Evaluating a Co-innovation Policy Initiative in New Zealand[1]

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Abstract

This paper describes a methodology to evaluate the process and impact of applying a "co-innovation" approach in the New Zealand Agricultural Innovation System. This is a participative and interactive approach to fostering effective innovation across sectors and stakeholders. The project involves four projects each providing an "innovation network" in different industry sectors which interact with a targeted national "Community of Practice" operating across organisations from industry, research and government in three primary sectors. This requires evaluation instruments capturing data at both process and impact levels and feeding emerging findings to project participants to guide on-going action. The project is in its first year and initial data is already providing insights into the notion of co-learning and its impact on participants and the innovation system. This paper details the evaluation approach being used and the initial results obtained.

1. Introduction

This paper explores the application of evaluation to a national initiative to stimulate innovation in the primary sector in New Zealand. The *Primary Innovation* program seeks to foster innovation through the development of effective innovation networks and so foster co-innovation leading to increasing innovation to lift national agricultural productivity and sustainability. The evaluation aspect is significant in a number of ways. Monitoring and Evaluation provides a way of monitoring progress, barriers and opportunities along the way to guide on-going program management and decision-making. It also needs to capture the impact/benefits of the process (if there are such benefits) on fostering co-innovation and subsequent impacts. Thirdly, the program needs to capture the learning about the application of co-learning and innovation networks to inform institutions and practice. This program is occurring in the context of New Zealand's unique situation – although it is expected that the insights learnt about co-innovation and its evaluation will have relevance to other contexts.

The following section will describe this context briefly, outline the Primary Innovation Program and its approach and provide the conceptual thinking behind the evaluation approach taken. The paper will then go on to the practical evaluation methodology being applied, preliminary data and its analysis and looks at what is planned through the rest of the program.

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2. Background

2.1 New Zealand's Agricultural Context

The New Zealand Ministry of Foreign Affairs and Trade (2013) reported that agricultural products make up over half of New Zealand's merchandise export with the country being the world's largest exporter of dairy products, sheepmeat, venison and kiwifruit. It noted that *the production and processing of agricultural products such as meat, dairy products, wool, fruit, vegetables and wine typically generate around 16% of our annual gross domestic product and employ around 15% of the workforce.*

The Ministry of Agriculture and Forestry (2011) calculated that the poor uptake of new technologies across agricultural industries in the country had *a direct economic cost in the order of $NZ 2.5 billion in lost dairy exports and $NZ 0.5 billion in sheep meat exports per year.(p.16) These inefficiencies were seen to be increasingly also impacting on dealing with complex issues such as those involving multiple stakeholders with competing interests such as water usage and quality and forest management.*

This is seen as failures in the National Innovation System (NIS). Metcalf (1995:38) described an NIS as…*a system of interconnected institutions to create, store and transfer knowledge, skills and artifacts which define new technologies.* The New Zealand Treasury, in describing the National Innovation System, noted that it was a useful concept for *identifying strengths and weaknesses in how knowledge is created, disseminated and commercialised in the economy*.

2.2 International directions in Innovation Systems thinking

There has been a growing trend over time to apply systems thinking in agricultural research, development and extension. Klerkx, van Mierlo and Leewis (2012) track through the *evolution of systems approaches to agricultural innovation.* They define four different system concepts that have emerged: Adoption and Diffusion theories; Farming Systems Research; Agricultural Knowledge and Information Systems; and more recently Agricultural Innovation Systems. While noting that there are different views co-existing in relation to Agricultural Innovation Systems (AIS) and hence different approaches to enhancing performance, they note that there is a common set of enabling factors such as building networks, fostering collaboration, enabling joint-learning and having suitable structures to facilitate this. They conclude that an AIS *perspective provides a comprehensive view of actors and factors that co-determine innovation* while acknowledging that more research is required to ensure a clear focus and drive its future application. A key component was highlighted as that of reflexivity – or reflexive monitoring. This is described as a focus on flexibility (adapting) rather than maintaining and monitoring a fixed set of steps to achieve the desired outcomes.

In addressing the need to enhance agricultural innovation, the World Bank (2006) sought to assess the usefulness of the innovation systems concept in guiding future investment in agricultural Research and Development. The authors conclude that major attention was needed in improving research system governance and the ability to form partnerships and supporting infrastructure. They also saw the need to facilitate a *stronger global community of practice in the field of agricultural innovation.*

2.2 The Primary Innovation Program

In response to the identified inefficiencies and opportunities in the New Zealand agricultural innovation system, the New Zealand Government through the Ministry of Business, Innovation and Employment has funded this five year project to fast track improvements and benefits from innovation for the nation. The goal of the project is to contribute to an *increase of productivity growth in biological industries and 30% decrease in environmental impact in RS&T investments*

by quadrupling of adoption rates of technologies, through networks of players working effectively together in a policy and organisational environment that fosters innovation (AgResearch, 2013a).

