

Delivering extension and adult learning outcomes from the Cicerone Project by ‘comparing, measuring, learning and adopting’

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Abstract. The Cicerone Project was a partnership between livestock producers, researchers and extension specialists on the Northern Tablelands of New South Wales, Australia that investigated several complex grazing enterprise issues between 1998 and 2006. It was conducted as a Participatory Action Research project, which first surveyed livestock producers to learn of their problems and then carried out investigations according to the Project’s chosen motto of ‘compare – measure – learn – adopt’. The Project included research into footrot diagnosis and an investigation of whole-farmlet livestock and pasture management systems complemented by a multi-faceted extension and education component, which delivered findings to a wide array of stakeholders across the Northern Tablelands and adjacent regions.

This paper describes the extension and education methods and outcomes and reflects on how successful the engagement of livestock producers was through a partnership, which focussed on co-learning by all participants. Several different communication approaches were used including the production of 40 newsletters and the delivery of 61 field days. Collaborators also held two symposia, which presented comprehensive overviews of the research results. In the final year of the Project, a roadshow was held to communicate results to a wider audience in neighbouring districts.

The results of the two footrot trials, which were conducted as Participatory Action Research projects, led to rapid and substantial changes in the testing regime for virulent footrot, resulting in large savings for livestock producers through more accurate detection of the disease. Other valued extension and industry outcomes were the ability to compare the biophysical and economic performance of different whole farmlets, an appreciation of the value of the whole-farm system approach, the trustworthiness of the results and the stimulation of livestock producers to think more deeply about their management systems, stocking rate and risk.

The Project benefited from the research efforts of four postgraduate students and was of benefit to ~300 high school and technical college students and also some 500 university undergraduate students who undertook learning projects in conjunction with Project members and collaborators. This Special Issue of 24 journal papers represents a substantial delivery of the findings from this complex agroecosystem Project, which broke new ground in terms of securing much closer working relationships between livestock producers, scientists and extension specialists. Ultimately, this volume will allow extension of the results of the Cicerone Project to reach a wider audience than has typically been achieved through other Participatory Action Research projects.

Received 21 November 2011, accepted 22 July 2012, published online 10 July 2013

Introduction

During the 1990s, several Australian research and development organisations included producer networks within their research programs. For example, the Sustainable Grazing Systems (SGS) Key Program adopted a participatory approach, which encouraged engagement with producers and thereby facilitated adoption of findings (Nicholson *et al.* 2003). Also writing of the SGS program, Andrew (2003) noted that producers benefit from being ‘in control of research and development to maximise

learning and on-ground change’ and interactions with other producers. However, according to Andrew and Lodge (2003), the farmers who participated in the regional producer groups within the SGS program had relatively little influence over the research undertaken by researchers; indeed, on the Northern Tablelands of New South Wales (NSW), producers felt somewhat disconnected from the research program (Price 2003).

In western Victoria, the Birchip Cropping Group has run industry-funded projects over many years with significant support from commercial partners (McClelland *et al.* 2004). To some extent, the Birchip Cropping Group sees itself as an 'intermediary between funding bodies and public sector researchers'. Also, the Grain & Graze national research and adoption program sought empowerment and change on a regional level in mixed-farming systems (Price and Hacker 2009). These projects and groups are examples of Participatory Action Research (PAR) where co-learning takes place between farmers, researchers and extension specialists (Carberry 2001).

In the case of wool enterprises, participatory research was found to be highly successful for woolgrowers who worked closely with the South Roxby Project in southern Victoria (Larsen *et al.* 2002). They found that involving growers in identifying problems and solutions helped to overcome the previous failure to adopt several findings from past research, such as aspects of worm control, price-risk management and genetic improvement.

Traditional extension methods, which have often been referred to as 'top-down' methods of extension (Vanclay 2004), have been common in the agricultural sector. One of the limitations of this approach is that, at times, producers' knowledge can be ignored or trivialised (Vanclay 2004). In the dairy industry, Teixeira *et al.* (2004) have described how there has been an evolution away from 'top-down' systems of information delivery towards programs which encourage co-learning.

Research and extension commonly focuses on single issues which fail to sufficiently take account of the complexity of the farming systems that livestock producers deal with every day. According to a qualitative study conducted by O'Keeffe (1992), achieving high adoption rates with graziers has been more difficult than with cropping farmers due largely to the fact that, in grazing enterprises, the linkage between management and outputs is far less rapid and observable. Through in-depth surveys of farmers, he discovered that, distinct from cropping farmers, graziers find it difficult to assess technological changes within their complex farming systems due in part to a lack of detailed understanding of key drivers of profitability. Thus, graziers often placed less value on information and 'learning' from 'top-down' extension programs than cropping farmers, preferring instead to learn about technologies through observation and 'trial and error' under conditions that are locally relevant (O'Keeffe 1992). The value of locally relevant research to graziers was also recognised by Reeve *et al.* (2000).

On the Northern Tablelands of NSW, the Cicerone Project was created to allow livestock producers to take a greater leadership role in determining the direction of research and its conduct following recognition from the main funding body, the Woolmark Co. (now Australian Wool Innovation, AWI), that involving livestock producers can lead to greater interest in the research being undertaken (Ison and Russell 2000). Such a finding is not unique to Australia; for example, Okali *et al.* (1994) have described how 'farmer participatory research' can be employed to enhance the effectiveness of agricultural research in many countries.

The Cicerone Project began following a meeting in April 1997 of some 45 livestock producers, researchers, extension workers and agribusiness representatives, which concluded that there was an under-utilisation of existing research and extension information relevant to the region. There was also a feeling of 'disconnection' between producers and scientists, and a need to enhance adoption (Sutherland *et al.* 2013). In part, this was related to the changing role of government agency extension staff, delivery methods, and research funding directions. This has also been found in other areas of Australia, such as in Victoria, where Trompf and Sale (2006) reported that, unless agencies actively recruited participation, less than 6% of producers took part in grazed pasture extension activities. In some cases, as a decline in funding of pasture and grazing technology has occurred, this has resulted in lower levels of adoption by livestock producers of knowledge that was previously readily accessible to farmers (Lowe 2007).

The Cicerone steering committee commissioned a survey of livestock producers to seek an assessment of the severity of their current management problems and to help identify areas for future research. The survey was carried out in late 1997 and completed early in 1998 (Kaine *et al.* 2013). The results set the directions for future investigations and provided convincing evidence that research developed along these lines would be relevant to livestock producers as ~80% of respondents supported the Cicerone Project concept and wanted to be involved with the Project (Kaine *et al.* 2013). As explained by Sutherland *et al.* (2013), the name of the Project, Cicerone, was chosen to suggest a 'learning culture' after the Roman orator and teacher, Cicero.

