

Evaluating a deliberative learning framework to deliver science on deer focus farms

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Abstract. A deliberative learning framework was used to develop a planned non-formal learning programme for delivery at farmer field days. The approach had elements of formal learning as it was designed in a prescribed framework, formally organised and had designated trainers. However, it was specifically designed for the non-formal deliberative learning principles of review of past knowledge, engagement with current decision-making and problem solving, and identifying opportunities for future planned learning to be implemented. This makes the approach a unique framework for the transfer of knowledge from abstraction to an action based application. Successful delivery of the learning packages was attributed to a single technical focus, practical take-home messages and linking science with the on-farm activities and information. In contrast, the approach was less successful when there were too many speakers, linkage between the science presentation and focus farm practices was lacking, and time management of the day was poor. The time for formal and informal interaction between farmers and scientists was identified by all respondents as enhancing learning. The appropriate codification of knowledge in a common language was identified as an important feature of connecting scientist and farmer.

Keywords: deer farming, focus farms, field days, learning package, scientific presentations

Introduction

Deer farming is a relatively young and diverse industry in New Zealand. Farms vary widely, including breeding, venison production and velvet production in both intensive and extensive environments. Deer farmers realise that they need to follow the example of both the sheep and dairy industries in improving on-farm productive and environmental performance to remain viable. Research has established some best farming practices for deer (Casey 2003), yet the levels of uptake are extremely variable. Also, deer management practices that do not adequately account for the natural behaviour of deer can have a negative impact on the environment, especially soil and water quality. Overseas consumer concerns about the health and sustainability of red meat production make the development and uptake of sustainable land management practices vital for the deer industry.

A deliberative learning framework was developed for the Meat and Wool NZ Pasture Quality programme and further refined for the deer industry in 2003 (Stevens et al. 2005). This programme, described below, used principles of non-formal learning (Eraut 2000), codification of knowledge (Boisot 1995) and adult learning techniques to link farmers' current tacit knowledge with 'new' information to help create 'new' knowledge in a day-long workshop. This framework had the problems of being expensive to run, taking a significant amount of time, and being restricted to a single topic when delivered. This paper details a modified deliberative learning process and its delivery to Deer Industry New Zealand (DINZ) Deer Focus Farms at two locations during 2011-2012.

The learning framework incorporated recent research findings, along with previous findings, into appropriate sized parcels of information for delivery to farmers. The aim was to use the predominant theme of improving weaning performance to link the many elements of deer growth and reproduction into a cohesive and year-round programme. Additional linkage with the 'After the Field Day Sustainable Farming Fund' project provided a platform to develop and deliver post-field day messages based on science and packaged in several ways to reinforce each message. A final aim was to evaluate the effectiveness of the delivery of these information packages within the learning framework at two regional Deer Focus Farms; North Canterbury and Northern Regions. This project did not set out to determine how many changes farmers made but rather whether they understood the science and how it might add value in the future. The results will enable scientists to adapt and tailor their science delivery to better fit the needs of both the Focus Farm and wider industry audience.

Theory

The process of learning can be defined as being formal and non-formal (Eraut 2000). Formal learning has been described by Eraut (2000) as:

- having a prescribed framework

- being an organised event or package
- having a designated trainer
- having an external specification of outcomes
- having a formal recognition of achievement (e.g. a certificate or degree).

Non-formal learning is that which happens in an unformatted environment. Eraut (2000) proposed that non-formal learning consisted of implicit learning, reactive learning and deliberative learning so as to distinguish learning situations and better understand non-formal learning in professional settings. He further proposed that each had three elements that influenced learning: past episodes, current experiences and future behaviour.

Deliberative learning is clearly a planned approach to non-formal learning. Within that typology past actions, events and experiences are reviewed to provide a reflection on the current state of tacit knowledge. Current engagement is to enter a learning phase to gain new knowledge, while future behaviour is guided by planned opportunities to learn from decisions that are made and actions that are taken based on that new knowledge.

Further to this framework of deliberative learning is the codification of knowledge (Biosot 1995). Codification involves the distilling of complex ideas into simple language and tools. Fundamental principles are converted to commonly used (end user) language and observations. 'Codified knowledge is useful knowledge' (Biosot 1995, p. 493). By comparison, encryption of knowledge through scientific language, for example, creates a barrier to uptake because knowledge is retained in its abstract, rather than action-based form (Snowden 2002).

