

Just knowing: tacit knowledge

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Abstract. This paper reports on a study examining the role of tacit knowledge in industry innovation, based upon a theoretical review and the results of two farmer workshops. It examines possible ways that an understanding of tacit knowledge might be used in future directions for professional development in agriculture. Tacit knowledge can be understood as the intuitive understanding that people use to guide their behaviour, particularly in response to stress, unexpected challenges and complex situations. Farmers with a high managerial ability appear to rely a lot upon tacit knowledge that they have built up through experience. The farmers attending the two workshops closely associated certain types of personality with acquiring tacit knowledge and professional learning. Being well connected in social networks with innovative farmers and expert agriculturalists was important to them for sharing information and building their own knowledge and capability.

Keywords: professional farming, capability building, farmer innovation, farming styles, networking, personality.

Introduction

Many studies have been carried out to relate the use of farming practices, production efficiencies, farmer age, farming experience and other quantifiable factors, to farm business success (e.g. Carley and Fletcher 1987). A number of such variables have been shown to be influential and have been included in simulation models that explain operational farming systems and underpin management decision making (Marshall et al. 1991). However, a key capability required in order for farmers to make use of the research outputs in decision making, is a requisite level of systems knowledge about farming.

Knowledge has been described as the most important resource for businesses in the 21st century. Knowledge that is unevenly distributed and unequally adopted across an industry is costly, inefficient and compromises industry outcomes (Elwyn et al. 2007). A knowledge-based view of farming considers that knowledge is its most critical resource and how it is applied provides its greatest competitive advantage (Grant 1996).

In a similar way to peoples' understanding of other areas of management, knowledge about farm management can be considered in explicit or tacit terms (Polanyi 1966). These forms of knowledge have been described with both dichotomous and continuous characteristics. At the extreme poles of these descriptions, explicit knowledge has been described as knowledge that can be codified, articulated and transmitted through systematic language and formalised procedures. Explicit knowledge in this paradigm is more tangible than tacit knowledge because it can be examined and communicated at a distance from its source. In contrast, tacit knowledge is described as the intuitive understanding that people have and that cannot easily be separated from them and the way that they behave.

Individuals know more than they can explain to others (Murray and Hanlon 2010). This additional knowledge that they have is generally described as tacit knowledge. It is intuitive, hard to verbalise and largely unarticulated. The benefit to professional farming managers of developing their tacit knowledge is that it represents a composite of well-developed cognitive abilities for addressing ill-structured problems (Kuo 1998). Tacit knowledge may be hard to communicate, but it is deeply rooted in action, involvement and commitment within a specific context; it is 'a continuous activity of knowing,' (Nonaka 1994, p. 16) and is sometimes described as 'just the way things are done around here' (Spender 1996).

A knowledge-based approach to farming brings together information, uncertainty, learning, managerial cognition and the use of technology to make strategic and operational decisions (Grant 1996). Knowledge creates value for farmers through:

- Its transferability. Ideally knowledge that is known by individuals within a farming operation can also be widely accessible to all its decision makers. The decision makers will also want to utilise the knowledge of successful operators outside their immediate farm business. Explicit knowledge is easily made accessible to other people, but tacit knowledge tends to be slow to transfer, more costly to develop and has relatively uncertain results.
- Its capacity for aggregation. Knowledge that builds upon previous knowledge and experience is more effective than knowledge that is isolated and idiosyncratic. Explicit

knowledge is able to be documented in various forms and moved around. Explicit knowledge particularly suits electronic transfer via computer technology. In contrast, tacit knowledge is retained by individuals and so is only available when the people with that knowledge are also available.

