FACILITATING LEARNING: ENHANCING DAIRY FARMER COMPETENCE THROUGH WORKSHOPS

A thesis submitted in partial fulfilment of the requirements for the degree of Masters of Applied Science in Agricultural Extension

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Abstract

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Agricultural extension in New Zealand pastoral dairy farming systems has traditionally comprised a mix of technology transfer, education and consultancy. Activities have been targetted at individuals, discussion groups and farmers mostly through the mass media and group activities. It has been assumed that the provision of information (technology transfer) will lead to individuals being better placed to make sound decisions, be innovative and make appropriate changes to their management practices. Individuals were assumed to benefit through a mix of improved profitability, more efficient use of resources and the achievement of non-profit oriented goals (e.g. personal satisfaction, lifestyle/family, land stewardship). Due to ever-changing circumstances, managing a viable farming business in the future will, however, require a different way of thinking compared to the past.

This study focused on the provision of learning tools tailored to the future needs of dairy farmers. Agricultural extension has evolved over the last two decades from "Transfer of Technology" to a paradigm of participatory action learning. The learning process involves the building of knowledge. Two areas of dairy farmer learning needs were identified using a competence questionnaire and workshops were then designed to meet these needs. The facilitated workshops "Northland Dairy Cow Nutrition" and "Preferred Future" were piloted and evaluated with dairy farmers. The latter showed that as well as achieving specific learning outcomes and applying new knowledge to their farming business, participants also gained confidence in their ability to learn. The outcomes for the "Preferred Future" workshop were comparable to those reported for "Dairy-MAP" (Pennsylvania, USA), "Smart Move" (Queensland, Australia) and "Farm Finance" (Pennsylvania, USA) workshops.

Reasons for a lack of enthusiasm for formal learning in the farming community have been outlined in the literature. Knowledge construction has rarely been acknowledged as an outcome of agricultural extension or education programmes. If, however, farmers become more aware of their learning needs through the application of a competency framework, they are in a stronger position to demand learning experiences that are relevant, timely, convenient and effective for them.

The major implication arising from this research, for both agricultural education and extension workers, is the need for a paradigm shift from the Transfer of Technology model to one of facilitated learning. This will require education and extension professionals to learn new skills themselves in order to provide leadership in facilitating learning. This will require competence in designing materials and tailoring activities to the learning needs of farmers. Positive learning experiences occur in facilitated workshops where there are: clearly identified learning objectives; a course design that builds participants' knowledge to meet these objectives; and facilitation that utilises the principles of adult learning and creates a non-threatening, non-judgmental and enjoyable learning environment.

Keywords: agricultural extension, education, dairy farmers, facilitation, learning, workshops
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My heartfelt thanks goes to the Massey University staff members who contributed to both of these workshops. Thank you for bearing with me when I insisted about how they were to be designed and conducted. It was great to see the satisfaction gained by the contributors at the end of these workshops. It is also satisfying to know that these design principles are now being incorporated into the agricultural academic courses at Massey University.

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PREFACE

"For every group of learners someone must take the role of instructor - the individual responsibility for helping the people present to learn".

Wlodkowski 1995 p. ix

None of us are exempt from change. In 1977 I enthusiastically started my career as a Farm Advisory Officer with the Ministry of Agriculture and Fisheries - as it was then. At that point I considered that I had a job for life, with a simple, linear career path ahead of me. After nine years practising agricultural extension I resigned. The working environment was rapidly changing and agricultural extension as we knew it was no longer an option. I spent two years providing a farm management consultancy service (on a fee-charging basis). For the following five years I sold rural real estate. This was not a planned career move, but more an act of fate. It taught me a lot about myself, about other people, and about coping with change.

In 1993, I was fortunate in securing a short-term appointment as Agricultural Extension Co-ordinator at Massey University. Although I came to the job with a fresh outlook and a desire to somehow improve agricultural extension, the first major change did not occur until I started studying for my Masters. A paper from educational psychology, "Cognition and Instruction", provided me with a new vocabulary and enabled me to build a new conceptual framework about learning. A review of the international literature on agricultural extension provided me with volumes of inspiration. The literature also provided me with insight in workshop design, facilitation, and evaluation and organisational learning.

I am enthusiastic about agricultural education and extension. This is due to the new knowledge I have recently built, and the opportunity to think differently about what it is we are trying to achieve, and how we might achieve it. This has given me new confidence. I hope to use this to give others new confidence also. This thesis provides some clues about how this might be achieved. It is supported by evidence from the international literature and from personal experience gained during the research.

Chapter 1

OVERVIEW AND PROBLEM STATEMENT

"Until senior managers become aware of the way they reason defensively, any change activity is likely to be just a fad."

Argyris 1991 p. 106

1.1 Introduction

Dairy farming in New Zealand prior to the 1950s relied heavily on pioneering skills, such as land clearing and development, building milking sheds and fences, and delivering milk or cream to the local factory (Nightingale 1992). In the 1950s and 1960s the focus was on increasing production through the use of fertiliser, better pasture species, further land development and improved grazing management. The 1970s saw a new level of improvement in pasture and stock management as highly developed farms often had little to gain from further land development. These phases in the evolution of dairy farming in New Zealand required hard physical work. More significantly when considering learning, the results were observable and acquiring knowledge and skills from others was relatively easy for those who sought improvement.

From the 1980s, however, the focus has been on profitability and improved management of all aspects of the dairy farm business. These aspects of farming require more cognitive effort than hard manual labour and are not readily observable. Acquiring these skills is not simply a matter of observing others: it requires the building of new conceptual knowledge.

The mid-1980s also saw a change in the level of financial support for dairy farmers by the Government (Sandrey & Reynolds 1990). At the same time, changes in the global economic and marketing environment placed further pressure on dairy farm profitability (New Zealand Dairy Board 1998, Rauniyar & Parker 1999). This required farmers to further improve the efficiency of their farming operations due to declining terms of trade and an increasingly uncertain economic environment. The new skills

required to assist this process, such as strategic planning and financial management, are not easily transferred by observation: they require time and effort to assimilate and practice. Few opportunities were made available for farmers to develop those skills because those providing agricultural education and extension services at the time appear not to have recognised the full significance of the rapidly changing business environment for New Zealand dairy farming. In their defence, the New Zealand Dairy Board's role in managing market and price risk, and their payment of an average milksolid price for the season, was substantial in reducing the impact of changes in the external commercial environment.

The on-going economic pressures to manage a viable dairy farm business provide challenges and opportunities for providers of agricultural education and extension, as well as farmers. Improving practice not only requires new information; often it also requires a new way of thinking so that the relevance of new ideas and their value is understood. Hence, to provide leadership in farmer learning, education and extension professionals need to provide learning materials and formats that help farmers build new knowledge and skills to equip them for a continuously changing business environment.

1.2 Problem statement

Farmers are frequently urged to improve their management practice and adopt innovations in order to secure the future viability of their farm business (e.g. Waugh 1998, Penno 1998). Despite this on-going advice, few formal opportunities have been tailored to the needs of farmers that help them build new knowledge and skills so they can better cope with future uncertainty. Added to this, their childhood experiences of learning, combined with low self-esteem of their ability to learn (Moore 1990, Rural Development Centre 1991) often make them reluctant to attend formal or non-formal learning opportunities.

It was against this background that the research question for this thesis was posed:

"How can educational or extension organisations provide a useful service to help farmers develop competence in planning and managing change in an uncertain future?"

1.3 Hypotheses

Two hypotheses were formulated for the research:

1. Farmers can build competence through a short-course workshop (16-20 hours) that will enable them to apply the resulting new knowledge and skills to their own farm.

2. Agricultural education professionals can develop competence in identifying farmer learning requirements and use this information to design, facilitate and evaluate short-course workshops that meet farmers learning needs.

1.4 Objectives

The first research objective was to identify dairy farmer competence for a range of management activities, especially those related to farm business management. This information was used to identify high a priority learning need (competence in strategic planning), which was used as the specific case study for Hypothesis 1. In order to test this hypothesis it was necessary to conduct a workshop, and to assess farmer competence in strategic planning before, during and after the workshop. Objective two was to design and pilot a workshop to build competence for strategic planning. Information and feedback from this workshop was used to test both hypotheses. The process for achieving the second objective required a third objective: to develop competence in workshop design, facilitation and evaluation.

During the course of this research an opportunity presented itself to design and run a workshop for farmers on dairy cow nutrition. This experience is reported here (Section 4.1) because it provided an experiential learning opportunity for workshop design, facilitation and evaluation.

1.5 Benefits and benefactors of the research

The research was targetted at two client groups: dairy farmers and those providing educational activities. The initial benefactors were, therefore, the dairy farmers who attended the workshops. As a result, these farmers developed new knowledge and skills in feeding dairy cows and strategic planning for their farm business. The other benefactors from this research were the agricultural education professionals who developed competence in identifying farmer learning needs and in the design, facilitation and evaluation of workshops to meet these needs.

The knowledge and skills gained from the research can be used to refine methods for identifying and meeting other farmer learning needs. In turn this will lead to improved dairy farm management in New Zealand. The methods and materials used in this investigation could be applied to other sectors of New Zealand agriculture.

1.6 Thesis overview

This study investigated the role of individual learning in the context of agricultural extension and education. The imperative for farmer learning is driven by the need to manage a viable agricultural business through innovation and continuous improvement in an uncertain economic, climatic and socio-political environment. In Section 2.1 the trends in agricultural extension from technology transfer to participatory action learning and research are outlined from a review of the international literature. Agricultural extension as an instrument of change has itself changed from a persuasive to a facilitative style in the last 50 years The facilitative style is more aligned to education - helping individuals to learn and build their own competence rather than simply transferring information from science. While the role of learning is recognised in most agricultural extension models, there is very little evidence in the agricultural extension literature (at least by the activities carried out and the literature referenced in written articles) that there is an understanding of the cognitive aspects of individual learning. Cognitive aspects of individual learning are discussed in Section 2.4. Organisational learning is discussed briefly, especially

leadership, communication and elements of a learning organisation that have direct application to innovation in agriculture.

The case for agricultural education, the reasons why it is avoided, the lack of opportunities and evidence of its benefits is presented in Section 2.2. Methods for identifying learning needs and the provision of learning opportunities for farmers are also discussed here.

The concept of competence as a tool for identifying learning needs, setting learning outcomes and assisting the learning process is introduced in Section 2.3. The Case Studies presented in Chapters 3 and 4 demonstrate the application of competence in identifying, developing and facilitating farmer workshops.

Cognitive aspects of individual learning, and the implications for instruction, are outlined in Section 2.4. This section is based on contemporary literature from the education domain and endeavours to build a picture of learning that is far removed from the passive reception and memorisation of information. The role of knowledge, cognition, metacognition and motivation in learning is discussed. These contemporary concepts of learning are seldom reported in the agricultural extension literature. An understanding of these concepts is beneficial for agricultural extension professionals, whose primary role is the facilitation of learning - both at the individual and group level. A sound understanding of learning that facilitates the effective design and delivery of workshops (and other activities) is necessary to help farmers build new knowledge.

Chapters 3 and 4 present the case studies conducted for this research. The "paper" layout was chosen for this Thesis, hence there is no separate "Methods" chapter. The method relating to each case study is outlined within the chapter describing the case study.

A case study for the identification of dairy farmer learning needs using a competency framework is reported in Chapter 3. The local setting is described along with the results obtained and the usefulness of the approach taken.

Two case studies used to investigate the role, design and effectiveness of farmer workshops are reported in Chapter 4. The workshop on dairy cow nutrition was designed and conducted in response to a specific request from a dairy company to meet a learning need for dairy farmers. Feedback was noted throughout the workshop, and an evaluation was completed by participants at the end. The "Preferred Future" workshop was designed to improve dairy farmer competence in strategic planning, and was also based on learning needs identified by farmers. Pre- and post-workshop interviews were conducted with all participants attending the "Preferred Future" workshop to assess learning.

In Chapter 5, the knowledge gained from the pilot workshops is synthesised with that gleaned from the literature. Some of the factors influencing learning are related to the case study experiences and their relevance to agricultural extension and education, especially the use of workshops and participatory action learning, is outlined.

Chapter 2

LITERATURE REVIEW

"Leaders often lose their power - even their right to lead -
by losing their willingness to change."
Wiggenhorn 1990 p. 73

2.1 Trends in agricultural extension

A context for extension and education in agriculture is provided in this Chapter. The drivers of change and the need for innovation on farms are highlighted. The efforts of agricultural extension over the last 50 years are discussed, especially the desire to bring about change, reasons for extension and the extension styles used. This setting provides an appreciation of why farmer workshops are an appropriate method for helping farmers to build both management and technical competence.

2.1.1 Introduction

The rapidly changing market-led and competitive business environment for international agriculture requires New Zealand dairy farmers to develop management technologies that will allow them to successfully compete in the future (Walker & Bell 1994; Parker 1997a,b). The rate of change and uncertainty demands that business people have a better ability to identify and evaluate alternatives (Scrimgeour *et al.* 1991) and this requires improved skills in strategic planning, implementation and control.

According to Tushman & Nadler (1986, p. 74) "one of the most important executive tasks in today's business environment is the sustained management of innovation and change". Few dairy farmers are specifically taught to manage for change, however, innovations have been occurring in the New Zealand dairy industry since before the Government employed its first dairy instructor in 1893 (Nightingale 1992). Scientific research, agricultural extension and the pioneering spirit of farmers have been instrumental in facilitating innovation and improvement. This is unlikely to be

sufficient for the future as issues become more complex. Increasingly there is a need for a perspective from a range of stakeholders such as farmers, researchers, industry organisations, customers, research funders, communities, service providers and governments to solve complex issues. A joint capacity for innovation between stakeholders will be one of the main factors sustaining successful performance in agriculture (Engel & van den Bor 1995).

2.1.2 Extension trends

The Transfer of Technology (ToT) approach that served agriculture until the mid-1980s fits poorly in a complex, diverse and risk-prone agricultural system (Pretty & Chambers 1993, Hamilton 1995). Agricultural productivity is no longer the only standard by which to measure innovative performance. Besides, technical solutions are often no longer sufficient to solve complex problems: social, economic and organisational changes are needed as well (Engel & van den Bor 1995). While there is an economic imperative for change on dairy farms (declining real returns for milk (Rauniyar & Parker 1999)) scientific and extension communities also need to change in order to meet the evolving needs of their clients (Hamilton 1995). Since the privatisation of New Zealand's Government-funded extension service into a consultancy service in the mid-1980s (Johnson 1997, Kuiper & Hall 1997), the dairy sector has maintained the only national extension organisation - the Livestock Improvement Advisory (LIA). Hence it would seem to be the best placed organisation to develop a new extension paradigm to enhance on-farm innovation and improvement into the next century on New Zealand dairy farms.

In the ToT paradigm, research decisions are made by scientists, and technology is developed on research farms and in laboratories; extension agents are then expected to disseminate the findings to farmers (Pretty & Chambers 1993). Learning is experienced by the researchers and the results of their learning are published in the scientific literature rather than in a format that can easily be understood and applied by extension agents and farmers. Farmers are expected to apply the research results without the benefit of the learning processes and experiences of the scientists.

Roling (1988) described a hierarchy of extension objectives (Figure 1), derived from Dewey's problem solving cycle. The "ultimate objectives" are those to which extension intervention hopes to contribute, but over which it has little control or direct influence.

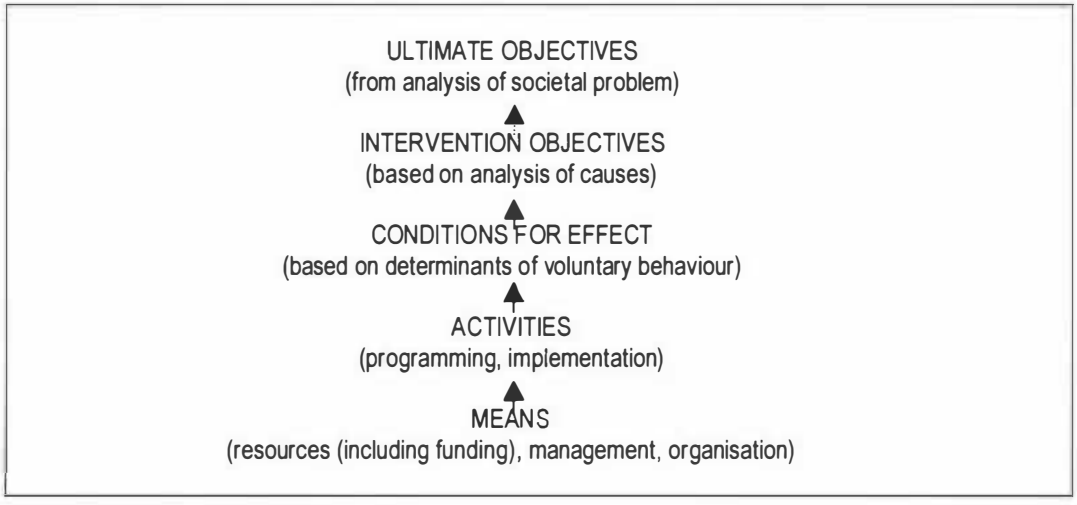


Figure 1 The hierarchy of extension objectives.
Source: Roling 1988: 60.

The "intervention objectives" are those outcomes that the extension intervention should achieve as a direct result of its own efforts. The "conditions for effect" relate to the determinants of voluntary behaviour seen as a cause of the problem such as level of knowledge and skill, peer pressure and "culture" (social norms or attitudes and beliefs). "Activities" are those typically carried out by extension agents: field days, seminars, newspaper articles, one-to-one discussions and visits. "Means" refer to the funding, staff, equipment, organisation and management skills available to carry out the intervention (Roling 1988).

Roling (1988) wrote about the concept of Agricultural Knowledge & Information Systems (AKIS) based on the systems approach. He later defined it as:

> the set of organisations and/or persons, and the links and interactions between them that are engaged in, or manage such processes as the anticipation, generation, transformation, transmission, storage, retrieval, integration, diffusion and utilisation of agricultural knowledge

> and information, which potentially work synergically to support decision making, problem solving, and innovation in agriculture or in the domain thereof
>
> (Roling 1990 cited in Roling & Engel 1991 p. 135).

In an extension model where farmers have greater responsibility for setting the agenda and participating in their own action learning, barriers to adoption do not logistically exist because there is no longer a normative reason why adoption should occur (Vanclay & Lawrence 1994). If however, the pendulum swings to the extreme, it is assumed implicitly that farmers have all the knowledge necessary to improve their situation, so long as a facilitator can help them discover and utilise it. Somewhere between these two extremes, there is a balance that includes the sharing of knowledge by all groups within a partnership as well as the building of new knowledge at intensive workshops or short courses. The key elements that are missing in the New Zealand dairy industry at present are the vision to form such a partnership, the facilitation skills required, and an infrastructure (resources and the mandate/responsibility) to "make it happen".

The changing paradigm in agricultural extension parallels the changing phases in agricultural research, extension and development. Rhoades (1989) identified four phases of agricultural development since 1950 (Table 1). They are not seen to be mutually exclusive, but an evolution of changing emphasis and increasing complexity. Each phase progresses from the previous one and requires the associated knowledge and skill as a foundation on which to build. Bawden (1987) showed a similar progression in successive phases of land management, starting with the pioneering phase, which leads to the production, productivity and then sustainability phases. Each phase built upon the previous, resulting in increased complexity of agricultural systems over time.

Table 1. Changing phases in agricultural research, extension and development.

Stage	Approximate dates	Characteristics
Production	1950-1975	Pioneering disciplines were breeding and genetics. Farmers were seen as recipients of technology.
Economic	1975-1985	Farming systems research was pioneered by economists and agronomists and farmers were seen as sources of information for technology design.
Ecological	1985-1995	Anthropology, agroecology and geography were pioneers. Farmers contribute their indigenous knowledge and are seen as both victims and cause of unsustainable development.
Institutional	1995-on	The pioneering disciplines will be management specialists, psychologists, organisational sociologists, political scientists, training specialists and educators. Farmers will be full collaborators in research and extension, and alliances will be developed between different institutions.

Source: Rhoades 1989.

The changing phases identified by Rhoades (1989) and Bawden (1987) have some parallels with the four extension paradigms proposed by Bloom (1991): technology transfer, problem solving, informal education, and human development (Figure 2). Coutts (1994) provided a description for each of these paradigms:

Technology transfer: Extension is the means of pro-actively changing voluntary behaviour in the form of adoption of new technology or management, by providing information, opportunity and persuasion. The assumption is that the scientists or experts have developed solutions to problems that, if adopted, will improve farm output and living standards.

Problem Solving: Extension is a reactive expert function which is a means of assisting individuals to find solutions to technological or management problems that are inhibiting farm performance. The adoption of new technology/management practices is an indirect, though 'inevitable' consequence of this process.

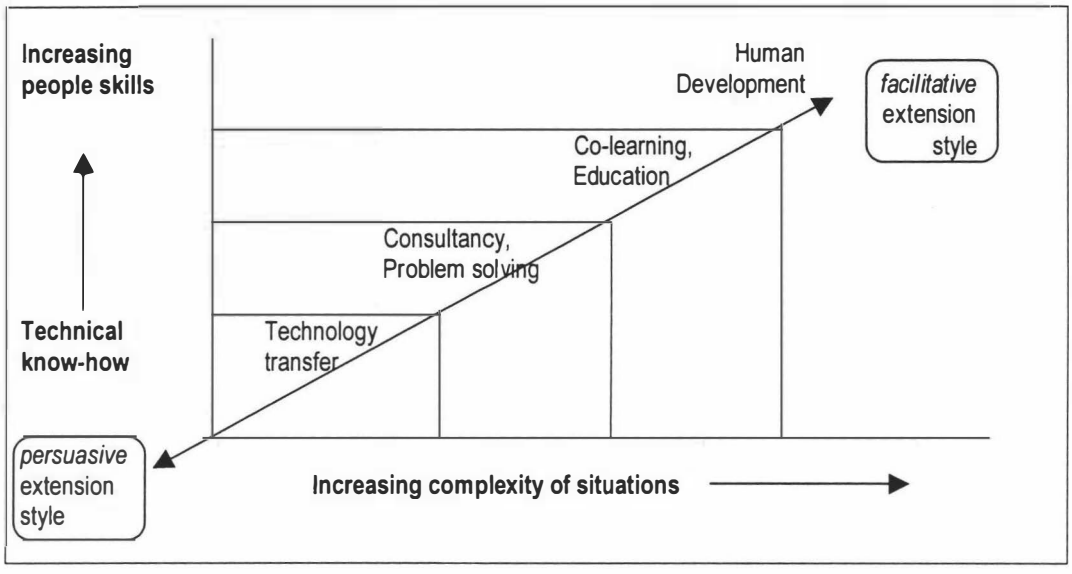


Figure 2 Complementarity of different extension paradigms.
Source: Adapted from Van Beek & Coutts (1992).

Education: Extension is a means of pro-active informal education which seeks to assist individuals to better understand their situation, and so enable them to make choices and take actions to improve their situation. It is assumed that an adult education approach assists people to make better choices.

Human Development: Extension is a means to facilitate and stimulate individuals and communities to take the initiative in problem definition and seeking solutions to individual and societal concerns/opportunities. The assumption is that given the opportunity and interactive framework, individuals and communities will and can best improve their situation: it encourages people to govern themselves (Coutts 1994).

If the evolution of extension is viewed as a continuum, several trends become apparent:

- a shift in focus from the farm (physical and economic aspects of production) to the farmer (co-operative learning);

- a shift in focus from information transfer to learning (knowledge and skill development) especially in a co-operative environment;

- a shift of responsibility for innovation and improvement from the extension organisation to the individual farmer;

- a shift in emphasis from the diffusion of innovation as a pattern through the community to patterns of improvement and innovation within an individual farm or business unit.

The changes identified here are cumulative and follow similar patterns. They build a picture of inescapable change from whichever dimension it is viewed. Understanding and accepting these changes is a precursor to establishing a vision for the future.

2.1.3 Defining agricultural extension

"Agricultural extension is a multi-faceted function that includes transferring technical knowledge to farmers, providing market information and management and consultancy services, and gathering information on producer needs and concerns" (Scrimgeour *et al.* 1991, p. 17). In the same report, a new definition for extension was proposed: "Its focus would be on rural education and facilitating life in the rural community" (*ibid.*, p. 33).

Stantiall and Parker (1998) provided a definition, based on the New Zealand dairy industry, which also illustrates the multi-dimensional nature of extension:

> Extension is a process (or several processes) that includes technology transfer PLUS elements of: developing an awareness and understanding; trial; and encouraging adoption/change to bring about improvement.
>
> (Stantiall and Parker 1998, p. 16)

Other definitions of agricultural extension also show how it is inter-twined with education:

> ". . . a service or system which assists farm people through education procedures in improving farming methods and techniques, increasing production efficiency and income, bettering their levels of living, and lifting the social and educational standards of rural life"
>
> (Farquhar 1962 cited in Scrimgeour *et al.* 1991 p. 2);

"... to educate farmers in the principles and practices of improved management systems"

(Walker 1982);

"to provide the understanding, forums, processes and learning opportunities to help address the - often apparently conflicting - goals of management (or communities, policy makers, and other interest groups)"

(Allen, cited in Stantiall & Parker 1998 p. 16).

Many definitions of extension are simplistic and focus on the extension agent-farmer interface. More recently, Roling (1988), and Vanclay and Lawrence (1995) have considered extension in a wider context. Roling (1988, p. 49) defined extension as:

"A professional communication intervention deployed by an institution to induce change in voluntary behaviours with a presumed public or collective utility".

Vanclay & Lawrence (1995) see agricultural extension consisting of three core theoretical positions: transfer of technology, agricultural knowledge and information systems (AKIS), and policy instrument approaches. They commented that the earlier definitions of extension have been inappropriate or deliberately misleading about the functional or instrumental value of extension (Vanclay & Lawrence 1995).

