FINAL REPORT

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

DAQ00145

Travel Award - Richard Routley to attend and present a paper at Farming Systems Design 2009

PROJECT DETAILS

PROJECT CODE:	DAQ00145
PROJECT TITLE:	TRAVEL AWARD - RICHARD ROUTLEY TO ATTEND AND PRESENT A PAPER AT FARMING SYSTEMS DESIGN 2009
START DATE:	22.08.2009
END DATE:	03.09.2009
SUPERVISOR:	RICHARD ROUTLEY (PRINCIPAL SCIENTIST, TEAM LEADER - FARMING SYSTEMS MODELLING)
ORGANISATION:	QLD DEPARTMENT OF EMPLOYMENT, ECONOMIC DEVELOPMENT AND INNOVATION
CONTACT NAME:	RICHARD ROUTLEY

Summary

Name of conference attended / reason for travel: The primary purpose of the travel was to attend and present a paper at 'Farming Systems Design 2009 - an international symposium on Methodologies for Integrated Analysis of Farm Production Systems', in Monterey, California. (http://www.iemss.org/farmsys09/)

To add value to the travel, I visited several other agricultural RD&E institutions in the USA to discuss latest advances in the development and application of systems simulation modelling in grain and mixed farming systems, crop sequencing for improving water use efficiency (WUE) in dryland farming systems, and approaches to adapting agriculture to climate change.

Travel destination: USA

Travel / Conference dates: Commence: 22 Aug 09, Finish: 3 Sep 09

Relevance to your area of work / discipline:

I currently lead the Farming Systems Modelling team within the Queensland DEEDI component of APSRU. The objective of this group is to conduct research leading to improved profitability and sustainability of Australian grain, cotton and mixed farming businesses through development of farm business designs that improve resource use efficiency and adaptation to

changing climate, market and policy conditions. The development and application of field and farm scale simulation models is a key enabling technology utilised by the group.

The 2009 Farming Systems Design symposium included a number of themes and subthemes that were directly relevant to our work ie

- Subtheme 1.2 Climate impacts on agricultural systems

- Theme 2. Field-scale farm design and improvement

- Subtheme 3.1 Systems for energy and water-use efficient farming

- Subtheme 3.2 Systems for reducing greenhouse gas (GHG) emissions and increasing carbon storage

- Theme 4. Model application and outcomes

- Theme 5. Software Support for Farming Systems Design

The paper that I presented was related to the assessment of water use efficiency (WUE) in rainfed grain and mixed farming systems - a research area that is a key focus of much current RD&E in Australia, including a number of GRDC funded projects. Attendance at this conference provided an opportunity to subject current Australian RD&E and concepts to international scrutiny and feedback, and to interact with and learn from international experts in this field.

Visits to other institutions provided an opportunity to discuss latest developments in topic areas including the development and application of systems simulation modelling in grain and mixed farming systems, crop sequencing for improving water use efficiency (WUE) in dryland farming systems, and approaches to adapting agriculture to climate change.

Outcomes

What were the main findings, benefits or lessons learnt? How do you propose to apply these to your current area of work / discipline?

The primary benefits of this travel was exposure to international developments in a number areas of farming systems science and analysis, and the networks and potential collaborative linkages that were formed. New knowledge and concepts will be integrated into and applied in Australian based research projects such as 'Grain and Graze' and the Southern Queensland Crop sequencing project. Some highlights of relevance to Australian farming systems RD&E arising from each element of the travel are outlined below.

A. FSD 2009 conference

1. New approaches and tools to model the productive, economic and environmental performance of farming systems at the whole farm scale

   A major focus of current research by our Farming Systems Modelling team is to develop and apply tools that enable the analysis of the consequences on new management practices and strategies on whole farm performance (in multiple dimensions eg productivity, profit, natural resource condition, risk etc). The primary tool that we have developed is APSFarm, a whole farm implementation of the APSIM simulation modelling environment. A large number of conference papers (eg Martin et al, Ascough et al, Rigolot et al, Dury et al, Marcello et al, Bergez et al, Groot et al, Hendrickson et al and others) addressed similar issues, illustrating that this issue is receiving much attention in many other countries (France, USA, Netherlands etc) and that a wide range of tools and approaches are being developed and utilised internationally. Exposure to these developments and experiences will allow us to incorporate the best of these approaches and tools in our own research projects.
2. Design of cropping systems to maximise resource use efficiency.