A deliberative learning framework was used to develop a planned non-formal learning opportunity for sheep and beef farmers between 1999 and 2002 (The Meat and Wool NZ 'Pasture Quality Workshop' programme). The approach had elements of formal learning as it was designed in a prescribed framework, formally organised and had designated trainers. However, it was specifically designed for the principles of non-formal deliberative learning to be exploited. This makes the approach a unique framework for the transfer of knowledge from abstraction to an action-based application.

Of significance in this programme was the codification of knowledge of pasture quality from science language to end-user (farmer) language. The encryption of first principles of science went through a change in 'codification' where 'expert' language was substituted with 'common' language to explain those principles (Snowden 2002). Once changed, the engagement with end-users was able to be done on a level playing field, where common language meant that experiences could be shared both easily and equitably among the participants and trainers.

Specifically the 'Pasture Quality Workshop' programme used focus groups to help identify the ways which farmers observed and managed for pasture quality, created technical material to help further inform and validate what farmers were observing and provided tools such as visual assessment, printed technical resources and software to predict both pasture quality and the potential animal performance from that pasture.

This programme used a range of engagement and development techniques to create a 'learning package'. This was viewed as a package of information and tools that provided the end user with both better understanding of the underlying principles of pasture quality, the impacts of that on animal growth and tools to help interpret and predict performance in on-farm situations. It used a range of adult education techniques that were integral in the delivery of the programme. The programme was delivered to approximately 2300 New Zealand sheep and beef farmers over a 2 year period from 2002-2003 in a series 220 day-long workshops. Success of the programme was measured and 75% of the participants thought that it would aid their decisions in managing pasture quality.

This approach was revisited and applied to deer industry needs in 2004 (Stevens et al. 2005). The process began by using focus groups to redefine the themes and issues for deer farmers. Overall these issues were similar to those chose by sheep and beef farmers, though minor differences occurred when considering factors such as seasonality of animal growth that is a feature of red deer but not of sheep and cattle. The software required further development to incorporate the changes in seasonal feed requirements and altered response when ambient temperature declines during winter. The format of the day required minor modification to ensure that the themes chosen by the focus groups were adequately addressed.

The resulting outcome was a workshop programme that provided the following format and content

1. Introduction – this outlined the objectives of the day, the programme content and a brief synopsis of the importance of the topic. Importantly during this session, the value of the

- expertise that resided in all participants was acknowledged to ensure that all opinions were treated with respect and valued equally. This then enabled a free flow of information between all participants and presenters.
2. Current farmer practice – this interactive session fitted into the deliberative learning framework (Eraut 2000) as a review of past actions, events and experiences where current knowledge of the audience and potential gaps in knowledge were identified, often through the posing of a question 'what is pasture quality?'
 3. Principles of pasture quality section – This technical session used a common 'codified' language, delivered by the presenters, that outlined the underlying principles of pasture quality, interpreted in the context that farmers recognised quality. For example farmers often recognised green leafy pasture as being high quality. This was cross referenced to the impacts of dead material having significantly lower feed quality, and to the link between high nitrogen availability leading to rapid growth, which meant that leaves were younger and more digestible.
 4. Q-Graze, an introduction to the software – This provided a basis for why the following session (Field exercise) was required and how that information collected from visual field assessment of pasture quality could be interpreted.
 5. Field exercise – This exercise was done immediately after lunch and provided a physical learning environment. Assessment of pasture quality was done visually as this is how farmers express both their desire to collect information and how they currently check pasture quality. The intent was to refine their current skills by providing a formal approach to calibrating their eye assessments.
 6. Q-Graze computer programme – the data collected from the field was then used to demonstrate the impacts of the visually assessed pasture quality, and to reinforce other principles such as the impact of pasture quantity and time of year on the potential growth rate of young ruminants.
 7. Management of pasture quality - This session used current experience and engagement with problem-solving as participants talked of the techniques that they used to manage pasture quality and the presenters used collated information from other experiences to provide context, new ideas and links back to the first principles that had been developed in session 3. Consolidation of the day – A final session addressed future behaviour by providing participants with the opportunity to reflect on what had been said during the day and plan learning opportunities by writing down future potential actions to help reinforce the new knowledge that participants may have formed during the day.