The four initial aims of the Cicerone Project were to: (i) create a learning environment in which researchers and producers could learn from each other, (ii) undertake training and increase awareness, (iii) provide access to a central learning farm (later called farmlets) and (iv) provide information (Sutherland *et al.* 2013). All of the trials were run on land leased from the CSIRO's Chiswick research station, which was ideally situated, being centrally located within the Northern Tablelands, having good road access and which was known to be reasonably representative of the grazing properties of the region.

By encouraging co-learning by all participants, the Cicerone Project recognised that the 'education' delivered through the traditional model of extension had become less effective (Knowles 1990) and that 'learning', and especially adult learning, is most effective when the person doing the learning is actively engaged in the process of acquiring knowledge, skills and changed attitudes. Thus, the Cicerone Project adopted a PAR method of 'action learning' by which livestock producers, researchers and extension specialists could learn with and from each other by working on real problems and reflecting on their experiences. This theme was expressed in the overarching motto which the Cicerone Project adopted of 'compare – measure – learn – adopt'.

Because the Project benefited from the participation of two education partners, NSW Technical and Further Education (TAFE) and the University of New England (UNE), the Project also became a focus for both undergraduate and postgraduate students to become involved in this Project, with its strong focus

on learning through observation and objective measurement. As has been noted by Biggs (1999), 'predicting, diagnosing, explaining and solving non-textbook problems are what professionals have to do, so this is what university teachers should aim to get their students to do, particularly in higher years'. Ross (1997) adds that 'Problem-based learning ... involves confronting students with problems from practice which provide a stimulus for learning'.

The broad hypotheses of the Cicerone Project (Sutherland *et al.* 2013) were:

- (a) 'that livestock producers will be more likely to adopt research if they are able to participate more in the research-adoption process, including identifying the research problems; and
- (b) that those scientists working more closely with producers will help to ensure greater relevance of research to end users'.

The authors acknowledge that, as Board members, the perspectives contained within this paper reflect their role as participants who have been involved in most aspects of the Project. Nevertheless, we contend that the paper provides a broad range of perspectives ranging from those of Project staff (CG), to extension (CE and RM), teaching and research participants (JS) as well as from livestock producer stakeholders (TC and PD).

The purpose of this paper is to explain the extension and adult learning activities conducted over the duration of the Cicerone Project, from 1998 to 2006, to assess how useful they were and to place them in the context of the extension literature. A complementary paper by Sutherland *et al.* (2013) explains the origin of the Project while another details the surveying of livestock producers (Kaine *et al.* 2013) to learn of their most pressing problems. Many other papers detail the overall methods and results while the final paper provides 'reflections' from the Cicerone Board members on the success or otherwise of the overall Project (Coventry *et al.* 2013).

Methods

To encourage livestock producers to feel a sense of 'ownership' of the Project, the Cicerone business plan recommended a Board of Management which would ensure that local producers comprised a majority of the Board positions and carried out the role of Chair (Sutherland *et al.* 2013). These voluntary positions, elected each year, were vital for the day-to-day running and direction of the Project. The Board met approximately monthly, with decisions on all research projects, including the farmlet trial, and the extension of the Project's results being the main focus of deliberations.

The inclusion of extension officers, researchers and a veterinary consultant on the Board ensured a broad awareness of technical issues and assisted in the timely delivery of Project outcomes. All members of the Board made substantial 'in-kind' contributions to the Project, not only through Board meetings but also in the conduct of research, support and delivery of field days, workshops, symposia, seminars, negotiating with funding bodies, publicity, and writing reports, newsletters and journal papers. In addition, one Board member who was a private veterinary consultant, gave significant in-kind contributions in relation to animal health matters. These contributions were

complemented by the two highly motivated part-time staff employed by the Project, both of whom also made significant in-kind contributions.

The trials conducted over the life of the Cicerone Project covered the areas identified through the initial survey, as well as some of the ideas that arose from meetings held during the Project. Whereas financial members of the Project received some preferential treatment in the delivery of information and were charged lower fees to attend field days and workshops, members of the public were nevertheless invited and some of these made significant contributions to discussions.

Communication about the Project and the results from the trials was undertaken throughout the Project. Initially, while the farmlets were being set up, communication was primarily through newsletters, field days and workshops. Later, the Project also produced brochures, handouts and posters for all of its events. In addition, the Project sought feedback after most of its workshops and symposia. This survey information was summarised and categorised to facilitate understanding the relative success of the different extension activities.

In relation to the central learning farmlets concept, after consultation with members and several public workshops and site visits, it was decided to run a 'whole-farmlet' trial with the aim of 'comparing the profitability and sustainability of three different farm input and grazing management systems'. Details of the design of the treatments and the guidelines for managing the farmlets have been described by Scott *et al.* 2013c.

In the final year of the Project (2006), a Cicerone 'roadshow' took key messages to six different localities around the Northern Tablelands, North-West Slopes and South-East Queensland where there was an interest in sheep production. The objective was to convey information about the findings to those producers who had been unable to attend Cicerone activities on site.

Results

Over the period from 1998 to 2006, Cicerone was one of the major extension deliverers on the Northern Tablelands for the sheep industry with flow-on effects still benefiting extension efforts through to the publication of this Special Issue. Many of its activities utilised a collaborative approach to delivery with partners such as the NSW Department of Primary Industries (DPI), CSIRO, UNE, TAFE, the then Armidale Rural Lands Protection Board and local private consultants. On several occasions, industry leaders or state- or nationally-recognised guest presenters participated.

Newsletters (1998–2006)

In 1998 the Cicerone newsletter commenced, which sent out information in an easy-to-read format, including some humour or anecdotes, to an appreciative audience of members. The newsletters disseminated information on the Project, the results from the footrot, farmlet and other trials and provided advanced notice of upcoming events. Over the duration of the Project, up to the end of 2006, 40 newsletters were produced, each with a circulation to members of over 100 copies.

Field days (1998–2006)

The Cicerone Project delivered 61 different extension activities, either on-farm or within the local area, to more than 1600

attendees (Table 1), some being repeat attendees. As shown in Table 1, a wide range of topics were covered relating to aspects of land management, animal health and welfare, environmental management, the farmlet experiment, economics, marketing and workplace issues.

Footrot trials (1999–2000)

The footrot trials undertaken by the Cicerone Project provides an example of the effectiveness of the PAR approach. Soon after Cicerone held initial public meetings of some 120 interested parties on the issue of footrot diagnosis, plans were made for a Producer Initiated Research and Development grant proposal to be submitted. This was successful and led to a field trial on the Northern Tablelands of the various strains of footrot along with a new DNA testing regime conducted by University collaborators (Gaden *et al.* 2013). A follow-up field trial was then approved and conducted in a location on the Central Tablelands, which confirmed the findings of the first trial. These studies led to an improved footrot diagnostic test, which has had substantial flow-on benefits to all sheep graziers by reducing false positive test results and thereby preventing unnecessary quarantining of properties.