Vanclay and Lawrence argued that the AKIS approach is internally inconsistent for extension and asked why farmers need help if they have so much knowledge already? From a learning perspective, there are several reasons why farmers still need help:

1. they have adequate knowledge, but it is not put into practice because of the cultural values, norms and beliefs that exist (i.e. peer pressure or social acceptability) (Stantiall & Parker 1998);
2. they have some knowledge relating to a particular topic, but do not have an adequately developed framework for using this knowledge (Rural Development Centre 1991);
3. the knowledge they have is 'wrong' i.e. based on mis-information originally, misinterpretation of information, or they have simply not adequately internalised

(learnt) new information that would modify their existing ('wrong') knowledge (Yates & Chandler 1991);

4. they do not have adequate or the most appropriate knowledge (Rural Development Centre 1991).

This thesis proposes that education has a significant role to play in agricultural extension to: facilitate awareness and use of existing knowledge in the community; provide conceptual frameworks for thinking about and using existing knowledge; identify and help rectify 'wrong' knowledge; and facilitate action research in conjunction with scientists and other parties.

Vanclay & Lawrence (1995) suggested that one of the core theoretical positions of extension science is the policy instrument approach. This perspective sees agricultural extension as a policy instrument of governments (and other organisations) which, when co-ordinated with other policy instruments (e.g. legislation, regulation, price premiums or penalties), can be used to achieve a particular policy objective (e.g. more or less production; improved quality; different pattern (timing) of production).

When extension is funded by a government or any organisation to bring about change, it will necessarily be persuasive. This point is often overlooked in definitions of extension - which usually only include the technology transfer dimension (Vanclay & Lawrence 1995). In order to facilitate change within an AKIS, an organisational infrastructure is required that can provide the resources and processes to help individuals, groups and communities improve, from their own perspective. Input from scientists and others can be provided on a collaborative basis to assist with this. In this sense, there is a need for innovation on farm as well as within extension and research organisations and funders of "technology transfer" (as they currently know it).

It should also be noted that the funders of facilitation within an AKIS perspective may also be persuasive in intent (Vanclay & Lawrence 1995, Hamilton 1995). This is often disguised because the publicised objectives are often written in terms of achieving value or improvement for the target group, when the main reason for improvements

by the target group is to benefit the funders. This causes confusion for the extension agency (they are told to achieve benefits for the funders but are judged by their ability to influence change in the target group). Often, the performance indicators used are inappropriate, which adds further confusion to the situation. For example, in the late 1970s, a typical objective for Farm Advisory Officers in MAF was "to achieve a 10% increase in lambing on farms in the district". In reality the weather had more influence on lambing % than all the advice given. Inspection of district average lambing % during the 1970s shows little year-to-year variation apart from that which can reasonably be ascribed to the conditions for pasture growth the previous autumn. Similarly, LIA consulting officers currently have an objective to increase EFS (effective farm surplus or operating profit) of dairy farms. While they may offer advice and claim to have some influence, they neither set the price for milk nor control farm expenditure. While EFS is an important driver of dairy farm profit, continually increasing EFS further may not be the priority objective for many farmers and it may not indicate efficient financial management (Shadbolt 1997). The EFS is often about 45-55% of gross farm income (GFI). One danger of such a high-profile focus on EFS is that the balance of GFI can still be mis-managed, especially if the cost of equity and debt is high and there is little or no re-investment in the business or its productive assets (Shadbolt & Clarke 1998).

To be effective, funders of extension must clearly communicate their objectives to all stakeholders, and the extension agents must have objectives that clearly and effectively contribute to those of the funders. On its own, extension is seldom an effective instrument for bringing about the changes desired by the funders. Extension is most effective when it is used in conjunction with other policy instruments such as legislation, financial incentives or penalties, or if its aims are closely aligned with those of the farmers.

2.1.4 Innovation in agricultural extension

Change or innovation is a common element of all extension programmes aimed at bringing about a change in farmer behaviour on behalf of an organisation. Learning is

increasing one's capacity to take effective action (Kim, 1990), it is both a process and a product (Jarvis 1987). There are many levels of learning, from awareness of an idea or piece of information through to a detailed understanding of a complex system, and the application of knowledge to achieve goals (Biggs 1991). Change can be thought of as innovation (developing or adopting a new idea); or as improved competence in carrying out a particular task or managing a business or system (Prochaska *et al.* 1994). Learning and innovation occur incrementally in the day-to-day lives of most individuals and organisations (Brown *et al.* 1987). To make significant change, however, a new or revised paradigm or conceptual framework is often required to allow the problem or issue to be considered from a different perspective (Tushman & Nadler 1986, Argyris & Schon 1987).

The disciplines of education and organisational learning have influenced the direction, form, and rate of change in agricultural extension (Hamilton 1995, Bamberry *et al.* 1997). Education research provides an understanding of individual learning (Brown *et al.* 1987), and organisational learning from the domain of business management can provide lessons and case studies in innovation that can be applied to farm businesses. For example, a study of companies that have operated for at least 75 years showed that the key to their survival was the ability to "run experiments to the margin" and to continually explore new business and organisational opportunities that create new sources of growth (Senge 1990). Many studies show leadership to be a common factor influencing the success or failure of organisations (e.g. Senge 1990, Argyris 1991, Nevis *et al.* 1995). The role of leadership within agricultural education and extension organisations in New Zealand needs to be reconsidered in the light of the changes wrought by privatisation and the shift to a market-led economic environment.

2.1.5 Leadership in learning organisations

Senge (1990) argued that leadership in learning organisations is dramatically different to that of a charismatic decision-maker. He suggested that leaders should be designers, teachers and stewards, and therefore need new skills. These skills include the ability to build shared vision, to bring to the surface and challenge prevailing mental models,

and to foster more systemic patterns of thinking. Leaders are responsible for building organisations where people are continuously expanding their capabilities to shape their future - that is, leaders are responsible for learning.

The leadership role for learning organisations is identical to that proposed for contemporary facilitators involved in agricultural extension and rural communities (e.g. Allen *et al.* 1998, Pretty & Chambers 1993, Cloonan & Roberts 1997, Kay 1997). Such facilitators have a "toolbox" of methods and techniques for carrying out their new role. These methods and techniques will be many and varied. One of the skills is the ability to choose the best methods for a particular situation.

Senge (1990) suggested that leadership in a learning organisation starts with the principle of creative tension - the difference between where the organisation wants to be and where it is (current reality). Many who are otherwise qualified to lead, fail to do so because they try to substitute analysis for vision. On the other hand, creative tension cannot be generated from vision alone - it demands an accurate picture of current reality as well (Senge 1990). Examples of new tools that may be helpful in fulfilling the role of leading learning organisations include systems archetypes; charting strategic dilemmas; the left-hand column; surfacing mental models and learning laboratories; and practice fields for management teams (Senge 1990).

All organisations learn, whether consciously or not. Some firms deliberately advance organisational learning, developing capabilities that are consistent with their objectives; others make no focused effort and therefore acquire habits that are counter-productive (Kim 1993).

Ultimately all learning, whether organisational or individual, is carried out by individuals. In Section 2.4 of this literature review, the cognitive aspects of learning and how they can be used in the facilitation of learning are discussed.

2.1.6 Vision for the future

Three essential elements were proposed by Pretty & Chambers (1993) as being necessary to develop an effective process for innovation and improvement in agriculture: participatory methods, institutional support and interactive learning environments (Figure 3).

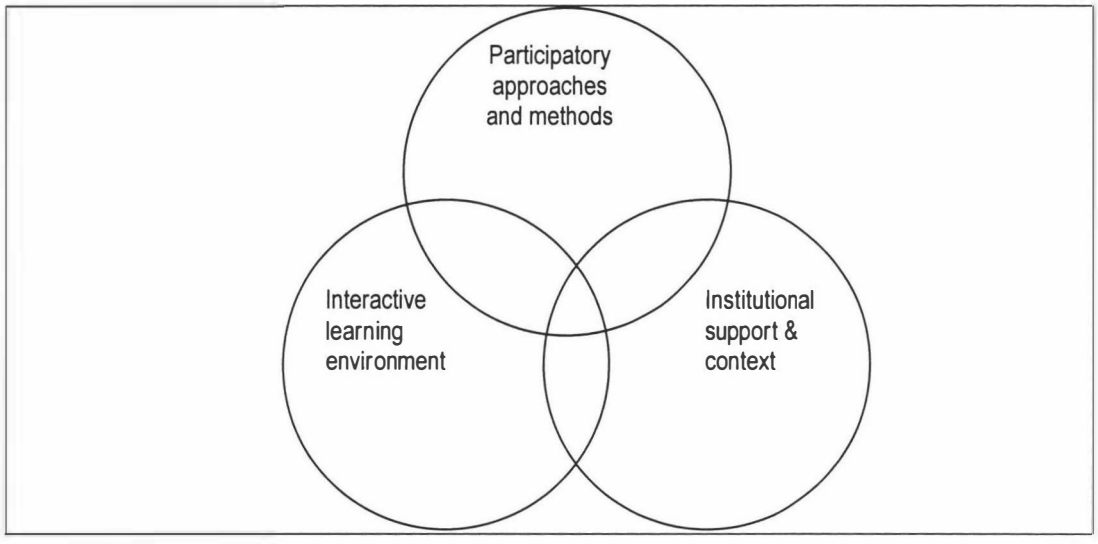


Figure 3 Conceptual framework for a new learning paradigm.
Source: Pretty & Chambers 1993 p. 13.

Participatory approaches and methods are required to support local innovation and adaption, accommodate diversity and complexity and enhance local capabilities so they are more likely to generate sustainable processes and practices. An interactive learning environment is required to encourage participatory attitudes, excite interest and commitment, and contribute to jointly negotiated courses of action. Institutional support is necessary to the spread within and between institutions of the participatory methods necessary to give innovators the freedom to act and share. Pretty & Chambers (1993) hypothesised that participatory practices are likely to be sustained and expand when all three elements are present. This model of agricultural extension shows the interdependence of all elements and overcomes the criticisms of the earlier, linear models such as ToT and Farmer First. The ability to develop such a network, and to overcome the challenge of aligning the elements, has been demonstrated by Hamilton (1995) in the Queensland Department of Primary Industries (QDPI). The

QDPI has demonstrated a commitment to improve its relevance and performance by developing a formal extension policy and setting up a Rural Extension Centre to develop new capabilities amongst its own staff (Coutts 1995).

Pretty & Chambers (1993) conceptual framework is consistent with Engel & van den Bor's (1995) suggestion that "the capacity to permanently and adequately innovate agriculture far exceeds the individual capacities of researchers, extensionists, industrialists, farmers or their organisations separately. It can be better viewed as a "social competence" carried out jointly (but not always in harmony) between these organisations". This model also fits with the "theatres of innovation" and the "interplay" and "Broker Practice" models as described by Paine (1997).

2.1.7 Conclusion

Agricultural extension continues to have a role in New Zealand to help bring about improvements and change on farms to meet the policies and requirements of funding organisations or institutions. Extension agents and organisations work within agricultural knowledge and information systems (Roling 1988, Roling & Engel 1991). The most effective future role of extension will be to work with local people using leadership and facilitation skills to develop participatory attitudes and the commitment necessary to work together. This will require a process of jointly negotiated courses of action in order to bring about improvements and innovation for individual and/or community benefit (Pretty & Chambers 1993, Hamilton 1995, Bamberry *et al.* 1997).

The ToT paradigm cannot achieve this aim as it constitutes only a small role in the processes operating within large, complex knowledge and information systems (Pretty & Chambers 1993, Hamilton 1995). It does not adequately value local knowledge, and lacks the range of facilitation techniques necessary to bring about change, particularly as complexity and uncertainty increases as is occurring in the world economy at present. In the latter context, group participation and action learning are key elements in bringing about improvement and innovation (Roling & Engel 1991, Cloonan & Roberts 1997, Kay 1997), but this will not occur without senior management support and leadership in the institutions funding and governing extension (Pretty &

Chambers 1993, Engel & van den bor 1995, Hamilton 1995). Organisational learning from management, and individual learning from education have much to contribute to improving the effectiveness of extension in this environment of rapid change (Senge 1990, Kim 1993, Vanclay & Lawrence 1995).

There are individuals in New Zealand with the knowledge, skills and experience to develop and implement the new approaches to agricultural extension outlined in this Chapter. However, a lack of awareness by those institutional leaders responsible for achieving change on farms is inhibiting the building of the infrastructure or support to bring these people together to make agricultural extension more effective.

". . . to be educated is not to have arrived,
it is to travel with a different view."

Peters, 1965

2.2 The case for agricultural education

Education is an intrinsic component of agricultural extension in New Zealand. This Section highlights the place of agricultural education and outlines some reasons why farmers avoid formal education. It also illustrates some attempts to identify farmer learning needs and provides international examples to show that workshops can be an effective method for improving farmer competence.

2.2.1 Introduction

A vision for agricultural training in New Zealand was proposed in MAF Policy's paper "Towards an agricultural training strategy for the 1990's":

> "Success for agriculture will be in an environment where learning is rapid and enjoyed by every participant. The learning will occur more rapidly than the changes in the environment, and will be surer and the envy of international competitors. The quality of the total agricultural workforce will be the industry's competitive advantage, adding to previous advantages gained from soils, climate and the skill of producers . . ."
>
> (Riddell 1992, p. 5)

This vision is still relevant. Unfortunately, progress towards realising it is being achieved by countries other than New Zealand, especially Australia, USA, Ireland and The Netherlands. Strategies for education outlined in the Australian National Farmers Federation directions paper "Innovations in Agriculture" included:

7. To deliver high quality client-focused outcomes and have performance evaluated accordingly.
8. To ensure arrangements for funding and delivery of education products to be flexible, responsive to industry needs, make maximum use of both existing and emerging information technologies and involve all education and extension service providers.

9. To ensure agricultural industries take a pro-active role, together with education providers and extension service providers to encourage the development of skills and the design of education modules.
11. To focus training and education systems for industry participants on improving industry competitiveness through adoption of innovative technologies.

(Australian National Farmers Federation 1996(a), p. 5)

Prior to 1992 it was considered that the government provided funding and significant leadership in agricultural training and education in New Zealand (Riddell 1992). During 1992/93 the government signalled that the responsibility for human resource development would switch to industry. Since that time, the focus of education in agriculture has been on training new entrants, and during this time enrolments for most agricultural courses at this level have declined (Rowarth & Caradus 1998). Some courses have ceased, (e.g. the Diploma in Wool & Wool Technology at both Massey and Lincoln Universities) and some institutions (e.g. Wanganui Polytechnic) no longer offer agricultural courses.

In 1997 there were still claims that education was crucial for the revitalisation and continued vigour of rural communities through access to quality information and building community capacity through lifelong education (Levett & Pomeroy 1997).

2.2.2 Lack of opportunity and avoidance of formal education

Why does reality not match the vision as described by Riddell (1992) or why are there no effective strategies in place as proposed for Australia? Several authors (e.g. Rural Development Centre 1991, Moore 1990, Gilling 1997, Taylor & McCrostie 1997) have noted the lack of appropriate learning opportunities for those in the rural sector. It appears that, despite the rhetoric, there are few, if any, learning opportunities for those other than new entrants to the industry that meet the real needs in terms of flexibility, access and relevance. On the other hand, there are some powerful influences that inhibit many people in the farming industry from engaging in formal or non-formal learning. The Rural Development Centre (1991, pp. 2-6) suggests the following:

(i) An underlying belief by farmers and society that if you provide people with land, they will know, as if by instinct, how to be farmers.

(ii) One of the key skills to be mastered by an effective farmer is that of managing variability in climate, market and interest rates, whereas most courses teach how to farm under static or average conditions.

(iii) Farmers question the relevance of programmes developed by trained agriculturalists.

(iv) In the past is has often been the case that in farming families, sons who have not done well at school are the ones who stay home and take over the farm. Hence a common view has developed that practical ability is more important than the abilities developed by learning theory.

(v) Farmers often perceive themselves as being independent and self-sufficient and hence question the need for any formal or non-formal education.

Further to items (iv) and (v) above, for many who left school at an early age to go farming, they did not perform well at school (Rural Development Centre 1991), hence school was not a pleasant experience. It is likely that they can not visualise what an enjoyable learning experience may be like. Avoidance of formal learning opportunities may also be associated with a low self-esteem about their ability to learn, and often a belief that they are not able to learn in formal educational situations (Rural Development Centre 1991). These factors are likely to be barriers to further formal learning. Cost, both financial and time, is often cited by farmers as a reason for not undertaking further education (Rural Development Centre 1991). Those who value education, however, simply see it as a matter of organising their priorities. Rogers (1973 cited in Salmon *et al.* 1973) pointed out that there is a potential conflict involved when an adult faces any form of educational involvement:

> The conflict is that every adult already has certain well-developed ideas about himself along with his own system of ideas and beliefs. To admit that he needs to learn something new is to admit that there is something wrong with his present system. Many people, although the may dimly perceive their need for new knowledge, may feel so threatened by the challenge to their previous beliefs that they are unable to learn.
>
> (Rogers 1973 cited in Salmon *et al.* 1973, p. 28)

In a study of dairy farmers on the Rangitaiki Plains by Cronin & Candler (1968), 36% of respondents indicated that lack of knowledge and confidence about development methods and services was the single most important factor hindering increased production. A survey of Central Canterbury farmers (n=109) by Moore (1991) found that 57% of farmers had 3 years or less secondary schooling and only 17% had completed five years. Forty percent had undertaken no further formal study beyond secondary school. A survey of Waikato farmers (n=100), reported by Scrimgeour *et al.* (1991), showed that 70% of farmers had no formal education above secondary level, and 30% left before completing School Certificate. A study of a small number of farmers (n=18), reported by Pomeroy (1993), showed that despite 67% of respondents having either tertiary education or a formal trade qualification, only 28% had significant business training. A study of farmers (n=77) by Butcher & Thomas (1997) showed that 40% did not attain School Certificate, and 70% had no further formal qualification beyond secondary school.

These few studies indicate that a large proportion of farmers may have no further formal education beyond secondary school, and that many have not attained School Certificate. While there is no doubt that these people are still able to learn, this level of education needs to be borne in mind when designing and promoting workshops for farmers and farm staff.

Bruner (1961) suggested that adolescents move from the iconic (mental images) to the symbolic (reasoning with symbols or "formal operations") stage of cognitive development (see also Section 2.4.1). This cognitive development is influenced by many factors, especially an individual's intrinsic motivation to learn. This will in turn influence not only the amount of knowledge acquired, but also the development of relational cognitive frameworks (see Section 2.3.5) and strategies for learning (i.e. learning how to learn) (Section 2.4.9). Some aspects of farm management can be observed and understood (e.g. how much pasture there is in a paddock), whereas other aspects, especially relating to planning and uncertainty, must be reasoned (e.g. feed planning for the next six months). It is this stage - reasoning with symbols

(especially complex mathematical calculations) - that the level of cognitive development can slow the rate of learning, and sometimes can inhibit the desire to learn.

Learning is a social activity (Leindhardt 1992), hence the relative remoteness and solitude of farming (in the context of formal learning) is a disadvantage, and more so for those who have not achieved cognitive development to the symbolic or formal operations stage.

According to Piaget (1950), the more secure people are in their knowledge and understanding of their environment, the more able they are to change, hence a new experience will challenge their intelligence rather than be a threat to their existence. Moore (1990) suggested that this may explain why farmers who have learnt to do something by example, but do not understand why they do it, may resist change because of a sense of insecurity.

Piaget referred to the displacement of former understanding as substitution and the rebuilding of old and new knowledge as integration. Integration is a more stable form of learning. An important part of the learning process - especially where there are strongly held beliefs - is to help people connect new ideas to their existing knowledge and to provide examples, processes and time to allow them to emerge from a state of confusion to consolidate their new knowledge (see also Section 2.4.2).

2.2.3 The value of agricultural education

The Australian National Farmers Federation recognised the powerful influences education and training have on the awareness and adoption of new management strategies and practice. They also recognised their poorly educated workforce and undertook a comprehensive study of the relationships between education and farm profitability (Australian National Farmers Federation 1996b). The key findings of the study included:

- Farm businesses which have agricultural qualifications within the management team are more profitable (>$26,000 mean increase in gross operating surplus) than other farm businesses.
- Farm businesses that engage in training are more profitable than other farm businesses (>$28,000 mean increase in gross operating surplus).
- Farm businesses which engage in training are more likely to make changes to their practice which improve, or are expected to improve, long-term profitability and viability.
- Most changes are influenced by interaction with, and information from, a number of sources.
- Past training participation is a good indicator of future training behaviour.
- Effective training is conducted in small groups with the opportunity for interaction with the facilitator and fellow participants.

No similar survey for New Zealand has been found in the literature. Moore (1990) related education to a management index (which measured the use of specific farm and business management practices). A direct relationship existed between the index and academic achievement from not attaining school certificate through to gaining a degree (*ibid.*).

Cameron & Chamala (1997) found that the level and type of formal education was significantly correlated with training course attendance, community participation, willingness to seek professional advice, and sharing of management tasks and management decision making. Those with more education also felt less threatened by the external environment, which fits with Piaget's proposition, as discussed in Section 2.2.2. McClelland (1965 cited in Gillard 1998) recognised two basic mind-sets that substantially affect people's perspective on enforced change. He labelled them "achievement" and "dependent thinking". Dependent thinkers are more resistant to change, demand security from agencies other than themselves, require order and predictability, and tend to be fearful of risk taking (Gillard *et al.* 1998). Dependent

thinking increases under stressful conditions and where people have learnt to believe that their efforts do not make a difference. Increased dependent thinking assures that self-esteem decreases; from this emerges a mind-set which is self-perpetuating.

2.2.4 The role of learning in innovation

Tushman & Nadler (1986) claimed that the most effective organisations are highly effective learning systems. Over time, management on New Zealand dairy farms has improved incrementally, based on experience and learning from others; particularly for cost- and labour-saving technologies (especially physical/observable and capital-intensive technologies) that improve production levels and efficiencies (Stantiall & Parker 1998). From time to time, however, farmers make significant changes to their farming systems (discontinuous or major change). Possible examples include increasing the scale of operation (e.g. increase land area or herd size by over 25%); changing from spring to autumn or split calving; or changing from 100% feed from the milking platform to over 25% bought-in feed. There are limited opportunities for product development on dairy farms, hence attention must focus on innovation in farm management practices.

There is no doubt that both incremental and discontinuous changes involve learning. Incremental change often involves the trial and adoption of ideas, usually with minimal risk. Discontinuous change often involves significant risk, and for many dairy farmers it is something often not previously experienced, so for them it is a matter of "learn-as-you-go" (Tushman & Nalder 1986, Bamberry 1997).

Between the extremes of incremental and discontinuous innovation, Tushman & Nadler (1986) identified synthetic innovations (Figure 4) which are major process (management) improvements. In dairy farming this equates to the use of conceptual management tools (rather than physical (observable) technologies) which already exist but require a significant effort to learn and implement. This offers the most practical opportunity for improvement on many farms, and provides an opportunity to reduce the risks associated with major changes by building new knowledge and developing competence before making such change.

In dairy farming, this equates to a change in management that uses well-known ideas to improve the level and efficiency of milk production.

Type of Innovation	Product (New or different products e.g. for a dairy farm)	Process (A change in the way the product is produced e.g. for a dairy farm)	Learning requirements	Level of risk
Incremental	Incremental product change *Few opportunities except milk quality*	Learning by doing *Better management based on experience, learning.* *Adoption of cost- & labour-saving devices.* *Adoption of technologies to improve production/efficiency*	Small	Small
Synthetic (Utilisation of existing ideas to achieve improvements)	Dominant designs *Few opportunities: (Products = milk, cull cows, bobby calves)*	Major process (management) improvements *Management tools such as:* *- feed budgeting;* *- herd health & reproduction monitoring & analysis* *- new labour management skills*	Opportunity for innovation	Small
Discontinuous (major change)	Major product changes *Limited opportunities: e.g. Compound-specific milk*	Major process (management) changes *e.g.* *Larger scale of operation (increase land area or herd size by over 25%)* *Change from spring to autumn or split calving* *Change from 100% feed from the milking platform to over 25% bought-in feed*	Substantial	Potentially large

Figure 4 Types of innovation and examples on New Zealand dairy farms. Adapted from Tushman and Nadler (1986).

Synthetic innovation might include: the application of management tools such as feed budgeting; a detailed understanding of dairy cow nutrition; improved labour management skills; detailed monitoring and analysis of herd health and reproduction; and strategic business planning (Parker 1997a). This development of new knowledge and skills fits the concept of "synthetic" innovation and would enable dairy farms to improve their innovative capacity if they become "highly effective learning systems".

2.2.5 Identifying learning needs

In a Rural Industries Research & Development Corporation (Australia) study completed in 1996, Bamberry *et al.* (1997) reported that managing change was an issue discussed by all farmers. Farmers commented on the necessity for change and to experiment, as well as the need to keep up with technology, even though this was often difficult. One farmer commented that in his long-term planning there was "... continual readjusting and adaptation of plans as circumstances changed". Other farmers also remarked on the need for flexibility in their management and planning. Comments included "You've got to think in different ways to the past".

Identifying specific learning needs, and their priority, has been problematic in agriculture. One of the issues is that people "don't know what they don't know". A useful concept is to identify the competencies that people use in their job (Stone 1997, Rural Development Centre 1991, Page *et al.* 1994) and ask them to score their perceived level of competence for each competency (Stantiall *et al.* 1997). This approach was used in this study (Chapter 3).

Surveys and interviews can also be used. Pathmanathan (1978) identified learning needs by analysing the responses to a 12-page survey of 150 agribusinesses in Victoria. Data were collected on 15 broad subjects, which were condensed into four categories for the analysis. Broad areas of interest were identified, but the specific information necessary to design farmer workshops was not obtained.

An Australian-wide survey by Salmon *et al.* (1973) showed that only 25% of 4,000 farmer respondents expressed an interest in management training. In general, those with smaller properties were less interested in management training than those with bigger properties, although those with the largest scale cattle and sheep operations showed the least interest of all. The majority of those who showed interest in management training (85% of those interested) were younger than 40 years old. In a study of 150 agribusinesses in Victoria (Australia) by Pathmanathan (1978) the need for management knowledge rather than production knowledge was identified. There was also a demand for communication training for staff. Agribusiness courses offered

by technical and tertiary institutions in Victoria were shown not to be recipient-oriented.