A key feature of the both the original sheep and beef and subsequent deer programmes was the recognition and incorporation of the farmers knowledge and expectations into the subject matter of the workshops by codification of the science first principles. This was illustrated by Lambert et al. (2000) who documented the farmers understanding of 'how do sheep and beef farmers manage pasture quality?' By developing this understanding early in the programme then appropriate material was developed to illustrate the effects of underlying first principles of pasture quality within the known framework of the participants.

Throughout this programme there are elements of acknowledgement, engagement, and understanding of the participant's methods of practice and current knowledge. These elements recognised the need of participants to reflect on their known-knowns (Modica and Rushtichini 1994) before exploring what may have been unknown, without the process being confrontational. The programme also used verbal, visual and participatory teaching techniques to engage all learning styles. The programme used a variety of resources to reinforce the key messages, including visual presentation, field assessment of pasture quality, software and supporting documentation. Finally the programme linked abstract knowledge with management and active knowledge within the codified framework that the participant was already using.

This programme was potentially limited by the time that was required to deliver it, both for the participants and the presenters. The workshop was a full day and required two presenters, as well as preparation work for setting up the visual pasture quality assessments. The question arose; can we break down messages into smaller pieces and deliver them successfully? The opportunity for presentation would be wider as they could be part of a larger field day, the audience could be potentially larger, and a single person would be able to present and facilitate the whole process. A wider range of messages could be delivered within a similar framework if packaged correctly. A further benefit would be that the continual delivery of parts of the message may provide more timely additions of information to match the timing of farmer decision making.

Background

Focus Farms

The monitor farm concept has transformed the sheep and beef industry since its introduction in the early 1990s (McIvor and Aspin, 2001; Rhodes and Aspin, 1993). A Deer Focus Farm programme had the potential to do the same for the deer industry. The focus farm approach provides a greater opportunity to test new technologies on-farm and to introduce current best practice management quickly and effectively as farmers, industry advocates and researchers work together. The Making the DIFFerence Focus Farm project, coordinated through Deer Industry New Zealand (DINZ) partners with the deer research providers in a key new approach for technology transfer.

Four focus farms were established in 2007 and each is run by a professional facilitator in conjunction with a steering committee of local farmers and agribusiness professionals for a three-year term. When choosing a focus farm a number of factors were taken into consideration. These included:

- a drive for top productivity and profitability
- an aim of sustainable management, environmental responsibility, quality assurance, innovation and excellence
- address regional areas of interests.

This research focused on two of the farms, North Canterbury and Northern Regions. The Northern Region Focus Farm is located in the Waikato and is 621 hectares of hill country which runs 10 000 stock units, mainly deer but also some sheep and dairy grazing. The North Canterbury Focus Farm encompasses a mix of deer, sheep, cattle, dairy grazing and cropping on two adjoining properties; 313 hectares and 535 hectares respectively. They run 970 deer, 2850 sheep, and some beef cattle.

Modifying the learning package framework

The learning package is a suite of information and a specific delivery approach suitable for delivery by trained presenters. The original framework, described by Stevens et al. (2005), was modified in the attempt to suit a wider variety of situations.

Content of the learning package To develop the learning package content the logical progression of a topic or issue was considered. This was then developed as follows: the target, key factors to consider in reaching the target, triggers that would enable actions to be taken, and potential actions or interventions to enable the target to be met (see example provided in Table 1).

Table 1. Learning package example; 'growing calves faster'

Start point	A live calf weighing 10 kg
Target	A calf weaned at 65 kg by March 1 st
Factors to consider	Hind lactation: calf genotype; feed quality and quantity; feed type; hind body condition score Calf intake: feed quality and quantity; feed type
Triggers	Birth date Pre-calving hind body conditions core Mid-January, weight of calf; body condition score of hind; amount, type and quality of feed
Potential actions (may be short and long term)	Provide a supplement Shift to a different feed type Plant different forages to change the situation next year Accept that you won't meet the target Accept that the current BCS of the hinds will fall but calf weaning weight will be OK

Developing the resources The learning package framework used the combined knowledge of the science team and their clear understanding of farm systems to develop the topics and resources. The example of 'growing calves faster' (Table 1) was supported by several resources which included a formal presentation, a document outlining key messages from the presentation, with key headings identified in Table 1. Further resource, available on a website (www.deerfarming.co.nz), included documents which have more detail on specific parts of the message such as:

- pre weaning calf growth
- what is driving milk production from the hind
- dry matter intake of hinds for lactation
- hind liveweight changes in response to feed on offer
- how do milk and forage interact?
- impacts of feed quality on calf growth
- chemical topping for pasture quality (video).