External linkages

Cicerone was invited to and presented information about the Project at 15 different industry events such as the New England WoolExpo (Armidale), NSW Grassland Society Conferences, Sire evaluation open days and various wool symposia. The combined attendance at such events has been estimated to have been at least 4100.

The Cicerone farmlets also became a focus for other producer groups and agribusiness discussion groups who visited the Project. Nine different groups (comprised of some 154 people) visited the farmlet experimental site from as far afield as South Australia and Western Australia.

Publicity

Over the life of the Project, a total of some 50 media releases were produced to promote Project events, some of which were developed with collaborating partner institutions such as the media units of the UNE and NSW DPI. This resulted in many events receiving broad coverage in the local media, including print, radio and television. The Project also published a website (<http://www.cicerone.org.au>, accessed 5 December 2012), which described the organisation, its background, provided links to publications such as newsletters and reports and promoted upcoming events.

Publications

As the Project progressed, results from the farmlet and other trials were published and delivered at local and national conferences. Prior to the publication of this Special Issue, three refereed journal papers (Behrendt *et al.* 2006; Colvin *et al.* 2008, 2012) and seven conference papers (Hall *et al.* 2001; Scott 2003a, 2003b, 2004, 2006; Gaden *et al.* 2004; Healey *et al.* 2004) had been published on different aspects of the Cicerone Project.

Symposia

The two symposia held in 2005 and 2006 (Scott 2005, 2006) were comprehensive efforts to disseminate up-to-date research results to Cicerone members and the local community with over 150 attending the 2 whole-day events. A total of 39 presentations were made, not only by researchers, postgraduate and honours students and extension specialists but also by livestock producers, covering the full array of findings from both the footrot and farmlet experiments.

Symposium (2005)

Some of the topics covered in relation to the farmlet study included drought, soils, pastures, livestock, wool, worm

Table 1. Summary of extension field days, workshops and symposia conducted by the Cicerone Project from 1998 to 2006

Year	Number per year	Topics covered	Numbers attending
1998	1	Footrot	20
1999	8	Holistic management, Footrot (2), Internet, Weeds, Farmlet planning days 1 and 2, Wool marketing	219
2000	11	Farmlet planning days 3 and 4, Footrot (5), Marketing visions, Wool stockpile, Wool and meat marketing	296
2001	7	Sheep genetics, Farmlet planning days 5 and 6, Future visions, New technology, Animal health (2)	209
2002	5	Farmlet walk, Learning from the Masters, Insurance and workplace health, Flystrike management	121
2003	10	Stockplan workshops (2), Land Water and Wool workshop, Soil test interpretation, four Pasture assessment days (4)	254
2004	8	Planning for reproduction, Research and technology, Planning for spring, Soil nutrient losses, Improving bottom line, AWI field day, Selection indices for livestock breeding	224
2005	2	Symposium 1, Pasture walk	107
2006	9	Symposium 2, Silage field day, Soil health, Six Roadshows	227
Total	61		1677

control, economics, modelling, trees, sustainability and producer perspectives of the three different management systems. A total of six livestock producers (both Board and general members) contributed their perspectives in front of their peers (Scott 2005) ensuring that the producer voice was active at these important communication events.

After the 2005 symposium, some of the recommendations made by participants included: increase the flexibility of management of the farmlets to allow optimal conditions for each system, keep producers involved, do not compromise the experimental design, do not be too prescriptive, allow fewer mobs and more paddocks on farmlets A and B to help retain desirable pastures, explore nutrient leakage, ensure reporting is easy to understand and 'keep up the good work'. This valuable feedback allowed the Project to respond appropriately to ensure the maintenance of credibility and relevance with producer members.

Other survey findings following the 2005 symposium (40% return rate) showed that 97% rated their overall satisfaction with the symposium as good to excellent; 97% rated the overall value of the Cicerone farmlet 'experiment' thus far as good to excellent; 90% said that the impact of the symposium on their

future farm management decisions was good to excellent and 81% said the video shown explaining the background of the Cicerone Project was excellent.

Comments from participants following the 2005 Symposium (Box 1) provided a long list of important messages from attendees which were notable for their consistency. According to the feedback received, the most valuable parts of this first symposium included worm control, the complexity of grazing enterprise investigations, the excellent interactions between researchers and producers, the thinking and learning that was encouraged in participants and the clear recognition that the farmlet trial needed to continue in order to capture the great potential from longer-term farming system studies (Box 1).

In the final paper of the 2005 symposium, which reviewed the progress of the Project to date, an invited external expert from a neighbouring state research and extension agency concluded in part that: 'the trials have clearly been of great interest to producers; Cicerone is just getting to the interesting stage; farmers are getting messages from all three farmlets; there is a need to test concepts until a plateau is reached (not reached yet); and there is a need to evaluate environmental effects over a sufficient time scale' (Saul 2005).

Box 1. Quotations received from participants after attending the 2005 symposium when asked 'What, to you, was the most important message from the Symposium?'

- Worm difference on farmlets A, B and C. Sustainability measures on C and sustainability problems on A and B.
- To reinforce the importance of parasite management.
- Integrated worm management.
- Rotation impact on worm management.
- Impact of the symposium on our future farm management decisions.
- Grazing is a complex, multi-faceted problem and management needs to be based on real data and careful analysis.
- Farming is complex – keep learning great resource of UNE and Chiswick at our doorstep. Great coming-together of researchers and producers – well done.
- Importance of liaison with producers.
- That Cicerone should continue – the interaction between producers and researchers is very strong and should be fostered.
- The continuation of the project is most necessary.
- Cicerone should continue for at least 5 years to capitalise on investment to date.
- Long-term experiments have huge potential.
- Results are at a very interesting stage but require more time to see where management techniques will lead in terms of sustainability and profitability.
- Much more work is required – the farmlet comparison needs to continue for many years.
- It needs to go for longer to benefit us all – make sure all wool levy payers get the benefit of it.
- There are more questions asked than answered; there is a need to continue or else the last 4 years have been wasted.
- Essential to keep the project going.
- Funding needs to continue. We have excellent information from Cicerone but we need to compare these more into the future.
- Keeping a view on personal goals aims and objectives – thinking was mentioned but is under-rated as overall central point.
- Learning from each system. No one system suits all properties/enterprises.
- Discovering the balance of all three farmlets for individual producers' needs.
- Feedback and on-going liaison adding to the information gained.
- The ability to bridge the divide between research and producer experience in such an interesting and enlightening symposium.
- All very thought-provoking, but of particular use: worm management, trees and pasture establishment.
- Very, very great food for thought in every category. An inspirational day and much to take back to the soil and animals. To Cicerone – thankyou.

