studies whether these government policies may be substituted with more market oriented approaches such as use of derivatives contracts. A two-period-two-agent model is used to draw analytical results. The paper examines the conditions for Pareto optimal government policies.

It is often argued that the price stabilization policy is not effective in that neither stabilizing the producers' incomes does not necessarily improve the producers' welfare nor the social welfare gains obtained by consumers are large enough to offset the social welfare losses created by the price fixing. The paper attempts to clarify under what condition price stabilization policies are preferred to income stabilization policies, *vis versa*, and under what condition no government intervention is desired.

The paper also examines the optimal trade policy. A Country whose national income heavily depends on the export of primary goods usually faces substantial income fluctuations due to volatile commodity prices and foreign exchange rates. The paper tries to identify how various trade policies should be used to minimize the income fluctuations; such as index futures contracts, buffer stocks, export/import subsidies, and quotas.

Opportunities for Mechanisation of Sugarcane Production in China: Experience with Sugarcane Machinery on Guang Qian State Farm

Malcolm Wegener, Yinggang Ou, Liangcheng Chen, Dantong Yang, and Pingxiang Yu

Sugarcane is an important industrial crop in South China. State farms are important cane producers, producing one-tenth of the nation's total cane. In order to evaluate a fully mechanised system for sugarcane production in China, a set of Australian-made sugarcane machines including tillage equipment, billet planter, cultivation and fertiliser application implements, chopped cane harvester and self-unloading transporter were imported and tested on Guang Qian State Farm, Guangdong Province. Most of the machines performed well but yields were lower than conventionally planted cane. Better management and coordination among the

parties involved in the experiment would lead to some improvement in the overall results. An economic evaluation of mechanical and manual production methods has been carried out.

Optimum Number of Regional Variety Trials for Selection of Wheat Varieties in South and Central Queensland and Northern NSW Graingrowing Regions

MK Wegener and IH Delacy

Selection programs for commercial varieties of wheat, barley and other crops involve the conduct of a number of staged selection trials in which the number of potential varieties is progressively reduced their performance in compared with standard varieties and information on their suitability for the growing environment is progressively built up. The potential cost of errors in selecting varieties is determined by the variance components derived from statistical analysis of regional variety trials. The opportunity cost or foregone income from not selecting a superior variety can be aggregated with the cost of carrying out the trial program to decide the least cost number of trials to conduct. The optimal number of regional variety trials that minimises these costs for wheat has been determined for central and south Queensland and northern New South Wales graingrowing areas.

The Profitability of Hail Netting in Apple Orchards

Kristel Whitaker and Simon Middleton

Approximately 40% of the apple orchard area on the Granite Belt in Queensland is covered with nets to protect the crop from hail damage. The effects of hail netting on apple orchard microclimate, productivity and tree growth have been measured over many seasons, however limited work has been done on evaluating the economic benefits.

A benefit-cost analysis was used to calculate the expected profitability of hail netting on the Granite Belt. Criteria used were the Equivalent Annual Return (the annualised Net Present Value), the Internal Rate of Return and the Payback Period. Estimates of the net benefits took into consideration the secondary benefits of hail netting, such as reductions in sunburn and bird damage to fruit, and were partly based on the probability distribution of hailstorms on the Granite Belt. Insufficient historical hailstorm data were available, so the probability distribution was developed from a survey of experienced growers in the region.

The incidence and severity of hailstorms can vary significantly between growers within the same district. Therefore, the benefit cost analysis was developed in such a way that it can be used as a decision tool for individual growers. By entering

information about his or her own orchard, a grower can determine if it is likely to be profitable to erect a hail net.

A Simplified Benefit-Cost Calculator to Foster Research Evaluation and Monitoring