- Its ability to produce capturable value (its appropriability). Knowledge creates value when it is applied. Explicit knowledge can easily be lost by those agents that may have paid for it but have limited opportunities to apply it and acquired from them by others that may not have paid the full costs but that have greater opportunities to apply it. Tacit knowledge is less easily transferred between individuals like this and so provides those individuals that have tacit knowledge with greater opportunities to extract value from it.
- The ability to develop and integrate specialisation. Human beings have a finite capacity to build and store knowledge for decision making. This means that subject experts are inevitably specialists with a large amount of tacit knowledge developed through their experience. The explicit material needed to transfer that knowledge tends to be limited in its usefulness due to its difficult language, complexity and assumed level of technical understanding. On the other hand transferring expert tacit knowledge is limited by the recipients' access to the technical expert.
- The embedded contribution it makes, in all parts of farming systems. There are no parts of farm systems or the instruments, tools and machines operating within them that do not depend upon the knowledge that was used to design them and implement them. Explicit knowledge can be easily codified as manuals and guidelines that are circulated with the materials and systems. Accessing tacit knowledge requires matching an appropriate mentor with the activities to be undertaken, the context in which it is being applied and the goals of the farmers involved.

Farmers with a high managerial ability in systems management appear to rely more upon their inherent skills and intuition than upon decision support systems and analytical processes (Wilkinson and Parminter 1997). They use the tacit dimension of their knowledge built up through experience to assimilate and adapt the explicit knowledge they acquired from external sources (Nuthall 2009). Despite this, little research seems to have been directed at understanding the psychology of farmer decision making and how further development of the managerial capability and knowledge of individuals within the primary sector could be addressed.

Background

To build an industry's capacity to acquire and utilise knowledge requires bringing together explicit and tacit knowledge capability (Nuthall 2009). The balance between them depends upon the subject matter. Technical subjects that can be applied across a wide range of contexts suit explicit knowledge learning with formal material developed. The use of pesticides is one example of this, with explicit knowledge recorded on labels and in product guides. Management systems that require modification and adaptation are an example of subjects requiring the communication of tacit knowledge.

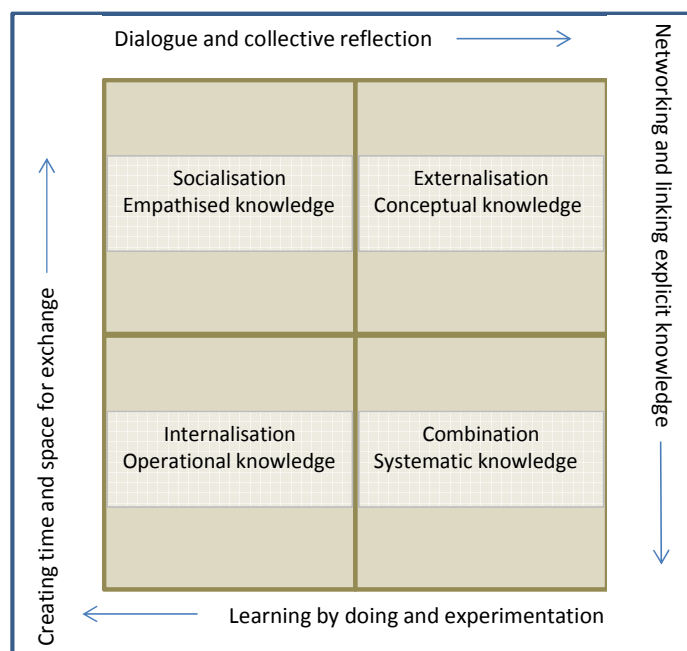
There are a number of characteristics about tacit knowledge that make it difficult to transfer across farming industries (Murray and Hanlon 2010). One of these is that tacit knowledge is causally ambiguous as the precise reasons for its success and failure when it is being applied cannot be known. The more tacit the knowledge, the more ambiguous it will be by nature. Increasing the proportion of tacit knowledge associated with a capability is likely to increase its ambiguity due to it being even more complex in breadth and depth than the knowledge it is replacing. The accumulation of tacit knowledge is highly contextually dependent and the expression of tacit knowledge is also situationally dependent. Therefore, different people in different situations may learn different things from the same sources of tacit knowledge. Explicit knowledge tends to be presented as a complete package whereas tacit knowledge is often incomplete and must be added to by the receiver. All of these factors contribute towards the ambiguousness of tacit knowledge and the complexity of its transfer (Murray and Hanlon 2010).