Delivering the learning packages A template for the delivery of the learning packages was modelled on the original approach and further developed to stress the interaction with the audience, in line with deliberative learning. The format was designed to be highly flexible depending on the topic, the size of the audience, and the amount of time available. The process was designed to engage the audience and work through potential farm system implications and outcomes (Table 2).

Table 2. Delivery template of the learning package presentation

Sections	What needs to be covered	% of time
Introduction	Introduction - defines the problem 1. Relevance 2. Importance 3. Relativity	5%
The question	<ul style="list-style-type: none"> • What is? – creates a definition of the factors affecting the problem • Brainstorm Question 1 using groups to get as wide a definition of the factors affecting the problem 	10%
Technical presentation around the topic	<ul style="list-style-type: none"> • As much cause and effect as we can get – this provides a basic understanding to enable participants to make changes in the future when circumstances change. 	30%
The second question	<ul style="list-style-type: none"> • How do? – creates the solutions to manage the problem • Brainstorm the potential management solutions. The length of this session depends on time constraints 	5%
Management presentation and/or discussion	<ul style="list-style-type: none"> • Putting technical data into practical technologies solutions. This session will involve interaction with the audience to ensure relevance and practicality 	30%
Outcomes	<ul style="list-style-type: none"> • What do we do next – can be as discussion, or individual by giving time for reflection and is often led by examples to get participants thinking 	20%

Making the resource available On-going learning was facilitated by making the layers of the resource available in several ways. The first was through a formal presentation at a field day. The second was through access to a website (www.deerfarming.co.nz) which is a dynamic evolving source of information that is specifically linked to the Deer Industry Focus Farm field day programme. It is constantly updated as the field days occur and questions are raised by the audience. The third was via the printed version of the fact sheets (which link back to the website). A fourth was a summary of further messages or discussion that arises from the field day and may be posted on the website or published in the Deer Industry News magazine for deer industry levy payers.

Methods

To test whether the altered framework of the learning package approach was effective, 20 farmers were randomly selected from the list of field day attendees, 10 from each identified Focus Farm region. They were interviewed, in person, using a convergent interview process (Dick 1999). Convergent interviewing is unstructured in terms of the content of the interview. The interviewer employs laddering techniques to systemically explore the reasoning underlying the decisions and actions of the interviewee (Grunet and Grunet 1995).

A list of questions relating to the learning package approach to deliver science information was used to guide the interviews. This allowed participants the opportunity to express their views in their own words. The aim of the interviews was to understand farmers' views of the science presentations and to gather suggestions on how they could be improved to better meet the needs of those listening. To enable this, different learning package topics were evaluated. For those farmers attending the North Canterbury field days, the focus of the interview was around

'growing weaners' and 'lactation' while interviewees from the Northern Regions field day were asked questions around the 'parasite' and 'weaning decisions' topics.

Farmers were asked questions based around five key themes; farm and farmer demographics, reasons for attending the field days, what they remembered from the presentations, the presentations themselves and recommendations to improve future presentations. The demographics of their property included the size of the property, number and type of stock units and years farming, why, and how often, they attended the field days. Questions on the presentations included the content, question time, supplementary information and the presenting style of the scientists.

In studies using open-ended questions, where interviewees are free to direct much of the conversation, and different factors or issues may be discussed by different participants, exact quantification of the number of respondents making a particular statement, can be misleading. Also, prevalence of response is not necessarily an indicator of response importance or significance. Therefore, rather than exact quantification, terms such as, *some*, *a few*, or *most* are used to describe the results. Similarly, due to the small sample size, it is statistically inappropriate to attempt to extrapolate any quantitative results to the population beyond the study participants. The primary aim of analysis is to identify the key themes that emerged from participants' reflection on their experiences of the focus farm field days. Participant quotes illustrate themes in their own voice.

Results and Discussion

The key findings from the research are divided into four sections: demographics of respondents and their properties, reasons for attending the field days, the scientific presentations and interaction with scientific presenters.