Cicerone became a significant focal point

It is noteworthy that, once the Cicerone Project commenced and achieved some of its early goals, such as the footrot trials and the planning of the farmlet experiment, interest in the Project increased markedly. Being able to demonstrate practical, cost-effective and valuable results from trials was highly valued by members and all those who interacted with the Project. Indeed, the initial Business Plan did not anticipate the potential for research by postgraduate students. The four postgraduates and their supervisors who carried out their research in conjunction with the farmlet experiment were attracted to undertake their studies only after the farmlets had been set up. Those who funded the postgraduate scholarships were also sufficiently impressed by the trial that they judged the student projects to be worthy of support. In addition, as noted above, groups of graziers from other districts visited, showing great interest and acknowledging that there was nothing like Cicerone in their districts.

Survey of members (April 2006)

In 2006, in preparation for the second symposium, a survey of members was carried out to ascertain member's characteristics, satisfaction and comments on the Cicerone Project thus far (Table 2; Fig. 1). Whereas the majority of respondents identified most strongly with the 'typical' farmlet B, suggesting that this farmlet was appropriate as the control treatment, a smaller but similar proportion identified with either farmlet A (higher inputs) or farmlet C (intensive rotational grazing) management. It was noteworthy that a considerable proportion identified with more than one type of farmlet management within their own commercial farms.

The average size of the properties and the numbers of animals run (Table 2) confirm that those members who responded to this survey represented those running fully commercial grazing enterprises as the average size of respondents' farms (1540 ha) was some 67% greater than that of the average grazing property in the region of 920 ha (Alford *et al.* 2003). Also, it is noteworthy that the members who responded were located in five different Catchment Management Authority regions (Table 2), suggesting the broad relevance of the Project activities.

Fig. 1 shows the responses to a series of 10 questions put to members about the Project and the farmlet trial that confirmed a high degree of satisfaction and guided decisions of the Management Board.

Symposium (May 2006)

Details of the issues valued by attendees are shown in Fig. 2 where responses are provided within categories of either influencing practices or of providing useful information. The five categories reporting greatest satisfaction are closely aligned to the major issues identified in the initial survey of producers, which showed the top issues to be, in decreasing order of importance: coping with dry seasons, affordable pasture feed supply, grazing management, drench resistance of internal parasites and overcoming soil fertility constraints (Kaine *et al.* 2013). These issues are interrelated and, in order to satisfactorily answer them, they all require resolution over an extended timeframe under conditions where complex interactions can be investigated and understood. As pointed out by Pannell *et al.* (2006), these conditions of time and complexity present significant challenges in getting extension messages adopted.

During this second symposium, attendees were asked a series of questions on how useful Cicerone had been. This session was

Table 2. Characteristics of Cicerone members' farms (before Symposium in April 2006) and farms of those who attended roadshows across the Northern Tablelands and adjacent regions (in September 2006)

	Pre-symposium (April 2006)		Roadshows (September 2006)		Grand total
	<i>n</i>	Total	<i>n</i>	Total	
Number of respondents	64		80		144
Average area of respondents' farms (ha)	1544	94 172	2020	161 621	255 793
Number of sheep (average number/farm)	6070	333 850	3832	306 575	640 425
Number of cattle (average number/farm)	481	25 960	411	32 908	58 868
Number identifying with different Catchment Management Authority (CMA) regions					
Border Rivers – Gwydir CMA	19			n/a	
Namoi CMA	8			n/a	
Northern Rivers CMA	33			n/a	
Other (including Hunter-Central Rivers and Central West)	6			n/a	
Number managing in similar way to Cicerone farmlets A, B or C					
Similar to farmlet A		15		9	24
Similar to farmlet B		39		56	95
Similar to farmlet C		19		13	32
Similar to any one farmlet (A, B or C)		43		n/a	
Similar to two farmlet types (AB, BC or AC)		6		n/a	
Similar to three farmlet types (A, B and C)		6		n/a	

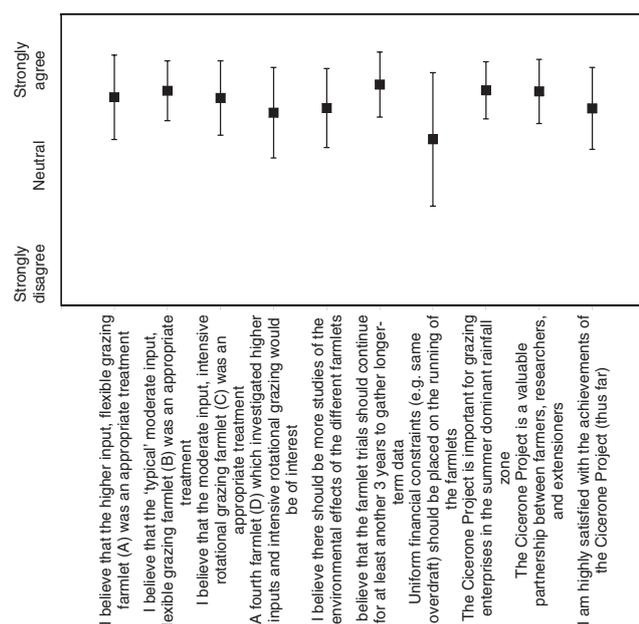


Fig. 1. Average responses (\pm standard deviation) to 10 questions from a survey of members and former members of the Cicerone Project in April 2006, before the 2006 symposium (number of respondents = 64).

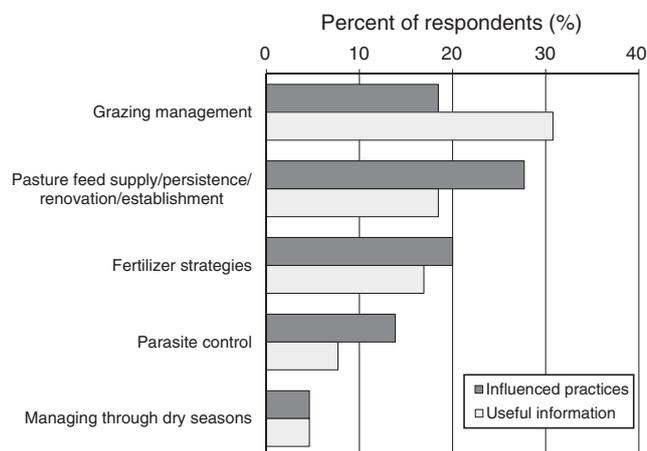


Fig. 2. Percentage of respondents ($n=39$) who attended the 2006 symposium reporting that the Cicerone Project had influenced their practices and/or provided useful information relating to five categories of issues addressed by the Project (total number attending = 65).

chaired by a representative of the main funding body (AWI) and the responses highlighted the Project's most valuable outcomes, the extent of collaboration and desire for Cicerone to continue. Evaluations revealed that 94% of respondents felt that the success of the partnership between producers, researchers and extension officers had been good to excellent.