Tacit knowledge transfer is also made more complex because it can be affected by the source, the recipient, the practice and the businesses context (Murray and Hanlon 2010). The more reliable, credible and trustworthy the source the more likely it will be for recipients to engage with them. If the recipient cannot take in the knowledge due to a lack of motivation, resources or ability then they are unlikely to learn. The relationship between the source and the recipient must be constructive in order for there to be complete openness about knowledge exchange. As the relationship is important, so is face-to-face contact. That means source and recipient would usually need to be proximal although video technology may be able to overcome some of the

limitations of distance. It can take time together before people with contrasting values and perspectives are able to share meaningfully about their tacit knowledge (ibid).

Nonaka (1994) developed a pathway (shown in Figure 1) describing how it may be possible to extract tacit knowledge and make it explicit for transfer to other parts of a firm or industry. The pathway mapped by Nonaka is an iterative and spiral process of socialisation, externalisation, combination and internalisation.

Figure 1. Organisational transfer of tacit knowledge



Source: Nonaka 1994

In the figure, socialisation is the sharing of tacit knowledge; externalisation is when that tacit knowledge is codified into metaphors, analogies, figures and stories to create new concepts. Combination is when the new concepts are incorporated into transfer documents and materials for transfer. Internalisation is when the new knowledge acquired from explicit sources is then assimilated by learning, doing and experimentation and so becomes tacit knowledge again.

Sharing tacit knowledge within such a network requires a number of conditions:

- A purpose and set of intentions for the future
- Personal relationships based upon trust
- A shared knowledge base for exchanging information
- A degree of creative chaos and/or an externally generated crisis
- Requisite variety so that effective knowledge can be created efficiently
- Benefits for people sharing their knowledge
- Autonomy amongst participants and freedom to act upon their new knowledge
- Willingness to admit knowledge gaps and failures.

The Nonaka model is a conceptual model for organisations or industries. However it is considered by some authors to be too broad to cover the transfer of tacit knowledge, which they consider to only occur between individuals. Only the socialisation step in the Nonaka model is specific to tacit knowledge (Murray and Hanlon 2010). Even then, the Nonaka model can only be applied to tacit knowledge that is able to be explicated. Some tacit knowledge (tacit implicit) may be just too inaccessible and personal to be codified as required in the Nonaka organisational model.

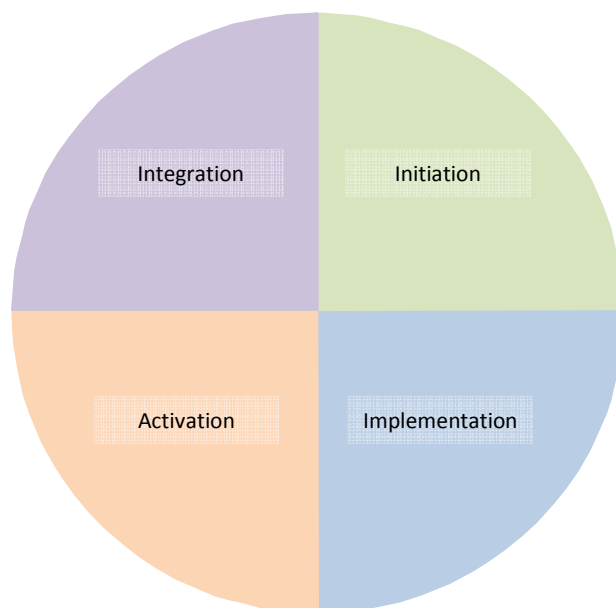
The participants in the study reported in this paper recognised tacit knowledge as a personal attribute that could be passed between individuals. As such, the four stage model of knowledge transfer developed by Szulanski (2000) describing transfer between individuals is much more specific to the types of tacit knowledge concepts expressed by the farmers involved in this study (Murray and Hanlon 2010).