The first two sections provide context for the interpretation of the delivery of the learning packages in the field day format. The second two sections provide an understanding of the impact of the learning package approach when isolated from the original 'significant event' format of a day-long workshop that was chosen by attendees as a non-formal learning opportunity. Those sections also provide information on how the science (abstract) presentations met the principles of engaging with the farmer (action) audience.

Demographics of respondents

Nearly all participants ran other stock including sheep and/or beef, while some also had forestry blocks. This is similar to the two focus farms which also run other livestock classes. Most participants ran extensive deer systems, with only a couple having intensive deer blocks. The largest property was 2,700 ha running 3,000 deer, while the smallest was 26 ha running 200 deer. Participants who attended the North Canterbury field days had been farming for 21 years on average. For the Northern Regions participants, the average was 26 years and included two respondents who had only been in the deer industry for four years. These demographics indicate the wide range of experience, involvement and scale that farmers were using to build their tacit knowledge and this range may have posed a significant influence on the ability of a single presentation to impart knowledge to the wider audience.

Reasons for attending focus farm field days

Generally, all participants noted that they tried to attend every event, but it did depend on what was happening on-farm. Field day topics were not a factor on whether to attend the field day. Between June 2011 and November 2012 there were seven events at the North Canterbury field days. There were six events at the Northern Regions field days between March 2011 and October 2012.

The average attendance to field day events of those farmers interviewed was similar for each focus farm, 4.2 and 4.3 (North Canterbury and Northern Regions respectively). Three out of the 10 people interviewed who attended the Northern Regions field day had attended all six events, while two had attended five events and the remainder attending three. Participants who had attended the North Canterbury field day ranged in their attendance, with two attending all seven, a further two five events and another two only two events. The average attendance of the respondents was considered very high, as Payne, Stevens and Casey (2006) reported that 43% of respondents had only attended 1 Focus Farm field day, while 27% were regular attendees.

All respondents attended the focus farms to improve their knowledge. As farmers who attended the Northern Regions field day noted they 'always learn something' while for another 'always pick up something new'. These same comments were made by participants at the North

Canterbury focus farm. Additional comments from farmers attending the North Canterbury field day included those who were 'interested in what they are doing'.

Listening to the scientists was another reason for attending, as one farmer noted 'scientists - a good idea'. Participants commented that it was interesting to hear researchers, in the field, talk on a topic, as opposed to just reading their results in a publication, which they did not always have time to do.

The attitude of participants to the scientists provided a positive platform for engagement. The regular attendance of scientists at these events may have helped in creating the situation of 'trusted adviser'. Further, the regular involvement of scientists may have helped to establish some common language, which would assist in recognition of codification of knowledge.

Scientific presentations

The science presentations attempted to use the non-formal learning typology described by Eraut (2000). It engaged the audience by posing an appropriate question to allow reflection on past actions, events and experiences, involved the audience in problem solving and provided time for the audience to reflect and potentially plan for future changes. Key features that were attempting to be addressed were timeliness of information delivery, and the delivery of smaller packages of information.

Overall, participants felt that having scientists present at the field days was an excellent idea and a good way of hearing about the latest research. The timeliness of the presentations in relation to on farm activity was valued. It allowed time for the farmers to reflect on recommendations from the scientists, before making the suggested changes, as they normally required other on-farm changes to occur. The term learning package was not recognised by the audience as they identified with specific topics, rather than the overall delivery construct that was being used.

Content of presentations While many could remember the topic, and the scientist who presented the topic, they could not provide specific details. However, while one participant noted that they did not remember the lactation topic at the North Canterbury focus farm, comments made during the conversation showed that they did, in fact, remember the key points from the presentation.

While attendees did not always remember the detail from the scientific presentations they did remember elements of the topic, even if they could not link it to its 'formal title'. This highlights the importance of the language used when delivering research findings to a wider audience.

This feedback has two potential elements. The first is that the information was incorporated into current tacit knowledge. Often the original learning experience may be lost once the knowledge is 'known'. Another element would be that the process of engagement was inadequate and therefore 'new' knowledge was not created from the interaction of scientist and participant. The information or lack of it that was revelled with deeper questioning suggested that both of these features may be at play, and may vary between the current knowledge of participants and the chosen science topic. This would be expected, given the range of demographics and topics, and given that farmers were not necessarily engaged with a particular topic when it was presented.

