FELLOWSHIP SUMMARY REPORT

Dr Julie Ingram

Achieving productivity growth and protection of natural capital: innovative approaches for translating scientific knowledge

University of Queensland (UQ) Australia; also temporarily hosted by CIFOR in Java

Professor Helen Ross, SAFS, UQ

23 Oct, 2018-15 April, 2019 – (12 weeks in this period)

I consent to this report being posted on the Co-operative Research Programme's website

1. What were the objectives of the research project? Why is the research project important?

The aim of this research was to review approaches to supporting farmer decision making, learning and adaptation with robust scientific evidence referring to Australian and Indonesian case studies to inform European and UK contexts.

Objectives

1. Identify and evaluate effective and novel ways of translating scientific knowledge into credible and relevant information for farmers to support productivity growth and protection of natural capital.
2. Assess current thinking and future developments for supporting farmer decision making and adaptation with robust scientific evidence with respect to concepts, methodologies and corresponding governance (institutional, policy mechanisms, markets) arrangements.
3. Analyse different approaches to translation in cases studies in Australia and Indonesia and identify approaches or principles which are transferable to other contexts.
4. Contribute to international research on translation concepts and understanding.
5. Contribute to policy development in EU and UK (and Australia and Indonesia) particularly with respect to supporting, coordinating and upscaling effective translation approaches.

The research is important because transition to sustainable agricultural systems represents a challenge for the innovation support services (extension and advice) and correspondingly for scientists and policy makers. Farmer uptake of promising practices is still low in a number of countries. Furthermore translating science for practice in the context of complex issues (particularly with respect to climate mitigation and adaption, soil carbon, nutrient management) has to overcome communicating uncertainty. Equally we need to understand the role of farmer led initiatives in the translation context.

In Australia development of Decision Support Systems has been an evolving and dynamic domain, as agronomic understanding advances, new technologies appear, and new perspectives emerge, each prompting further analysis and reflection. We are now arguably at a key point in DSS history to re appraise and question their future relevance both in Australia and Europe. In Indonesia smallholders urgently need to make adaptation decisions in response to seasonal climate variability supported by scientific information, the case study here offers an effective model and explores potential scaling up and out.

This research extracts lessons for wider use; it provides recommendations for future developments in academic and policy arenas. Previous evaluations have been limited to individual projects and initiatives, and have been small-scale and fragmented.

2. Were the objectives of the fellowship achieved?
Or are they on the way to being achieved?
If not, for what reasons? (The data or research is still ongoing or being analysed; technical reasons (e.g. equipment not working, adverse weather conditions, unexpected results, etc.; other reasons?)

Objectives 1-4 have been achieved, 4-5 will be achieved once the work is published and shared more widely and recommendations made to policy makers.

In Australia, firstly a literature review was undertaken and preliminary scoping interviews were conducted to provide a framework for data collection and analysis. This phase also helped to focus the research on the evolution and future development of decision support systems (DSS) with particular reference to grain growing in the northern grain growing region, where farming system operate in an environment of rainfall uncertainty and risk. Following this the objectives listed above were achieved through analysis of data collected as follows (see Fig 1):

- Semi structured face to face or telephone interviews with stakeholders involved with specific DSS programmes and tool development, as well as with regional and national experts (policy and

decision makers) concerned with facilitating the provision of scientific information for sustainable agriculture. Interviewees (20) included: crop modellers (CSIRO, USQ), industry stakeholders (Grain Research Development Corporation), government experts (DAF, DES Qld; DPIRD, WA), farmer grower group representatives, independent crop consultants, social scientists (CSIRO,) academics (UQ and Universities of Melbourne and Curtin in Perth), and research project and government initiative evaluators.

- Three interactive seminars and workshops with academics and government experts working for state government (agriculture and environment) and a final stakeholder workshop in Toowoomba was used to present findings, collect feedback and validate findings.