Hamilton (1995) carried out a Rapid Rural Appraisal as part of a research project on soil conservation practices amongst arable farmers in the Darling Downs area. Several specific information needs arose from this process, including farm business management skills.

"Economics was an issue that the Rapid Rural Appraisal indicated was chaotic in the view of the participants. Economists were criticised by participants as providing tools and information that were irrelevant to farmers. Farmers felt they lacked farm business management skills."

(Hamilton 1995, p. 58)

Floyd (1995a,b) implemented a simple questionnaire through a national agricultural 'free-to-farmers' newspaper. Respondents ranked 43 issues of concern to them, including external factors such as prices and interest rates and economic outlook. Strategic planning issues were ranked eighth in order of importance. When grouped together, issues relating to farm business management had the highest score by a wide margin, followed by marketing issues.

2.2.6 Appropriate learning opportunities

There are many levels of learning, from becoming aware of an idea through to developing a whole new mind set or cognitive framework (Section 2.4). Unfortunately, the vision of learning for many teachers is one of information and recall. Often the notion is held that information is all that is needed for learning to occur, and so long as the information provided is memorised, then it can be tested by recall (Johnston & Nicholls 1995). Teachers often model their practice on their own experiences as a student, rather than on the needs of their students (Costa 1992). Also, content should be focussed on the future rather than the past:

"The very people who prepare tomorrow's workers with relevant skills can all too easily be the masters of old technology". (Riddell 1992, p. 2)

Conferences, field days, seminars, written material and videos all provide information, but rarely allow the building of new knowledge to the point of developing a new conceptual framework (Biggs 1991). Such an achievement requires focussed effort and time by the learner and flexibility and relevance in terms of timing, appropriate facilitation, and content by the education provider (Stantiall *et al.* 1999). For example, the Rural Development Centre (1991) suggests that the key skill to be mastered by an effective farmer is that of managing variability - climatic, market and interest rates. Yet, they claim that checking the relevant agricultural courses indicates that the concept of managing variability is not well developed - at least not in a way it can be applied down on the farm (*ibid* p. 3).

Workshops of one to four days duration with a small number of participants (less than 15) are an effective and efficient method for building new knowledge (Letts 1997, Bevan *et al.* 1995). Wlodkowski (1985) provided a comprehensive reference for workshop design that included motivational planning as well as content planning. Maslow's hierarchy of needs is cited to show how the workshop design and environment (especially in relation to the participants' self-esteem) is critical to achieving good learning outcomes (Alderman 1990). Knowledge of good workshop design (as outlined in Section 2.4.12) provides a useful framework for setting up effective and enjoyable learning opportunities as reported by Saxowsky & Gustafson (1996), Holden (1997), Letts (1997), Stanfield (1997), Wightman (1998a,b).

Riddell (1992) suggested that farm managers and workers should develop relationships with formal education providers in order to keep themselves up-to-date. He contended that managers and workers can become too focused on the content or technology whereas this often dates quickly. Similarly, Wiggenhorn (1990) describes how large companies, such as Motorola, which work with rapidly changing technology, values its relationship with educational institutions to develop a learning culture and increase the capability of its employees.

2.2.7 Farm business management workshops: Some international examples

The "Dairy-MAP" 1997 annual report (Holden 1997) summarised the changes in importance rating participants gave various aspects of planning before and after the workshops. Almost all (93%) participants believed that managing better was the key to increasing profits and, while 66% of respondents attributed low profits to external causes prior to the workshop, this had decreased to 13% after the workshop (Holden 1997).

Wightman (1998a) evaluated the "Smart Move" programme (a series of workshops on strategic planning for dairy farmers) that was completed by the Malanda groups (North Queensland). Families reported many benefits from involvement in the programme, including an improved ability to: interpret financial and production performance indicators; develop and assess new business options; undertake estate planning; and communicate with family members. Families enjoyed learning as a group - especially when workshops were held on farm. Some groups (several families) wanted to maintain the group as a vehicle for continued, shared learning.

The "Smart Move" programme, strongly encouraged participation by whole families, compared to most other workshops reported where only one or two family members attended. Similar experiences in the training of stockpersons were reported by English *et al.* (1998) where courses where conducted on farm, with the management team and all staff present.

The post-workshop interviews for "Smart Move" attempted to assess the programme's impact on individuals by recording changes attributable to the programme. All participants said that they had received value for money, and would recommend "Smart Move" to others. In summary, "Smart Move" helped to put some participants in a better position to manage their dairy farming business. It also gave them confidence to use the new knowledge and skills they had gained (Wightman 1998a). Similar results for "Smart Move" were obtained with the Warwick (Queensland) farmer trial group (Wightman 1998b).

A series of 6-day workshops on farm finance were conducted for farmers in Pennsylvania, Maryland and New York states to help them achieve competency in basic financial management (Hanson & Cunningham cited in Hanson *et al.* 1998). These workshops were financed by the U.S. Department of Agriculture Farm Service Agency, as part of the 1995 Farm Bill. A post-workshop survey (n=180) indicated that an increased knowledge level of financial statements was obtained by 84% of the participants, while 78% reported they had increased their knowledge of financial planning (Hanson *et al.* 1998).

Farmers who estimated a greater economic value from the workshop also had greater farm income and profit, attended outreach sessions more frequently and were more satisfied with the workshop than those who estimated lower benefits. The workshop had a substantial impact regardless of previous educational attainment. In fact, workshop participants with only primary (USA) education consistently showed the highest post-workshop increase in knowledge gained and the greatest impact on estimated increases in gross farm income. This was partly attributed to the carefully planned content and facilitation of the workshops that enabled all participants to build their knowledge regardless of their previous level of knowledge (Hanson *et al.* 1998).

The Farm Credit Services Association of North Dakota and Minnesota approached North Dakota State University to develop educational materials and to co-operate in offering training in long-term business planning to farm owners (Saxowsky & Gustafson 1996). Six hundred sets of business planning manuals were distributed to people who attended a multi-day workshop or who ordered the material. They also received survey forms, of which ninety-four were completed and returned. When asked what farmers hoped to accomplish by developing a business plan, the most common responses included: increased profit and improve financial viability; have a clear direction for the business; implement succession planning; be able to act rather than react; be able to set goals and monitor progress; be able to see the "big picture" (Saxowsky & Gustafson 1996).

The respondents indicated that the benefits of better business planning were: a better understanding of their financial situation; having a logical thought process; being able to better explain how current actions move the business towards the owner's goals; having open communication among family members; having a better understanding of future capital needs; being aware of the relative profitability of the enterprise; being more optimistic through being in control; having an increased understanding of cash flow planning; having written ideas and plans (Saxowsky & Gustafson 1996).

More than 90% said that they would continue to plan because they felt it necessary in order for their business to survive. About 33% had talked about their business plan, but not yet written it down; 25% modified their existing record keeping in order to accommodate their business planning; and 20% were using their current recording system to document their business plan (Saxowsky & Gustafson 1996).

McDonald *et al.* (1997) provided a series of activities (no details given) on dairy cow nutrition for farmers in Victoria, Australia. The post-activity evaluation findings indicated: the adoption of ration formulation as presented in the 1996 programme was low, although there was a strong customer satisfaction; perception of a positive cost:benefit from attending the programme; and a demand from past participants to have a refresher activity.

These comments suggest that the participants viewed the knowledge they had gained to be valuable to them despite ration formulation not being used as the extension agents had intended. One can question whether adoption of a certain management package is an appropriate indicator of success: building new knowledge and making improvements as defined by each individual farmer are valuable outcomes but difficult to quantify. Farmers may be better able to articulate these benefits if they were explicitly discussed during the workshop activities.

English *et al.* (1998) reported on the training of livestock industry workers in Scotland, Greece, Spain, Italy and Norway. While the context is different, there are many similarities with the farm business management courses reviewed earlier in this Section

in terms of educational and learning principles. The report included 111 'test courses' involving 1386 participants. Courses were scored as "useful/very useful" by over 90% of the participants, and the great majority "craved" further training opportunities A key issue identified by English *et al.* was the difficulty of accessing training due to geographical, practical and motivational issues, as well as lack of suitable training materials and inadequate training approaches. Similar factors led to the development of the farm business management workshops in the USA (Saxowsky & Gustafson 1996, Hanson *et al.* 1998), Australia (Hamilton 1995, Wightman 1998a,b) and New Zealand (the current study).

The international experience indicates that a well-designed and facilitated learning experience can help farmers gain new knowledge, develop the confidence to apply this to their farms and also generate the desire to undertake further learning.

2.2.8 Conclusion

The reasons why many people in the farming community avoid formal and non-formal education are plausible and well-documented (Moore 1990, Rural Development Centre 1991). Despite the rhetoric, customised learning opportunities for farmers in New Zealand have been rare (Riddell 1992, Gilling 1997). Farmers require learning opportunities that are relevant, timely, local, and designed and facilitated to achieve the desired learning outcomes (Wlodkowski 1985, Wightman 1998a,b). Agricultural education and extension specialists need to take these factors into account when designing and facilitating workshops and other activities for farmer learning. It is likely that a new set of skills will be required for many professionals in order to achieve effective and enjoyable outcomes of learning activities (Pretty & Chambers 1993).

Evidence on the value of farmer education is sparse, but studies reported here (e.g. Moore 1991, Cameron & Chamala 1997) show that a positive relationship between course participation and improved management ability, and in one case (Australian Federated Farmers 1996b) a substantial response in terms of increased profitability.

The first challenge for agricultural education in New Zealand is to identify the learning needs of the farming community. The use of a competency framework for this purpose is discussed in Section 2.3. A case study trialling the competency approach is reported in Chapter 3.

"Unlike physical assets, competencies do not deteriorate
as they are used and shared.
They grow."

Pralahad & Hamel 1990, p. 82

2.3 Competence: A concept for identifying learning needs, setting learning outcomes and assisting the learning process

Sections 2.1 and 2.2 have established the context and the importance of agricultural extension and education. Identification of farmer learning needs is a necessary first step to delivering relevant learning opportunities. This Section explores the use of competence as a concept for helping to identify learning needs, set learning outcomes and to assist the learning process.

2.3.1 Introduction

The concept of competence is a useful tool for helping people identify their learning needs. Asking directly "What do you need to know?" is seldom effective as it is not easy to "know what you do not know" Most people, however, can contribute to the question "What knowledge and skills do you need to do your job effectively?" (Stone 1997). Once these particular attributes or competencies have been identified, the individual is then able to assess his or her level of competence for each item. After the competency profile or model has been determined for a particular role, it can then be used in curriculum development for training purposes (Rural Development Centre 1991). The same information is also used for course or workshop development; initially to set the learning outcomes, and then to design a process to help individuals achieve these outcomes.

The definition used here for individual competence is "the application of knowledge, skills and personal characteristics that lead to outstanding performance" (Stone 1997). Competency is the description of the knowledge, skills, and personal characteristics required for outstanding performance.

2.3.2 Identification of learning needs

Using the competency framework helps individuals (owner-operators, employers, employees, educators) gain an insight into aspects that are important in their role, and hence to identify areas for personal improvement (Page *et al.* 1994). If used as part of a regular review process, new areas of knowledge and skill development should also be identified to add value to their individual contribution in line with the strategic direction of the business (Boam & Sparrow 1992, Stone 1997).

Within an organisation, it is unlikely that all members will exhibit top performance for all competencies. Hence, high performance should be leveraged by utilising those with the knowledge, skills and preferred behaviours to carry out the relevant tasks, as well as helping others to improve their performance (Stone 1997).

Competencies are identified by asking "What are those things we all share that make us successful?"; "What knowledge and skills will we need in the future to continue that success?"; and "How does the best work get done?" (Stone 1997). In small businesses, competence operates differently compared to large operations where specialisation occurs. Often managerial competence resides within one or two individuals and the management process can not be separated from the personality and experience of the key individuals (Tweed & McGregor 1998).

2.3.3 Competency profiles

Page *et al.* (1994) developed a list of 46 generic core competencies that they believe are critical for achieving the level of competitiveness that defines good management. The list was derived from surveys and workshops with New Zealand business owners and managers. Whereas most lists of generic competencies include mostly knowledge and skills, Page *et al.* (1994) included a number of items related to personal characteristics.

The Rural Development Centre (1991) developed competency profiles through facilitated workshops for sheep farming, broadacre dryland cropping, beef cattle production, horticultural production and small area farming in northern New South Wales. The profiles were developed as part of the process of reviewing the New South

Wales Department of Agriculture Home Study programmes and other agricultural training courses. In 1981, the New Zealand Agricultural Training Council (A.T.C.) published a series of agricultural training guides (A.T.C. Publication numbers 19-22) that contained a list and detailed description of a comprehensive range of tasks (competencies) for a number of farming types. The guides were aimed at the training of new entrants into agriculture and focussed on animal health, handling and nutrition plus competencies associated with cropping.

Once a set of competencies has been identified, they can be prioritised in terms of those requiring improvement. For an individual, this helps identify which are the learning/training areas to invest in. For the course designers, this list acts as a guide for setting the course outcomes, which in turn guides the course design and learning processes to be used. The list of learning outcomes can be used by participants to monitor their progress during the workshop, as well as evaluating their level of achievement at the end.

2.3.4 Organisational competence

Prahalad & Hamel (1990) developed the concept of core competencies of an organisation (this relates to the particular mix of the competence of individuals). Prahalad and Hamel argued that the self-perception of a portfolio of competencies rather than a portfolio of businesses is critical when planning a competitive business. They contend that this is necessary to cope with a dynamic and uncertain socio-political and economic environment. They claim that for an organisation, a core competence: 1. provides potential access to a wide variety of markets; 2. should make a significant contribution to the perceived benefits of the end product; and 3. should be difficult for competitors to imitate (e.g. when the competency is a complex mix of individual technologies and production skills) (Prahalad & Hamel 1990). Identifying the core competence of a business should be part of the strategic planning process. For the present study, however, the focus is on individual competence.

2.3.5 Building competence

Biggs (1991) outlined a taxonomy of individual competence development - from incompetence to expertise (Figure 5). In the levels from pre- to multi-structural (Figure 5), student learning is focused on the accrual of knowledge. The transition to the relational level is associated with the organisation and structuring of knowledge. At the extended abstract level the knowledge may be theorised about and generalised. This level may be recognised as the "formation of abstract concepts and generalisations" step in the Lewinian experiential learning cycle (Figure 6).

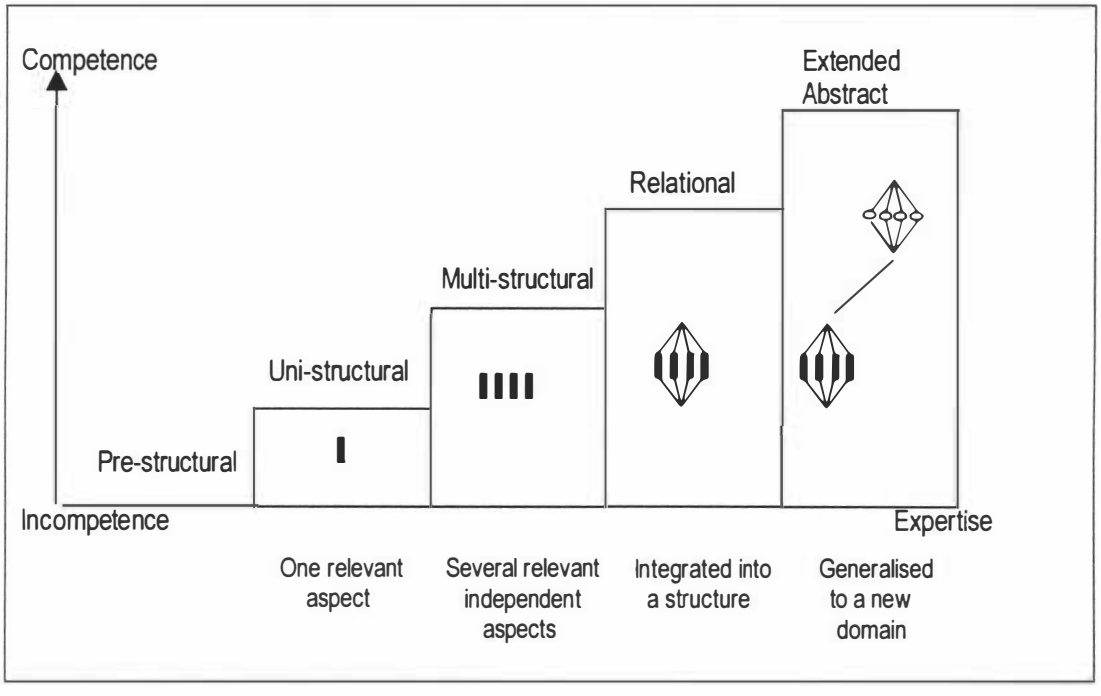


Figure 5 Five levels from incompetence to expertise.
Source: Biggs (1991), p. 13.

2.3.6 Setting learning outcomes and assisting the learning process

Figure 6 shows the conceptual development that occurs starting with 'one relevant aspect' or piece of information, to gaining more information, and then linking relevant pieces of information together into a structure (or framework). Ultimately this structured knowledge can be applied to other domains or situations. This is discussed further in relation to the role of knowledge in learning (Section 2.4), and in the "Preferred Future" case study (Section 4.2).

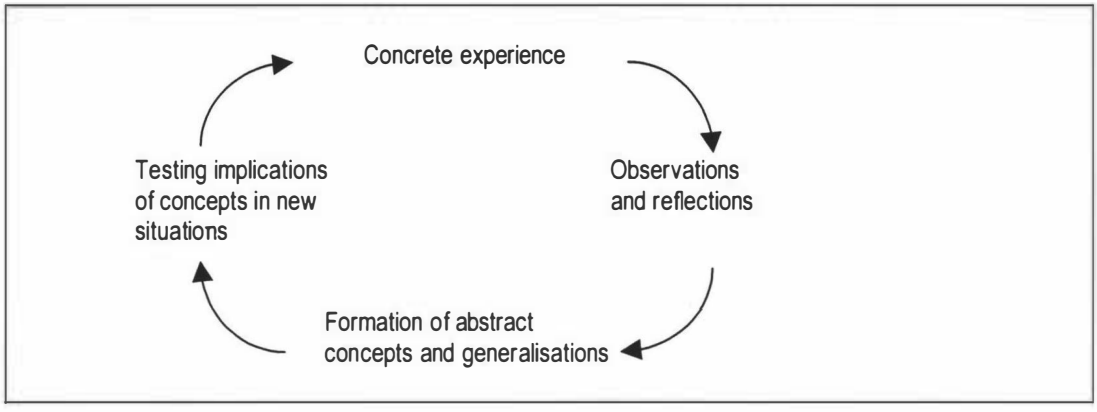


Figure 6 The Lewinian experiential learning model.
Source: Kolb 1984.

2.3.7 Conclusion

Competence appears to be a useful concept for identifying learning needs (Rural Development Centre 1991, Page *et al.* 1994, Stone 1997), setting learning outcomes (Stone 1997) and assisting the learning process (Biggs 1991). It is used in a range of disciplines from agricultural extension (Stone 1997) to education (Rural Development Centre 1991) and organisational management (Boam & Sparrow 1992, Page *et al.* 1994). It is used in the current study to identify farmer learning needs (Chapter 3), and to assist in the learning process and evaluate workshop effectiveness (Chapter 4). Developing competence using an understanding of the cognitive aspects of individual learning is discussed in Section 2.4.

". . . learning is increasing one's capacity to take effective action."

Kim 1993, p. 38

2.4 Factors influencing cognition and learning: Implications for instruction.

This Section considers cognitive aspects of individual learning based on contemporary education literature. It focuses on the role of knowledge, and considers aspects of the learning process that need to be taken into account when designing and facilitating farmer workshops. For agricultural education to make progress in a global sense, as discussed in Section 2.2, those who are responsible for its provision and delivery must have a clear vision and understanding of what is required and provide leadership in their role of helping farmers to develop competence.

2.4.1 Introduction

The achievement of learning outcomes, whether in the classroom or in the workplace, requires effective instruction (Resnick 1987). Contemporary views do not see learning as passively receiving information; but as a process of knowledge construction by the learner that is influenced by cognition, metacognition, context (Glaser 1991, Mayer 1992), and motivation (Paris *et al.* 1983, Borkowski *et al.* 1990). Motivation and context are, in turn, influenced by a number of variables, especially emotional factors (Borkowski *et al.* 1990).

2.4.2 The nature and role of knowledge

Having a vast amount of accessible, interconnected and usable knowledge is a key requirement for good thinking, problem solving and learning (Alexander and Judy 1988). The role of prior knowledge influences an individual's ability to solve problems and to acquire further knowledge (Alexander & Judy 1988, Pressley & McCormack 1995). The impact of prior knowledge on problem solving and learning can differ depending on whether this knowledge is "correct" and aids learning, or contains misconceptions and inhibits learning (Glaser 1984). If there is a rich network of information present, as in the case of an "expert", then prior knowledge will be of

immediate value in problem solving and as an aid to further learning (Pressley & McCormack 1995). When knowledge is present, it can be used with little effort, resulting in mental processing capacity being available for more complex problem solving or learning. If, however, little knowledge is present, then an individual may resort to alternative strategies to solve a problem (*ibid.*).

The outcomes of learning are determined not only by the content of instruction, but also by existing knowledge (Shuell 1986). This also applies to misconceptions held, hence in some cases it is necessary for students to reconcile new information that conflicts with existing knowledge. It is possible, therefore, that existing ideas and beliefs may obstruct the construction or application of new knowledge (Collins et al. 1989, Shuell 1986). One method of helping students to overcome misconceptions is to encourage them to actively consider and revise their own beliefs, especially through group discussion, so long as it is carefully controlled, and not allowed to become personal. This allows individuals to check their own beliefs with those of others, and to reject or modify their previous beliefs, or to accept the new ideas (Brooks & Brooks 1993, Shuell 1986).

The implication for instruction of all of this is the need to establish the learner's existing knowledge. This could, for example, be done individually via a written questionnaire, or by brainstorming in a group situation (Brooks & Brooks 1993, Angelo 1996). One has to be aware, however, that the truth is not necessarily revealed through questioning when trying to identify existing knowledge or existing misconceptions (Angelo 1996). Although it will work most of the time for most students, it may still result in some fearing that their lack of knowledge will be exposed. Yates & Chandler (1991) found that teachers who rely on either "discovery" methods, or direct instruction without checking for student misconceptions, are generally not very effective at changing those misconceptions. They also found that teachers who were successful in correcting student misconceptions did so by presenting information and demonstrations that directly confronted those misconceptions. These successful teachers were also more likely to set test questions

that asked students to explain what they knew rather than recall what they knew about the topic.

2.4.3 Forms of knowledge

Knowledge can be categorised in various ways, the most common being declarative, procedural and conditional (Alexander & Judy 1988; Yates & Chandler 1991). Declarative knowledge consists of information or "the facts" one has in memory (i.e. knowing what). They are represented by propositions and cover all topics. It is considered they are static (even though they may be part of a rich network), and are activated by recall.

Procedural knowledge consists of units of declarative knowledge built up to guide the use and transformation of information into actions (i.e. how to use declarative knowledge). Yates & Chandler (1991) suggest that certain procedural knowledge can improve declarative knowledge acquisition. The development of more procedural knowledge appears to result in faster and more efficient mental processing, and it also results in less mental effort being required.

Conditional knowledge is built up to form declarative and procedural knowledge as a guide to when and why various actions are to be carried out. It allows the intentional selection of various procedures in order to achieve a goal. Paris *et al.* (1983) argued that declarative, procedural and conditional knowledge are all necessary for individuals to become strategic thinkers, and to be able to use their existing knowledge to greater effect.

2.4.4 Knowledge construction

Learning is an active process of knowledge construction, and occurs by interpreting information by using one's existing knowledge (Mayer 1992, Reynolds *et al.* 1996). Although the general concept of knowledge construction appears to be gaining acceptance, there is still uncertainty about the exact process by which it occurs. Mayer (1992) suggested a mechanism involving 'learning processes' he calls selecting, organising and integrating (Figure 7), which corresponds to Sternberg's (1994 cited in

Mayer 1992, p. 408) three-knowledge-acquisition components: selective encoding, selective combination and selective comparison. These knowledge-acquisition components operate on a variety of cues that are present in the material being learned. Cue utilisation is affected by moderating variables such as number of occurrences, variability of contexts, location of cues, importance of the to-be-learned information, and density of the information to be learned (Schuell 1986).

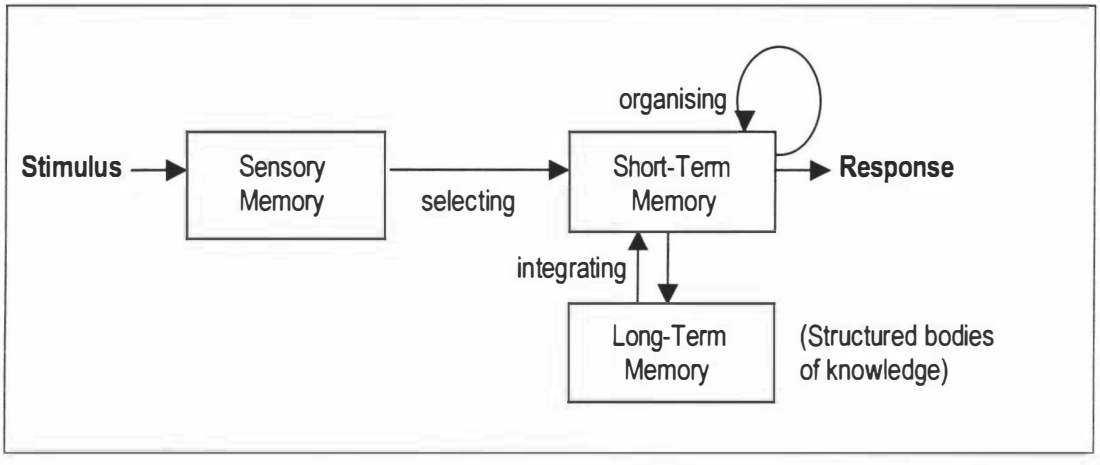


Figure 7 A cognitive model of knowledge construction.
Source: R.E. Mayer in Pressley, Harris, & Guthrie (Eds.) (1992), p. 246.