The responses regarding the question 'How useful was Cicerone to you?' (Box 2) highlighted the participants' appreciation of the learning opportunities that Cicerone had provided. Thus many of the respondents used terms such as 'learning', 'outside the box/square' 'encourages thinking', 'made

me rethink', 'thought provoking', 'learnt from Cicerone's mistakes' in ways consistent with a project which has contributed substantially in the area of social capital. The reference to Cicerone's 'mistakes' is most likely related to the fact that early in the farmlet trial, during a year badly affected by drought (2002), the grazing rest period on farmlet C was judged to have been excessively long; once it was clear that this was constraining young animal growth, the rest period was shortened in response (Hinch *et al.* 2013).

The majority of the research projects and extension activities undertaken were guided by the original survey (Kaine *et al.* 2013). After the 2006 symposium, a detailed survey of participants produced a rich array of qualitative results. Some 90% of respondents said they were likely to change management decisions based on the information received while 91% rated the usefulness of the Project to them as good to excellent. In response to the question about how useful had Cicerone been, the comments made about the interaction between producers, researchers and extension officers, collectively, provide evidence that the second hypothesis was found to be true. Some relevant quotations include: 'Great for liaison between growers and staff and great results for both sections'; 'Personal access to professional people within Cicerone who can and do advise on my own problems. Wonderful natured producers, researchers and extension people working and learning together'; 'To understand and work more closely with farmers and scientists – a good partnership'.

When respondents were asked open-ended questions about the most important conclusions that could be drawn from the Cicerone Project symposium and suggestions about the conduct of the studies, a wide array of issues and topics were identified (Fig. 3). It is clear that respondents valued the research-adoption partnership, which allowed two-way learning, but also saw a clear need for the studies to continue longer in order to satisfactorily test the farmlet systems under non-drought conditions. They also identified the need for more measurements of possible soil degradation and other sustainability assessments.

Some of the outcomes rated most highly included the economic information from the farmlet comparisons, the use of a whole-farm system approach, and the degree to which the results stimulated thinking about farm management, stocking rates and risk management. A substantial number of respondents supported one producer's suggestion to the Cicerone Board (M. Oppenheimer, pers. comm., 2005) that, if resources were to become available, a fourth farmlet should be added to the farmlet experiment so that a combination of intensive rotational grazing and a high level of inputs could be investigated. Less common responses related to the opportunities for future benchmarking between the Cicerone farmlet experiment and members' farms as well as recognition of the value of the data that had been collected to date.

Roadshows (2006)

The Cicerone roadshow evaluation data (Table 2 and Fig. 4) revealed interesting comments on the information presented and whether it might be applicable to other areas. Although some distance from the Cicerone farmlet experiment, there was an interest in sheep production in these regions with

Box 2. Representative sample of quotations received from participants following attendance at the 2006 symposium in response to the question ‘How useful was Cicerone to you?’

- Poses questions as well as answers. Encourages thinking about problems. Points out some of the interactions. Brings into focus increased costs as well as increased production.
- Greater awareness of alternative grazing/management systems and aspects that will be adapted to our own grazing enterprise. Always new ideas to learn about and implement.
- Recognising the complexity of interactions between soil, plants, animals, climate and markets. Satisfied me that IRG is not a magic bullet.
- Enables the farmer to observe trials of grazing systems without have to spend their own money and thus risk! Provides analysis far beyond the capacity of any normal farmer.
- It has been very useful to follow and see the activities, the field days, the presentation of the results and the interaction in questions and comments by those present and to relate it back to my own enterprise.
- Hugely – to learn about the changes over time on the different farmlets.
- Extremely useful. Introduced new ideas and concepts of dealing with issues of managing and grazing enterprises.
- Cicerone has been a great resource for not only wool graziers but farmers in general. If the information provided doesn't spark an interest it provides ideas and demonstrates that you have to look 'outside the box'.
- Successful farmers are ones already looking to improve their management, and the Cicerone Project facilitates that.
- Very useful. Made me rethink what I am doing.
- Helped in looking at differences between management systems on the different farmlets. Stock performance, income v. expenditure, sustainability, inputs (capital, time), what is the future (long-term)?
- Provided information that can be tailored to individual farming enterprises.
- Very eye-opening when put in context, farm to farm. Thought provoking and makes you assess your own situation. There are so many variables and outside influences that affect farming, it's hard to keep track when farming in isolation. Cicerone has pulled us all together and opened up topics that make us receptive to thinking outside the square.
- Great learning tool. Valuable comparison of grazing management systems. Highlights management issues and impact of prolonged drought conditions. Integrates key components of livestock management. Board management not dissimilar to farm family situation – it has problems and doesn't always get it right. The effects of different livestock management systems bringing about loss of income and decreased gross margins.
- From a farming point of view it has been useful to have enough scale to include livestock in the system, but the time period of the project (5 years) is too short. Funding bodies need to realise that these projects need long-term funding.
- It has been a learning experience in terms of correcting decisions from good and bad things done by Cicerone. I have learnt from Cicerone's mistakes. From what has been learnt, it has led to new questions and new methods to measure whole farm systems.
- Having this opportunity and seeing different grazing systems in operation and their subsequent profitability has been a learning curve; no one strategy works.
- I am not a farmer but Cicerone has been a great learning experience. It has helped me understand the economic and risk implications of different management approaches.
- Better understanding of grazing systems and their shortfalls and advantages. Learnt from Cicerone's mistakes.
- Cicerone has not been just about the farmlets, the field days have been very interesting. The ability to see how different management affects pastures on the same rainfall and soils has been fascinating.

particular interest shown in the findings relating to grazing management. Of the 110 who attended the roadshows, some 80% had not been to a previous Cicerone event over the past 6 years. Evaluations revealed that 93% of the attendees were landholders with 79% running both sheep and cattle, 10% sheep only and 11% cattle only (Table 2). The attendees that responded to the evaluation survey (76% return rate) managed 306 000 sheep and 32 900 head of cattle on a total of 161 600 ha. Of those responding, 85% agreed or strongly agreed that they could use the information from the roadshow on their own properties while 61% responded that they were likely to change management decisions based on the information received. Of these, 25% would change practices relating to fat scoring of ewes and lambs while 32% stated they would adapt their practices relating to grazing management and monitoring of resources, pastures and landscapes. Interestingly, a large proportion of those who said 'no' to this question, commented that the information had

reinforced or confirmed their current management practices. In addition, there was widespread agreement that the Cicerone Project had been a valuable partnership.

Student learning

The Cicerone Project farming systems study was of great value for learning – not only by livestock producers, researchers, extension specialists and consultants – but also by some 300 students from high schools and TAFE and a further 500 university undergraduate students who visited the Project and the farmlets to learn about farming systems research and adoption. Those most deeply involved were the four postgraduate students (Behrendt, Colvin, Scott and Shakhane) and two Honours students (Lance and Morrow) whose work is reported elsewhere in this Special Issue and in other publications. Some of the learning experiences of the undergraduate students are described below within a teaching and learning context.