The four phases of tacit knowledge transfer shown in Figure 2 consist of:

1. Initiation when there is recognition that a new invention, innovation or practice exists and a knowledge gap that needs to be addressed. The perception of this gap provides motivation for change.
2. Implementation of the change process by acquiring the necessary materials, skills and resources and maybe some trialling.
3. Activation is the day when the new way of doing things replaces the previous way of doing things. For example, this may involve discarding old equipment or taking on a new role.
4. Integration is the process that people go through to fully adapt a new way of doing things to their own needs and systems. The time required for this may be hard to estimate but is often not catered for in the initial planning.

The simplicity of the phases may suggest that tacit knowledge transfer is a normal and easy process. However, there is much evidence to the contrary, particularly in complex systems. The transfer of knowledge can become 'sticky' during any phase (Szulanski 2003; Elwyn et al. 2007; Murray and Hanlon 2010).

Figure 2. Four phases of knowledge transfer



Source: Szulanski 2000

If each phase is considered in turn, stickiness can be associated with the specific attributes of tacit knowledge.

1. Stickiness can arise during the initiation phase as a result of people having difficulty with recognising opportunities for gaining new knowledge. It can take considerable cost and time to identify differences that might provide practical advantages. These costs are likely to be greatest with tacit knowledge because of the difficulties of being alongside people when they are applying their knowledge.
2. During the implementation phase, stickiness can result from inadequate communication between the source of information and the recipient. This particularly applies when a technology or practice is being applied in a new context requiring additional adaptation. It results from differences arising between how things 'should be done' and 'how they are actually done'. The precise reasons for success or failure in application may not be known but are exacerbated by large differences between these. Tacit knowledge is highly context dependent and so is likely to suffer more than explicit knowledge during this phase.
3. Stickiness during the activation phase is due to similar factors as during the implementation phase. Problems that might arise will be easier to resolve when all the expected causal relationships are known. Explicit knowledge that requires additional tacit knowledge for successful application is most vulnerable during this phase if personal support from a mentor is not available.
4. If too many problems arise, especially early on in the integration phase, the new way of doing things may be abandoned. If it goes well then the new practice becomes part of everyday practice. Again reliance upon explicit knowledge communication may result in rejection of new knowledge within the industry.

Tacit knowledge has been mostly studied and understood in research about personalities and how these affect learning. Alternative studies place tacit knowledge in research about intuition and cognitive psychology (Reber 1989). The latter is an important development because it means that tacit knowledge can be developed through learning experiences. Possibly both are involved. However, the review reported in this paper generated three questions for the work with farmers to consider:

1. Do the distinctions between the forms of knowledge – explicit and tacit, assist farmers make sense of their own learning experiences?
2. Can the concepts of tacit knowledge be useful to farmers for their professional development?
3. What role might tacit knowledge have in formal industry approaches to developing learning and building capability amongst farmers?

Methodology

To understand the place of tacit knowledge in the lives of farm managers, two workshops were held with farmers. One workshop was held in Feilding in the Manawatu Region of New Zealand (May 2012), the other in Invercargill (July 2012) the provincial capital of Southland. A sample of farmers was drawn in each locality, using convenience sampling of farm owners, sharemilkers and farm managers. Convenience sampling is known as a type of non-probability sampling because only those people known to the researchers are able to be included (Denzin 2009). The main advantage of using this sampling technique was the accessibility of the people involved. The main disadvantage was the lack of statistical representativeness. However in this study, the authors wanted to describe the relationship between tacit knowledge and being a professional farming manager and in this case the advantages of convenience sampling outweighed the disadvantages.

At the workshops, post-it notes® and the concept pyramid method was used to bring together participants' ideas (Parminter and Perkins 1996). The workshops started with participants contributing their ideas about the key strategic subjects associated with being a professional farming manager. These ideas were gathered, clustered and given a heading. After that, participants added new ideas specific to tacit knowledge. Finally participants reviewed their experience at the workshop and discussed how the primary industries could develop capability in tacit knowledge.