Barry White

Increasing use of Benefit-Cost Analysis (BCA) in research evaluation has not been accompanied by consensus on the increased returns flowing from the evaluation effort. There are likely to be a wide range of views held by researchers, agricultural economists and research managers on how evaluation can be made more effective. The paper draws on the author's experience in the evolution of BCA in research evaluation to propose how the current state of the art might be advanced. A BCA calculator is presented which enables a BC ratio to be simply and accurately determined. Inputs are total costs and duration, potential benefits, and the adoption lag and rate. The adoption data, for example, is used in a table to look up the appropriate factor for the sum of discounted benefits. The calculator is likely to be seen as a somewhat oblique approach for those now accustomed to using the same inputs in a spreadsheet. However, the more likely role is as an introductory tool for researchers and research managers which is easier to understand, convenient and transparent. Further, the calculator shows that the effort in BCA calculations is trivial compared to that required to determine the input data. The calculator should also be seen as part of an investment approach which is competitive and indeed superior to more intuitive and less accountable approaches to resource allocation decisions. More widespread use of ex ante BCA, coupled with ongoing monitoring, are seen as the essential priorities for research evaluation. Monitoring can convert estimates of key inputs such as adoption patterns from an artful art to a science.

Farmer Perceptions of Wetlands and Wetland Management in the Upper South East of South Australia

Stuart Whitten and Jeff Bennett

In recent times much attention has been paid to wetland conservation and management. Relatively little of this attention has been paid to the trade-offs land manager's face when deciding on the use of privately owned wetlands. In this paper the results of a survey of wetland management trade-offs in the Upper South East region of South Australia are reported. Wetland benefits are reflected by farmer attitudes and wetland management behaviour. The results indicate that farmers obtain considerable non-monetary benefits from their wetlands. These non-monetary benefits from wetlands are traded-off against monetary opportunity costs (mainly from restrictions to grazing livestock) and additional

management costs. Management constraints faced by land managers are analysed and some potential incentive structures suggested.

Private Incentives for Environmental Public Goods

Stuart Whitten and Jeff Bennett

Private land managers make decisions regarding the use of their environmental resources in response to information and incentives contained in the price mechanism. However, the price mechanism often fails to reflect adequately the information relating to the public good attributes of environmental resources. Hence decisions made by private land managers do not necessarily reflect the desires of society as a whole. The aim, in this paper, is to explore the incentives of wetland owners together with some of the constraints imposed by the production process and the institutional framework. Specifically three aspects of the resource allocation problem faced by society are explored. Firstly the nature of private and public outputs produced by a specific environmental resource, wetlands, is analysed, ie. the incentive framework. Secondly the nature of the production process which uses wetlands as inputs and jointly produces both private and public goods is investigated. Finally the institutional framework within which private wetland managers operate is examined. The theoretical construct developed in this paper will be tested as part of the 'Private and Social Values of Wetlands' research project currently in progress.

Risk Beyond Farmers' Control: Grain-Sheep Mixed Farming Systems under Rainfall and Commodity Price Variability

Rukman Wimalasuriya

Variability of rainfall and commodity prices are important off-farm factors influencing the profitability of dryland farming. Since neither of the above factors can be predicted, lessons from the past can be a preparation for the future. Analysing farm profit over ten years is suggested as a way to understand the risks inherent in farming. Financial sustainability of a farm business depends mainly on the net growth of farm equity over the years which can be achieved even with fluctuating farm profit.

"FarmProf" is a simple spreadsheet model developed in Excel, to analyse both annual farm profit and farm equity of a broadacre cropping farm or a mixed grain-livestock farm over a ten year period. If crop yield data are not available, FarmProf uses rainfall data to estimate crop yields. The model was used to analyse the profitability of a hypothetical mixed farm in North-central Victoria for the ten years from 1988-89 to 1997-98.

There were five high-profit years, three medium-profit years and two low-profit years over the ten

years. It was assumed that the rates and prices of farm inputs remained constant. Starting with a farm equity of 75% and a farm debt level of \$200,000, the farm equity grew to a notional 209%. The contribution of rainfall and cereal price variability to the peaks and troughs in annual farm profit is discussed.

Sources of Growth in Australia's Wine Industry: The Past Decade and the Next

Glyn Wittwer and Kym Anderson

Use is made of a 2-region computable general equilibrium (CGE) model of the Australian economy (FEDSA-WINE) to examine the relative contribution of key factors in the rapid growth of Australia's wine industry since the late 1980s. The model distinguishes South Australia (where half the industry is located) from the rest of Australia, and non-premium grapes and wine from premium white and premium red. The imposition of a wholesale sales tax dampened (especially non-premium) domestic wine sales, but was spectacularly offset by growth in domestic and export demand for premium (especially red) wine and rapid productivity growth and quality improvements in both winegrape growing and winemaking. Drawing on these insights into the relative contributions of these factors during the past decade, the CGE model is then used to project the industry's growth pattern to 2000 and 2010 under different wine tax regimes. The results suggest that even with conservative assumptions for demand and supply growth, the industry seems destined to reach at least some of its 30-year targets to the year 2025 well before 2010.