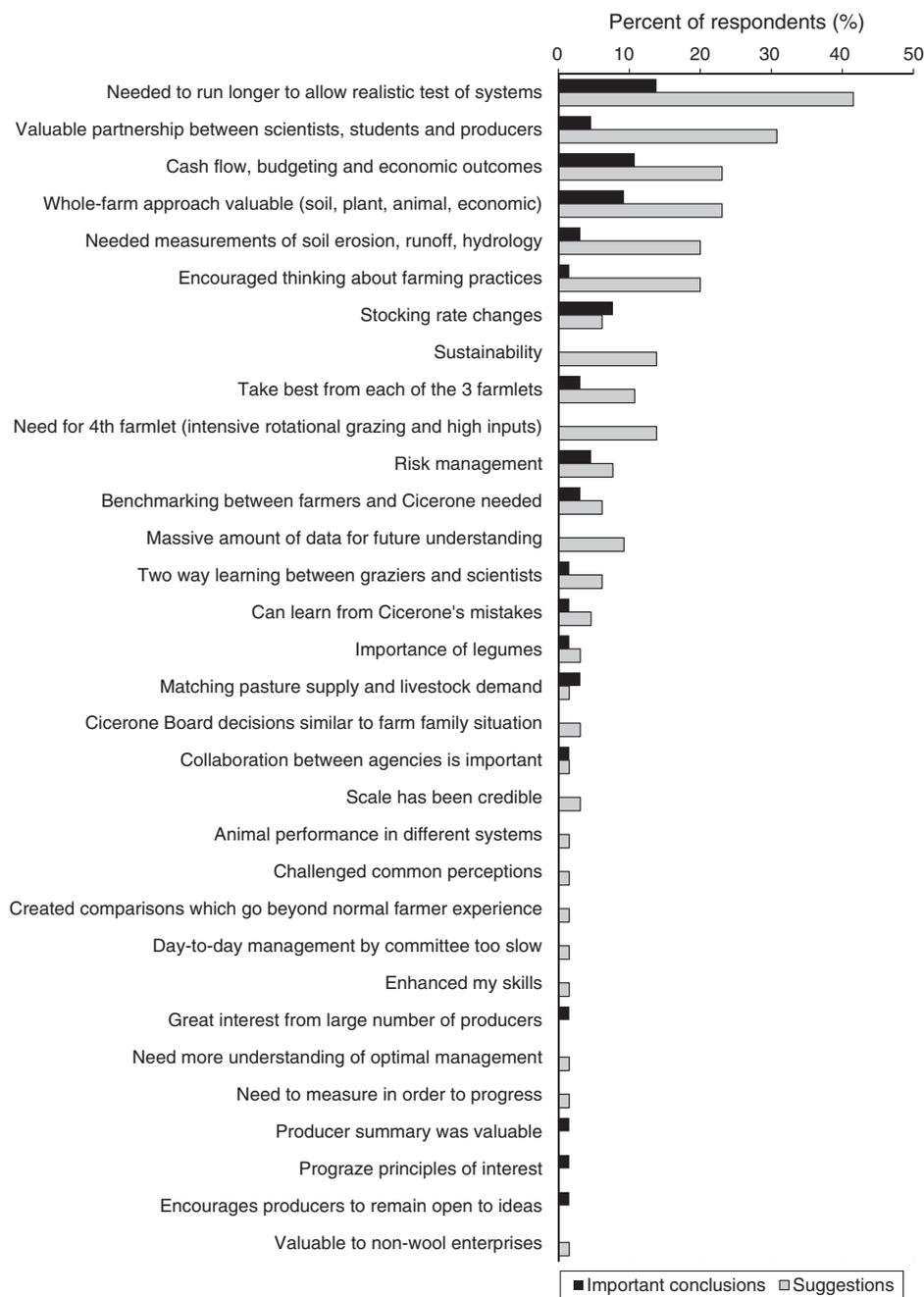


Fig. 3. Percent of respondents ($n=39$) who attended the 2006 symposium reporting their views on the most important conclusions from and suggestions about the Cicerone farming systems project and its conduct (results categorised from responses to an open-ended question) (total number attending = 65).

Undergraduate students studying ‘agricultural extension’ at the UNE became deeply involved in the Cicerone Project. Over several years, under the supervision of their lecturer, groups of students were presented with ‘real life’ tasks of designing, organising, implementing and assessing field days and workshops in conjunction with the Cicerone Project staff. These field days were judged to have been highly successful, not only for the producers who attended, but also for the students

who participated. In the words of the supervising lecturer, this ‘real world experience’ was ‘immensely useful’ to the students (J. Prior, pers. comm.).

The Cicerone Project’s farmlet study also provided three realistic grazing enterprises, which were used as the basis for several visits each year (1999–2006 inclusive) by consecutive cohorts of undergraduates studying pasture agronomy at the third-year level in the degrees of Bachelor of Agriculture and

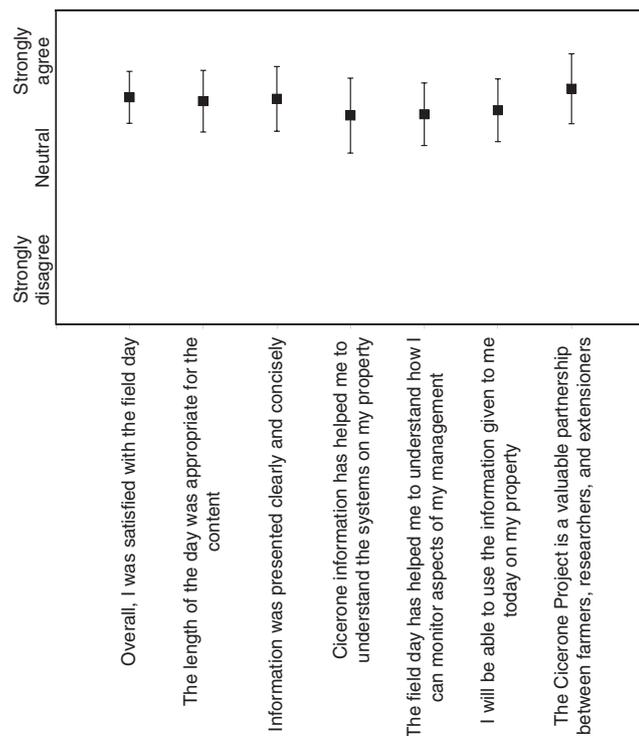


Fig. 4. Average responses (\pm standard deviation) to seven survey questions put to all 110 attendees at the six roadshow events across the Northern Tablelands and adjacent regions in September 2006 (number of respondents = 80).