The Primary Innovation Program is described as taking an *innovation network approach to the research itself to deliver this impact.* Botha (2013) quotes Rycroft (2003) who describes (Innovation) networks as…*those linked organisations (e.g. firms, universities, government agencies) that create, acquire and integrate diverse knowledge and skills required to innovate complex technologies……innovation networks are organized around constant learning.* The program's innovation network is based around *a trans-disciplinary team from three primary sectors (forestry, horticultural and pastoral) and across eight industry organisations, Crown Research Institutes and Universities.* It is structured around two linked tiers – specific Innovation Projects and a cross-sector *Community of Practice (CoP).* The Community of Practice consists of a group of senior industry participants who, based on their learnings from the Innovation Projects and through interactions as CoP members reflect and learn from the process and so influence their own organisational approaches to and institutions enabling collaborative learning and fostering innovation. The criteria used for the selection of the Innovation Projects which served as case studies included: having a *problem* focus rather than focusing on a specific technology or practice (e.g. improving the reproductive performance rather than grazing practices for dairy heifers); covering several primary sectors to explore the influence of different industry structures on co-innovation; covering a range of voluntary, market and regulatory mechanisms for change (e.g. water use efficiency is strongly influenced by regulated allocations); and covering problems where potential solutions are largely uncontested among stakeholders.

The Innovation Projects explicitly use a *co-innovation approach* within their innovation network. Botha (2013) links *Co-Innovation* with the terms *Innovation co-creation* and *Innovation co-production.* He quotes from Kukkuru (2011) who refers to all relevant stakeholders participating across the value chain with…*a more collaborative engagement, with greater interaction and intensity of participation among creators, from generation, selection, incubation and eventually even to marketing of the new product or service.* The Co-innovation principles described by Nederlof et al (2011) underpinning the Innovation Projects have been summarized (AgResearch, 2013b) as:

- Action oriented – following an adaptive cycle of plan-do-review
- An holistic and systemic view of problems
- Active multi-actor participation, collaboration and learning
- Multi-disciplinary

The five key Innovation Projects are: *TPP* (Tomato potato psyllid) – dealing with an invasive insect; *Irrigation scheme water use efficiency* – inclusion of climate forecasting; *Herd reproductive performance* – increasing dairy heifer fertility; *Dairy farm nutrient management* – increasing the implementation of farm nutrient management plans; and *Timber segregation* – better meeting market needs.

A key element of the program is incorporating Reflexive Monitors into the process. Reflexive Monitors in the program context (Botha 2013) are described as persons who *challenge and influence presumptions, current practices and the underlying institutions, either in the design of a project or in its management and who keeps reminding participants of the ambitions for system innovation.*

3. Evaluation Concepts

A widely accepted definition of evaluation is one by Patton (1997)…*The **systematic collection** of information about the: activities, characteristics, and outcomes of programs to make judgments about the program, improve the program, and/or inform decision about future programming.* This definition cuts across process and outcome evaluation and links it to both a means of improving a program as well as informing about the impact of the program.

In the context of Innovation Systems, Klerkx et al (2012) distinguish between reflexive monitoring and more traditional approaches to monitoring and evaluation. They look at different approaches in terms of the *extent of participation* in the evaluation process and the *ambition to reach institutional change.*   *Result-oriented (e.g. Logical Framework)* evaluation was seen as low in both areas whereas *reflexive monitoring* was seen to be high in both engendering participation as well as institutional change. Van Mierlo et al (2010) saw the importance of reflexive monitoring in … *stimulating reflection on project goals, activities and results in the light of developments in the existing system or the envisaged system innovation.* This is about *stimulating learning in an innovation network* and was seen as successful if it *stimulates those kinds of learning that lead to a change of practices and their institutional embedding*.

Despite Klerkx et al's linking logical frameworks (or log frames) to low participation and low ambition on institutional change, this does not have to be the case. The United Nations Population Fund (2004) describes log frames as *a dynamic planning and management tool that summarizes the results of the logical framework approach process and communicates the key features of a programme design in a single matrix. It can provide the basis for monitoring progress achieved and evaluating programme results*.