The Changing Structure of Protection in Indonesia: Sectoral, Regional and Income-Class Biases, 1987 to 1998

Glyn Wittwer, Helder da Costa and Kym Anderson

Indonesia undertook substantial trade liberalization between the late 1980s and mid-1990s. Reform then slowed somewhat, before being forced by the financial crisis to accelerate again in 1998. Building on World Bank estimates, this paper compares protection levels by industry/sector for 1987, mid-1995 and late 1998. Using both nominal and effective rates of protection, the extent of decline in the anti-trade bias is shown. The protection rates also suggest a pro-Java, anti-Eastern Indonesia bias in the policy regime. A new 3-region computable general equilibrium model of the Indonesian economy is to be used to confirm these biases. That model's results will be used also to show whether the policy regime's biases against agriculture and other primary sectors, and against poorer households, have strengthened or weakened over the past decade.

The Impact of Crisis Induced Policy Reforms on Indonesia Agriculture Performance and Trade

G Wittwer and R Stringer

The ongoing economic crisis enveloping Indonesia has not just halted, it has dramatically reversed decades of strong economic growth, steady progress in poverty reduction, and substantial gains in improving food security. Since the economic crisis began in August 1997, the Rupiah's value has remained volatile, the inflation rate has reached 60 percent, and the most optimistic estimate for the 1998 economic growth rate is -10 percent. Among its many attempts to address the crisis-related impacts, policymakers have agreed to reduce tariffs on more than 500 food items to 5 percent; eliminate local content requirements for dairy products; dismantled export controls for plywood and wood products; withdraw BULOG's import and trading monopolies for wheat, wheat flour, garlic, sugar and soybeans; abolished the clove monopoly; reduce agricultural export taxes to 10 percent; eliminate inter-provincial commodity trade restrictions; remove export restriction on palm oil products; privatize plantation and estates; privatize input suppliers; and liquidate cooperatives. Subsidies to rice and fertilizer remain, however. The paper examines the implications of these policy changes on the agriculture sector and in particular uses the Wayang computable general equilibrium (CGE) model of the Indonesian economy to quantify the expected impacts of a depreciation of the real exchange rate on Indonesia's trade performance and national welfare.

Impacts of Tariff Adjustment upon Import Demand for Australian and New Zealander Beef in Taiwan

R Woo

Australia, New Zealand and the United States are the major suppliers of beef imported by Taiwan. Although Australia and New Zealand outstrip the U.S. on the market of "lower-grade" beef, the U.S. retains almost the entire market of "upper-grade" beef in Taiwan, owing to the lower tariff rate for "upper-grade" beef. However, the "unfair" tariff structure will be eliminated under trade liberalization. The general objectives of the study are to analyze the demand structure for beefs from different origins, and to estimate the impacts of the tariff adjustment upon the import demand for various beefs in Taiwan.

Based on the concepts of utility separability and two-stage budgeting procedure, the beef expenditure was estimated first. A LA/AIDS model was then adopted to estimate the expenditure shares of beefs from various origins. The price and income elasticities were then derived from the estimated coefficients of the beef expenditure equation and the estimated expenditure shares. In addition, policy

simulation analyses were also performed to forecast the beef demand structure and to evaluate the possible impacts of policy adjustment.

According to the empirical analyses, the income and price elasticities of demand for Australian and New Zealander beeves are lower than those of U.S. beef. The U.S. beef will lose its market share to the Australian beef due to the tariff adjustment. It was estimated that the market shares of beeves imported from Australia and New Zealand will be 72% and 17%, respectively, by the year 2000.