Question time after the scientific presentation There was enough time provided to ask the scientists questions at the end of their formal presentations. Some noted that many of the questions they had were raised by other farmers during this session. Question time provided an opportunity for the presenter to clarify the topic but also that they 'enjoy question time as good to hear what other farmers think'. Some, although they found listening to other's questions (and the responses) useful, would not ask questions in this type of forum.

The concept of co-learning was a feature of the original learning package format. This concept acknowledged the 'expert' input that all participants could provide. While the interaction with the scientists was made available, the short time-frames of the field days, and other topics on the programme meant that development of the co-learning, or co-innovation, approach was restricted in the field day setting.

Learning identified and changes made on farm Even though most participants had not (yet) made changes based on the scientific information presented, most farmers commented that the scientific presentations 'got you thinking'.

A participant at the Northern Regions field day noted that the presentation given around weaning had influenced him to change his practice and adopt what the presenter suggested. This would be his first year at trialling the new system and a number of other changes were required to be made on-farm for this to occur.

Another participant attending the North Canterbury field day was now allocating time to class animals; based on a presentation given by an AgResearch scientist. After listening to the presentation, the farmer realised the task's importance and that it was not going to take as much time as he first thought, rather he 'just needed to get more organised'.

A key tenet of non-formal learning is the opportunity to plan future learning opportunities. In the context of the learning package, it is in the opportunity of farmers to implement a new decision or actions based on 'new' knowledge, and observe the impacts. While the modified learning package format identified the need for an Outcomes section (Table 2), often this did not get the time required for appropriate idea formulation. Often this section was restricted to what might be done on the host farm as an example, and therefore lacked the power that this session had in the original format learning package.

Science relevance to the overall field day programme Feedback from attendees at the Northern Regions field days differed from those who attended the North Canterbury field days. North Canterbury attendees felt that the field day was well structured. The format of starting the field day with the scientific presentation, a formal question time, followed by a farm tour was considered successful for enhancing the relevance of the science messages. The North Canterbury field day programme ensured that the science and the farm tour were integrated and relevant to the current farm activity i.e. mating or weaning for example. An informal time at the end of the day gave participants the opportunity to follow up on questions with the scientist if required.

Farmers noted that the facilitator made sure the day always ran on-time. This was appreciated by all who attended, especially those who had to travel a distance. The North Canterbury focus farm is a relatively new operation and one farmer noted that 'as they get more information this will flow onto the audience'.

Participants at the Northern Regions field day also commented that the scientific presentation to start followed by the farm tour and concluding with the BBQ was a successful structure for the field day. This style of agenda was followed less often at this focus farm. In addition, many noted that they would like the content of the scientific presentations to link better with what the focus farm was doing. One farmer noted that they would like to have a discussion around the decisions that the focus farm was making and get the scientist to comment on these decisions. Furthermore having more than one topic per focus day was not seen as ideal by participants.

The scientific presentations (learning package) were seen to work best when they were the focus of the field day and the topic was linked with a practical demonstration afterwards during the farm walk. Some farmers need to relate to the practical side of a topic before they can fully understand the ramifications such a change would make to their own farming enterprise. Furthermore, actually seeing theory in practice can raise a number of questions which they may not have thought to ask after the formal presentation. It also means attendees can ask the focus farmer how the recommended changes worked in their particular farming system.

For the scientific presentations to link with the practical on-farm tour, the facilitator and presenting scientist need to communicate beforehand. This is beneficial in a number of ways, it means the facilitator can pass on information about the focus farm to the scientist and the scientist can inform the facilitator of the chosen topic and key elements of the talk. This in turn means the facilitator can tailor the farm tour to suit the presentation.

The results here reflect the original aims when the learning package approach was first developed. It creates the question that shortening the format and potentially isolating within the wider context of the field day dilutes the benefits that may be created from the interaction between the participants (farmers) and new technology and information (scientists). This is quite critical to the rate of technology uptake, as many agricultural technology advances are presented to end-users through a field day approach, and are often added to other field days due to a congested field day calendar.

Supplementary material Generally participants noted that the idea of providing supplementary material was worthwhile, as it was hard to retain all the information from the scientific presentations. There was, however, mixed feedback about the supplementary material actually provided at the field days and afterwards.