The framework can be adapted to a range of different desired outcomes as well as different approaches to get there (Rogers, 2008). It can equally be adapted to a Co-innovation or Agricultural Innovation Systems approach as to a top down project working to achieve pre-defined agricultural practices and productivity. Log frames allow the link to be made to the desired outcomes and the approach being used to get there (Roberts and Coutts, 2011). It therefore provides the basis for describing the appropriate evaluation questions, required information and hence how best to capture the data needed. In describing the principles for the Innovation Projects, for example, the point was made that *these (co-innovation) principles will be applied in each of the Innovation Projects as well as being principles against which activities in each will be evaluated.* (AgResearch, 2013b).

Log frames also help in distinguishing between longer term objectives and measurable impacts within the life of the program. By developing and clearly articulating these Key Result Areas, the program funders and research group can be clear about where they are heading and what they will be 'judged' on in terms of returns on the investment made (not necessarily in direct economic terms). The point is often made that logical frameworks should not constrain a project – and often need to be modified as new information emerges and learning occurs in the context of activities undertaken. This is consistent with the type of evaluation suggested by Klerkx et al (2012) for evaluating Innovation Systems.

4. Evaluation Approach taken

4.1 Program log frame

The approach taken to evaluation planning in this program was to involve the research group in describing what 'success' would look like given the nature of the project and the co-innovation principles underpinning it. This consisted of a workshop which involved training in evaluation principles and teasing out the process and desired outcomes and approaches to achieve it.

Logical evaluation questions were then developed along with identifying the information needed to answer these questions as the project progressed – and so inform the project direction. A result of this process (and subsequent iterations) was a log frame with six levels for organizing thinking and evaluation questions. These levels are:

1. **Longer term Outcomes** - towards which the program is intended to contribute along with other complementary initiatives.
2. **Key Result Areas** - specific measurable short term impacts or achievements to which the program is planning to deliver on in its life (*including unintended benefits or consequences*).
3. **Uptake Strategies** - approaches used to communicate, influence, assist and/or encourage appropriate people or groups to effectively be engaged.
4. **Underpinning Activities** - Research, Development & Planning Activities and Outputs needed or used (from other sources) to provide the science, tools, information or materials to support the change process
5. **Supporting Structures** - resources, staff, management processes, Steering Groups and other structures to oversee and undertake program activities.
6. **Context** - political, economic, climatic and other factors that can impact on the success or otherwise of the program and process.

For the purpose of this paper, we will focus on levels 2 and 3.

4.2 Key Result Areas

As pointed out in the previous section, the Key Result Area (KRA) level for the program is the guiding light of the program – being clear about where you are heading. This was articulated in two parts (AgResearch 2013b) as:

1. *There will be an effective Community of Practice (CoP) operating across 24 industry organisations, universities and CRIs and 3 sectors; forestry cropping and pastoral that understand co-innovation and technology uptake as part of the innovation system and will have directly contributed to an improved innovation system including a measurable increase in the understanding and use of the Innovation System (IS) approach and principles by CoP members and individuals they have influenced, and continuing to work together as co-learners within the innovation system.*

2. *There will be four ongoing effective Innovation Projects across 3 industry sectors that provide solutions to industry problems and have contributed to improved sector innovation systems including a measurable increase in the understanding and use of the IS approach and principles in the Innovation Projects and continuing to use the IS approach in other projects.*

These KRAs reflect the multiple levels of intended outcomes: Using co-innovation to achieve better outcomes in the Innovation Projects; learning about how to use and implement co-innovation in practice most effectively; developing capacity in key decision-makers in the Agricultural Innovation System; and embedding co-innovation principles into the way organisations do business. Learning about evaluating co-innovation is also an implicit outcome.

Specific indicators were then developed around the generalised evaluation questions of: *What has been the extent to which there has been change in the understanding, commitment to and changed institutions and practices in relation to the use of IS in the CoP community and the extent to which the CoP has worked effectively and demonstrated increased innovation activity and outcomes?; What has been the extent to which each Innovation Project has worked effectively by using IS methodologies (e.g. reflective practice) and of Innovation Project leaders*

valuing the use of RMs by incorporating them or similar roles in other projects? What has been learned about the value of IS and its application?