It has become apparent in recent years that social interaction plays a greater role in the process of knowledge acquisition than previously thought (Glaser 1991, Leinhardt 1992, Reynolds *et al.* 1996). If knowledge is considered to be distributed amongst a group of people, and the amount of knowledge held by the group collectively is greater than that held by any individual, then by sharing their knowledge, each helps the other to gain new knowledge. (This is consistent with Roling's AKIS discussed in Section 2.1.2.) As well as the sharing of new ideas, group discussion also helps individuals to check their own ideas and beliefs, or helps others to correct their ideas. Discussion allows an individual's thoughts to be exposed and hence tested against the collective knowledge rather than just being held privately (Swartz & Perkins 1990, Costa 1992).

This concept of gaining knowledge from others, whether in a group or from an instructor, has been referred to by Vygotsky (1978) as the zone of proximal

development. This is a process whereby a learner performs within their range of competence, yet they are assisted by the group or the instructor to reach potential levels of higher performance than would have occurred without assistance. This has also led to the concept of 'scaffolding' or the provision of temporary assistance to help a learner construct new knowledge by the provision of new information and facilitating its understanding (Rosenshine & Meister 1992).

The benefits to the learner of acquiring 'basic facts', and becoming proficient at manipulating those facts (i.e. developing associated procedural knowledge) has significant implications for instruction (Glaser 1991). Key features include: outlining clear goals for a lesson; linking new knowledge to existing knowledge; and clearly describing the conditions for use of the information or associated procedures and skills (these features are discussed in relation to the workshop case study in Section 4.2.9). The use of advanced organisers (Ausubel 1968) is also a useful instructional technique as it prepares students for the content to be learned, the relationship among its elements, and can guide students towards discovery of knowledge for themselves (Good & Brophy 1995). The use of analogy and metaphors is another instructional technique to help students construct knowledge by linking new ideas to existing knowledge (Brooks & Brooks 1993). Furthermore, students often learn more from what their teachers do than from what they say (Biggs 1991).

2.4.5 Representation and organisation of knowledge

The view of learning as a process of knowledge construction also leads to some ideas about the way that knowledge is stored in the mind. The concept that relationships between information is just as important as the information itself offers the idea that knowledge is stored as networks or schemata in the long-term memory (Glaser 1991, Reynolds *et al.* 1996) (Figure 7). It is also proposed that these schemata are activated by experience, rather than by recall of learned facts which are stored and retrieved as isolated pieces of information (Biggs 1991, Glaser 1991). According to Glaser (1991), as learning occurs, structured bodies of knowledge develop in the memory. These not only provide ready access to information, but also identify the relationship between

various pieces of information. It also reduces the need for competent individuals to resort to trial and error when faced with a new situation, and allows for effective progress in new learning and problem solving.

Research in a number of domains (e.g. Yates & Chandler 1991, pp 162-3) has shown that higher-level organising structures can be acquired or refined during direct teaching. As a result of students being provided with a model and structured information about the basic schematic organisation relevant to a specific domain, they are better able to construct their own schemata.

2.4.6 Domain vs general knowledge and knowledge vs strategy

Recent research has thrown into doubt the long-held concept that problem solving is dependant on an individual's 'mental skills' (Shuell 1986). Rather than some innate mental ability being responsible for the ability to learn and solve problems, it now appears that knowledge plays a significant role (Shuell 1986). Individuals with domain-specific knowledge are able to process information about that domain differently from domain novices. Experts in a domain are better able to utilise new information presented about the domain, and are better able to recall domain-specific information when required. Experts tend to see deeper, more principled information in a situation relating to their domain, whereas novices tend to see superficial information (Biggs 1991, de Jong & Ferguson-Hessler 1996).

Although domain-specific knowledge is advantageous when working within that particular domain, general intelligence still plays a role in cognitive performance. However, it has been noted by Pressley & McCormick (1995) that general intelligence is not necessarily a good predictor of domain-specific performance. A deep, interconnected knowledge base (conceptual framework) will be of great benefit for solving problems in that particular domain, but it will not necessarily transfer for use in other domains. When working in an unfamiliar domain, one tends to revert to general strategies, which are weak in their effectiveness compared to a large relational knowledge base (Perkins & Solomon 1989, de Jong & Ferguson-Hessler 1996).

2.4.7 Metacognition

Metacognition, or higher-order processing, is the knowledge and control of one's own cognitive processes and actions (Brown 1987). Metacognition includes both knowledge (knowledge about cognition) and executive control processes (co-ordination and control of cognitive resources) (Brown 1987, Borkowski & Muthukrishna 1992). Generally recognised elements of metacognition include planning, predicting, problem identification, monitoring, reflection and evaluation of one's own thinking processes (Collins *et al.* 1989). This higher level cognitive processing helps to identify what one does or does not know; it allows the monitoring of new knowledge and its relationship with existing ideas, as well as monitoring one's efforts when solving a problem or learning new information (Brown 1987).

The ability to carry out these self-organising tasks seems to be one of the distinguishing features (as well as having a rich, interconnected knowledge base) of experts. This suggests that an individual needs to develop metacognitive skills, as well as a knowledge base *per se*. Good metacognitive skills also give an individual a better chance to search for new solutions when existing ones do not work (Brown 1987).

2.4.8 Learning strategies

Domain knowledge includes strategies or goal-oriented processes for accomplishing tasks. Cognitive strategies are used to acquire, retain, and retrieve different kinds of knowledge and performance (Anthony 1994). Strategies have been categorised by Collins *et al.* (1989) as heuristic, control and learning strategies. Strategies can be taught using a variety of methods (as outlined in Section 2.4.9).

Heuristic strategies are general approaches or 'rules of thumb' used for accomplishing tasks. They do not always work, but experts tend to have a portfolio of heuristics to chose from that have been built up tacitly over a period of time through their experiences with problem solving (Collins *et al.* 1989, Perkins & Solomon 1989). Good facilitators explicitly provide rules of thumb that they use in order to help workshop participants cope with new concepts, for dealing with problems encountered, and for cross-checking complex numerical processes. (For example, a facilitator may know

from experience that most figures for a return on capital for farming range between -5% and +15%, hence a figure outside this range would require further checking.) Heuristics can operate at both the cognitive and metacognitive levels of thinking (Pressley *et al.* 1987).

'Control' strategies are part of second-order knowing or higher-order thinking (Glaser 1991). It is at this metacognitive level where self-regulation, or management of the thinking and learning process, is carried out. For example, the 'control' or metacognitive strategies require reflection on the problem-solving process, and selection of a possible problem-solving heuristic (Pressley *et al.* 1987, Perkins & Solomon 1989).

Learning strategies utilise goal-directed operations employed to facilitate task performance (Harnishfeger & Bjorkland 1990). Learning strategies can be general (as with heuristics), specific; or review existing knowledge (Perkins & Solomon 1989). In a rapidly changing global environment, and in the increasingly complex work place, the provision and facilitation of learning strategies will provide long-term benefits for those who develop and use them for problem situations. A practical component to incorporate into workshops is to help people become aware of their own learning, and to explain and model strategies for them to use (Pressley *et al.* 1987).

2.4.9 Methods for teaching learning strategies

"A key goal in the design of teaching methods is to help students acquire and integrate cognitive and metacognitive strategies for using, managing and discovering knowledge" (Collins *et al.* 1989, p. 480). Three teaching methods (modelling, coaching and scaffolding) are at the core of cognitive apprenticeships, designed to help students acquire an integrated set of cognitive and metacognitive skills through the process of observation and of guided and supported practice (Collins *et al.* 1989, Rosenshine & Meister 1992). Modelling is where the facilitator leads by example, or provides a demonstration of what is required, whereas coaching consists of observing students while they carry out the task and offering hints, feedback, and reminders about how they can improve their performance and accomplish the task (Collins *et al.* 1989).

Scaffolding refers to the (temporary) support that a teacher provides to help a student carry out a task. Articulation and reflection are methods designed to help students focus their observations of expert problem solving, and gain conscious access to (and control of) their own problem-solving strategies (Swartz & Perkins 1990). Articulation includes any method of getting students to articulate their knowledge, reasoning, or problem solving process for a particular problem, whereas reflection enables students to compare their own problem-solving processes with those of the teacher or other students (Collins *et al.* 1989). Exploration is aimed at encouraging learner autonomy, not only in carrying out expert problem-solving processes, but also in defining or formulating the problems to be solved by providing them with the opportunity to carry out problem solving on their own (Collins *et al.* 1989).

2.4.10 Sequence

During the workshop planning phase, the sequencing of material should be arranged to support the teaching methods used. Collins *et al.* (1989) outlined three factors to consider: increasing complexity, increasing diversity and global before local skills. The rational behind sequencing global before local skills is to allow the learner to build a conceptual picture of the target skills or processes before concentrating on the detail. Not only does this provide direction when working on sub-goals, but it also provides a guide for task performance. This provides the opportunity for the learner to monitor their own progress and to develop self-correction skills (Collins *et al.* 1989, Swartz & Perkins 1990, Pressley *et al.* 1987). At farmer workshops, this would involve providing a model of a system in a symbolised form - as most farmers are likely to have a practical working knowledge of the concepts being taught. Once the model has been explained, attention can then focus on the detailed parts of the model and the learning and application of specific knowledge and skills (Pressley *et al.* 1989).

Sequencing according to increasing complexity refers to the construction of a series of tasks and task environments where more and more concepts and skills are necessary for expert performance (Collins *et al.* 1989, Rosenshine & Meister 1992). As one goes further down the track towards expert performance, isolated skills and knowledge is

simply not adequate, and increasingly it becomes necessary for networks of accessible knowledge skills and concepts to be constructed. The building of these networks is aided by increasing diversity during instruction. The introduction to a variety of different tasks and problems allows the learner to distinguish the conditions under which the skills and strategies being learned do or do not apply (Rosenshine & Meister 1992). The concept of increasing complexity and diversity at farmer workshops should not cause a problem, but will still require detailed planning.

Going from the known to the unknown is another aspect of sequencing that is not mentioned by Collins *et al.* (1989). This was identified by Tom Angelo at his seminar to staff at Massey University on 10 July 1996. This is why it is important to establish prior knowledge at the start of a workshop so that knowledge construction can be built upon a foundation of what is already known.

2.4.11 Social context

The learning environment (in the widest sense, including emotional variables) significantly influences learning through the motivational consequences it generates (Alderman 1990, Biggs 1991). These motivational influences may be positive or negative. Hence, an understanding of the influence of emotional variables in the learning environment can be used to improve the effectiveness of instruction.

Collins *et al.* (1989) considered five sociological characteristics to take into account in an ideal learning environment: situated learning, the culture of expert practice, intrinsic motivation, exploiting co-operation and competition. The situated and social nature of learning applies to domain-specific knowledge as well as metacognition and motivation.

Situated learning & the culture of expert practice

Brown *et al.* (1987) argued that learning and cognition are fundamentally situated in a particular context. Hence programmes which teach abstract concepts are unlikely to be as successful as placing learning in a social and physical context that teaches what is learnt with how it is learnt and used. Resnick (1987) discussed the differences between:

learning at school (where the emphasis is on individual cognition); 'pure thought'; (symbol-based learning); and generalised skills and principals, compared to outside school where learning is socially shared. Higher levels of thinking which involve developing cognitive concepts (where reality is represented by symbols), may be difficult for some people because they are more familiar with working in practical situations with 'concrete' materials and tools (Shuell 1996).

Groups offer several advantages for enhancing individual learning (Glaser 1991). A group extends the available knowledge, hence provides alternative problem approaches; it multiplies the loci of self-regulatory activity by providing numerous triggers for cognitive uncertainty; it monitors individual thinking, opinions and beliefs, and can elicit explanations that clarify points of difficulty; and it provides supportive scaffolding (Glaser 1991).

The culture of expert practice includes the way people think and act, 'the way things are done around here', the history, the jargon, and what is learned as well as how and why it is learned. Brown *et al.* (1987) noted that students are often given the tools of a discipline, but because of the isolated nature of the education system, are unable to use or interpret them in terms of the culture or expert practice. Although farmer workshops will resemble the decontextualised, symbolised classroom situation, as learners, farmers are already well established in their culture. However, the distinction is subtle, because the learners are motivated to learn and use the cognitive 'tools' that the facilitators can offer. In general, however, the aim is to link any academic tools used as closely as possible to the practice and culture of farming. This will be further discussed in relation to the pilot "Preferred Future" workshop in Chapter 4.

Motivation

The intrinsic motivation of individuals needs to be considered in specific situations because a person's motivational beliefs and behaviour are derived from contextual transactions (Paris & Turner 1994). While a motivational problem when adults choose to learn is unlikely, an unhelpful or threatening environment created by the facilitator could result in minimal real learning (Alderman 1990, Ames 1992). When planning

workshops, it is important to avoid situations where participants feel threatened or their 'lack of knowledge' is exposed (Wlodkowski 1985). It is also important to maintain motivation amongst group members. Adults sometimes develop a belief that they do not have the ability to learn (Alderman 1990, Borkowski *et al.* 1990, Rural Development Centre 1991, Gillard *et al.* 1998). Hence, even though they may overcome the initial barriers and attend a workshop, it may still be necessary to change their attribution beliefs by initially providing small steps that can be mastered, then help them make the appropriate attributions between their own efforts and their learning successes (or failures) (Figure 8).

As can be seen in Figure 8 the first link to success is setting goals for performance (Alderman 1990). Goals provide motivation, a clear sense of direction and a mechanism for self-assessment. To provide realistic motivation, learning goals should be proximal (close to being achieved), attainable and challenging. For the facilitator this requires some idea of existing knowledge and a clear vision of how to effectively build new knowledge to bridge the gap between the starting point and the goal.

Depending on the experience and ability of the learner and the complexity of the task, the facilitator may need to explicitly provide learning strategies, for example, those used for comprehension include summarising, questioning, clarification and prediction (Paris *et al.* 1983, Swartz & Perkins 1990).

In Link 3 (Figure 8) the key to a successful experience is to base it on a learning goal rather than a performance goal. The focus on a learning goal is on "how much progress I made" rather than on "how smart I am" (Alderman 1990). The attribution a student makes for success will affect their expectations. The learners must link their own personal effort or strategy to the successful outcome. The facilitator's role is to help the student make the appropriate attribution (Link 4, Figure 8) by providing a role model, and giving feedback. Specific feedback describing the use of effort, ability or strategies (as appropriate) is most helpful in linking appropriate attributions (Zimmerman & Martinez-Pons 1992).

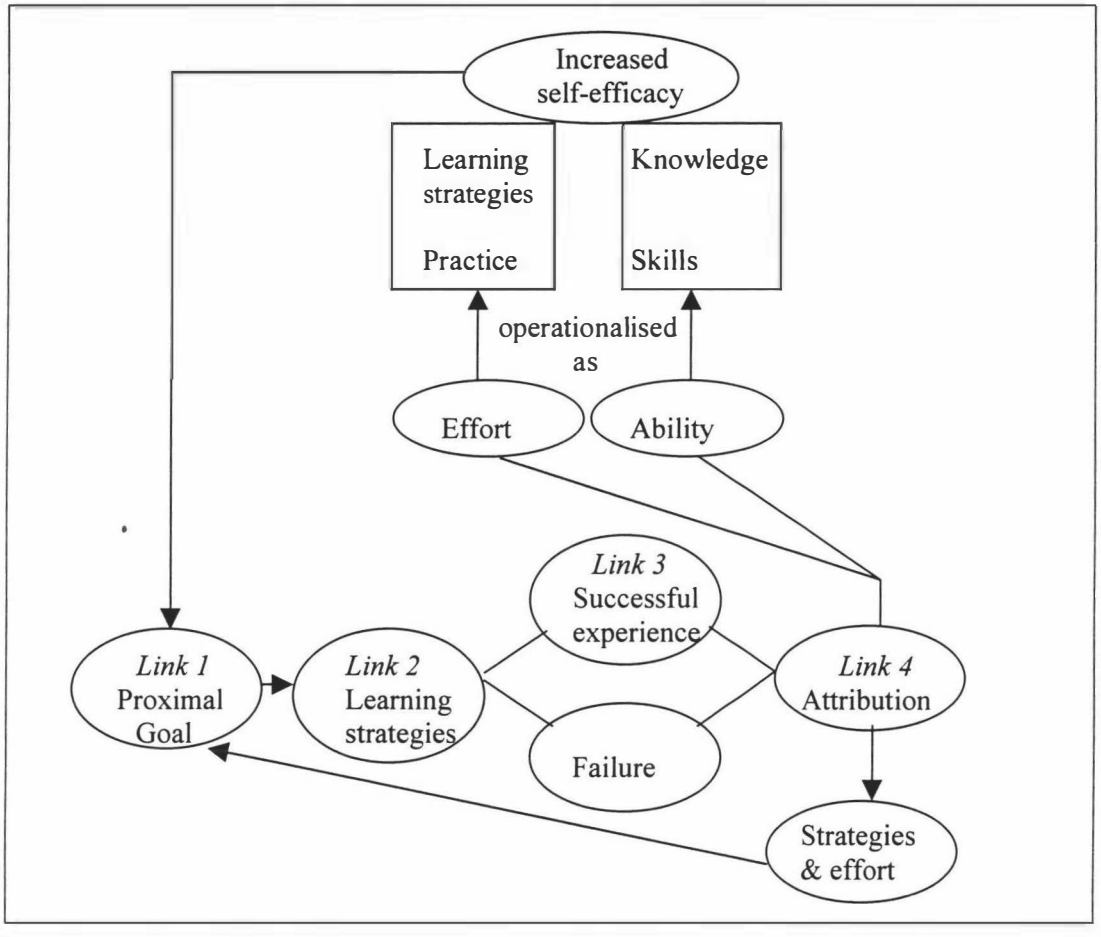


Figure 8 Motivational links to success.
Source: Alderman 1990.

Learners who have succeeded and attribute their success to their own effort or ability have concrete performance feedback that will lead to increased self-efficacy (confidence in their own ability). When failure occurs, the learners' attributions are important determinants of their future expectations for success (Alderman 1990). For example, learners who attribute failure to the use of the wrong strategy are more likely to try again than those who attribute failure to lack of intelligence. Often learners do not know why they failed, and this provides the facilitator the opportunity to provide them with a new strategy to complete the task. The provision of choice, a sense of control by the learner, challenge, guidance and collaboration throughout the workshop will help to ensure that learning is effective (Alderman 1990, Zimmerman & Martinez-Pons 1992, Paris & Turner 1994).

Even with the best planning and facilitation, successful learning outcomes will not be achieved if the learners are not motivated. According to Wlodkowski (1985), a motivated learner is a person who will responsibly begin, continue and complete learning activities with a reasonable amount of effort. He summarised the following characteristics of motivated learners: they want to enhance their competence and self-esteem; they value what they learn; they have a choice in the courses they attend; and they enjoy the learning experience.

Exploiting co-operation and competition

Exploiting co-operation refers to having learners work together in a way that fosters problem solving (Collins *et al.* 1989). This results in having both access to greater learning resources through shared knowledge, and greater motivation. Exploiting competition refers to the strategy of giving the learners the same task to carry out and then comparing what each produces. This reveals both strengths and weaknesses and provides an opportunity for learners to focus their attention and efforts on improvement. However, it is important to focus on processes, not products, and to avoid creating embarrassment or situations that have a negative motivational effect (Borkowski *et al.* 1990).

2.4.12 Providing effective instruction

The seven key principles of adult learning were summarised by Ladyshewsky (1995) as: the content should be relevant to the learner; the learner agrees with the goals of the learning process; the learner is actively involved; the tasks set are practical and applicable; a 'safe', comfortable environment is provided; the learner is responsible for learning at his/her own pace; and the learner can see progress towards the learning goals. These principles incorporate the key factors that influence learning as described earlier in this Section. In addition, Wlodkowski (1985) identified expertise, empathy, enthusiasm and clarity as necessary when providing adult learning experiences. The application of these concepts will be discussed in relation to the "Preferred Future" workshop (Section 4.2.9).

2.4.13 Conclusion

Learning is a complex process. Levels of learning range from becoming aware of a piece of information to developing relational frameworks and abstracting or generalising that knowledge to other domains (Biggs 1991). By understanding and implementing key factors that influence the learning process, more successful learning experiences and confident learners should result (Wlodkowski 1985, Alderman 1990). For instruction to be effective all factors need to combine in a positive way, so individuals can actively construct knowledge and strategies into long-term memory networks (Glaser 1991, Leindhardt 1992, Mayer 1992, Reynolds *et al.* 1996). Both the domain-specific knowledge and the learning strategies should then be available for future application and problem solving, further learning, and greater motivation to learn (Glaser 1984, Alexander & Judy 1988, Collins *et al.* 1989, Pressley & McCormack 1995).

Knowledge is a fundamental element of learning (Glaser 1984, de Jong & Ferguson-Hessler 1996, Shuell 1986). The acquisition of a rich, interconnected and accessible knowledge base provides an individual with an ability, not only to solve problems, but also to have better recall and understanding and a greater ability to accomplish further learning (Shuell 1986, Alexander & Judy 1988, Mayer 1992, Angelo 1996). Knowledge construction is an active process in which social interaction plays an important role (Resnick 1987, Leinhardt 1992, Mayer 1992, Reynolds *et al.* 1996). Other factors influencing individual learning include the use of learning strategies, the sequencing of material in a teaching programme, the learning environment and motivation (including emotional factors) (Collins *et al.* 1989, Pressley *et al.* 1989, Alderman 1990, Swartz & Perkins 1990, Rosenshine & Meister 1992, Paris & Turner 1994).

Several cognitive and emotional factors that influence individual learning were taken into account when planning the first case study reported in Chapter 4. Following the opportunity to reflect on this experience, there was greater effort to incorporate more factors into the second case study in order to achieve the planned learning outcomes (Chapter 4).

Chapter 3

IDENTIFICATION OF FARMER LEARNING NEEDS

"The most innovative organisations
are highly effective learning systems."
Tushman & Nadler 1986, p. 75

Using a self-assessment questionnaire to identify dairy farmer management competence [1]

This Section reports on an exploratory study to assess the management competence of a group of New Zealand dairy farmers. The results from a self-assessed questionnaire were then used as the basis to identify learning needs. The study showed the value of the concept of competence in helping to identify farmer learning needs.

3.1 Introduction

An individual's performance in their employment or business is influenced by the application of their knowledge, technical skills and personal characteristics to problems and opportunities. Stone (1997) described the combination of these characteristics as competence. As the socio-economic environment changes, so do the competencies that are required to maintain competitive advantage (Hamel & Prahalad 1994) in the labour force or market place. Hence, extension programmes to assist dairy farmers become better managers should address areas where management competence is poor, as well as build on existing management strengths. The intention was to plan a series of workshops to help farmers learn new management techniques in the areas identified by the results of the survey.

[1] The material in Chapter 3 was presented at the 1997 "Rural Australia: Toward 2000" Conference, Wagga Wagga, NSW.

The Australian Dairy Research and Development Corporation (DRDC) also recognised the need to improve farm management and accordingly funded research to develop learning situations for farmers to help them: identify problems and issues; plan remedial strategies; implement actions with group support, and identify on-farm technological needs over the next 5-10 years (Frank *et al.* 1995). The two-year project highlighted significant barriers to developing competencies amongst farmers. These included: a reluctance of extension personnel and farmers to become involved in groups, and a reticence amongst group members to take ownership or leadership of the group. Frank *et al.* (1995) suggested that identifying and improving competencies requires significant resources and time, and that there are likely to be unexpected barriers to achieving desired outcomes.

3.2 Local context

The Calving Date Systems Comparison (CDSC) at Massey University's No. 1 Dairy Farm was a research trial initiated by local dairy farmers (Tolmin 1997). The farmers asked for the study to provide them with production and financial information to assist them with strategic management decisions concerning their dairy production systems, particularly calving date. A non-replicated farmlet (40 ha each) experiment comparing 100% spring, 100% autumn and 50-50 spring and autumn calving cows was established for this purpose in August 1996 (Tolmin 1997). The farmers also requested that an extension component be incorporated within the trial to ensure that information was made available to them as it was generated. If the extension programme was to impact the effectiveness and efficiency of dairy farm management, it needed to go beyond the simple one-way dissemination of trial results. Prior experience has shown that the presentation of research results (information) to farmers on its own is often not efficient in transferring technology to the farming community (Beaven *et al.* 1995, Hamilton 1995). Hence it was important to initially identify areas where farmers believed their management competence was limiting farm performance and to utilise the information from the trial and other sources to address these needs. Thus, information on competencies could be used to design appropriate workshops and other extension activities for local dairy farmers in conjunction with

the 3-year CDSC. The research described in this Chapter was designed as a scoping study to test the usefulness of the competence approach in identifying specific learning needs of farmers. If useful information resulted, then this would be used as a basis for workshop development.

3.3 Method

A number of methods have been used to identify competencies, such as group discussion (Rural Development Centre 1991), literature search and written survey (Page *et al.* 1994), and questioning (Stone 1997). While similar methods could be used to assess competence, a written questionnaire was used as the most practical method given time and resource constraints. The list of competencies was constructed partly from a literature search, and partly from the professional experience of the researcher. A two-page questionnaire was administered to the attendees of two field days held at Massey University's dairy farms; one in November 1996 (the first field day on the CDSC) and February 1997 (the annual Massey University No. 4 Dairy Farm Field Workshop). Useable responses were obtained from 25 and 95 dairy farmers, respectively. The questionnaire (Appendix 1) asked farmers to rate their confidence that their existing knowledge would allow them to achieve a range of management tasks (1=not confident to 5=confident); and competence, in a range of management tasks. Competence was scored on a 1 to 5, ranging from 1 ("poor ability, low efficiency, limited understanding") to 5 ("very good ability, high efficiency, complete understanding").

Respondents were also asked to provide some data describing their property and circumstances. The data were coded and entered into an Excel spreadsheet for subsequent analysis with SAS to derive simple descriptive statistics.

3.4 Results

The age, occupation and herd size of the respondents is summarised in Tables 2 and 3. About one quarter of the respondents were 24 years of age or younger (Table 2). Younger farmers were associated with the larger herds ($r = -0.29$, $P < 0.05$). The smallest and largest herd was 72 and the 930 cows, respectively. The herd size across

all farming respondents averaged 308 cows, which is larger than the national average of 208 cows (Leslie 1998). One-third of the respondents had herds of less than 199 cows, and two thirds had 200 or more cows.