At the Northern Regions field day, some liked the supplementary material provided. However, for others the handouts were not that useful as 'at the time seems important but realise it's the blurb around it which is more important' or that they 'become redundant after the day'. The summary sent out after the field day by the facilitator was considered useful. Other participants

at the Northern Regions noted that they enjoyed reading about the North Canterbury focus farm in the Deer Industry News. Farmers commented that this was a good idea.

Those attending the North Canterbury field days noted that although they were provided with the PowerPoint presentation, the information provided was 'only the start of the conversation'. Many believed it was the information discussed around those slides which was more critical. Others felt that DINZ was good at 'covering the gaps' in terms of information from the focus farms through their website and printed publications. All participants provided recommendations for how they would like to receive supplementary information. This demonstrates that farmers are engaged and interested in the scientific topics presented.

Scientists presenting style The presenter's style made a difference in the level of engagement participants had with the topic. Generally the scientists' presentations were considered excellent; they could relay information in a way which suited the audience. Presenters who were considered outstanding shared the same traits. They spoke at a level the audience understood, provided practical examples, kept their presentations concise and to the point and were engaging.

There were comments around some speakers who did not get their topic across as articulately as the others. An example was made about a presenter, who 'was trying to tell a story but didn't quite get there'. Participants noted that while the topic was of interest to them due to the presenter's style they 'switched off'. Farmers noted that those scientists who were not quite as good were not 'presenting in a way which grabs farmers' attention'.

Presenters were considered good if they could communicate complex issues in an engaging, but simple and concise way. These presenters could 'speak their [farmers] language'. This is a skill which is very different from presenting to other scientists or publishing in academic journals, however, it is invaluable when creating and delivering learning packages for farmers. Those presenters with less experience and skill communicating with farmers', need to practice their presentation beforehand, either with farmers and/or scientists considered excellent in this type of presentation. Farmers noted that it was the conversation around the PowerPoint slides that was really important to them, and presenters needed to be comfortable and competent in this respect.

These results recognise that science presenters must use the common language of the farmer. The concept of presenting in ways that engage the audience reinforces that need to ensure that the messages are codified in a common framework. The reference to presenters being able to deliver complex messages in simple and concise ways is a direct reflection of importance of codifying knowledge to gain uptake (Boisot 1995).

Interaction with presenters

Interaction with presenters was important for farmers, indeed that was one of the reasons for attending. While all considered the question time at the end of the formal presentation as good and useful, the informal time to discuss topics with presenters was equally important. At the Northern Regions field day participants noted that they enjoyed the time to talk with presenters during the farm walk, which normally occurred after the scientific presentation and lunch. It allowed people to reflect on the topic and ask any further questions. Those attending the North Canterbury field day also commented on the usefulness of being able to talk to the presenters during the farm walk which provided 'heaps of time to ask questions'. One farmer summed up the general feeling of those participants who attended the North Canterbury field day; 'throughout the day lots of opportunity to speak one-on-one with the speakers'. Indeed they noted that the presenters seem to make an effort to be approachable to the entire group.

A study by Payne et al. (2009), which looked at how the deer focus farms were working, noted that time for informal discussion was considered to be an essential component of the field day. While listening to 'experts' speak formally and viewing the changes of the host farm were considered important, the informal time was considered by many to be the most important part of the field days. This time was 'key for the entire concept of running a focus farm' (Payne et al. 2009, p. 219). The social time at the end of the focus farm day provided an opportunity for farmers to ask invited speakers questions, on a one-to-one basis, as opposed to asking a question out loud in front of a large group. Results from this study reinforced how important this informal time is.

This again reflects the need to enact the full typology of deliberative learning (Eraut 2000) by engaging past episodes, current experience, and future behaviour. The learning package must enable all of these elements to create new knowledge in the participants. This opportunity also

provides the opportunity for 'academic' and 'action' experts to engage in a non-confrontational way, with further formality removed from the encounter.

Role of facilitator

The role of the facilitator is important to help get maximum value out of the scientific presentations for field day attendees. The facilitator is responsible for setting the structure of the day, this includes the topic or topics, when the scientific presentations occur and what attendees will see on-farm. Participants of this research would prefer to see only one topic per field day which links theory to practice. Good communication between the facilitator, farmer and scientist before the event will help maximise their value.

Keeping the day to schedule is another important role of the facilitator, especially as participants have noted that the informal time at the end of the day is an opportunity to talk with the scientific presenters. If the day is running behind schedule, this is the session which gets reduced.