   A number of papers addressed the issue of improving resource use efficiency (radiation, water, nutrients) in crop and forage production systems (Bedoussac & Justes, Angadi et al, de Ruiter et al, Fletcher et al, Liang et al). Both the general approaches of addressing farming systems performance from the perspective of resource use efficiency, and some of the novel management interventions examined (eg intercropping) have potential application in Australian farming systems RD&E.
3. Participatory design of new farming systems.
   A number of papers addressed the topic of designing improved farming systems using participatory methods with a range of stakeholder groups, in combination with the use of sytems modelling and other assessment tools. (Cerf et al, Prost et al, Debaeke et al and others). While many of these papers were quite theoretical in nature, they included some concepts that are potentially applicable in Australian farming systems RD&E.

B. USDA, Akron and CSU, Fort Collins, CO.

Discussions with researchers at these institutions was focussed on the issue of improving Water Use Efficiency (WUE) in rainfed cropping systems. While there are some fundamental differences between rainfed farming systems in Colorado and Northern Australia (ie Colorado systems are based on plant growth during Spring/Summer/Autumn with no growth during winter due to low temperatures/snow), there are many similar principles employed (eg maximising soil water accumulation during fallow periods, optimising cropping frequency and fallow length to maxise efficient use of rainfall).

Field research at the Central Great Plains Research Station at Akron CO includes well resourced, long term crop rotation experiments designed to compare the long term productivity and sustainability impacts of a range of crop rotation strategies.

C. USDA-ARS, Agricultural Systems Research Unit, Fort Collins, CO

Discussions with researchers at the ARSU focussed on technologies for simulation of pasture and animal production in mixed farming systems. This group use the RZWQM simulation modelling platform and have recent experience in the development of whole-farm modelling capacity, including modelling pasture and animal production from extensive rangelands. This is an area of current interest to the APSRU group as we develop capabilities to deal with whole farm issues, and improving the performance and capitalising on the opportunities available in mixed grain/livestock production systems.

D. World Bank, Washington DC

The purpose of this component of the travel was to deliver a seminar to World Bank staff on the topic of "Adapting agriculture to global change: a systems approach to dealing with complexity". The seminar was delivered jointly with Dr Alison Laing, CSIRO, Canberra and served to highlight the capabilities of Australian researchers in this area. The seminar was attended by ~ 30 world bank investment managers and other staff and was well received. Likely benefits of this activity will be access to World Bank funding to build capacity within Australian R&D institutions to address global change adaptation issues nationally and internationally.

Achievement/Benefit

Did you present a paper?

Yes: Routley RA, Robertson MJ, Bell L, Moore AD and Kirkegaard JA (2009) A framework for evaluating farm water use efficiency (WUE) in rainfed grain and mixed farming systems. In 'Farming Systems Design 2009 - Methodologies for Integrated Analysis of Farm Production Systems' Monterey, CA).

The following files are attached to this report:

1. FSD2009 Routley et al.pdf - Paper presented at FSD conference
2. USDA CSU presentation.pdf - presentation given at USDA in Akron and Fort Collins, and Colorado State University in Fort Collins.
3. World Bank presentation.pdf - presentation given at World Bank, Washington DC (jointly with Dr A Laing, CSIRO)

Collaboration Details

Identify and outline potential opportunities or alliances (both national and international collaboration linkages) that will benefit the Australian grains industry from your travel.

The major collaborative opportunities that were identified include:

1. Collaboration with Wagenengin University & Research (WUR) and the French National Institute for Agricultural Research (INRA) in the area of design and analysis of cropping and mixed farming systems at the whole-farm scale.
2. Collaboration with USDA (CGPRS) (Dr David Nielsen) and CSU staff (Prof Gary Peterson, Dr Dwayne Westfall, Dr Niel Hansen), in the area of farm WUE and crop sequencing in grain cropping systems.
3. Collaboration with the USDA-ARS Agricultural Systems Research unit in the area of simulation modelling of mixed farming systems, in particular the development of capabilities to model tropical and sub-tropical pasture and animal production systems.
4. Opportunities to build research capacity in Australia in the area of adaptation to global change (including but not limited to climate change) through access to World Bank funding.

Additional Information

How do you propose to communicate the knowledge gained from your travel award?

The paper presented at the Farming Systems Design 2009 symposium is available for publication in Australia via GroundCover and other industry publications. The framework described in the paper and a spreadsheet model based on that framework is being widely utilised in the national Grain and Graze programme.

The knowledge gained at the symposium and through the associated travel will be synthesised and integrated into current and future RD&E projects (eg Grain & Graze, Crop Sequencing in Southern Queensland) and other publications and presentations will be developed as needs and opportunities arise. For example, knowledge gained at CSU will contribute to papers on farm WUE to be delivered at 2010 GRDC advisor and farmer updates in Goondiwindi and Moonie.