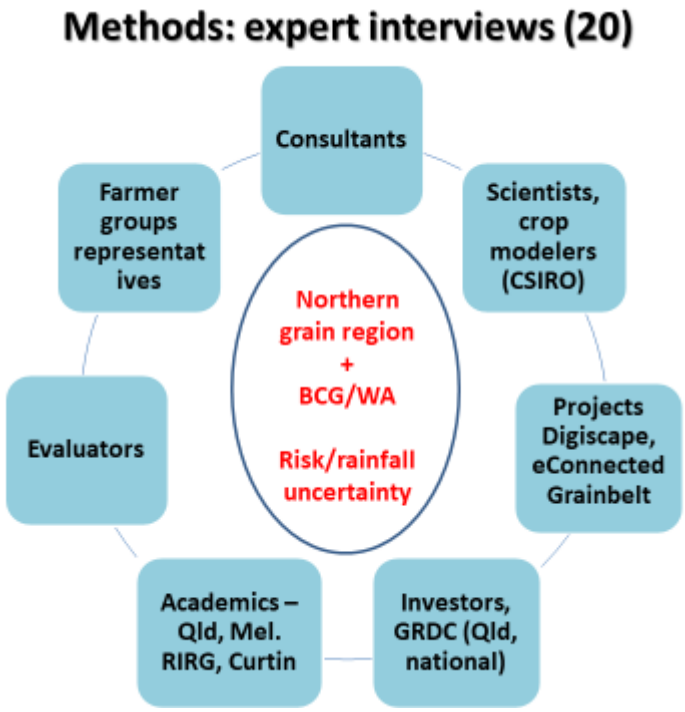

Fig 1 Data collection methods Australia

Analysis of literature, interview and workshop data allowed the exploration of current thinking and future developments for supporting farmer decision making and adaptation with decision support systems and tools. Specific examples provided insights into the use of DSS as learning tools in Australia (e.g. Yield Prophet, Farmscape project, SoilWaterApp), and the value of user involvement in tool development. Fig 2 summarises the new perspectives that emerged, specifically showing how the future of DSS are determined by trends in model development and digital agriculture/big data.

In Indonesia, working closely with Professor Winarto in University of Indonesia, Science Field Shops were used as a case study. These are an extension approach to coping better with climate change in rice paddy systems which revolves around collaborative research between farmers and scientists on agrometeorological topics. They are aimed at increasing the adaptive capacity of farmers to seasonal climate variability, and the efficacy of applied science through feedback from field experiences. Three fields trips were made to attend farmer evaluation meetings (Indramayo and Sumadang in Java) and observe farmer discussions (8 x farmer meetings). A participatory meeting was also run to capture farmers' research questions about managing soil health in rice paddy and to plan future on-farm experimentation. Interviews were undertaken and meetings held with stakeholders directly involved in the development and facilitation of the Science Field Shops. Analysis is ongoing.

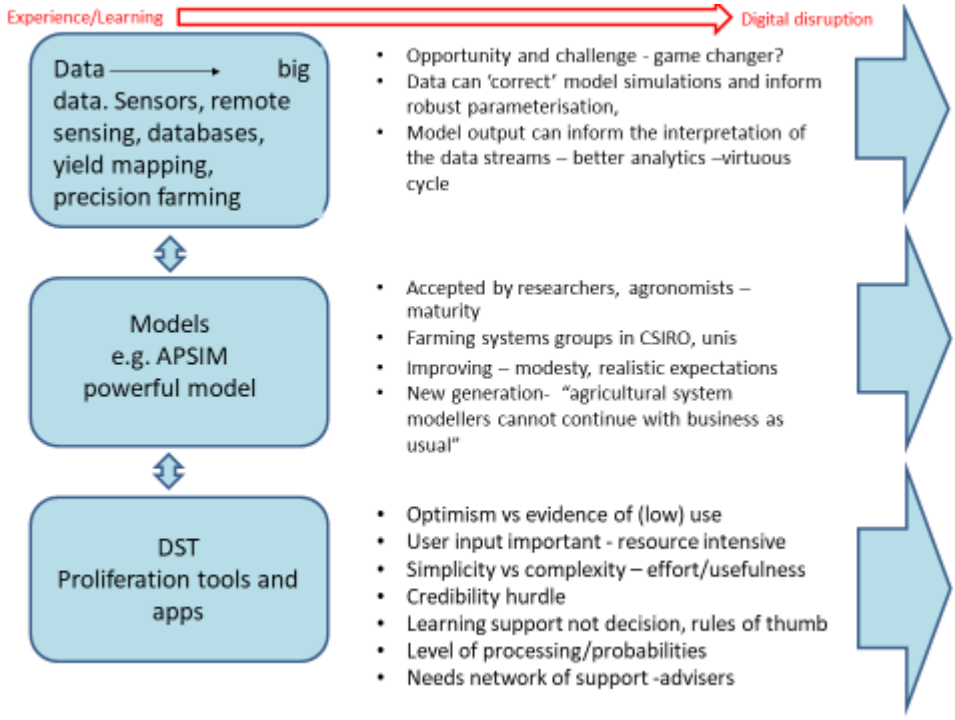

Fig 2 DSS trends in relation to modelling and digital agriculture

3. What were the major achievements of the fellowship? (up to three)

For Australia, the research identified the following issues:

- They more effective as learning rather than decision support tools, they are best used to explore management alternatives with 'what if?' questions for different soil water conditions and rainfall probability. DSS perform best when users are involved in their development but this is expensive and often only happens in one off projects.
- New perspectives emerged, specifically showing how the future of DSS are determined by trends in model development and digital agriculture/big data. Digital agriculture is becoming an important part of current and future agriculture, this brings in new data and analytics and creates new opportunities for DSS. Meanwhile a new generation of models is called for utilize these new analytics and data to enhance DSS.
- A proliferation of tools and apps for farmers and advisers in Australia especially dealing with climate uncertainty is apparent with new (non expert) players (e.g. software developers), entering the 'translation' arena – bringing some tensions (and possible synergies) with established crop modelers and expert agronomists. These span a range of formats with different extents of data aggregation and required processing, from simple spread sheets or apps to more sophisticated simulation models. Although advances in crop modeling (specifically APSIM) has led to a new level of maturity, confidence and use in Australian contexts (where soil water is a particular issue), potential users show a preference for simpler tools like SoilWaterApp (model based but requires fewer inputs).The challenge for modellers is to balance this simplicity/complexity (provide credible outputs/enable simplicity inputs) demand.

4. Will there be any follow-up work?

- A journal DSS publication is being drafted and submission is planned for autumn 2019

The fellowship has initiated a collaboration between UOG and UQ, we are now seeking funds for further research. UOG and University of Indonesia are already collaborating on a pilot research project using a small research grant.

Being based at CIFOR in Java also gave me the opportunity to interact with researchers there, give a number of present in the Science@10 seminar series, and look for future collaboration.

A joint paper with Curtin university colleagues is being finalised on farmer experimentation in relation to digital information and tools

- *Is your research likely to result in protected intellectual property, novel products or processes?*

No

5. How might the results of your research project be important for helping develop regional, national or international agro-food, fisheries or forestry policies and, or practices, or be beneficial for society?

Please express this in terms of environmental/food security/food safety/economic/health (human and livestock and plant) benefits, etc.

This research provides new insights into how more effective decision support to farmers in the context of climate uncertainty can benefit sustainable agriculture and hence food security and environmental protection. It can potentially feed into research strategies for the Grain Research Development Corporation in Australia who need to make investment decisions about future translation mechanisms and tools and optimise the potential of digital technologies. The insights are transferable to other contexts both in Australia and more widely.

The insights from the Indonesian case study on 'Science Field Shops' show how grassroots farm-led activities together with scientist input on agrometeorological topics can be effective for improving the adaptive capacity of farmers to seasonal climate variability, and thus provide some resilience and food security.

How was this research relevant to:

The objectives of the CRP?

- In addressing the topic of research translation (decision and learning support and adaptation) this research aligns to the objectives of the CRP work programme and thus allows the CRP to directly support the Green Growth Strategy and similar global initiatives. Drawing on experiences in two countries with established but different programmes and examples of innovative collaborative translation, the findings offer insights for research, governance and policy which are transferable to other contexts. The research identifies emerging trends in, and contributes to debates concerning, the next generation of support approaches combining ICT, crop models, DSS, big data, as well as farmer-led initiatives and highlights issues and tensions of upscaling and outscaling of smaller effective initiatives into more mainstream activities. This collaboration also contributes to national and international scientific understanding, and with the inclusion of Indonesia has wider relevance and impact than just the CRP membership.

- *The CRP research theme?*

The 'translation challenge' is a central element of all the CRP themes. The research specifically aligns with sub- Theme III *Innovations in Social Science, Economics and Education* in that it draws on experiences in Australia and Indonesia, two different contexts where there are established approaches to translating scientific knowledge into credible and relevant information for farmers. This research also delivers on the sub Theme I of *Integrated Agricultural Production Systems* in that it advances understanding of effective use of scientific knowledge which supports productivity growth and protection of natural capital. As the case studies are concerned with learning support to cope with risk and climatic uncertainty and provide resilience, the research also informs sub Theme II *Climate risks to production.* Identifying governance processes and policy development and implementation needed to support such approaches contributes to the wider aims of the CRP programme and themes

6. Satisfaction

- *Did your fellowship conform to your expectations?*

  Yes it was a great opportunity to develop new thinking about DSS with new insights from Australia and Indonesia; and to meet and work with new colleagues. Having the flexibility to take time to go to Indonesia was appreciated. The fellowship was well managed and supported.

- *Will the OECD Co-operative Research Programme fellowship increase directly or indirectly your career opportunities? Please specify.*

  Unknown yet.

- *Did you encounter any practical problems?*

  No

- *Please suggest any improvements in the Fellowship Programme.*

7. Advertising the Co-operative Research Programme

- *How did you learn about the Co-operative Research Programme?*

Through colleagues at work

- *What would you suggest to make it more "visible"?*

Word of mouth works well, perhaps ask alumni to give presentations or act as ambassadors? Ensure they acknowledge any publications inked to the fellowship and keep a repository of these to future applicants to look at.

- *Are there any issues you would like to record?*