There were some differences between facilitation of the Feilding and Invercargill workshops. At the Feilding workshop there was no prior structure for people to use with their post-it notes. At the Invercargill workshop participants as a starting point were provided with the headings from the Feilding workshop. This saved some time but may have reduced some innovative thinking. At the Feilding workshop people were asked to develop their ideas about tacit knowledge subsequent to outlining their ideas about explicit knowledge. At the Invercargill workshop participants integrated their ideas about tacit knowledge with their ideas about explicit knowledge. This had the effect of Feilding participants concentrating on the more unique attributes of tacit knowledge and the Invercargill participants thinking more about the integrative aspects of tacit knowledge.

The workshops addressed the first question by examining how distinctive and complementary the two sets of knowledge (explicit and tacit) might be when the farmers applied them to their own professional abilities. If the two sets of knowledge overlapped with each other or were mutually exclusive, the concepts would be considered to have low utility amongst farmers. The second question was examined by comparing the relative degree of association between the tacit knowledge concepts and the farmers' own ideas about how to become professional farming-managers. If the tacit knowledge concepts had equal degrees of association as explicit knowledge concepts they were assumed to be equally important to growing capability. The results to the third question was dependent upon whether or not the tacit knowledge concepts were related to developing expertise in the technical areas of farming or the managerial areas. If they were related to the technical areas, then this would provide an opportunity to build on existing learning courses that have been widely supported in the industry. If they were more related to managerial areas where the interest in courses is much lower, then another approach would be required.

Results

The workshop results indicated that being a professional farming-manager required capabilities in a number of areas. Those capabilities identified at the workshops were (Parminter et al. 2012; Parminter and Neild 2012):

Explicit knowledge

- Practical farming skills including: pasture utilisation, livestock performance, stockmanship, machinery and food quality.
- Best use of all natural resources including: efficient resource use, controlled weeds and pests, understanding of climate and weather.
- Informed business perspective including: consistent profitability, effective decision making, maintained and implemented farm policies, good time management, passion for the industry and knowledgeable about relevant rules and guidelines.
- Effective people managing including: effective networking, high performance leader, good communication, being a role model.
- Strong personal belief including: personal drive, adopter of improved practices, upskilling and learning, work-life balance.

Tacit knowledge (Feilding)

- Utilised tacit knowledge including: being visionary, taking risks, being passionate, proactive, courageous, confident and focussed.

Tacit knowledge (Invercargill)

- Upskilling and learning including: openness to learn, learning how to learn, self-critical evaluation, self-reflection, continually learning and observing others.
- Personal drive including: big-picture perspective, setting goals, visualisation of outcomes, passionate, motivated, taking initiative, personal integrity and confident.
- Effective networking including: being charismatic, trustworthy, understanding personalities.
- Effective communication including: being a good listener, handling conflict, sharing experience and encouraging people to think.
- High performance leadership including: understanding learning styles, coaching others and providing examples.
- Effective plan implementation including: being forward thinking, efficient, adaptive and having high standards.
- Maintaining and implementing farm policies including: expressing values and building a sustainable culture.
- Good stockman including: being instinctive with livestock.

For the workshop participants, people seeking to be professional farming managers needed explicit knowledge to develop their capability in practical farming, business acumen and people skills. The sorts of people that were going to excel in these areas were going to have a strong personal drive tempered with achieving a work-life balance for themselves and their families.

The Feilding list of tacit knowledge attributes of a professional farming manager built further upon their description of explicit knowledge attributes of 'Personal Belief'. This suggests that the participants consider the acquisition and application of tacit knowledge to be related more to the personality of the farming manager rather than to a particular expertise in using practical skills. In part this may have been a result of the way the question was asked at that workshop. In the Invercargill workshop, participants also associated tacit knowledge with capabilities to do with people, relationships and decision making. There was also support for associating tacit knowledge with livestock working relationships. At the Invercargill workshop again, tacit knowledge was not linked to the more practical skills and capabilities. This may be because participants did not feel the tacit knowledge in practical subjects was enough to distinguish professional farming managers like themselves, from other farmers.