Bachelor of Rural Science at the UNE. Over these 8 years, undergraduate students took part in these learning and assessment activities. For these practical experiences, students were typically allocated into teams who used a problem-based approach to learning about some of the complexities of grazing enterprises and worked together to produce collective reports for formal assessment of that part of the unit.

These practicals allowed a considerable degree of reinforcement of lecture material as well as skill development. For example, in a particular year (2005), the assignment required each team of six students to produce a creative, integrated 'Consultants' report (of ~40 pages) on 'The past, present and future of the Cicerone farmlets' thus encouraging the development of team work, presentation of data and complex document preparation as well as mastery of a wide array of relevant technical content relating to the pasture-based grazing enterprise farmlets.

Because the unit topic related to pasture agronomy, the report needed to contain relevant results from computer simulations of pasture and livestock biology as well as of pasture measurements (growth, herbage mass, herbage digestibility) taken by students on particular farmlet paddocks during their skill development exercises. Student teams were asked to address issues such as the sustainability and profitability of livestock enterprises and to summarise historic data provided to show comparisons between farmlet systems in herbage mass, pasture composition, pasture quality, animal performance, etc.

Discussion and conclusions

The approach taken by the Project was one of 'learning by doing' and of regular reflection and continuous improvement. During the Project, several formal reviews of the Cicerone Project were conducted on behalf of the primary funding agency, AWI. These presented opportunities to consider achievements and contemplate changes. For example, during a review meeting in July 2003, feedback encouraged the development of a range of new extension activities, most of which were delivered over the next 3 years.

Engagement, ownership and partnership

The extension efforts of the Cicerone Project were rewarded by a high degree of ownership, interaction, communication and cooperation between the producer members and collaborators. This was in contrast to the disconnection many graziers in this region felt with the earlier SGS key program (Price 2003). Producers had a large say in the research being carried out through the initial planning meetings, the survey, regular field days, farm walks, input into the Board meetings and into the guidelines of the farmlets. This engagement between all of the participants encouraged researchers and extension workers to focus on the identified needs of producers (Pannell *et al.* 2006), which meant that results were more likely to be accepted.

Researchers were challenged by the need to conduct studies under the 'real world' conditions of the farmlets, which incorporated a breadth of issues not often encountered in more traditional research. They were scrutinised by the producer-led Board, which asked researchers to work at a scale much larger than typical research plot experiments. Cicerone addressed this limitation by choosing a scale for the studies (three farmlets, each of 53 ha), which was seen to be 'credible' as it better represented the scale and complexity of commercial production systems than many previous experiments. This enhanced the relevance to producers' businesses and was coupled with in-depth economic analyses (Behrendt *et al.* 2006, 2013a; Scott *et al.* 2013a, 2013b), which allowed key messages to be distilled from the complex array of experimental results.

The close engagement that developed between livestock producers, researchers and extension specialists in the Cicerone Project, supported by the qualitative results reported above, resulted in a partnership based on mutual trust and interest. We contend that such a relationship was certainly more likely to encourage adoption of findings as proposed in the first hypothesis. In relation to the second hypothesis, that working more closely together will ensure greater relevance of research to end users, again we suggest that the evidence suggests that this was also proved true. This was especially the case for the footrot investigations, which had a clear outcome within the life of the Project. In relation to the farmlet experiment, which investigated two complex issues known to require considerable time to arrive at plateau conditions (higher pasture inputs and intensive grazing management), it was clear from the symposia results that producers found the trial to be of great value. The benefit of this closer relationship is likely to continue well into the future due to the publication of this Special Issue, which has provided a means of delivering the

results with far more certainty than was possible at the end of the trial in December 2006.

Producer leadership

The extent and depth of producer leadership demonstrated within the Cicerone Project is worthy of special comment. We suggest that it was greater than producer involvement in many other projects as, in this Project, producers were intimately involved in making critical decisions on the management and direction of the entire Project.

Trust and tensions between actors

The social network which evolved around the Cicerone Project was based on a high level of trust and credibility, both of which are characteristics identified by Pannell *et al.* (2006) to be highly desirable for enhancing adoption. At times, the needs of the livestock producers for credibility and flexibility, expressed through the Board, caused problems for some research participants who wanted to keep particular factors, such as stocking rate, under stricter experimental control. However, in all cases, a satisfactory compromise was found and researchers were able to accommodate these changes into their explanation of results. The result was a continuing positive relationship between all of the participants.

We contend that the closeness of the relationship between the producers and collaborators in this Project was substantially closer than the relationship between producers and scientists in the SGS Project described by Price (2003). While no formal analysis was conducted in the Cicerone Project of the 'social spaces' between Project 'actors' (Price 2003), we suggest that there developed a particularly high level of trust and close cooperation among all members of the Cicerone Board and with the two Cicerone staff members. This was in spite of the relatively high rate of turnover of producer members of the Board at Annual General Meetings of the Cicerone Project. While this turnover of producer members made it difficult at times for the Project to stay 'true to its course', the maintenance of trust was maintained; no doubt this was facilitated by the fact that, over the life of the Project, the producer occupying the position of Chairman changed only once.

Effect of drought conditions

The finding from the 2006 symposium that 'management through dry seasons' recorded the lowest score from survey respondents within the 'influenced practices' and 'useful information' categories is thought to be due to the fact that, up to the end of the farmlet trial, the relative performance of the farmlets during these dry years was poorly understood. It was only following a great deal of further analysis during the completion of the postgraduate theses and the preparation of this Special Issue that collaborators were able to draw more meaningful conclusions about the dry conditions experienced.

During the Project, the rainfall received was generally below average with extended periods of below-average soil moisture and above-average severe frosting (Behrendt *et al.* 2013b). These conditions meant that, during the trial, there was an ongoing need for appropriate information such as the demonstration of Prograze R methods of pasture and animal assessment held

during autumn and winter as well as other technical days, such as Stockplan R workshops to help producers understand and support their decisions.

Locally relevant

The participatory nature of the design of the farmlets (Scott *et al.* 2013c) allowed the provision of this research to be locally relevant and useful. One of the producer members of the Cicerone Board stated: 'Having a local research facility is of great value as we often hear messages from 'down south' such as: 'when the autumn break occurs'! In northern New South Wales, we very rarely have a valuable autumn break and hence many of the messages from southern research can be seen as irrelevant to our local district' (Dutton 2006).

Learning

The special value of these farmlets to undergraduate learning was due to the approach taken by Cicerone management expressed in its motto of 'compare – measure – learn – adopt', which meant that different relevant systems could be observed and measured immediately adjacent to one another, thus providing credibility to the comparisons. Thus, both the 'trialability' of the farmlet comparisons and the 'observability' of results from the three quite different management systems (Pannell *et al.* 2006), were key factors in facilitating adoption of these complex technologies. The farming systems approach adopted here is consistent with the recommendation from Bawden *et al.* (1984) that the investigation of problems as systems is a superior method of developing an understanding of complex agricultural issues by students.