Table 2 Age distribution of survey respondents and average herd size by age group. (Figures in brackets are the percentage of respondents in each category.)

Age group	No. responses	Av. Herd size
≤ 24	32 (27%)	364[a]
25-44	64 (53%)	316 [a]
≥45	24 (20%)	204[b]

[a, b] Different superscripts within columns are significant at $P < 0.05$ (RSD = 157).

Table 3 Occupation of survey respondents, average age and average herd size.

Occupation	No. responses	Av. Age (years)	Av. herd size (cows)
Farm owner	45 (37.3%)	43	277[b]
Sharemilker	26 (22.0%)	30	291[b]
Manager	19 (15.7%)	32	284[b]
Employed staff	30 (25.0%)	23	386 [a]

[a, b] Different superscripts within columns are significant at $P < 0.05$ (RSD = 160).

Table 4 shows the respondents' assessment of their confidence in the level of knowledge they have in a range of dairy farming practices, whereas Table 5 shows respondents' assessment of their competence in a range of farm management practices.

The differences between owner-operators and sharemilkers, managers, and employed staff; and between respondents with large (200 or more cows) and small herds (less than 200 cows), was not significant. The respondents were most confident (1=not confident to 5=confident) in undertaking tasks associated with physical farm management (e.g. calf rearing (median score 4), herd reproduction (4)); and least confident in the use of computer software (2). The farmers did not feel competent (1=very low ability, 5=very high ability) in price forecasting (2) or a range of other business management practices, e.g. strategic planning (3), preparing an annual cashflow (3).

Table 4 Respondents' (n=120) assessment (1=not confident to 5=confident) of their knowledge in various aspects of dairy farm management.

Task	Overall Median (n = 120)
Calf rearing to cost effectively rear heifer replacements	4
Growing herd heifer replacements to reach target liveweights at 24 months	4
Pasture grazing management to produce high quality, productive pastures	4
Herd mating management to meet industry targets for herd reproductive performance	4
Herd health monitoring to identify the causes of animal production losses	4
Soil management to minimise treading damage to soil structure	4
Feed planning to keep cows fully fed during lactation	4
Time management to ensure time is regularly available to enjoy off-farm activities	4
Dairy cow nutrition to design a balanced ration for milking cows	3
Labour management - to successfully employ staff	3
Soil fertility to determine fertiliser quantities to economically grow extra pasture	3
Techniques to evaluate farm business performance	3
Goal setting to write goals for a five-ten year farm business plan	3
Farm business analysis to determine the profitability of alternative dairying systems	3
Use dairy farm management software (e.g. spreadsheet, 'UDDER')	2

Table 5 Respondents' (n=120) assessment (1=not competent to 5=competent) of their competence (ability/efficiency) in various aspects of dairy farm management.

Task	Overall median (n = 120)
Monitoring and recording farm production	4
Identifying opportunities to improve milk production	4
Preparing a whole farm feed budget	4
Maintaining accurate records of cash transactions	4
Interpreting & using information from farm accounts	3
Planning and costing changes to a dairy farm	3
Preparing an annual cash flow	3
Drawing up a 5-10 year strategic plan	3
Forecasting prices and costs 1-5 years ahead	2

They were, however, more comfortable with other aspects of business management such as monitoring and recording dairy farm production (4) and maintaining accurate records of cash transactions (4).

Farmers with herds of fewer than 200 cows were more confident (median score 4) than those with herds over 200 cows (3) in their ability to determine the fertiliser requirements to grow extra pasture economically, but for other issues, such as

knowledge of soil management to minimise treading damage and labour management, scores were not associated with herd size (P=0.05).

3.5 Discussion

The lower North Island dairy farmers who attended the two Massey University field days indicated that they felt least competent in the areas of strategic and business planning, and most competent in the physical production aspects of dairy farming, which is in agreement with other studies. For example, Floyd (1995a,b) showed from a survey of 200 farmers that the issues of most concern to them related to business management (68% of the issues raised related to: financial, business, marketing and/or people skills), while 32% of the issues primarily concerned herd production (animal health, livestock, feeding). Frank (1995a,b) in a study of north Queensland cattle managers, identified business management skills as one of the capabilities that could be further developed. In another study of business management training for Queensland farmers, Cameron & Chamala (1997) found that level and type of education were significantly correlated with attendance at training courses, community participation, and willingness to seek professional advice and share management tasks and decision making. Thus, farmers who most need personal development are the least likely to take up the opportunities provided. This behaviour poses a significant challenge to extension agents.

The current survey suggests high priority should be given to developing workshops and extension materials on goal setting and strategic planning, and skills to analyse the profitability of different dairy farming systems. The non-significance of farmer age, management position and herd size on the rating of management capabilities suggests workshops can be designed to meet the needs of dairy farmers and their employees who come from a wide range of circumstances. Findings from the CDSC could be incorporated into these workshops (e.g. analysing the profitability of the 100% spring vs 100% autumn calving) to provide examples that farmers can directly associate with when learning new management skills.

In recent years, a successful workshop format for extension purposes has been developed at Massey University and used at farmer conferences (Beaven *et al.* 1995, McFerran *et al.* 1996). The lessons learnt from the evaluation of conference workshops can be used to design extension activities to help farmers develop specific business management skills. The key elements of a successful workshop have been identified as: group size of less than 15; the use of a skilled facilitator; completing a variety of processes and exercises that allow individuals to acquire and develop knowledge and technical skills; and the inclusion of exercises that directly apply to the participants' farms.

3.6 Future Research

The self-assessment of dairy farmer management competence with a questionnaire is a simple and low cost first step in obtaining complex information about farmers' existing abilities (Section 2.3). However, the authenticity of the farmers' own rating of competence needs to be verified. The self-scoring method has inherent risks of inaccurate responses due to acquiescence and/or social desirability biases. Acquiescence is the tendency of respondents to agree with any statement regardless of its content, or to score a response similar to the previous one (Kalton & Shuman 1982, Wright 1976 cited in Gendall & Hoek 1990). Social desirability bias occurs when respondents answer questions about moral or ethical issues or personal ability in ways that they perceive are socially desirable, presumably to create a favourable impression with the survey designer (Locander & Burton 1976, Phillips & Clancy 1971/72 cited in Gendall *et al.* 1992).

The next stage of the project will therefore investigate the development of competency models using participatory processes with farmers. The competency models will define the factors that are important for an individual or an organisation to become successful in business (Stone 1997). During the process of model development, the individual also becomes conscious of these factors, and thus is able to identify areas for their own improvement. The process also identifies activities and behaviours that are redundant because they no longer add value to the business. For

farmers who employ staff, the benefit of being able to develop a competency model for themselves is that they can also use this process to assist their staff. This will help to identify, develop and maintain the appropriate competencies at all levels of the farming business. The principles and processes of competency modeling can be applied to the rural servicing sector as well as to farmers. One of the most critical steps will be to train facilitators who can develop competency models with farmers.

3.7 Conclusion

Determining competencies provides a useful framework for identifying the knowledge, technical skills and behaviours required to operate a successful farming or rural business in the emerging socio-economic environment. A simple questionnaire was used in this study to identify areas where competence development is required amongst dairy farmers. Increasing competence through workshops and other extension tools will enable farmers to better cope with the future. Appropriate resources to help farmers identify and develop competencies in rural communities are required.

The findings from this study were used as the basis for developing the "Preferred Future" workshop on strategic planning for dairy farmers (Section 4.2). The workshop on dairy cow nutrition reported in Section 4.1 was designed and delivered in response to a specific request. This request provided an opportunity to design and deliver a workshop to develop farmer competence to meet an existing and already identified need.

Chapter 4

WORKSHOP DESIGN, DELIVERY AND EVALUATION:

"Effective learners are motivated knowledgeable, reflective and socially interactive."

A. St George 1996, p. 55

4.1 Case study 1: "Northland Dairy Cow Nutrition" workshop

This Section presents the development process and outcomes of a workshop to 'upskill' a group of individuals from the dairy industry in dairy cow nutrition. The workshop was developed and conducted by Massey University staff at the request of the Milk Supply Manager of Northland Co-operative Dairy Company Ltd. It was held 11-13 November 1997 in Whangarei.

4.1.1 Introduction

The request from the dairy company milk supply manager provided an opportunity to design and facilitate a workshop to enhance farmer competence in the area of dairy cow nutrition. It was a first conscious effort by the researchers to incorporate cognitive aspects of individual learning and principles of learning as outlined in Section 2.4. Being the first attempt, considerable discussion was required during the planning stage to take these factors into account. The effort paid dividends during implementation, which resulted in positive feedback from the workshop participants. This experience provided a sound basis for preparing the "Preferred Future" workshop which will be discussed in Section 4.2.

4.1.2 Setting the objectives

The workshop objectives were negotiated during initial discussions with the client, who also provided feedback on a set of draft objectives. Based on these discussions, the objectives were developed in order to: define the specific outcomes required; provide guidance to the presenters; ensure that the key concepts were identified and discussed; ensure that the appropriate reference material was supplied; ensure that

exercises were relevant and facilitated learning by the participants; link together the workshop sessions; and evaluate the effectiveness of the workshop.

It was agreed that by the end of the workshop the participants should be able to:

1. explain the key metabolic pathways linking the main dietary components to dairy cow production;
2. calculate the energy and protein requirements of cows in different physiological states, be aware of the limitations of using mineral concentrations as a basis for cow requirements, and list the main factors which determine the potential voluntary feed intakes (VFI), and list the factors which may limit the attainment of VFI in practice;
3. identify potential problems (health and production) arising from feeding different feeds based on their nutrient composition data from references and laboratory reports;
4. identify potential problems (production and health) by monitoring cow performance, and identify appropriate remedial (and/or preventative) actions involving changes in feeds (supplements) and/or management;
5. calculate the likely extra economic return from a given change in ration;
6. describe the difference in philosophy between the dairy grazing management systems of the last three decades, and those being used to achieve high production and high profit through increasing both per cow and per hectare performance;
7. identify key issues in pasture management and supplementary feeding systems that will influence dairy farm production and profitability.
8. integrate pasture management and supplementary feeding systems to reach the objectives set by individual farmers (e.g. optimise total profit (or profit per cow or per hectare); achieve high pasture utilisation; achieve high per cow or high per hectare performance).

Achieving the required outcomes was dependant on the participants: building a sound understanding of complex biological processes and interactions within the cow; amending the way in which they thought about various feeds; being able to represent

some of these interaction mathematically to calculate requirements and responses; and being able to synthesise this material into an overall conceptual framework. A decision was made that a minimum of two days (16 hours) would be required to achieve these outcomes with a small group of farmers (maximum 15) in an interactive workshop.

4.1.3 The planning process

The presenters met to develop for the programme details required to help the workshop participants achieve the negotiated objectives. The workshop strategy was to initially develop an understanding of the key components of the rumen system, gradually putting them together to build a 'big picture' of dairy cow nutrition. The programme culminated with case studies where the principles, skills and information could be applied. The case studies also provided some role-modelling (i.e. the participants were able to 'see' how the 'experts' approached a problem and the steps they took to solve it).

A workbook was designed to integrate key information with the questions and exercises, and to provide participants with a place to write their responses and other notes. It also helped to guide the presenters and participants through the programme. In each workshop session there was a brief presentation of some key information, or a demonstration of some particular skills (process). In either case, reference was made to materials provided in the workshop folder. Next, the participants answered a number of questions, or completed an exercise that required them to become engaged with the information or to use the skills that had been demonstrated. This involvement revealed areas requiring further clarification or explanation. This was attended to before moving to the next topic. The case studies provided another opportunity to revise, clarify and apply the points covered earlier in the workshop. The workshop programme is summarised in Figure 9.

Programme:

Tuesday 11 November 1997

1.00 pm	Introduction, workshop outline
1.15 pm	Ruminant digestion (Energy, carbohydrate, protein, sugars & starch, fat, minerals)
2.40 pm	*Afternoon Tea*
3.00 pm	Dairy cow nutritional requirements
4.30 pm	Cow intakes, pasture allowances and pasture residuals
5.00 pm	*Close*

Wednesday 12 November 1997

8.00 am	Feeds and their limitations - pasture and rations analysis: what to look for
9.40 am	*Morning Tea*
10.00 am	Providing appropriate rations to meet the nutrient requirements of the individual cow from pasture and supplementary feeds
12.00 noon	*Lunch*
12.45 pm	Calculating responses to extra feed
2.10 pm	*Afternoon Tea*
2.30	Dairy pasture and grazing management to achieve high production
3.30	Integrating pasture management and supplementary feeds - whole herds and whole lactations
5.00 pm	*Close*

Thursday 13 November 1997

8.00 am	Case study scenarios provided by team members
10.00 am	*Morning Tea*
10.20 am	Case study scenarios provided by locals
12.00 noon	Summary, Evaluation

Figure 9 Programme for the "Northland Dairy Cow Nutrition" workshop.

4.1.4 The participants

Fifteen participants attended the workshop. Their occupations/backgrounds were as follows: dairy company farm advisory staff (4); consulting officers/farm management consultants (2) veterinarians (2) and farmers (7).

To ensure participants had an adequate existing level of knowledge, a condition of entry was that they were confident in: completing daily, weekly, seasonal and annual feed budgets using dry matter and metabolisable energy (ME); using cow feed requirement tables and obtaining information on the nutritive values of feeds. This pre-requisite was set for participants because of the amount of knowledge construction required during the workshop.

4.1.5 The workshop process in action

The workshop was implemented as planned. The information, concepts and examples of skill application were presented and this resulted in initial questions and discussion. The questions and exercises were worked through by participants (either individually or in small groups), creating more discussion and questions of clarification. The group members interacted in an open manner, sharing experiences and providing and sharing examples from their own experience throughout the workshop. Consequently, a positive learning environment was created where all participants felt comfortable to ask questions, and to make a positive contribution to the discussion.

4.1.6 Workshop outcomes

Participants completed an evaluation questionnaire (Appendix 2) at the end of the workshop. Table 6 summarises participants' questionnaire responses about how confident they were in meeting each of the learning objectives at the end of the workshop and how much new knowledge they had gained. The participants indicated they were reasonably confident in being able to meet each of the objectives set (median score of 4 for objectives 7-5 and a median score of 5 for objectives 6-8. All on a scale of 1="not confident" to 5="confident". There were no scores below 3.) From this feedback it appears that the negotiated learning outcomes were achieved.

Participants were asked to estimate their "gain in knowledge" concerning dairy cow nutrition on a scale of 1="learnt little" to 5="learnt a lot". The range was 2-5, with a median score of 4 for all except Objective 2a (median=5) (Table 6). This indicates that most participants gained a considerable amount of knowledge, however, for each objective there were a small number (not the same individuals throughout) who already had reasonable knowledge in the subject matter in question. On the basis of this rudimentary evaluation, it was concluded that the workshop helped each of the participants build on their existing knowledge and to integrate this with the information, concepts and skills presented during the two-day programme.

Table 6 Summary of workshop participants' (n=11) scores of confidence in their learning outcomes and gain in knowledge. (Four participants did not complete the written questionnaire.)

	Learning outcome	Gain in knowledge
I am now be able to:	not confident ... confident 1 2 3 4 5	learnt little ... learnt a lot 1 2 3 4 5
1. Explain the key metabolic pathways linking the main dietary components in feed to dairy cow production.	median 4, range 3-5	median 4, range 3-5
2. Calculate the energy and protein requirements of cows in different physiological states, and to be aware of the limitations of using mineral concentrations as a basis for cow requirements.	median 4, range 3-5	median 4, range 2-5
2a. List the main factors that determine the potential voluntary feed intakes (VFI) and list the factors that may limit the attainment of VFI in practice.	median 4, range 3-5	median 5, range 2-5
3. Identify potential problems (health and production) arising from feeding different feeds based on their nutrient composition data from references and laboratory reports.	median 4, range 3-5	median 4, range 2-5
4. Identify potential problems (production and health) by monitoring cow performance, and identify appropriate remedial (and/or preventative) actions involving changes in feeds (supplements) and/or management.	median 4, range 3-5	median 4, range 2-5
5. Calculate the likely extra return from a given change in ration.	median 4, range 3-5	median 4, range 2-5
6. Describe the difference in philosophy between the dairy grazing management systems of the last three decades, and those being used to achieve high production and high profit through increasing both per cow and per hectare performance;	median 5, range 3-5	median 4, range 2-5
7. Identify key issues in pasture management and supplementary feeding systems that will influence dairy farm production and profitability.	median 5, range 4-5	median 4, range 2-5
8. Integrate pasture management and supplementary feeding systems to reach the objectives set by individual farmers (e.g. optimise total profit or per cow or per hectare; achieve high pasture utilisation; achieve high per cow or high per ha performance).	median 5, range 3-5	median 4, range 3-5

Positive discussion and verbal feedback occurred during lunch and tea breaks throughout the workshop. This feedback was confirmed by responses to the open-

ended questions in the written evaluation (Appendix 2) summarised in Tables 7-9. These questions asked participants to note: what aspects of the workshop were done well, what aspects could have been improved and if the workshop did not meet their expectations, to explain why. The presenters gained satisfaction and confidence from the positive interaction and feedback. A number of unplanned benefits also arose from the workshop: first, participants discovered that there were local resource people available to them; second, the presenters gained experience in developing and presenting a workshop for farmers; and third, the considerable networking that occurred led to other activities of common interest being organised between participants and presenters.

Table 7 Aspects of the workshop that the participants considered were done well (responses to an open-ended question).

Discussion time/interchange of ideas.	(8 mentions)
Explanation of individual sections/papers well presented.	(6 mentions)
Good reference material.	(4 mentions)
Protein requirements.	(2 mentions)
Mineral requirements.	(2 mentions)
Cow nutritional requirements.	
Ruminant digestion.	
Feeds & their limitations.	
Ration balancing, calculating feed costs.	
Calculations that show why we don't see the results (we expect).	
Smith's case study.	
Topic flows very logical.	
Punctuality, informality.	

The feedback indicated that the participants found the design of the workshop and reference material very suitable, especially the mix of presentations and discussion. The questions and exercises set in the workbook proved to be good stimulants for interactive discussion.

Some comments indicated personal preferences for more or less time spent on particular topics e.g. comments included "Maybe more on pasture" and "A little more depth on changes seen on-farm . . ."(Table 8). If a specific topic was identified (e.g. pastures), this may be revised for future workshops. It appears that the art of good facilitation is to balance the programme to suit the majority of participants.

Table 8 Aspects of the workshop which participants considered could be improved (responses to an open-ended question).

None.	(2 mentions)
Maybe more on pasture.	(2 mentions)
A little more time spent on some of the subjects (none specified).	(2 mentions)
A little more depth on changes seen on-farm e.g. milksolid production, animal health which could indicate imbalances occurring.	
Less use of whiteboard for prepared examples.	
More time working through examples in the book.	
More research to support some statements.	
Be able to read papers prior to the workshop.	
Some confusion, arguments between speakers.	

Some participants found it difficult to cope with disagreements amongst 'experts' (Table 9). While there were no major disagreements, some differences in opinions between speakers were detected.

Table 9 General comments from participants about the workshop (single comments) (responses to an open-ended question).

Enjoyed the two days & found it stimulating.
Well done. Where's the next one?
Excellent two-day workshop.
Well done. Good to see Massey staff in Northland.
Very good workshop. Discussion between tutors and participants was quite enlightening.
Very pleased to be part of this seminar.
I would certainly promote any future seminars, and I would like to see this happen.
An excellent workshop.
Met my expectations
More than met my expectations

When this happened, time was taken to: acknowledge the differences, and for each presenter to support their claims and why they differed from the other perspective; to acknowledge that the situation was complex; that even the 'experts' were working with incomplete information; and that each person needed to make their own judgement based on the information they had at the time. The participants felt that some information seemed contradictory e.g. "some confusion, arguments between speakers" (Table 9). From verbal comments received during the workshop, however, the confusion often disappeared once the context in which the statements were made

had been clarified and the participants had developed a better understanding of the issues being discussed.

In general, the results achieved were a credit to the presenters, and the flexibility they showed in their approach helped the attendees to develop their knowledge about the complex relationships and interactions involved with dairy cow nutrition.

4.1.7 Discussion

The "Northland Dairy Cow Nutrition" workshop required participants to not only acquire and 'internalise' a lot of new information, but also to construct or reinforce the conceptual frameworks to integrate and use this information. The aim was to build accessible, interconnected and usable knowledge as described by Alexander & Judy (1988) (Section 2.4.2). These conceptual frameworks act as a foundation upon which experience can be built, and facilitate the construction of further knowledge. This is most likely to have occurred as the participants applied the new knowledge to their own farming systems. During the workshop some participants became aware of ideas that conflicted with their own, whereas for others their existing views were reinforced. Being aware that misconceptions can inhibit learning (Alexander & Judy 1988) allowed the workshop facilitators to cope with them as they arose. Dealing with misconceptions was appreciated by the participants and was reflected by the number who commented on the value of discussion time/interchange of ideas (Table 7). Participants also developed an ability to help others in the group to understand the concepts involved.

Each workshop participant gained different knowledge and skills from the workshop depending on: their previous knowledge and experience; how well the workshop and the environment suited their ability to learn; and the motivation or vision they had for the use of the new knowledge. Participants gained the most new knowledge about factors that determine voluntary feed intake (Table 6). The topics which participants were most confident with at the end of the workshop related to pasture management (Table 6) where they had substantial practical experience (and a lot of published

information and advisory support prior to the workshop - if they had chosen to use this).

4.1.8 Conclusion

The available indicators show that this workshop was successful and met the initial objectives set (Tables 7-10). Informal feedback, the participants' indication of their learning outcomes, and their responses to the open-ended questions on the evaluation form, all affirmed how well the workshop was conducted. However, there were areas identified for improvement as well, and these were taken into account when designing and delivering the "Preferred Future" workshop (Section 4.2).

The initial detailed planning for the workshop paid dividends. The format used (including the workbook, the reference material, and adequate time for discussion) all played a part in achieving successful learning outcomes. Some participants indicated that they would be prepared to take part in other workshops about topics of interest to them if they were conducted in a similar manner. Identifying an on-going requirement for self-development by the participants was an unplanned, but valuable outcome.

Experience from this workshop was incorporated into the "Preferred Future" workshop reported in Section 4.2.

"Organisations must learn to manage tomorrow's opportunities as competently as they manage today's businesses."
Hamel & Prahalad 1991, p. 92

4.2 Case study 2: Developing dairy farmer business management competence through the "Preferred Future" workshop[1]

Based on the results of the survey of dairy farmer competence (Chapter 3), Hypothesis 1 (Section 1.3) was more closely defined:

Hypothesis 1 (revised) Farmers can build competence in strategic planning through a short-course workshop (16-20 hours) that will enable them to write and monitor their own farm business strategy.

In order to investigate the hypotheses, it was necessary to design, conduct and evaluate a workshop to test its effectiveness in achieving the desired outcomes. The development delivery and evaluation of the "Preferred Future" workshop is reported in this Section.

4.2.1 Introduction

Despite the wealth of information freely available via a range of media, many farmers lack both the confidence and the capabilities needed to develop their own written strategic business plans. The fact that most farmers do not have a formal strategic plan for their business is testimony to this. Information *per se* about strategic planning is unlikely to be constraining individuals in completing this task since it is widely available and has been promulgated by the extension agencies in the past (Shadbolt *pers comm.*). This suggests that the 'one-way' approach to technology transfer is inappropriate for developing business management capabilities amongst the farming community. The aim was to test the effectiveness of a participatory workshop on farm business management to help individuals build and apply new knowledge and skills in strategic management, specifically planning and control.

[1] The material in Section 4.2 was presented at the 1999 Annual Conference of the New Zealand Branch of the Australian Agricultural and Resource Economics Society Inc., Christchurch (In Press).

The workshop was designed to allow participants to develop their knowledge and skills by writing their own farm strategy. Adult learning principles were utilised in the workshop design. Participants were able to integrate and apply their existing knowledge and experience within a strategic planing conceptual framework.

4.2.2 Background

In an uncertain economic environment, strategic planning is an essential management skill to successfully guide the business towards the attainment of shareholder goals. As well as helping the manager to become aware of the many factors that influence the business, strategic planning also provides the opportunity to share and communicate ideas with other stakeholders. The strategic planning process adds rigour to decision-making for the long-term and assists with risk management (e.g. Loveridge & Pitt 1990, Mintzberg *et al.* 1998).

The years of stable economic conditions in New Zealand from the 1950s to the early 1970s did not foster strategic planning as an essential element of business planning because minimum product prices were guaranteed by the Government or Producer Boards. Hence, it was neither a significant part of agricultural education or rural culture. While the Advisory Services Division of MAF ran a week-long course annually on farm business management in the late 1970s and early 1980s, these courses were by invitation and catered only for a small number of farmers. Only recently has interest increased concerning the importance of strategic planning in agricultural businesses (Floyd 1995a,b, Parker 1997a). At the same time, surveys showed that farmers themselves realised that they lacked the skills to carry out the long-term planning necessary for their businesses (Chapter 3). This also led to an awareness that there are few tools specifically designed to assist farmers learn and develop capability in strategic management. This situation is not unique to New Zealand. A similar realisation led to short course programmes such as "Dairy-MAP" in Pennsylvania (Holden 1997), "ProDairy" in New York State (Oelker 1995), "Property Management and Planning" (PMP) throughout Australia (Letts 1997) and

"Smart Move" (the dairy subsection of PMP) in Queensland (Wightman 1998a,b) (see Chapter 2 for a review of these programmes).

In 1997, an opportunity arose for Massey University staff to design and pilot a workshop titled "Preferred Future" to assist New Zealand dairy farmers develop strategic management skills. Two research projects were running concurrently, but with complementary elements. The Calving Date Systems Comparison (see Chapter 3) which included a component to help farmers evaluate different dairy production systems. A Public Good Science funded project "Extension Methodologies to Enhance Technology Uptake by Dairy Farmers" was seeking to test the proposition that education to build new knowledge and conceptual frameworks was an important element of this process.