1. From these results, the acquisition and development of tacit knowledge appears to require an understanding of how to utilise personality differences for directing personal growth.
 - a) A knowledge of one's own personality – its strengths and weaknesses, its effect upon others and their effect upon ones' self: e.g. (see Parminter et al. 2012 and Parminter and Neild 2012) 'understand personalities'; 'willing to be different'; 'calculated risk taker'.
 - b) Skills in self-reflection appear needed – how to dispassionately observe one's own behaviour, its social consequences and how to improve contextual assessments and decision making: e.g. 'learning how to learn from mistakes and experiences'; 'self-critical evaluation of farm system'.
 - c) Openness to new ideas and doing things differently is also required: e.g. 'learning from observing others' 'taking the initiative'.

2. Tacit knowledge may require expanding peoples' social networks to include people that are valued mainly because they challenge expectations and assumptions and so encourage learning:
 - a) Ones' own learning: e.g. 'learning how to learn from peers'; 'being able to filter biases and opinion from information and advice'; 'accepting constructive criticism'.
 - b) Creating opportunities for others to learn: e.g. 'sharing experience and understanding'; 'encouraging people to think, rather than providing them with the answers'; 'being a coach'.
 - c) Being willing to work with others for the collective good: e.g. 'obtaining the respect of others'; 'striving for win-win'; 'proud of industry'.
3. Farmers recognise that tacit knowledge is often applied to systems-thinking and decision making, incorporating people – their needs and abilities:
 - a) Whole system interactions: e.g. 'exploring and knowing more about your own system'; 'putting together snippets of knowledge'; 'big picture perspective'.
 - b) A particular emphasis was made about the way that professional farming managers displayed tacit knowledge when working with livestock: e.g. 'instinct with livestock'; 'great stockman'.

When the results are related back to the initial three research questions, it appears that the farmers quite easily recognised in their own experiences the differences between developing their explicit knowledge and developing tacit knowledge and the roles that each of these had in their professional development. The farmers tended to rely upon sources of explicit knowledge to build their capability in technical areas of farm systems. The farmers mainly associated acquiring tacit knowledge with building their managerial capabilities particularly in relation to personal development, networking and systems decision making. Although the importance of tacit knowledge to professional development within their industry was self-apparent to these farmers, at a personal level it was difficult for them to assess and ascribe value to opportunities for further developing their tacit knowledge through industry initiatives. The farmers strongly related tacit knowledge to particular personality types. That degree of association makes the application of tacit knowledge initiatives widely across the industry more difficult to promote.

Application

Intuition that underpins tacit knowledge is considered by some researchers as an indefinable characteristic that only particular managers are able to use to their advantage. In contrast, other studies have indicated that it is possible to define intuition and identify the people exploiting its strengths to become recognised experts in their fields (Kuo 1998, p. 90). What is important is that tacit knowledge cannot be appreciated separately from the actions that have given rise to it and sustain it. Tacit knowledge is critical to professions where people know-by-doing and where success is dependent upon managers interpreting their operating context and reading the potential opportunities and threats (Busch 2008).

Being able to link with innovative people willing to share rather than hoard their knowledge is one way of overcoming knowledge stickiness and is important for building managerial capability. This has been described as adding to peoples' social capital (Nuthall 2009). The social capital relationships that exist between managers and individuals in other parts of the industry from producers to retailers assists them to access new knowledge and find new ways to increase productivity (Ireland et al. 2003).

Only when the recipients have internalised and recreated the tacit knowledge is a transfer programme complete. The ambiguity and uncertainty surrounding tacit knowledge could suggest that the effort needed to codify it and incorporate it would enhance its transferability. However, too much codification actually limits internalisation and the redevelopment of tacit knowledge (Polanyi 1966). An active learning programme as part of the transfer process will enable recipients to adapt and configure the received knowledge to fit their situation and build tacit knowledge.