Facilitation skills

The need for considerable facilitation skills in developing common approaches to complex areas of land and water management has been pointed out by Ison *et al.* (2007). We agree that these facilitation skills were highly desirable and indeed those with professional facilitation skills were used on several occasions during the Project. The Project benefited from appointing an Executive Officer (CG) with both science training and considerable practical extension experience as well as from having two professional extension officers (CE and RM) on the Management Board. In addition to contributions from several other extension officers from NSW DPI, the assistance of those with professional facilitation expertise was utilised especially during crucial planning and review meetings. During the Project, support was sought for a postgraduate scholarship to study the adult learning aspects of the Cicerone Project; unfortunately, this support was not forthcoming.

Social impacts

Cicerone was viewed as 'a great place for farmers to get away from our own patch and see what is happening elsewhere' (Dutton 2006). While the social impacts from the Cicerone Project were difficult to quantify, there was substantial evidence that great strides had been made in overcoming the perceived disconnect between researchers and producers identified before commencement of the Project (Sutherland *et al.* 2013).

As noted by Briske *et al.* (2011), resolving differences of opinion regarding complex issues such as grazing management, might be assisted if, in addition to understanding the scientific properties of grazed pastures and livestock, more effort was made to understand the human dimension of management decision-making, which governs rangeland management. Some of the other issues raised by Briske *et al.* (2011) include questions of the mental models graziers use, the seeking of cause and effect relationships and the value of the added investments in fences and watering points involved in intensive rotational grazing systems.

The decision making practices embedded in systems such as Holistic Resource Management (Savory 1991) were also considered during the planning phase of the Cicerone Project's farmlet experiment. Proponents of this method were invited to include one farmlet managed according to these principles, including the decision-making paradigms recommended by Savory. A meeting was held with trainers promoting this management approach. The trainers suggested that such principles could not be adequately measured in a farmlet trial of different systems, which was being proposed by Cicerone under its motto of 'compare – measure – learn – adopt'. The result was a decision to objectively evaluate 'intensive rotational grazing' as a whole-farmlet system compared with a typical management system in order to satisfy the interest expressed by Cicerone members in grazing management systems.

The question of cause and effect relationships has been explored in numerous papers of this Special Issue (Guppy *et al.* 2013; Hinch *et al.* 2013; Shakhane *et al.* 2013), with a detailed discussion of causal inference in unreplicated experiments by Murison and Scott (2013). Regarding the capital investments made in intensive rotational grazing systems, this issue has been explored in detail by Scott *et al.* (2013b). In addition, a paper by Scott *et al.* (2013d) presents an integrated overview of the findings of the farmlet experiment from as many points of view as possible, including not only aspects of soil, pasture and livestock but also aspects of management that could be quantified, such as profit, capital expenditure and labour time expended.

The publication of the Special Issue has been with the unanimous support of the former Cicerone Board members and all collaborators. Many of these, including livestock producer members, are coauthors of one or more papers, including this paper. Thus, this producer-led partnership has been able to develop shared goals, methods of answering questions and interpreting results necessary for successful participatory partnerships (Briske *et al.* 2011).

In response to the call by Briske *et al.* (2011) for better integration of the human and biophysical dimensions in studies of grazing management, we contend that the Cicerone Project succeeded in providing a suitable framework to manage and evaluate such 'complex adaptive systems' more comprehensively than most other grazing studies.

Formal extension assessment

It is acknowledged that the outcomes from the extension component of the Project would have been more completely understood had a formal, objective assessment been undertaken

by a third party. However, being producer-led, the funds paid to the Project were spent directly on Cicerone activities with only limited funds being directed to any of the collaborating organisations including the main institutional extension provider, NSW DPI. Thus, without funding support, the ability for any of the institutional partners to devote significant resources to the Cicerone Project, such as supporting a formal evaluation of the extension outcomes, was limited. The need for sufficient appropriate resources to be allocated for social research relating to learning partnerships has been noted by Crawford *et al.* (2007).

As noted in the final paper of this Special Issue (Coventry *et al.* 2013), the high degree of commitment shown by institutional partners to the Cicerone Project would have been even greater if a mechanism could have been found to provide some funding to support those contributions made by partners. For example, in the final year of the Project, when a decision was taken to conduct a substantial outreach effort to different regions, some marginal funding was provided by the Cicerone Project to assist the extension partner, NSW DPI. This funding triggered a significant complementary in-kind effort, which successfully developed and delivered the 'roadshow' content to six different localities at minimal cost to the Cicerone Project.

Conclusions

As an example of PAR, this Project encountered some significant challenges, not only in conducting complex and challenging multi-disciplinary field studies but also in managing the social interactions which affect all large collaborative projects. Nevertheless, it is clear that, consistent with the findings of Ison and Russell (2000), genuinely seeking input from graziers and then acting upon that advice by conducting locally relevant research (Reeve *et al.* 2000) in an objective and trustworthy fashion (Pannell *et al.* 2006), with the active participation of graziers, has brought about great benefits, as demonstrated by the substantial evidence presented in this paper.

We have attempted to provide an overview of the extension and learning outcomes of the Cicerone Project substantiated by evidence wherever feasible. However, it must be stressed that, as reported in other papers in the Special Issue, a complete understanding of the findings of this multi-faceted, complex Project were imperfectly understood at the end of the Project (December 2006). Since that time, the four postgraduate students involved in the Project have completed their studies, considerable further data analysis has taken place and all of the papers for this Special Issue have been prepared. This has meant that the findings that the Project might have wished to see adopted were not fully understood while the Project was still current. The fact that the learnings have continued to accumulate beyond the end of the Project has no doubt further increased the overall value of the Project. It is to be hoped that these more considered ruminations contained in this Special Issue will facilitate continued learning and be of benefit to extension programs and, most importantly, to livestock producers long into the future.

Acknowledgements

The authors gratefully acknowledge the contribution and commitment provided by the members of the Cicerone Project from 1998 to 2006. The

substantial support and commitment of time to the extension effort by Mr Michael Lollback and Ms Alison Strong (formerly NSW DPI) and of Dr Julian Prior of the University of New England is gratefully acknowledged. Planning for the extension components of the Project also benefited from contributions from Mr Alan Bell and Mr Warren Macdonald of NSW Agriculture, and from Dr Doug Gray, Dr Geoff Kaine and Dr Ian Reeve of the University of New England.

Funding support for the Cicerone Project was provided by woolgrowers and the Australian taxpayer through AWI. Other financial support for postgraduate scholarships was provided by the Australian Sheep CRC and by the University of New England. Substantial in-kind contributions were made by the Cicerone Board members and by the University of New England, NSW Department of Primary Industries, CSIRO and NSW TAFE.

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