4.2.3 Method

Factors that contribute to successful design and facilitation of adult education workshops, and methods of evaluation were identified from a literature search.

Workshop development

Key elements were combined to develop the "Preferred Future" workshop. These elements were: domain content knowledge (principles of business management; the development and use of financial performance indicators); prior knowledge (survey results of farmers' perception of their competence for a range of management skills); and a learning/facilitation framework. The design team met initially to define workshop outcomes and identify the main headings to be included (and their order) in the programme (Figure 10).

Copies of "Pro-Dairy", "Dairy-MAP" and "Smart Move" were obtained from their developers for ideas on content and layout so that it was not necessary to "re-invent the wheel". Although these programmes generated many ideas, a different style and approach was adopted for the "Preferred Future" workshop. Each session was developed through a number of iterations, until the authors were confident the content and layout would assist facilitation and enhance participants' learning.

Session 1: Getting Started: Looking Inside and Out (Day 1)

By the end of Session 1 you should be able to:

Explain and use the strategic planning process;
Identify external factors (using a PEST analysis) that could impact your business in the future;
Use a SWOT analysis to identify the strengths, weaknesses, opportunities and threats relating to your business.

Session 2: Setting Directions (Day 2)

By the end of Session 2 you should be able to:

Identify the attributes associated with "success" for your family and farm business;
Use scenario planning to help analyse possible future situations;
Write a mission statement and associated goals and objectives for your farming business.

Session 3: Measuring up (Day 3)

By the end of Session 3 you should be able to:

Analyse the health of your current farming business using the value created technique;
Identify and describe measures of success applicable to your farm.

Session 4: Turning plans into reality (Day 4)

By the end of Session 4 you should be able to:

Refine objectives, define action plans and be aware of project management techniques;
Identify and use a number of techniques to monitor and control your farming operation and business.

Figure 10 Programme for the "Preferred Future" workshop.

Learning objectives were stated in terms of what the participants should be able to do by the end of the workshop, for example:

> Apply the strategic planning process to your farm business;
> Use scenario planning to help analyse possible future situations;
> Write a business and personal mission statement, and related goals and objectives;
> Analyse the 'health' of your farming business using the value created technique.

The resultant workbook was used to guide the facilitators through the workshop, and as a tool to help participants learn. The workshop was held on 16, 20, 23 and 28 April 1998, 10.00 am – 2.30 pm each day.

Workshop facilitation

The facilitators used adult learning principles (Ladyshewsky 1992), general learning principles (Glaser 1984, Resnick 1987, Alexander & Judy 1998, Glaser 1991, Mayer 1992, Pressley & McCormack 1995) and recommended facilitation techniques (Wlodkowsky 1985, Collins *et al.* 1989, Rosenshine & Meister, 1992, Nurre 1998). In

order to test Hypothesis 2 (Section 1.3), two aspects of facilitation were evaluated: participants' progress towards the learning goals and their level of enjoyment throughout the learning process.

Evaluation

Data collected during and after the workshop was used as evidence to support both Hypotheses (Section 1.3). Several mechanisms were used to check participants' progress towards the learning goals. These included: informal questioning and feedback throughout the workshop; formal reflection sessions throughout the workshop; a written questionnaire and verbal feedback at the end of the workshop; and an interview 16 weeks after the workshop.

Throughout the workshop, the facilitators looked for, and responded to, visual cues such as signs of interest, insight, confusion and boredom (Wlodkowski 1985). These instances were not recorded, but they helped contribute towards positive communication between the facilitators and participants, and helped ensure that participant learning was on target. As an intrinsic part of the facilitation process, the participants were asked to complete a summary page in the workbook at the end of each session, especially to note important points that they gained from the session, and also the "muddy" points (issues about which they were still unclear). These points were discussed at the start of the next session, with the "muddy" points being further discussed until participants indicated that they understood and were able to apply the ideas. "Important" and "muddy" points identified by participants were recorded by the researcher as field notes. This method of collecting data throughout the workshop was used because it did not disrupt the flow of the workshop.

At the end of the workshop, participants completed a written questionnaire (Section 4.2.7) modified from one used in the Dairy-MAP programme (Holden 1997). This method was used in order to collect data that could be compared with similar workshops, and because it allowed the information to be collected quickly (10 minutes), while the ideas were still fresh in the minds of participants. Questions related to progress towards the learning goals, the importance the participants placed on elements of strategic planning before and after the workshop, and background

information about the participants. A verbal feedback session was also conducted at the end of the workshop, and these comments were recorded as field notes. This provided an opportunity for participants to express ideas that they had not been asked for in the written questionnaire, and it provided the facilitators an opportunity to respond immediately, if required, to any issues raised.

The evaluation at the end of the workshop provided data on the participants' progress towards the learning goals. The purpose of the workshop, however, was for the participants to apply what they learnt to their farm business. This required some time to elapse after the workshop for participants to apply what they had learnt. Sixteen weeks after the workshop participants were visited and interviewed to monitor the progress in applying what they had learnt. A semi-structured interview technique was used to discuss progress at a global level because this allowed flexible questioning and discussion. At the same visit, each participant also completed a detailed written checklist indicating their progress towards each learning goal and progress towards applying or completing the corresponding segment of a strategic business plan. The use of a written instrument enabled this detailed data to be collected efficiently.

Selection of participants

The aim was to have no more than 16 participants on the workshop, with a preference for both husband and wife (spouse/partner) from each farm to attend the workshop. Selection was also limited to the greater Manawatu area for logistical reasons, as the workshop was to be held at the LIC complex at Awahuri, 20 minutes west of Palmerston North. The participants had previously attended either the Calving Date Systems Comparison field day at Massey University's No. 1 Dairy Farm in November 1996, or the Massey University No. 4 Dairy Farm Field Workshop in February 1997. Attendees at these events had completed a survey to assess their competence in a range of farm management practices (see Chapter 3). At the end of the questionnaire they were invited to write their name and address if they were interested in attending a workshop to help them further develop their farm management skills. The workshop attendees were selected from this list to, as far as possible, represent farm owners and sharemilkers across a range of farming circumstances within about half an hour's drive

from the workshop venue. Those selected where initially telephone to confirm their interest and to check suitable dates. A letter outlining the workshop details, and information about the pre- and post-workshop interviews was sent to those who wished to participate. Seven couples confirmed their availability for the dates set for the workshop. Of the seven couples represented, nine people attended the workshop (six men and three women). Both partners from only two couples attended, with one partner from each of the other five couples. (One partner from each of the five couples was unable to attend for reasons ranging from child-care, to off-farm work commitments.)

4.2.4 Background of participants

Four of the couples represented at the workshop were dairy farm owner-operators and three were sharemilkers. The age of attendees ranged from 24 to 45 years, with an average of 34 years. Three of the 14 people involved had degrees (all BAs) while the rest had no tertiary qualifications apart from one who had completed a building apprenticeship prior to going sharemilking.

Of the nine workshop participants, four worked full-time on farm, four worked both on- and off-farm and one was employed full- time off the farm. For the balance of the spouses/partners, two were employed full-time on the farm, two full-time off the farm and one was not employed.

Plans for the future

Prior to the workshop, five of the couples indicated they were "moderately-very likely" to expand their herds over the next five years, one couple indicated they were "likely" to exit the industry in that time (Table 10).

Table 10 Participants' future plans with respect to dairy farming.

In the next five years, how likely are you to:	Number of farms			
	Not very likely	Somewhat likely	Moderately likely	Very likely
Expand your herd by more than 29%	1	1	3	2
Exit the dairy industry	6	-	-	1
Use a consultant regularly	2	-	1	4
Have a comprehensive strategic plan for your farming business	-	1	2	4
Have an on-going system for monitoring the 'health' of your farming business	-	1	1	5

Five of the couples considered it was "very likely" that they would use a consultant in the next five years and two said this was "not very likely". Six couples indicated it was "moderately to very likely" that they would develop a comprehensive strategic plan and an on-going system for monitoring the 'health' of their farming business in the next five years and one couple said that this was "not very likely".

Farm description

The farms represented by the participants ranged from 32 to 245 ha (Table 11). In the same year the number of cows milked ranged from 86 to 460 (Table 11), and total production from 17,000 to 179,000 kg milksolids. Six herds calved in spring and one in spring and autumn (i.e. split). A summary of the labour employed is shown in Table 12.

Table 11 Brief summary of participants' farm size, number of cows milked and production.

Farmed area		Cows milked		Total production for the 1996/97 season (kg milksolids)	
≤ 65 ha	4 farms	≤ 100 cows	1 farm	≤ 50,000	3 farms
66-150 ha	1 farm	101-200 cows	3 farms	51-100,000	2 farms
151-200 ha	-	201-300 cows	1 farm	101-150,000	1 farm
201-400 ha	2 farms	301-400 cows	1 farm	151-200,000	1 farm
		401-500 cows	1 farm		
Range:	32.5-245 ha		86 - 460 cows		17,000-179,000
Average:	109 ha		212 cows		74,300

Table 12 Farm labour: Number of people working on each farm.

	Family members		Non-family members	
	Full time	Part Time	Full time	Part Time
Number of farms	7	5	2	2

Prior to the workshop participants were asked to indicate whether or not they had carried out a number of farm business management practices over the previous year (Table 13).

Table 13 Management practices undertaken by participants prior to the workshop.

Within the last year I was able to:	Number of farms	
	Yes	No
Monitor key control points (e.g. production per cow; feed cost per kg)	7	-
Set written short-term objectives	2	5
Set written long-term goals	6	1
Work with an advisory team on our farm	6	1
Work with a financial professional to plan for the future	4	3

4.2.5 Workshop design and facilitation

The workshop content flowed from the development of a vision statement, through to the use of project management techniques to ensure the planned tasks are completed. The introductory session indicated that the participants' expectations were in-line with the purpose and objectives of the workshop. Typical comments were:

> "I expect to develop my strategic planning ability".
>
> "I am keen to develop my business management skills".
>
> " I think we need to be able to put definitions/concepts to a lot of the things we do in farm business, - especially in planning for the future".
>
> "I've got to change from just milking cows to start thinking about the farm business".

The first session (Figure 10) was designed as an icebreaker to create interaction between participants and with the facilitator. This established a "flow experience" (a situation where participants and facilitator were totally absorbed by the learning experience; so much that conscious efforts were required to stop for lunch and at the day's end) (Wlodkowski 1985).

At the end of each session, participants were asked to complete two tasks before the next session (which would be held in two to four days' time). One task was to complete the exercises started on during the session (e.g. write their mission statement or identify possible scenarios for their business). The other task was to reflect on the day's learning, by writing down the most important and the "muddiest" points (the things that needed further clarification for that individual) (Angelo 1996). The second, third and fourth session started by discussing both their progress on the tasks set and their feedback on the previous session, including commentary on the important and

"muddy" points. These review sessions were valuable for identifying concepts and ideas that needed further clarification and discussion, and also in providing a sense of urgency and motivation to have the tasks completed. The open, friendly atmosphere that was established from the start was a key factor in obtaining participant feedback and sharing.

Clear progress was made in the first two and a half sessions as the participants built new knowledge and applied it to their own situations. This was monitored via direct questioning and discussion, and by observing and discussing with each individual the notes they had written in their workbook. During the last half of the third session (which dealt with financial analysis), a large number of concepts were introduced in a short period of time - which was insufficient for participants to understand and apply them. This part of the workshop will be revised for future groups. The final session was designed to synthesise the knowledge developed during the workshop.

4.2.6 Participants' responses during and at the end of the workshop

Early indications of the impact of the workshop were seen during the feedback session at the beginning of the second session when one of the course participants (who had a BA) said she was "surprised to learn that there is a formal process that can be used for planning and management". During the same session, several participants expressed delight at "being able to apply the principles they had learnt directly to their own situation".

During the Session 3 feedback all the participants had a well-developed draft mission statement. There was a great degree of enthusiasm and pride in presenting them. Occasionally there were a number of unplanned benefits identified by participants, for example:

> "the realisation that I can include values in a mission statement".

The following is an example of a mission statement as it was presented to the group at the third session:

"Our farming business will operate profitably and will supply high quality products from a tidy, sustainable environment. We will continue to grow and develop while recognising the value of staff, by providing opportunities, training and advancement in a happy and safe work environment in the farming profession."

Each participant also had one or two draft goal statements and associated objectives. Often, these were not well written, and needed clarification through questioning. Examples of presented draft goal statements are:

"To maximise efficiency of the labour team."

"To achieve 380kgMS/cow, with grade-free milk for a whole season."

"To select the right employee."

The session 4 feedback was remarkably positive, considering the number of concepts and the amount of information provided during session 3. The main concept, the importance of key performance indicators, had been appreciated, even though it was impossible to develop the ability to select or calculate financial indicators in the time available. Typical comments were:

Important points:

"I became more focused on the items that I should measure."

"I now know about financial measures and their importance in measuring progress towards goals & objectives."

"I realised that I need to identify clear indicators."

Muddy points:

"The calculations required for determining business growth."

"Understanding all of the financial indicators, and which ones to use when."

"The tax calculations in NOPAT."

The feedback sessions also highlighted points requiring further clarification. Time had been programmed for further explanation and discussion. Based on this discussion and further questioning, the participants developed an understanding to their own satisfaction for most issues.

Examples of issues requiring further clarification:

"PEST (external analysis: Political, Economic, Social & Technological)."

"Problems identifying own strengths & weaknesses."

"The scenario planning process."

The comments recorded at the final session summed up the learning and enjoyment that occurred at the workshop

"I was challenged. I enjoyed the workshop and appreciated the efforts of the organisers and presenters. The venue was good".

"The workshop has helped to fill a large gap that exists between formal university courses and what we need at farm level".

"The workshop has provided a format for planning for the future".

"It was enjoyable, with a non-threatening atmosphere".

"It was a very relaxed".

"I will be able to put these ideas into practice. It was a non-threatening atmosphere. I was a bit concerned about coming along because things weren't as good on the farm as they could be, but I soon realised it didn't matter. It was a non-judgmental atmosphere".

"We didn't previously do all the things we have learnt, but we did have some goals and objectives written down".

4.2.7 End-of-course written evaluation

During the last session, participants completed a written evaluation (Appendix 3). Participants did not necessarily answer all questions. Most indicated that they were "moderately prepared" to "well prepared" to carry out a range of planning tasks, such as developing goals and objectives for their farming business in the next six months. This was compared with information obtained at an interview several weeks after the workshop (Table 14). In most cases there was a major shift in rating of elements of strategic management from "not", "somewhat", or "moderately" important to "very" important. This indicated that the participants had not only learnt about these tasks, but they had also changed their thinking about the relative importance of the tasks.

At the end of the workshop most participants indicated in the written evaluation that they had thought about, discussed or started writing on each element of strategic planning discussed during the workshop. Two participants had completed their mission statements. Some participants had completed some elements (e.g. goal statements) before attending the workshop.

Table 14 Participants' beliefs about elements of strategic management before and after the workshop (some respondents did not complete some questions).

		Not important	Somewhat important	Moderately important	Very important
Write a mission statement	***Before***	2	4	2	-
	After	-	-	1	7
Set goals for dairy operation	***Before***	-	-	4	4
	After	-	-	-	8
Critically assess SWOT	***Before***	2	5	-	-
	After	-	-	1	7
Benchmark against other operations	***Before***	-	1	5	2
	After	-	-	2	6
Define critical success factors	***Before***	-	3	2	2
	After	-	-	1	6
Develop a strategic business plan	***Before***	-	4	2	2
	After	-	-	1	7
Work with an advisory team	***Before***	-	3	4	1
	After	-	-	3	5
Comprehensively analyse the 'health' of the business	***Before***	-	1	3	3
	After	-	-	3	5
Complete an external (PEST) analysis	***Before***	3	1	-	2
	After	-	1	1	5

The components of the workshop the participants found memorable and well-explained or demonstrated were directly associated with having sufficient time for the participants to discuss and apply the concepts to their situation and receive feedback (e.g. writing a mission statement and long-term goals) (Table 15).

Less memorable and poorly explained parts corresponded to material where there was insufficient time for discussion and inadequate opportunity to learn to apply the material to their own situation (e.g. financial performance indicators, control plan).

Participants were given the opportunity in the questionnaire to make any other comments. No other written comments about the workshop were received. Prior experience with conferences or short-courses indicated participants often use this opportunity to release frustrations about the things they were not happy about (McFerran *et al.* 1996, Blair *et al.* 1998). As no such responses were received, this suggests overall satisfaction with the workshop as confirmed by their verbal feedback at the final session.

Table 15 Participants' opinions about the learning experience provided by the workshop.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
This was an enjoyable learning experience	7	1	-	-	-
Attending this workshop has given me greater confidence to plan for the future	7	1	-	-	-
Attending this workshop has given me greater confidence in my ability to learn new business management concepts	6	2	-	-	-
Attending this workshop has helped me to realise the value of investing time in learning new farming skills	7	1	-	-	-
I would attend another workshop run in a similar manner if the topic related to my business goals	6	2	-	-	-
I will promote similar courses to farm staff and other dairy farmers	6	2	-	-	-

4.2.8 Sixteen week evaluation

All participants were interviewed in August 1998, 16 weeks after the workshop. Of the seven couples represented at the workshop, two had drafted a 5-10 year strategic business plan; two had partly, and three had not, written such a plan (Table 16). Those who had written or partly written their plan said they felt good about it: it helped to clarify their thinking concerning the future, as can be seen from the following comments:

> "Feel good now it's done. I have clearer thoughts now that the plan is written down."
>
> "We have planned through to the next job - the number of cows needed, 10 year goals, and opportunities to look for."
>
> "Not written - locked into present position for next 5-6 years."

Progress towards completion

Progress made in preparing the various segments of the farm strategy is summarised in Table 16. The segments already completed by most participants were those which had already been completed during the workshop, or on which much time had been spent in the workshop (e.g. mission statement, long-term goals, SWOT analysis, opportunity identification). The segments of a strategic plan that were poorly completed by participants sixteen weeks after the workshop were those on which they had

insufficient time to apply during the workshop (e.g. defining critical success factors, identifying control points, developing appropriate key performance indicators.)

Table 16 Participants' progress towards completion of each segment of the farm business strategy after 16 weeks (some respondents did not complete some questions).

Task	Number of farms				
	Completed	Partly completed	No progress	Would like more help	Does not apply
Defined and documented your current business situation	3	4			
Calculated and interpreted financial indicators for your farm	4	2	1		
Analysed the 'health' of your farming business using the value created technique		1	5	1	
Completed a SWOT analysis	5		2		
Identified & documented external factors that will impact your business in the future	4	3			
Identified controllable and uncontrollable factors affecting your business	4	2	1		
Identified opportunities for your farming business	5	2			
Completed a scenario plan of possible futures	3	3	1		
Defined your critical success factors	1	3	2		
Written a vision for your business	4	2	1		
Written a mission statement	5	1	1		
Written long-term goals	4	3			
Written short-term objectives	4	2	1		
Written a 5-10 year strategic plan	3	2	2		
Developed appropriate KPIs for your farming business	2	3	2		
Identified critical control points for your farming business	1	2	4		
Have a written plan to monitor, document and control business performance	2	2	3		
Use written project management techniques to achieve objectives	3	2	2		

Application of new knowledge or skills

It became apparent during the post-workshop interviews that participants were using the knowledge and skills gained from the workshop, whether or not they had written a farm strategy. The responses below illustrate this:

"Use more indicators: monitor more - e.g. daily milk, pasture; plan better."

"Refined mission statement; look at what we do and why; has helped in discussing these issues with staff; made me more mindful of planning; able to think about planning in a more structured way."

"More aware of vision; linked vision to goals."

"Ensure vision & mission are in harmony with beliefs."

"Identified importance of long- term planning."

"I now realise that we can not just go from day to day - we need to sit down and plan in order to make things happen; It made us more focussed and aware of planning for our goals - even though we had been planning previously."

"Has formalised the thought process – makes thinking about planning easier. It has helped during a recent revision of our farming business. Has also applied the process to other (off-farm) situations."

Difficulties in putting together a business plan

When asked about the difficulties in putting together their business plan, the most common response was "lack of time". Although most participants had the concepts and knowledge clear in their minds, the next step – writing it down – was elusive. Some participants also became aware of other issues such as conflicting goals and the importance of external influences on their business, and the need to deal with these by planning for the future. Comments about the difficulty encountered in writing a business plan included:

"Finding a balance between conflicting goals."

"Motivation to write it down."

"Identifying external factors: I now take more notice of industry issues."

"Forecasting the future; finding the right words to use; recognising all of the factors in the equation."

"Uncertain about possible changes to existing situation."

"Financial analysis, - future costs, prices and values; - have coped by building in several scenarios."

"Need to set new goals once existing goals have been achieved."

Help required to complete the farm business plan

Although a common response was the need to have more time, it seemed that "something else" was also needed by the farmers in order to capture their ideas into a written plan. One of the participants stated that having a facilitator would help complete the writing of the business plan. Several participants agreed that an

appropriate facilitator working with them for approximately four hours would produce a first draft of a business plan.

> "More time; see prepared examples."
>
> "Someone to facilitate the process."
>
> "Uninterrupted time."
>
> "Finalising KPIs; using SWOT analysis."
>
> "More time."

Areas for further knowledge

Participants were asked if there were other areas in which they would like to increase their knowledge or skills. The answers mostly related to specific issues raised during the workshop, especially financial or accounting skills and off-farm/industry issues.

> "Financial KPIs."
>
> "Increase accounting skills."
>
> "Better knowledge of industry issues."
>
> "Build knowledge of external factors; interested in marketing opportunities available."

Progress towards learning goals

Individual progress towards learning goals after 16 weeks is shown in Table 17. The scores suggest an association between progress in learning (becoming confident in the various elements of business planning) and the elements completed by the workshop participants. For example, the elements most participants felt confident with were those they had progressed most (e.g. mission statement, long-term goals, SWOT analysis, opportunity identification). Conversely, progress towards "identifying control points" was not surprising, as insufficient time had been provided during the workshop to develop this skill. Exceptions to this were analysing the health of the farm business, for which six participants said they had made good learning progress but had not completed this segment after sixteen weeks. Likewise, for developing key performance indicators (KPIs) three participants said they had made little learning progress, whereas six had completed or partly completed this segment (Table 18).

Table 17 Individual progress towards achieving learning goals after 16 weeks.

Learning goal: To be able to:	I'm at the beginning stages. A long way to go.	This is getting a bit easier. I'm on my way.	I'm getting to grips with this. I'm a bit more confident.	I'm much more confident with this.	I feel I can cope with this on my own now.
Define and document our current farming situation		1	3	2	3
Calculate and interpret financial indicators for our farm		4		2	3
Analyse the health of the farming business	1	1	1	4	1
Understand & use SWOT analysis in our farming business	1	1	3	2	2
Understand & use PEST analysis in our farming business	2		5	1	1
Identify controllable & uncontrollable factors influencing our farming business	1		3	2	3
Identify opportunities for our farming business			1	3	5
Apply scenario planning to our farm business	1	1	3	1	3
Establish criteria for success for our farming business	1		2	2	4
Write a vision statement for our farming business		1	1	1	6
Write a mission statement for our farming business		1	1	1	6
Write goals & objectives statement for our farming business		1	2	1	5
Write a 5-10 year strategic plan for our farming business	1		2	1	5
Develop appropriate KPIs, for our farming business	3	2	2	1	1
Identify critical control points for our farming business	3	2	2	2	
Write a plan to monitor progress towards goals for our farming business	1	2	1	3	2
Apply project management techniques to achieve objectives in our farming business	1	1	1	4	2

Table 18 combines information about progress towards learning goals and progress towards applying or completing the corresponding segment of a strategic business plan. It shows that for most of the segments in which participants made the most

learning progress, the greatest number have completed or partly completed this segment of the business plan.

Table 18 Individual progress towards achieving learning goals after 16 weeks compared to completion of elements in the farm business strategy.

Segment of strategic business plan	Little learning progress *	No progress towards completion/ I would like help **	Good learning progress *	Segment completed/ partly completed **
Identify opportunities for our farming business	0	2	9	5
Define and document our current farming situation	1	0	8	7
Write a vision statement for our farming business	1	1	8	6
Write a mission statement for our farming business	1	1	8	6
Write goals & objectives statement for our farming business	1	1	8	6
Write a 5-10 year strategic plan for our farming business	1	2	8	5
Identify controllable & uncontrollable factors influencing our farming business	1	1	7	6
Apply scenario planning to our farm business	2	1	7	6
Understand & use SWOT analysis in our farming business	2	2	7	5
Apply project management techniques to achieve objectives in our farming business	2	2	7	5
Establish criteria for success for our farming business	1	2	8	4
Understand & use PEST analysis in our farming business	2	3	7	4
Analyse the health of the farming business	2	6	6	1
Write a plan to monitor progress towards goals for our farming business	3	3	6	4
Calculate and interpret financial indicators for our farm	4	1	5	6
Develop appropriate KPIs, for our farming business	5	2	4	5
Identify critical control points for our farming business	5	4	4	3

* Learning progress for individual participants (n=9) (2 responses not recorded).

** Degree of completion for each farm represented (n=7) (1 response not recorded).

For the segment on "Analysing the health of the business", six respondents indicated that they had made good learning progress, yet six had also made little progress towards completing or applying this to their business. As a comparison, for the segment on "Identifying critical control points for our business", five respondents had made little learning progress, and only three had completed or partly completed applying this to their business.

4.2.9 Discussion

The aim of this project was to design, implement and evaluate a workshop that would significantly influence the ability and motivation of farmers to use strategic planning. The evidence indicates a satisfactory level of achievement for the "Preferred Future" workshop. Over a sixteen-week period, completion or application was not necessarily a good indicator of what the participants had learnt. This is because several of the participants had not found the time to implement the ideas over this period. Hence, evaluating such a workshop is, in itself a complex matter. This study provided an opportunity to develop techniques in the measurement of the knowledge gained by workshop participants to enable improvements for future workshop design, facilitation and evaluation.