4.3 Project Approaches

Specific Indicators were also developed around the co-innovation *process* being used. These included applying the principles of IS in the program (e.g. *participation, collaboration; reflection);* and the process of *scaling out and up[2].*

Evaluation questions around process included: What is the extent to which the IS principles are practiced?; To what extent have CoP members interacted as a team, understood and adopted the principles of AIS and made changes based on reflexive practice?; and what is the extent to which co-innovation principles and practices, participatory methods and reflective practice have been used and their effectiveness in influencing the Innovation Projects?

4.4 Evaluation Methods

Based on the evaluation questions, evaluation methods were proposed and developed. From the *process* perspective, the key mechanisms are based around:

- **Project Reporting**: documenting processes actually used in terms of use of co-innovation principles and tools;

- **Targeted Interviews**: capturing the feedback from Reflexive Monitors (RMs) and their influence on project activities and direction; and

- **Structured feedback**: changes in understanding, skills and attitudes from those involved in the process through activity feedback sheets and interactive group debriefs.

These process evaluation methods will also provide some of the data needed to monitor and capture realisation of the *KRA*s. These will be supplemented by:

- **Case studies**: capturing impacts of the project activities on collaboration, research activities, policies and practice (Innovation Projects can also act as case studies in themselves);
- **Social Network Analysis (SNA)**: tracking changes in relationships over time between individuals and institutions;
- **Narratives:** capturing examples/observations of changes in thinking and actions by participants and their organisations directly resulting from involvement;
- **Scientific indicator benchmarking:** analysing shifting trends in collaborative projects, papers and outputs; and
- **Benchmarking surveys**: capturing changes in thinking and practice of those involved at the beginning, middle and end of the project.

At the higher level of the Log Frame, national innovation and agricultural performance indicators would need to be monitored over time. The Log Frame and hence evaluation needs to inform the way in which evaluation instruments are designed. For example, structured feedback sheets from project planning, training and sharing activities include questions about impact on the thinking and future actions of participants. Possible actions could include intentions to meet and/or collaborate with other participants outside of this project itself – for example, is the process fostering broader collaborative action? The feedback results are automatically collated on a central web platform and made available to project teams to consider and act on as appropriate.

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[2] Scaling out has been described as *a geographical spread of co-innovation approaches over time, while scaling up is expanding beneficial institutional and capacity building practices within and across organizations and networks at local to national levels* (Pachico and Fujisaka 2004)

5. Initial Results

The project is only into the first of its five years life span. The project Annual Report (AgResearch 2013a) noted that five workshops were held between December and June 2013 covering topics including: learning practical methods for facilitating co-learning for system innovation; the 'What' and the 'How' of the monitoring and evaluation process; progressing the water use efficiency Innovation Project; and establishing the CoP with the industry partners.

5.1 Community of Practice

It was noted in the Annual Report (AgResearch 2013c) that *participation of identified end-users in the programme has been achieved through initial interviews with end-users to identify their perceptions of what is working and not working well in the New Zealand agricultural innovation system and to identify what they want to get out of participation in the programme. Five additional end-users have joined the programme.* A key inaugural workshop was undertaken in June 2013. This workshop was with the overarching 'Community of Practice' with ten organisations represented and was eight months into the project. Its purpose was to establish the role of the group and report initial interviews within the Innovation Projects.

An outcome of this meeting was summarized in the Annual Report of the project as: *A 20th June workshop with the industry and research partners in the programme Community of Practice jointly developed an ambitious vision for changes in the New Zealand agricultural innovation system to enhance innovation in the primary sectors. Participants at the workshop quickly turned systemic barriers to innovation that were identified from interviews with key individuals in the innovation system into opportunities to enhance innovation. For example, the systemic barrier "a lack of interaction amongst actors in the innovation system" was turned into the opportunity of creating "space to connect" across industry, government, research organisations and end users*". Feedback sheets showed that six of the 10 participants indicated that they would undertake further thinking about overcoming barriers to innovation with two planning on taking specific activities to address identified steps. Eight of the 10 participants indicated that they would contact other participants from the workshop in relation to other areas of interest or collaboration (a key outcome for the project). One participant indicated that they would run their own co-innovation workshop for their organisation to generate ideas and interest.

5.2 Research teams

There were two workshops with the broader research group focusing on the monitoring and evaluation aspects – the first looking at the 'what' and the second on the 'how'. The eight researchers (four organisations) in the first workshop indicated that they had a very good understanding of the goals of the innovation project (7-10/10), were quite happy with the process used (6-8/10) but there was a range of comfort/understanding (4-9/10) with the analytical process being used in the Innovation Projects. Three of the participants indicated that they would follow up with other participants post the workshop and one indicated that they would consider the methodology for other research activities in their own organisation.