How Different is Mining from Mineral Processing? A General Equilibrium Analysis of new Resources Projects in Western Australia

Qiang Ye

Western Australia is experiencing an investment surge in the mining and mineral-processing sectors of the economy. Unlike previous surges, this one involves a large proportion of mineral-processing projects. This brings to the fore questions about government policies which have long favoured processing over mining. In particular, does mineral processing deliver more jobs per dollar invested and does it generate more export earnings than investment in mining projects? The answers to these questions are potentially of great significance to the future course of the WA economy. In this study, the differential effects on the WA economy of 25 mining and 10 mineral-processing projects are analysed from perspectives of both the Gregory thesis and the absorption approach using an economy-wide model of WA. The results indicate that: (i) Both the mining and mineral-processing projects will have substantial flow-on benefits to the WA economy as a whole. (ii) On a \$1-million-invested basis, mineral processing has larger flow-on effects on employment than does mining. (iii) Mineral processing also generates more export revenue once the projects are operational, again on a \$1-million-invested basis. (iv) Many service industries, such as Retail trade, Business services, Health and Education, are major beneficiaries of new resource projects. The reasons why the minerals projects have larger effects are also analysed.

The Economic Component of a Multi-Dimensional Biophysical, Agricultural Production and Socio-Economic Decision Support System, To Explore 20 year Profiles for Irrigation Regions in the Southern Murray Darling Basin.

Michael ES Young, Dawn P Fordham, Kim WJ Malafant and Julian Morison

An integrated scenario modelling system - The Irrigation Futures Framework (IFF?) - was developed to link biophysical, agricultural

production and socio-economic models in a decision support framework. Various combinations of input and commodity price projections, irrigation water salinity and irrigation water availability scenarios were explored. Based on historical climatic, hydrological, production and financial data of irrigation farms in northern Victoria, watertable movements were modelled over a 20 year period, with resulting soil salinity, crop, pasture and animal production impacts. The financial consequences of the biophysical impacts of alternative irrigation management scenarios were investigated and the flow-on effects to the region's economy estimated using Input/Output analysis. The financial component of the model valued the change in drymatter production through its impact on livestock (dairy, sheep and beef) production, resulting in changes to total farm gross margin and net return to full equity of the farms in the catchment.

Revisiting Australian Pork Sales Response to Advertising 1988 - 1997

Lin Zhang and Ellen Goddard

The pig meat market in Australia is characterized by generic (fresh pork, bacon etc.) advertising. These advertising expenditures are funded from collective levies from pig producers. At the same time, there are extensive brand advertising activities in the pig market. So far, there have been several studies done on the effectiveness of generic pork advertising in Australia up to 1988. However, the previous studies only looked at generic advertising and didn't account for other media information as brand advertising effects on pork consumption. As well, the previous studies are contradictory about the effects of generic pork advertising.

In this study the economic relationships in the consumption of pig meat are examined and the effectiveness of the advertising programs from 1988 to 1997 is evaluated. The two-stage demand system used in this study is made up of a single equation determining Australian aggregate expenditure on meat and an expenditure share system derived from a translog indirect utility function for four meats: pork, ham, bacon and other products. Own generic, brand and cross commodity effects of advertising are included in the analysis.

Farmers' Grain Disposal Behaviour in China

Zhang-Yue Zhou, Wei-Ming Tian and Guang-Hua Wan

When grain production is largely subsistence in nature, how grain producers dispose of their grains is of great value for policy formulation. Of special importance is the amount of surplus grains which are actually marketed and placed at the disposal of the non-grain producing population, because the

availability of an adequate level of the marketed surplus grains is crucial in promoting and sustaining the economic development of a country. This study, using farm-level survey data, examines factors affecting Chinese farmers' grain disposal decisions. Emphasis is given to examine factors which affect the level of the marketed surplus, farmers' own human consumption, feedgrain usage, and the level of stock. Policy implications will be explored.

Testing Rice Market Integration in China: The Case of Guangdong and Jiangxi

Zhang-Yue Zhou, Guang-Hua Wan and Wei-Ming Tian

Recent studies which examined the integration of grain markets in China reveal that, at the national level, there is generally a lack of integration in the Chinese grain markets. A number of factors are responsible for the low level of integration. Given the fact that the overall level of integration in the grain markets at the national level is very low, a logical question to be asked is: Would those factors, which affect the integration of markets at the national level, have affected, to the same extent or to a lesser extent, the integration of markets within a province? Would there be a higher level of market integration between markets within a province? Answers to such questions will be of great policy implications and will offer useful directions for the Chinese government to prescribe policy measures to improve grain market integration at the provincial and/or national level. This study examines the integration of rice markets in China at the provincial level.

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