Building a conceptual framework

The overall aim of the workshop was to provide participants with a conceptual framework and the knowledge, tools and skills to carry out strategic planning for their farm business. The feedback (during, at the end, and 16 weeks after the workshop) indicated that this was successfully achieved. Although the detail of several segments of the planning process was not taught effectively, the balance of the workshop ensured that participants had developed an overall conceptual framework and were able to apply it to their business. Having this framework enabled them to identify the areas they have not fully understood. This awareness allowed choices about further actions – either to build their strategic plan without those segments, or to make an effort to improve their knowledge and ability in all segments.

The development of a conceptual framework was considered essential, especially given the short time frame (16 hours) for the total workshop. The framework enabled participants to "think differently" about the way they went about planning for the future. This different paradigm created new opportunities and enabled them to better utilise available information or to seek new information to help them plan and improve their future as the following comments illustrate:

At the end of the workshop:

"The workshop has provided a format for planning for the future."

"We didn't previously do all the things we have learnt, but we did have some goals and objectives written down."

Post-workshop

"I now take more notice of industry issues."

"We now realise that we can not just go from day to day - we need to sit down and plan in order to make things happen. It made us more focussed and aware of planning for our goals - even though we had been planning previously. We have coped with uncertainty about future costs, prices and values by building-in several scenarios."

"It has made me more mindful of planning; able to think about planning in a more structured way."

"It has formalised the thought process – makes thinking about planning easier. It has helped during a recent revision of our farming business. The process can also be applied to other (off-farm) situations."

Specific learning achievements

For ten of the 17 specific learning goals the workshop participants made good progress and had applied them to their farming business within 16 weeks of the workshop (Table 18). These included skills such as opportunity identification, writing a mission and vision statement and preparing goals and objectives. Most of these topics were covered early in the workshop, had adequate time, and involved little or no numerical manipulation. For two of the learning goals (establishing criteria for success and understanding and using the PEST technique), most participants made good learning progress, but few had completed or partly completed applying them to their business. The remaining five goals on the list all comprised some numerical manipulation, or the identification (setting) of, and monitoring of, numerical targets.

Insufficient time was allowed for participants to fully grasp these concepts and to develop skills in their application.

Workshop design & implementation

Part of the success of the workshop was due to incorporating the four qualities Wlodkowski (1985) identified as necessary when facilitating adult learning: expertise, empathy, enthusiasm and clarity. The expertise was built into the content of the workbook, as well as during the facilitation process. Likewise, the workbook and facilitation contributed to clarity of presentation. Empathy and enthusiasm are not easily incorporated into a written form. Rather, they were injected into the workshop as natural qualities of the facilitators, and this was appreciated by the participants as comments at the end of the workshop show:

> "I was challenged. I enjoyed the workshop and appreciated the efforts of the organisers and presenters.
>
> "It was enjoyable, with a non-threatening atmosphere".
>
> "It was a very relaxed".
>
> "It was a non-threatening atmosphere. I was a bit concerned about coming along because things weren't as good on the farm as they could be, but I soon realised it didn't matter. It was a non-judgmental atmosphere".

A successful facilitator, according to Wilkinson (1998), is someone who: enjoys working with people; thinks logically and quickly; communicates clearly and expressively; practices active listening; conveys warmth; demonstrates self-confidence and leadership; and is always looking to improve. Nurre (1998) listed the habits of effective facilitators as: being pro-active; beginning with the end in mind; putting the important (but not urgent) things first; thinking win/win; seeking first to understand through active listening; synergise (co-operative creativity); and revitalise (invests in own learning). Experience from the "Preferred Future" workshop would support these characteristics as being important in the facilitation of effective learning.

The results of a series of Farm Finance Workshops in Pennsylvania, Maryland and New York showed that the percentage of farmers rating the instructor as excellent

doubled between 1995 and 1996 (Hanson *et al.* 1998). The County agents indicated that a large part of the improvement was due to their increased familiarity and working knowledge of course materials in the second year. This illustrates the importance of not only facilitation skills but also the mastery of course content when delivering workshops. In a fully commercial environment, there is not the luxury of a one-year settling-in period: workshop facilitation skills will need to be excellent for every delivery. Information from these workshops also showed that they achieved substantial impact for participants at all levels of (formal) educational attainment. This supports the experience that with a well-designed workshop, good facilitation and a good learning environment, all participants should be able to learn, gain confidence in their own ability, and enjoy the experience.

Principles of adult learning

Seven key principles of adult learning were summarised by Ladyshewsky (1995). The first two: that the content should be important and relevant to the learner; and that the learner agrees with the goals of the learning process. At the workshop introductory session the participants' expectations were compared with those proposed by the facilitators, and were clearly aligned.

The next two principles are: that the learner should be actively involved; and the tasks set should be practical and applicable. This happened throughout the "Preferred Future" workshop, however, as discussed previously, when insufficient time was available, the learning outcomes were not achieved to the level required.

Ladyshewsky's (1995) fifth principle is that a 'safe', comfortable environment should be provided. This applies not only to the physical setting, but also the emotional environment established by the facilitators. This includes empathy (as discussed earlier) and being supportive in an environment free from threats where participants feel free to openly discuss their situation and to express their thoughts and feelings. It appears that the workshop catered for this, as the following comment indicates:

> "It was a non-threatening atmosphere. I was a bit concerned about coming along because things weren't as good on the farm as they could be, but I soon realised it didn't matter. It was a non-judgmental atmosphere".

Ladyshewsky's (1995) last two principles are that the learner should be responsible for learning at his/her own pace; and that the learner can see progress towards the learning goals. For the first two and a half days the learners were able to learn at their own pace, but for the last day and a half the volume and type of material (a high density of numerical manipulations) reduced choice about the pace of learning. The learning outcomes and the application of knowledge and skills reflected this (Tables 16 & 17). Based on their achievements during the workshop, it seems that given more time and/or a different approach, the participants were all capable of achieving these learning goals.

Participants were made aware of progress towards the learning goals during the workshop via a number of mechanisms. The written goals and detailed programme provided the end goals and a map to get there. A sheet was provided for participants to reflect and write feedback at the end of each session. Throughout the workshop, the facilitators checked progress informally by questions and discussions that reminded participants to think about their learning progress. A formal checklist with each learning goal and a series of boxes headed "I'm at the beginning stages – a long way to go" through to "I feel I can cope with this on my own now" allowed participants to assess their own progress.

Learner motivation

The fact that the participants wanted to come to the workshop, and made a commitment to invest their time and fit in with the dates set, indicated that their level of motivation was high. Also, they continued through and completed the workshop unless unavoidable circumstances caused them to miss one or two sessions. The "Preferred Future" workshop feedback reinforced the characteristics of motivated learners summarised by Wlodkowski (1985): the participants wanted to enhance their competence and self esteem; they valued what they learnt; they had a choice in the courses they attended; and they enjoyed the learning experience. Table 15 shows that

seven out of eight respondents strongly agreed that the workshop was an enjoyable learning experience; and that attending the workshop helped them realise the value of investing time in learning new farming skills.

Van Tilburg (1992) reported a 1987 study of Ohio Co-operative Extension Service clientele. From 276 farmer workshop participant responses a principal-component analysis identified five factors relating to participation: low anticipated difficulties with arrangements; high commitment to the extension organisation; anticipated high quality of information; anticipated positive social involvement; and possession of a high internal motivation to learn. The same factors appeared to motivate persistence in attending except that commitment to extension was replaced with commitment to the teacher. Participation outcomes fell into three broad categories: negative learning experiences; self-improvement outcomes and positive social outcomes (Van Tilburg 1992). A successful and enjoyable workshop should contribute to the latter two categories, providing even greater motivation for participants to want to attend another workshop in the future.

Changes in beliefs

Along with the building of a new conceptual framework and new skills, came a change in beliefs about the importance of aspects of strategic planning (Table 14). After the workshop, most participants indicated that various aspects of the strategic planning process were very important, whereas before the workshop they had considered these aspects to be not, somewhat or only moderately important. These results show a similar trend to those reported in the "Dairy-MAP" 1997 Annual Report (Holden 1997) (Table 19). Oelker (1995) concluded from the results of an evaluation of "Dairy Excel" graduates in Ohio State that some had made progress in changing their attitudes about the profitability of their small farms in relation to herd size, as well as their attitudes towards the management of human resources on their farms.

Confidence in ability to learn

Changes in behaviour observed by the facilitators and comments made by participants indicated that the workshop was not only providing them with knowledge and skills, but it also increased their confidence in their own ability to learn. This was tested with

a specific question in the evaluation at the end of the workshop. Six of the eight participants present at the time strongly agreed that the workshop had given them greater confidence in their ability to learn new business management concepts (Table 15).

Table 19 Comparison of before and after responses for the 1997 "Dairy-MAP Focus on the Future" and "Preferred Future" workshops.

	Moderately or very important			
	Dairy-MAP (n=30)*		**Preferred Future** (n=8)	
Topic	**Before**	**After**	**Before**	**After**
Write a mission statement	14%	86%	25%	87%
Set goals	21%	86%	50%	100%
Develop a strategic plan	44%	96%	25%	87%
Define critical success factors	44%	96%	25%	75%
Critically assess strengths, weaknesses, opportunities and threats (SWOT)	48%	96%	0%	87%

*Source: Holden, 1997: Dairy-MAP 1997 Annual Report.

Workshop outcomes

Ideally, to demonstrate the application of knowledge and skills learnt, all participants would have completed and written their strategic plan within eight weeks of the workshop. The results of the post-workshop evaluation show that only two had completed, and another three had partly completed, their strategic plan. Saxowsky & Gustafson (1996) suggested that the primary benefit is not the document at the end of the process but the thoughts that are developed and evaluated during the process; that the purpose of long-term planning is to help farmers better manage their business rather than provide a document for others (such as lenders) to use. They also note, however, that writing clarifies the thinking process and reduces selective recall. A written document also provides a record of the plans, which allows for improved communication with family members, staff and other stakeholders, and aids revision of the plan.

The evidence from the "Preferred Future" workshop supports these comments because all participants indicated that they now thought differently about planning - whether or not they had written their plan - and those who had written it indicated that this process help to clarify their thinking even further. Also, regardless of whether

or not the plan was written, all participants provided evidence that they were now using some or all of the components of strategic planning in their farm business. Comparable evaluation information from similar workshops is difficult to obtain. The most comparable information is from the "Dairy-MAP" programme in Pennsylvania State (Holden 1997), which showed a similar pattern of changed beliefs to those in the "Preferred Future" workshop (Table 19).

Participant selection for future workshops

When seeking participants for future workshops, the main criteria will be that they are: motivated to learn the subject being offered; in a position to apply the knowledge and skills taught (in this case they need to own their own business in order to apply the strategic planning principles); and prepared to participate in the learning activities being offered by the facilitators (given that an appropriate environment has been established). There is a big advantage to both partners attending the workshop together; this, however, is not always possible (the next best option is to set exercises that encourage discussion between the partners at home between workshop sessions).

Depending on the nature of the topic, it may be necessary to set criteria for attendance based on levels of existing knowledge. For example, for a course on dairy cow nutrition, practical working knowledge of feed budgeting would be a pre-requisite. Parsons *et al.* (1998) suggested that dairy farmers with different production systems have different specific learning needs, and therefore segmenting the market and targeting workshops for specific groups results in more effective course design and improved learning experiences.

4.2.10 Conclusion

The workshop achieved most of the planned learning outcomes. Those not achieved were identified, and as a result future workshops will be modified. Unplanned outcomes included a greater awareness by the researcher of the emotional aspects of learning, and the large influence they have on achieving both successful learning outcomes and confidence to proceed with further learning.

The information collected during, at the end, and eight weeks post-workshop, indicate that the "Preferred Future" workshop was successful in: providing participants with a useful framework to carry out short- and long-term planning; improving participants confidence in their own ability to learn, and helping to motivate them to apply what they had learnt.

In relation to the FRST-funded research project on dairy farm extension, the workshop experience provided an example of the necessity to help farmers build new conceptual frameworks to allow them to better utilise both their existing knowledge and new information and concepts. For this reason, it also satisfies the objectives of the Calving Date Systems Comparison Trial research team, who wanted to help farmers develop knowledge and skills to help them with strategic decisions such as evaluating dairying systems with different calving patterns. The "Preferred Future" workshop helped farmers to build a "big picture" framework for strategic planning, and to articulate their own factors for success. It also provides them with tools, skills and knowledge to analyse whether or not a particular alternative will help them achieve their vision. This in contrast to the past, when many farmers made strategic decisions without clearly articulating their vision or goals, hence did not recognise or resolve conflicting goals. As a result, actions taken often compromised the rate of progress.

Chapter 5

IMPLICATIONS

"The rate at which organisations learn may become
the only sustainable source of competitive advantage."
Stata 1989 cited in Senge 1990, p. 7

5.1 Implications from this study

The results from this study support the hypothesis that farmers can build competence in dairy cow nutrition and strategic planning through a short-course workshop (16-20 hours). The results from the study also support the hypothesis that agricultural education professionals can develop competence in identifying farmer learning requirements and use this information to design, facilitate and evaluate short-course workshops that meet identified farmer learning needs. Hence, the hypotheses as formulated in Section 1.3 were supported by the study and the three objectives as outlined in Section 1.4 were achieved.

The research findings are supported by similar work internationally, e.g. Saxowsky & Gustafson (1996), Holden (1997), Hanson *et al.* (1998), Whiteman (1998), as discussed in Section 2.2.7. A range of courses designed in different countries, including the results of the current study, provide evidence that well-designed and facilitated workshops are effective in developing farmer competence in various aspects of managing their business. Improved competence results in greater confidence (Alderman 1990, Paris & Turner 1994). Improved competence and confidence make it easier to consider, make and manage change, as shown by the post-workshop evaluation results reported here, from similar workshops (e.g. Saxowsky & Gustafson 1996), in the educational literature (e.g. Alderman 1990) and in the organisational literature (e.g. Wiggenhorn 1990). An awareness of concepts from the contemporary education literature (as described in Section 2.4), and an ability to apply them to the case study workshops, played a significant part in their success. This, in turn, provides

confidence to design, conduct and evaluate further farmer workshops in the future, and also to train others to do likewise.

5.2 Implications for agricultural education

Farmers require continuing education opportunities that focus on issues that are relevant to them (Wlokowski 1985). The courses should result in new knowledge and skills that can be applied to their situation. Few farmers are able to spend long periods off the farm for educational purposes, but they may be prepared to invest a day or two at a time to learn new information or skills - especially if they perceive it will be of value to them. Continuing education needs to be flexible in terms of timing, timeliness and location. One or two-day workshops delivered at local venues could meet these needs. Good design and facilitation are critical for conducting effective workshops that help participants build new knowledge in a non-threatening manner. In order to meet the demands of farmers and their staff in the 1990s, educational institutions will need to develop workshops that deliver flexible, effective and enjoyable learning opportunities. In many cases, agriculture educational professionals will need to develop skills in order to design, facilitate and evaluate continuing education workshops.

On-going research is required to identify and prioritise the learning needs of farmers. The competency framework provides one useful tool for identifying needs, but it should be validated against other assessments to monitor levels of bias (Gendall 1990, Gendall *et al.* 1992). As technology and the business environment (economic and socio-political) continue to change, new competencies will be required and some will become obsolete. Hence, the development and review of a competency framework ("What are the knowledge, skills and personal characteristics required to be successful?" (Stone 1997)) allows new competencies to be identified over time. Ideally, workshops should complement facilitated action-learning activities and be part of an individual's on-going learning process (Hamilton 1995).

5.3 Implications for agricultural extension

Agricultural extension has become increasingly reliant on educational processes to help clients keep pace with the changes that are occurring in a more complex and uncertain economic environment. Significant change often requires new ways of thinking. Educational opportunities such as workshops, can help participants build new knowledge and conceptual frameworks that will allow them to view a situation from different perspectives. Extension organisations and extension agents can develop skills in education and/or develop partnerships with educational institutions which offer relevant, flexible and timely learning opportunities for their target audience.

5.4 Implications for New Zealand dairy farmers

An open mind and a willingness to learn (intrinsic motivation) are essential requisites for coping with an uncertain future. Tushman & Nadler's (1986) model of innovation suggests that the application of existing management practices to a farming business is one of the greatest opportunities for improvement apart from incremental or discontinuous change. Nevis *et al.* (1995) provided a list of essential elements for a learning system that is applicable to a farming business. This list included: having an experimental mindset; a skill development and learning focus though continuous education; and a concern for measurement.

Jarvis (1987) viewed learning as both a process and a product. The education literature provides empirical and theoretical support for the concept that learning is the construction of knowledge. The Australian Federated Farmers (1996b) survey data showed a positive relationship between education and profitability. Other authors (e.g. Moore 1990, Frank 1995a) have shown a link between education or conceptual skill level and efficiency of management.

Despite the reports of the positive association between education and management performance, New Zealand dairy farmers have not been well supported by either educational or extension institutions. Education providers have offered farmers few appropriate opportunities to develop specific management competence. The education situation is about to change, albeit slowly: Massey University is about to

provide one- to two-day workshops to assist farmers to develop business management knowledge and skills. These should be available locally and timed to suit local farmers. The University will be collaborating with extension agents and researchers as well as farmers, to research priority learning requirements.

5.5 Conclusion

The case studies presented demonstrate that it is possible to help farmers build competence in dairy cow nutrition and strategic planning through a short-course workshop (16-20 hours). The study also demonstrated that agricultural education professionals could develop competence in identifying farmer learning requirements and use this information to design, facilitate and evaluate short-course workshops that meet farmers learning needs.

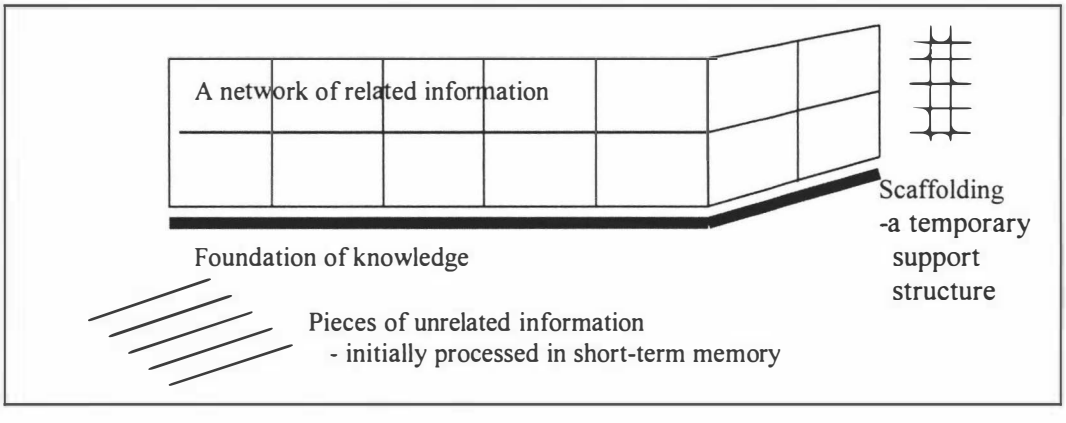
An understanding of the cognitive aspects of individual learning and the factors which influence it, based on contemporary education literature, provide a sound basis for successfully designing, facilitating and evaluating workshops. Success can be measured in terms of: achieving the defined learning outcomes; improving confidence in participants' technical or managerial competence as well as in their own ability to learn; and in the level of enjoyment achieved during the process.

GLOSSARY

Action learning:	Learning by experience - often in a facilitated situation. See also: learning.
Action research:	Learning by experience and documenting the process and the results so that they are available to others to consider and use. See also: learning.
AKIS	Agricultural Knowledge and Information Systems. A concept of how people and organisations create, store, exchange and utlise agricultural knowledge and information.
BA	Bachelor of Arts degree.
Cognition	Any process relating to thinking or mental activity.
Competence	Demonstrating the knowledge, skills and personal attributes that allow a person to carry out a task effectively and efficiently (even though a person has the appropriate knowledge and skills, his/her poor attitude may result in the task *not* being completed effectively nor efficiently).
Competency	A description of the knowledge, skills and personal attributes that allow a person to carry out a task effectively and efficiently.
Facilitator	A person who assists the progress of (in this context) learning.
FRST	The Foundation of Research, Science and Technology. This is the New Zealand Government's agency for allocating Government funds to scientific research.
Heuristics	Rules of thumb used to help solve problems and make decisions.

Information — Something that is readily communicated and shared *between* people, whereas **knowledge** is *in* the minds of individuals (knowledge is information that has been acquired and interpretted by an individual in the light of their experience and beliefs, hence is not necessarily readily able to be shared).

Knowledge — This is constructed from information, like the frame of a house is constructed from a pile of timber. The pile of timber has no particular form, purpose or meaning, but when each piece is put into a particular place, and is connected into the network of the frame, it becomes useful, not only for its own sake, but also as a basis for further building. The relationship between the pieces can be as important as the pieces themselves. Knowledge is the foundation for thought processes.



KPIs — Key Performance Indicators: measures used to monitor progress.

Learning — Both a process and a product. It is something done by individuals, either alone or as part of a group or organisation. Learning can be shared and can contribute to organisational learning, but it is not necessarily documented, hence it is not easily available for others to consider or use. Learning is essentially "private". *Research* also involves learning, but the learning is documented and available in the public arena for others to consider, debate, critique and use. It adds to the body of knowledge that is available for referencing.

Research is learning that is made "public" (the equivalent definitions are applied to the terms *action learning* and *action research).*

LIA — Livestock Improvement Advisory. The farm management advisory and consultancy branch of LIC.

LIC — Livestock Improvement Corporation. A subsidiary of the New Zealand Dairy Board that provides and delivers services to New Zealand dairy farmers.

Metacognition: This refers to the higher-order, or over-all, organising ability relating to cognitive processes. This involves: knowing what one knows and does not know; monitoring ones own efforts to solve problems or to learn; planning ahead; predicting the outcome of one's own performance; and efficiently allocating time to various cognitive tasks.

MAF — The New Zealand Ministry of Agriculture and Fisheries (in 1998 it became the Ministry of Agriculture and Forestry).

MS — Milksolids. The total solids component of milk. In New Zealand this measurement has replaced milk fat as the basis for production levels and payment.

NOPAT — Net Operating Profit After Tax.

Personal characteristics — Attitudes, beliefs and motivation. They contribute to effective performance. People may have adequate knowledge and technical skills, yet do not perform satisfactorily due to their personal characteristics.

PEST	Political/legal, Economic, Social/cultural, Technological. A framework for considering the external factors that influence a farming business.
PMP	Property Management Planning. An Australian programme for developing management skills amongst Australian farmers.
Research	See learning.
Scaffolding	A temporary support structure. In this context, helping someone to learn a step at a time by helping them develop appropriate knowledge, skills or learning strategies.
SWOT	Strengths, Weaknesses, Opportunities and Threats. A framework for thinking about the current (or future) position of a business.
Technical skills	These are a form of knowledge; the processes used to manipulate knowledge to carry out every day tasks, make decisions and solve problems. Technical skills can be learnt formally or informally, and are usually developed and improved by experience and practice. The successful and efficient execution of technical skills is contingent upon individuals having an appropriate knowledge base.
ToT	Transfer of Technology (or dissemination of information). Often used colloquially as a synonym for agricultural extension, although it is only a small (but still important) component of extension.
Zone of proximal development	This is a process whereby a learner performs within their range of competence, yet they are assisted by the group or the instructor to reach potential levels of higher performance than would have occurred without assistance.

REFERENCES

Alexander, P. A. & Judy, J. E. (1988). The interaction of domain-specific and strategic knowledge in academic performance. *Review of Educational Research, 58*: 375-404.

Alderman, M. K. (1990) Motivation for at risk students. *Educational Leadership 48* (1): 27-30.

Allen, W. J., Bosch, O. J. H., Gibson, R. G. & Jopp, A. J. (1998). Co-learning our way to sustainability: An integrated and community-based research approach to support natural resource management decision making. *Multiple objective decision making for land, water and environmental management.* Florida: St Lucie Press.

Ames, C. (1992). Classrooms: Goals, structures and student motivation. *Journal of Educational Psychology 84:* 261-271.

Angelo T. (1996). *The Teachers' Dozen* seminar notes for Massey University staff 10 July.

Anthony, G. (1994). Learning strategies in the mathematics classroom: What can we learn from stimulated recall interviews? *New Zealand Journal of Educational Studies, 29*: 127-140.

Argyris, C. (1991). Teaching smart people how to learn. *Harvard Business Review May-June* 99-109.

Argyris, C. & Schon, D. A. S. (1978). *Organisational learning: A theory of action perspective.* Addison Wesley Publishing Co. Inc.

Australian National Farmers' Federation. (1996a). *Innovation in agriculture* [Web Page]. URL http://coombs.anu.edu.au/SpecialProj/NFF/innoag.html [1997, July 31].

Australian National Farmers' Federation. (1996b). Change, training and farm profitability. *National Focus, 10.*

Ausubel, D. P. (1968). *Educational psychology: A cognitive view.* New York: Holt, Rinehart & Winston.

Bamberry, G., Dunn, T. & Lamont, A. (1997). The relationship between farmer education and good farm management: Implications for extension providers. *Proceedings Second Australasia Pacific Extension Conference, Albury 1*: 479-491.

Bawden, R. J. (1987). Learning systems and technological change. *Proceedings of the Centenary International Conference on Technology, Education and Society: Future Directions.* Melbourne. RMIT.

Beaven, L., Coulson, J., Hurley, E., Labromonte, L., Londono, P., McCosh, K., Randall, A. & Waroka, W. (1995). *An evaluation of the 1995 Central Districts Sheep and Beef Cattle Farmers' Conference.* Palmerston North: Department of Agricultural and Horticultural Systems Management, Massey University.

Biggs, J. B. (1991). Student learning in the context of school. In J. B. Biggs (Ed.), *Teaching for learning: The view from cognitive psychology:* 7-29. Hawthorn, Vic.: Australian Council for Educational Research.

Blair, A., Costa, P., Hambleton, J., Johnstone, P., O'Toole, S., Porteous, J., Rawlings, M., Shelton, M., Smith, J. & Worthy, R. (1998). *Southern North Island Sheep & Beef Cattle Farmers' Conference: Analysis of conference.* Postgraduate Agricultural Extension and Consultancy Group. Palmerston North: Massey University.