Introducing new technologies and practices that require adaptation to fit their operating context is dependent on the availability of tacit knowledge to minimise the risks of losses to individuals and industry rejection. Objective information provided through explicit knowledge material describes the attributes, qualities and limitations of new technologies and practices (Grant 1996). The subjective information in tacit knowledge is where recipients learn how to modify a technology to fit their personal goals and circumstances. As described earlier, the availability of tacit knowledge ensures that people can extract the maximum advantages from the new technology in the shortest time (Grant 1996). Introducing new technologies and practices

means providing learning programmes that recognise three dimensions to tacit knowledge (Eraut 2000):

1. Understanding people and context. These provide a way of understanding cause and effect relationships between peoples' actions and situations and how they affect the outcome of introducing a new technology or practice
2. Routinised actions. Learning to repeat a series of actions and procedures over time internalises these so that they become intuitive. This enables people to become more aware of changes in context rather than the task itself and engage in problem solving and adaptive decision making.
3. Intuitive decision making. Initially people developing new skills tend to focus upon recognising patterns in their actions and establishing standardised procedures that they can use. Gradually they replace this with a growing awareness of the interactions between different situations and the procedures that they have been following to develop new decision making heuristics.

These dimensions are fully integrated when people carrying out routine actions recognise a change in context leading to intuitive decision making and the establishment of new routines (Eraut 2000).

Active learning methods have been used to stimulate professional development learning in tacit knowledge such as that being developed for farmers (Garet et al. 2001). These methods include:

- Observing and being observed, creating opportunities for farmers to observe scientists, consultants and other expert farmers in action. It also involves having people from these industry roles observing farmers on their own properties. These observations can take a variety of forms from direct participation to video recording.
- Planning future activities involves taking a project approach to personal development. It requires using a project structure to setting goals and milestones, incorporating sources for new ideas, scheduling meetings with other people involved in similar learning projects, recording learning results and having these plans reviewed and critiqued over the life of the project.
- Research and communication activities that involve farmers working on problem solving subjects important to them, with the input of technical experts from within and external to their industry assists farmers to build their tacit knowledge. Participating farmers are in the best position subsequently to transfer their tacit knowledge to other farmers.
- Evaluating and reviewing results requires that farmers are able to associate their personal and business goals and objectives with numerical and subjective performance measures. These performance measures can be monitored overtime and regularly reviewed with others to identify opportunities for improvement. They also can be used to identify new knowledge and innovation in the industry that can be applied more widely through tacit knowledge transfer.

All of these action learning methods were experienced by some of the farmers participating in this study and considered beneficial by them.

Conclusions

Realising the benefits of tacit knowledge and overcoming possible reasons for 'stickiness' is important for agricultural sectors in three key areas of industry development:

1. Obtaining the maximum advantages for professional development from explicit knowledge material and formalised learning events by integrating these with tacit learning
2. Increasing the uptake of new technologies and practices by providing support for tacit learning
3. Encouraging the transfer of individual innovation and increasing collectively held knowledge by creating opportunities for tacit learning

Formal courses in professional development tend to leave out opportunities for learning from tacit knowledge. Generally formal courses on their own are considered to be less effective at building expert knowledge than utilising experiential approaches such as study groups, mentoring and coaching (Garet et al. 2001). The latter are much more suited to presenting a combination of explicit and tacit knowledge material. Utilising the work day experiences of farmers builds greater tacit knowledge and can have more of a long-term influence on their learning than relying on abstract concepts and principles. This may take more time to present but extending the length of short duration courses has in itself been shown to increase their effectiveness (Garet et al. 2001). Professional development activities that involve farmers in

field studies outside the learning events but with people from the same rural community, is thought to enhance the reinforcement of the lessons being learnt at the events themselves (Garet et al. 2001).

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