The 19 participants (representing six organisations) in the second evaluation planning workshop were quite satisfied with the process (range of 7-10/10), with a range of responses about whether it had clarified the project's objectives (range of 5-9/10) with varying levels of comfort expressed about the different areas of monitoring and evaluation needed. There remained some uncertainty about applying the analytical framework to their projects (average 6.2/10) and their own M&E

reporting roles (6.8/10). There was a call for a concrete M&E process with regular review points. Almost all of the participants said they would consider adaptation of the evaluation approach for other projects within their organisations with three quarters planning on following up workshop contacts for further discussions and meetings.

5.3 Innovation Projects

The feedback from nine participants (including farm owners, farm managers, and researchers) of the one Innovation Project workshop (Water Use Efficiency) with feedback data during this early period showed that *most* were comfortable with the goals of the project (average rating of 8.2/10, range of 4-10), were happy with information presented (8/10, range 6-10/10) and with the process for discussing water use efficiency (8/10). While most were happy bringing in the new element of nutrient management into the boundaries of the project (average of 8/10), at least one person indicated reservations (2/10) with questions emerging around the differences at the farm level and their measurement. Many participants indicated that as a result of the workshop they would undertake a range of activities included promoting further workshops, using the knowledge gained in other projects, considering weather predictions in relation to irrigation timing and work on system models.

6. Discussion and Conclusions

As pointed out earlier, the evaluation process needs to fulfill a number of functions: monitor progress and guide direction; capture impacts in terms of co-innovation capacity and its benefits; and provide insights into how to foster a co-innovation culture and supporting structure. This is a significant initiative and investment in the agricultural sector by government – and there is a need to be able to demonstrate benefits arising from the investment.

The development of the evaluation log frame through a collaborative and iterative process showed that this approach *could* capture the complexities and emergent outcomes of this type of program. It assisted in clarifying the planned process and the key result areas consistent with the co-innovation principles and project objectives. Objectives were able to be expressed in terms of '*an improved innovation system including a measurable increase in the understanding and use of the Innovation System (IS) approach and principles by CoP members and individuals they have influenced, and continuing to work together as co-learners within the innovation system*' – equally as a set objective of specific gains in productivity or economic returns.

The log frame also provided a robust basis for proposing and deciding on the data needed from monitoring and evaluation and the methods that could gather this information. It allowed transparency, a focus for discussion and planning and, along with the evaluation planning workshops, contributed towards ownership of the monitoring and evaluation process. It also allows a process of arriving at mutual agreement with the government and research organisations undertaking the project about what the program can be expected to achieve in its time frame and what data will be accepted as demonstrating these achievements. Log frames are 'living documents' and changes can be negotiated between the key funders and stakeholders based on changing circumstances and what emerges out of the on-going evaluation process.

Initial feedback has mainly been captured through feedback sheets given to participants at the end of formal activities run within the program. These were designed around a pattern to capture feedback on process, clarity, issues and actions triggered. They specifically also looked at actions that may have been triggered in fostering collaboration outside of the project itself. The use of a 0-10 scale with associated comments has allowed an understanding of the relative

weight of responses as well as the detail. This will allow tracking changes (for example in understanding of co-innovation as a research approach) over the life of the program – including the range of understanding with those involved. Specifically asking for issues and concerns also provides an opportunity to give immediate feedback that might require changes and actions.

Having a central location for feedback, automated collation and circulation of results ensures quick and transparent communication of the results to program participants to inform their contribution and future action. This looped process also has helped individuals to see the value of providing their input through this mechanism – and be more committed to completing them. The challenge is to maintain the momentum in using this mechanism effectively as the program progresses. An important mechanism will be to show how such feedback has impacted on program decisions and process in supporting the researchers and stakeholders involved.

In the first year of the program, the other monitoring and evaluation mechanisms are still in the development phase. This includes capturing feedback from Reflexive Monitors, the use of narratives, case studies, Social Network Analysis and broader benchmarking of collaborative research indicators and impacts. It will be important to have these underway as early as possible within the program to gather richness of data from these multiple sources.

The program is a dynamic and collaborative initiative and without an effective monitoring and evaluation process there is a danger that it will lose direction, learnings will be lost and/or impacts will not be captured. The policy program is ambitious although it has the flexibility required to explore and learn from applying co-innovation principles in real situations and a platform to incorporate these learnings across the innovation system. The evaluation process will provide an early indication of how successful this will be.

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