There can be a number of strong personalities who attend these field days. These people tend to dominate the question time and this can cause other attendees to not feel confident in asking questions or sharing their experiences. It is the responsibility of the facilitator to ensure that they provide an environment where everyone has a chance to talk.

Outcomes from these reflections continue to reinforce the concept that the physical setting and attributes of field day may often reduce the effectiveness of the field day as a delivery mechanism for learning packages and may also hinder the development of new knowledge in some circumstances. Field days must be set up to maximise the appropriate interactions required for new knowledge creation if this is their main aim.

Conclusion

Results from this small study show that the key aspects to engaging with deer farmers to maximise the success of the learning packages remain the same as they were in the original learning packages. The typology of deliberative non-formal learning, set in a formal framework provided good learning outcomes. The translation of this approach into a shorter time and smaller information bite format was partially successful. The delivery of the learning packages through the DINZ Deer Focus Farm programme identified several areas that influenced the outcomes of the method.

The scientific presenters were viewed as a valuable learning tool within the focus farm concept. However, responses identified the importance of the organisation of the field day and presentation style as the two key drivers of success. It is important that facilitators understand the process and the information required to ensure good technical learning. Within the learning package, an active process must be used to engage the audience with elements of review of past knowledge, engagement with current decision-making and problem solving, and through identifying opportunities for future planned learning by applying new knowledge from the day. While the modified package attempted to provide time lines to achieve all of these elements, these were not always met on the day. It is critical to develop good science 'stories' through the codification of the complex in simple messages in appropriate language to enable better farmer understanding and to provide continued access to credible information. This allows science messages to begin to go 'full circle' - from the scientists to the field day to farmer and agribusiness and remaining available on the website.

In conclusion, the linking of all aspects of the field day programme to the science is critical to the success of any science transfer and uptake programme. The Focus farm provides an on-farm hub that the facilitator, the scientists and the farmers can use to examine the effectiveness of current farm practice, develop better understanding of research and its potential impact on improving farm production and productivity, and monitor the success of any changes implemented. The information and questions that arise need to be an on-going part of the programme and remain available to farmers as their understanding grows over time and they need the opportunity to revisit subjects of interest.

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References

Boisot M 1995 'Is your firm a creative destroyer? Competitive learning and knowledge flows in the technological strategies of firms', *Research Policy*, 24, pp. 489-506.

- Casey M 2003 '*Deer nutrition symposium: the nutrition and management of deer on grazing systems*', Grassland Research and Practice, Series 9, New Zealand Grassland Association, Dunedin, NZ.
- Dick B 1999, *Rigour without numbers: the potential of dialectical processes as qualitative research tools*, Interchange, Chapel Hill.
- Eraut M 2000 'Non-formal learning and tacit knowledge in professional work', *British Journal of Educational Psychology*, 70: 113-136.
- Grunet K and Grunet S 1995 'Measuring subjective meaning structures by the laddering methods: theoretical considerations and methodological problems', *International Journal of Research in Marketing*, 12(3): 209-225.
- Lambert M, Paine M, Sheath G, Webby R, Litherland A, Fraser T and Stevens D 2000 'How do sheep and beef farmers manage pasture quality?', *Proceedings of the New Zealand Grassland Association*, 62: 117-121.
- McIvor S and Aspin M 2001 'R&D Success Stories and Principles to Practice', *Proceedings of the New Zealand Grassland Association*, 63: 23-26.
- Modica S and Rushtichini A 1994 'Awareness and partitional information structures', *Theory and decision*, 37(1): 107-124.
- Payne T, Stevens D and Casey M 2009 'Deer focus farms – are they working?', *Proceedings of the New Zealand Grassland Association*, 71: 217-222.
- Rhodes A and Aspin M 1993 'MRDC monitor farms – using information', *Proceedings of the New Zealand Grassland Association*, 55: 23-26.
- Snowden D 2002 'Complex acts of knowing – paradox and descriptive self-awareness', *Journal of Knowledge Management*, 6(2): 1-27.
- Stevens D, Woodward S and Westbrooke V 2005 'Developing decision making tools for improving pasture quality on deer farms in New Zealand', *ABFM Journal. Farm Business and Farming Systems Management*, 2: 75-80.