Bloom, P. D. (1991). The changing social contract for agricultural research and extension. Address to the Australian Institute of Agricultural Science, Brisbane. AIAS Queensland Branch Newsletter No. 341. In N. A.

Hamilton (1995). *Learning to learn with farmers.* Published PhD Thesis. Wageningen: Wageningen University.

Boam, R., Sparrow, P. (1992). *Designing and achieving competency: A competency-based approach to developing people & organisations.* Maidenhead: McGraw-Hill International.

Borkowski, J. G., Carr, M., Rellinger, E. & Pressley, M. (1990). Self-regulated cognition: Interdependence of metacognition, attributions and self-esteem. In B. F. Jones & L. Idol (Eds.), *Dimensions of thinking and cognitive instruction*: 53-92). Hillsdale, NJ: Erlbaum.

Borkowski, J. G. & Muthukrishna, N. (1992). Moving metacognition into the classroom: "Working models" and effective teaching strategy. in M. Pressley, K. R. Harris & J. T. Guthrie (Eds.), *Promoting academic competence and literacy in school* (477-501). San Diego: Academic Press.

Brooks, J. G. & Brooks, M. G. (1993). *In search of understanding: The case for constructivist classrooms.* Alexandria, VA: Association for Supervision and Curriculum development. (Chapter 9: Becoming a constructivist teacher, 101-118).

Brown, A. (1987). Metacognition, executive control, self-regulation and other more mysterious mechanisms. In F. E. Weinert & R. H. Kluwe (Eds.), *Metacognition, motivation and understanding.* 65-116. Hillsdale, NJ: Erlbaum.

Brown, J. S., Collins, A. & Duguid, P. (1987). Situated cognition and the culture of learning. *Educational Researcher, 16 (1):* 32-42.

Butcher, S. & Thomas, K. (1997). *Technology transfer in agriculture: Satisfaction with current sources used by farmers; research and development needs of farmers; methods used by, and funding for providers.* Wellington: MAF policy.

Bruner, J. S. (1961). The act of discovery. *Harvard Educational Review 31*: 21-32.

Cameron, D. & Chamala, S. (1997). Education, attitudes and farm business management training in Queensland. *Proceedings of the Australian Society of Farm Management Conference, Toowomba.*

Cloonan, D. & Roberts, G. (1997). A rationale for rangeland researchers and extensionists to explicitly recognise human activity systems and act accordingly. In A. Wollin & K. Rickert (Eds.) *Third Australian New Zealand Systems Conference Proceedings.* 51-62. Gatton: University of Queensland.

Collins, A., Brown, J. S. & Newman, S. E. (1989). Cognitive apprenticeship: Teaching the crafts of reading writing and mathematics. In L. B. Resnick (Ed). *Knowing, learning and instruction: Essays in honour of Robert Glaser.* 453-494. Hillsdale, NJ: Erlbaum.

Costa, A. (1992). An environment for thinking. In C. Collins & J. N. Mangieri (Eds.), *Teaching thinking: An agenda for the 21st century* (169-181). Hillsdale NJ: Erlbaum.

Coutts, J. A. (1994). Process, paper policy and practice: A case study of the introduction of a formal extension policy in Queensland, Australia, 1987-1994. PhD Thesis, Wageningen: Wageningen University. In N. A. Hamilton (1995). *Learning to learn with farmers.* Published PhD Thesis. Wageningen: Wageningen University.

Coutts, J. A. (1995). Agricultural extension policy as a framework for change. *European Journal of Agricultural Education and Extension 2* (1): 17-28.

Cronin, M. & Candler, W. (1968). *Factors hindering increased production on the Rangitaiki Plains and in Galatea.* Palmerston North: Department of Agricultural Economics and Farm Management, Massey University.

de Jong, T. & Ferguson-Hessler, M. G. M. (1996). Types and qualities of knowledge. *Educational Psychologist 31* (2) 105-113.

Engel, P. G. H. & van den Bor, W. (1995). Agricultural education from a knowledge systems perspective: from teaching to facilitating joint enquiry and learning. *European Journal of Agricultural Education and Extension 1* (4): 1-24.

English, P. R., McPherson, O., Deligeorgis, S. G., Vidal, J. M., Bertaccini, F. & Sterten, H. (1998). *Evaluation of training methodologies, motivational influences and staff and enterprise development initiatives for livestock industry workers in Scotland, Greece, Spain, Italy and Norway.* In Press.

Floyd, P. (1995a). Amazing reply from Rural News survey. *Rural News: 20: November 17.* Auckland: Rural News Ltd.

Floyd, P. (1995b). Survey identifies top ten. *Rural News: 14: December 2.* Auckland: Rural News Ltd.

Frank, B. R. (1995a). Constraints limiting innovation adoption in the north Queensland beef industry. I: A socio-economic means of maintaining a balanced life-style. *Agricultural Systems 47:* 291-321.

Frank, B. R. (1995b). Constraints limiting innovation adoption in the north Queensland beef industry. II: Non-adoption is an intelligent response to environmental circumstances. *Agricultural Systems 47:* 323-346.

Frank, B. R., McIntosh, F. & Chamala, S. (1995). Methodologies to improve the transfer of technology. *Report to the Dairy Research and Development Corporation.* Department of Agriculture, University of Queensland.

Gendall, P. & Hoek, J. (1990). A question of wording. *Marketing Bulletin, 1:* 25-36.

Gendall, P., Hoek, J. & Blakeley, M. (1992). Estimating a socially undesirable behaviour. *Marketing Bulletin, 3:* 1-8.

Gillard, E. (1998). *Fostering meaning learning and effective influence.* Discussion Paper.

Gillard, E., Jones, Q. & Bourne, A. (1998). Using leadership development processes as leverage for rural community development. *QDPI Building Rural Leaders Project Paper.*

Gilling, M. (1997). *Farm families and sustainability in the mid-Rangitikei.* Wellington: MAF Policy.

Glaser, R. (1984). Education and thinking: The role of knowledge. *American Psychologist 39*: 93-104.

Glaser, R. (1991). The maturing of the relationship between the science of learning and cognition and educational practice. *Learning and Instruction, 1*: 129-144.

Good, T. L. & Brophy, J. (1995). *Contemporary educational psychology (5th ed.).* New York: Longman.

Hamel, G. & Prahalad, C. K. (1991). Corporate imagination and expeditionary marketing. *Harvard Business Review, July-August:* 81-92.

Hamel, G. & Prahalad, C. K. (1994). *Competing for the future.* Harvard Business School Press.

Hamilton N. A. (1995). *Learning to learn with farmers.* Published PhD Thesis. Wageningen: Wageningen University.

Hanson, G., Parsons, R., Musser, W. & Power, L. (1998). Impact analysis of farm finance workshops. *Journal of Extension, 36*(3).

Harnishfeger, K. K. & Bjorkland, D. F. (1990). Children's strategies: A brief history. In D. F. Bjorkland (Ed.), *Children's strategies: Contemporary views of cognitive development* 1-22. Hillsdale NJ: Erlbaum.

Holden, L. (1997). *Dairy Map 1997 Annual Report.* PA: Pennsylvania State University.

Jarvis, P. (1987). *Adult learning in the social context.* New York: Croom Helm.

Johnson, R. M. W. (Ed.) (1997). *The development of agricultural advisory services in New Zealand.* Wellington: MAF Policy.

Johnston, P. H. & Nicholls, J. G. (1995). Voices we want to hear and voices we don't. *Theory into practice 34* (2) 94-100.

Kay, R. (1997). Applying autopoiesis to the facilitation of worldview change. In A. Wollin & K. Rickert (Eds.) *Third Australian New Zealand Systems Conference Proceedings:* 75-87. Gatton: University of Queensland.

Kim, D. H. (1993). The link between individual and organisational learning. *Sloan Management Review, 35*(Fall): 37-50.

Kolb, D. A. (1984). *Experiential Learning: Experiences as the Source of Learning and Development.* Englewood Cliffs, New Jersey: Prentice-Hall, Inc.

Kuiper, D. & Hall, M. (1997). Paradigm lost & regained: Moving from extension to consultancy in New Zealand. *Proceedings Second Australasia Pacific Extension Conference, Albury 1*:

Ladyshewsky, R. (1995). *Clinical teaching: HERDSA Gold Guide No. 1.* Jamieson Centre, ACT: Higher Education Research and Development Society of Australasia Inc.

Leinhardt, G. (1992). What research on learning tells us about teaching. *Educational Leadership 49* (7): 20-25.

Leslie, M. (1998). Profitability of farms less than 60 ha. *Dairyfarming Annual 50:* 31-42, Palmerston North: Department of Animal Science, Massey University.

Letts, M. A. (1997). A humanistic approach to facilitating change in agriculture. *Proceedings 11th International Farm Management Congress, Calgary, Alberta, Canada.*

Levett, A. & Pomeroy, A. (Eds.) (1997). *Managing social transformation in rural New Zealand: Speakers and group discussion reports.* Wellington: MAF Policy.

Lewin, K. (1952). *Field theory in social science: Selected papers on group dynamics.* London: Tavistock Publications.

Loveridge, R. & Pitt, M. (Eds.) (1990). *The strategic management of technological innovation.* New York: J. Wiley.

Mayer, R. E. (1992). Cognition and instruction: Their historical meeting within educational psychology. *Journal of Educational Psychology, 84*: 405-412.

McDonald, B., Walton, M., Boomsma, J. (1997). Target 10 - achieving a strong customer focus for future directions. *Proceedings Second Australasia Pacific Extension Conference, Albury 1*: 245-251.

McFerran, R., Williams, P., Dilley, M., Stevens, J., Anthony, T., Hurley, E. & Kuiper, D. (1996). *An evaluation of the 1996 Central Districts Sheep and Beef Cattle Farmers' Conference.* Palmerston North: Department of Agricultural and Horticultural Systems Management, Massey University.

Mintzberg, H., Quinn, J. & Ghoshal, S. (1998). *The strategy process.* New York: Prentice Hall.

Moore, K. (1990). *Learning on the farm: The educational background and needs of New Zealand farmers.* Wellington: New Zealand Council for Educational Research.

Nevis, E. C., Dibella, A. J. & Gould, J. M. (1995). Understanding organisations as learning systems. *Sloan Management Review, Winter.* 73-82.

New Zealand Dairy Board. (1998). *Annual report.* Wellington. New Zealand Dairy Board.

Nightingale, T. (1992). *White collars and gumboots: A History of the Ministry of Agriculture and Fisheries 1892-1992.* Palmerston North: Dunmore Press.

Nurre S. M. (1998). *The habits of an effective facilitator* [Web Page]. URL http://www.TheFacilitator.com/htdocs/arti...ml#The habits of an effective.

Oelker, E. (1995). Dairy Excel: Not extension business as usual. *Journal of Extension, 33*(6).

Page, C., Wilson, M. & Kolb, D. (1994). *Management competencies in New Zealand: On the inside looking in?* Wellington: Ministry of Commerce.

Paine, M. S. (1997). *Doing it together: Technology as practice in the New Zealand dairy sector.* PhD Thesis. Wageningen: Wageningen University.

Paris, S. G., Lipson, M. Y. & Wixon, K. K. (1983). Becoming a strategic reader. *Contemporary Educational Psychology, 8:* 293-316.

Paris, S. G. & Turner, J. C. (1994). Situated motivation. In P. R. Pintrich, D. R. Brown & C. E. Weinstein (Eds.), *Student motivation, cognition and learning: Essays in honour of Wilbert J. McKeachie:* 213-237. Hillsdale, NJ: Erlbaum.

Parker, W. J. (1997a). Developing farm business management expertise for competitive advantage. *Proceedings of the 1997 Dairyprac Convention 20-23 July, Conrad Jupiters, Gold Coast, Australia:* 150-152. Queensland Dairy Farmers' Organisation.

Parker, W. J. (1997b). Managerial competence essential in global, competitive market. *New Zealand Dairy Exporter, September:* 102.

Parsons, R. L., Hanson, G. D., Luloff, A. E. & Winsten, J. R. (1998). Extension outreach opportunities among segmented dairy producers. *Journal of Extension, 36*(4).

Pathmanathan, C. S. (1978). *The training needs of agribusiness - a commodity systems approach.* Melbourne: University of Melbourne School of Agriculture and Forestry.

Penno, J. (1998). Changing the way you farm to increase EFS. *New Zealand Dairy Exporter 74 (6) December* 28-29.

Perkins, D. N. & Salomon, G. (1989). Are cognitive skills context-bound? *Educational Researcher 18* (1) 16-25.

Peters, R. S. (1965). Education as initiation. In R. D. Archambault (Ed.) *Philosophical analysis and education.* London: Routledge & Kegan Paul.

Piaget, J. (1950). *The psychology of intelligence.* London: Routledge & Kegan Paul.

Pomeroy, B. (1993). *A profile and comparison of rural manufacturing and farming in New Zealand.* Wellington: MAF Policy.

Prahalad, C. K. & Hamel, G. (1990). The core competence of the corporation. *Harvard Business Review, May-June:* 79-91.

Pressley, M., Borkowski, J. G. & Schneider, W. (1987). Cognitive strategies: Good strategy users coordinate metacognition and knowledge. In R. Vasta & G. Whitehurst (Eds.), *Annals of child development (5)* 1-22. New York: JAI Press.

Pressley, M., Goodchild, F., Fleet, J., Zajchowski, R. & Evans, E. D. (1989). The challenges of classroom strategy instruction. *Elementary school Journal (89)* 301-342.

Pressley, M., Harris, K. & Guthrie, J. (Eds.) (1992). *Promoting academic competence and literacy: Cognitive research and instructional innovation.* San Diego, CA.: Academic Press.

Pressley, M. & McCormick, C. (1995). *Advanced educational psychology for educators, researchers, and policymakers.* New York: Harper Collins. (Chapter 4: The role of knowledge in cognition: 84-109.

Pretty, J. N. & Chambers, R. (1993). *Towards a learning paradigm: New professionalism and institutions for agriculture.* Brighton: IDS.

Prochaska, J. O., Norcross, J.C. & DiClemente, C. C. (1994). *Changing for good.* New York: The Hearst Corporation.

Rauniyar, G. & Parker, W. J. (1999). *Longitudinal analysis of dairy farm income and expenditure in New Zealand: A review of 25 years of adjustment.* Paper presented at the 43rd Australian Agricultural and Resource Economics Society Conference, 20-22 January, Christchurch. In Press.

Resnick, L. B. (1987). Learning in school and out. *Educational Researcher, 16 (9):* 13-20.

Reynolds, R.E., Sinatra, G.M. & Jetton, T. L. (1996). Views of knowledge acquisition and representation: A continuum from experience-centred to mind-centred. *Educational Psychologist 31* (2) 93-104.

Rhoades, R. (1989). Evolution of agricultural research and development since 1950: Toward an integrated framework. Sustainable Agriculture Programme Gatekeeper Series SA12. London. IIED. Cited in J. N. Pretty, & R Chambers (1993). *Towards a learning paradigm: New professionalism and institutions for agriculture.* Brighton: IDS.

Riddell, R. J. (1992). *Towards an agricultural training strategy for the 1990s.* Wellington: MAF Policy.

Roling, N. G. (1988). *Extension Science: Information systems in agricultural development.* Cambridge: University Press.

Roling, N. & Engel, P. G. H. (1991). The development of the concept of an agricultural knowledge and information system (AKIS): Implications for extension in W. M. Rivera, & D. J. Gustafson (Eds.) (1991). *Agricultural Extension: Worldwide institutional evolution and forces for change.* Amsterdam: Elsevier.

Rosenshine, B. & Meister, C. (1992). The use of scaffolds for teaching higher level cognitive strategies. *Educational Leadership 49* (7) 26-33.

Rowarth, J. & Caradus, J. (1998). Primary production professionals beyond 2000. *Primary Industry Management 1 (2)*: 16-18.

Rural Development Centre. (1991). *Competencies for farming: A compendium of profiles.* Armidale, NSW: The Rural Development Centre, University of New England.

Salmon, P. W., Fountain, R. N. & Hawkins, H. S. (1973). *Human adjustment in Australian agriculture 1972*. Melbourne: University of Melbourne School of Agriculture and Forestry.

Sandrey, R. & Reynolds, R. (Eds.) (1990). *Farming without subsidies: New Zealand's recent experience.* Wellington: MAF, GP Books.

Saxowsky, D. M. & Gustafson, C. R. (1996). Assisting farmers with business planning. *Agricultural Finance Review:* 943-957.

Scrimgeour, F., Gibson, J. & O'Neil, P. (1991). *Agricultural extension: An economic assessment.* MAF Policy Technical Paper 91/11.

Senge, P. (1990). The leader's new work: Building learning organisations. *Sloan Management Review, Fall:* 7-23.

Shadbolt, N. M. (1997). Key performance indicators. *Dairyfarming Annual 49* 107-111. Palmerston North: Department of Animal Science, Massey University.

Shadbolt, N. M. & Clarke, B. (1998). Evaluating the profitability of your dairy farm: Is EFS everything? *Massey University No. 4 Farm Field Workshop* 11-15. Palmerston North: Agricultural Services, Massey University.

Shuell, T. J. (1986). Cognitive conceptions of learning. *Review of Educational Research, 56*: 411-436.

St George, A. (1996). Cognition and instruction. *Study Guide 2* p 55. Massey University.

Stanfield, D. (1997). If you grab then by their learning principles, the rest will follow. *Proceedings Second Australasia Pacific Extension Conference, Albury. Volume 1*: 391-400.

Stantiall, J. D. & Parker, W. J. (Eds.) (1998). *Adoption of technology & information on New Zealand dairy farms: Report on a dairy industry exchange forum.* Palmerston North: Institute of Veterinary, Animal and Biomedical Sciences, Massey University.

Stantiall, J. D., Parker, W. J., & Kuiper, D. (1997). *A self assessment of dairy farm management competence provides information for designing extension workshops.* Paper presented to the Rural Australia: Toward 2000 Conference.

Stantiall, J. D., Parker, W. J. & Shadbolt, N. M. (1999). *Developing dairy farmer competence through the "Preferred Future" workshop.* Paper presented to the Australia New Zealand Agricultural Resource Economics Conference, Christchurch. In Press.

Stone, B. (1997). A systems approach to professional development. *Journal of Extension 35*: *1.* Available: E-mail: almanac@joe.org. Message: send JOE February 1997 Commentary.

Swartz, R. J. & Perkins, D. N. (1990). *Teaching thinking: Issues and approaches.* Cheltenham Vic.: Hawker Brownlow. Chapter 7. How teachers relate to teaching thinking: Lesson design and instructional strategy.

Taylor, N. & McCrostie, H. (1997). *Entrepreneurship in New Zealand farming: A study of alternative enterprises on farm.* Wellington: MAF Policy.

Tolmin, B. (1997). Trial assesses autumn calving's impact on profitability of summer dry farms. *New Zealand Dairy Exporter 72 (11): 106-108.*

Tushman, M. & Nadler, D. (1986). Organising for innovation. *California Management Review, 28*(3 (Spring)): 74-92.

Tweed, D. & McGregor, J. (1998). *Competence-based management in small to medium enterprises in New Zealand: An examination by size, structure, innovation and growth.* Palmerston North: Department of Systems Management, Massey University. In Press.

Van Beek, P. G. H. & Coutts, J. A. (1992). Extension in a knowledge systems framework. Discussion notes number 2, "Circles" Newsletter, QDPI Study Group. Brisbane. Queensland Department of primary Industries. In N. A. Hamilton (1995). *Learning to learn with farmers.* Published PhD Thesis. Wageningen: Wageningen University.

Van Tilburg, N. (1992). Why adults participate. Convenience, reputation, and self-improvement count. *Journal of Extension, 30* 3 (Fall).

Vanclay, F. & Lawrence, G. (1994). Farmer rationality and the adoption of environmentally sound practices; A critique of the assumptions of traditional agricultural extension. *European Journal of Agricultural Education and Extension, 1*(1): 59-90.

Vanclay, F. M. & Lawrence G. A. (1995). *The environmental imperative: Eco-social concerns for Australian agriculture.* Central Queensland University Press: Rockhampton.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA. Harvard University press.

Walker, A. F. & Bell, B. (1994). *Aspects of New Zealand's experience in agricultural reform since 1984.* MAF Policy Technical Paper 94/5.

Walker, A. B. (1982). *Knowledge, beliefs, attitudes, motivations and extension practices.* Unpublished Masterate essay, Massey University.

Waugh, J. (1998). Bottom line, profit is priority over top line, total production. *New Zealand Dairy Exporter 74 (4) October* 108-110.

Wiggenhorn, W. (1990). Motorola U: When training becomes education. *Harvard Business Review, July-August*, 71-83.

Wightman, J. (1998a). Smart Move: Evaluation of the Warwick farmer trial group. *Report prepared for the Subtropical Dairy Programme and the Dairy Industry Research and Development Corporation.*

Wightman, J. (1998b). Smart Move: Evaluation of the Malanda groups one and two. *Report prepared for the Subtropical Dairy Programme and the Dairy Industry Research and Development Corporation.*

Wilkinson, M. (1998). *Target characteristics for facilitator candidates* [Web Page]. URL http://www.TheFacilitator.com/htdocs/arti...ml#Target characteristics for facilitator.

Wlodkowski, R. J. (1985). *Enhancing Adult Motivation to Learn.* San Francisco: Jossey-Bass Publishers.

Yates, G. C. R. & Chandler, M. (1991). The cognitive psychology of knowledge: Basic research findings and educational implications. *Australian Journal of Education, 35*: 131- 153.

Zimmerman, B. J. & Martinez-Pons, M. (1992). Perceptions of efficacy and strategy use in the self-regulation of learning. In D. H. Schunk & J. L. Meece (Eds.), *Student perceptions in the classroom* 185-207. Hillsdale, NJ: Erlbaum.

Appendix 1

MASSEY UNIVERSITY

Farmer Survey Questionnaire

A. PRESENT KNOWLEDGE OF ASPECTS OF DAIRY FARMING:

Please use the scale to indicate the level of your present knowledge would allow you to achieve the outcomes described for the following statements by circling the most appropriate number on the scale:

	1= I am **NOT** confident: My present knowledge would **NOT** allow me to achieve this				5= I **am** confident: My present knowledge **would** allow me to achieve this
My present knowledge is sufficient in:					
1. Labour management for me to successfully employ staff & to be considered a "top" employer	1	2	3	4	5
2. Herd mating management to meet industry targets for reproductive performance	1	2	3	4	5
3. Herd health monitoring to identify causes of animal production losses	1	2	3	4	5
4. Calf rearing systems to cost-effectively rear heifer replacements to target weaning weights & without losses	1	2	3	4	5
5. Growing herd heifer replacements to reach target weights at 24 months	1	2	3	4	5
6. Dairy cow nutrition to design a balanced ration for milking cows	1	2	3	4	5
7. Pasture grazing management to produce high quality, productive pastures	1	2	3	4	5
8. Feed planning & monitoring to keep cows fully fed during lactation	1	2	3	4	5
9. Soil management to minimise pugging damage to soil structure	1	2	3	4	5
10. Soil fertility to determine quantities of fertiliser required to economically grow extra pasture	1	2	3	4	5
11. Farm business planning analysis to determine the profitability of alternative dairy farming systems	1	2	3	4	5
12. Goal setting to write goals & objectives for a five-ten year farm business plan	1	2	3	4	5
13. Techniques to evaluate the business performance of my dairy farm	1	2	3	4	5
14. Time management techniques to ensure time is regularly available to enjoy non-farming activities	1	2	3	4	5
15. Computers to use dairy farm management software (e.g. Spreadsheet, UDDER)	1	2	3	4	5

B. COMPETENCY IN FARM MANAGEMENT

Please use the scale to indicate your level of competence (ability / efficiency) in each of the following areas of dairy farm management. (Circle the most appropriate number):

	Very low Poor ability Low efficiency Limited understanding	*Competency Scale*		Moderate		*Very High* Very good ability High efficiency Complete understanding
16. Monitoring and recording farm production	1	2	3	4	5	
17. Maintaining accurate records of cash transactions	1	2	3	4	5	
18. Preparing an annual cash flow budget	1	2	3	4	5	
19. Forecasting prices & costs 1-5 years ahead	1	2	3	4	5	
20. Interpreting & using information from farm accounts	1	2	3	4	5	
21. Identifying opportunities to improve milk production	1	2	3	4	5	
22. Planning & costing changes to a dairy farm	1	2	3	4	5	
23. Drawing up a 5-10 year strategic plan	1	2	3	4	5	
24. Preparing a whole farm feed budget	1	2	3	4	5	

25. Name, in order of importance, up to three aspects of dairy farming that you would most like to improve
your knowledge, and the ability to use this knowledge efficiently in management:

1. _____
2. _____
3. _____

26. ***Would you attend a workshop designed to develop knowledge and skills in dairy farming?***

Yes ☐ What would be a convenient locality to hold it? _____

No ☐

27. ***How much would you be prepared to pay for a workshop designed to improve your knowledge & skills in dairy farm management?*** $ _____

28. ***Would you prefer:*** a half-day workshop? ☐ Yes ☐ No

a full day workshop? ☐ Yes ☐ No

an evening workshop? ☐ Yes ☐ No

a short course (2-3 days) when the cows are dry? ☐ Yes ☐ No

C. BRIEF DETAILS OF MY PRESENT FARM AND PRODUCTION SYSTEM:

29. Soil types on my current farm are:

Predominantly (over 50%) heavy (poor draining) soils ☐

Predominantly (over 50%) light (free-draining) soils ☐

Mix of heavy and light soils ☐

30. What is the reliability of summer (Jan-Feb) rainfall for maintaining pasture production on your farm?

Low ☐

Medium ☐

High ☐

31. Peak number of cows milked mid-Oct 1996: _____ cows

32. Farm size (milking platform only): _____ effective ha

33. Milksolids produced in 1995/96 season: _____ litres or _____ kgms

34. Date of first calving in 1996: _____

35. Date of last calving in 1996: _____

36. Number of staff employed: Full-time: _____

Part time (casual): _____

37. Present position: ***(Please circle the most appropriate ONE)***

Farm owner

Sharemilker

Manager

Contract milker

Employed staff

Other _____

(please specify)

38. Which District Council area is your home farm located in? _____

39. Are you currently a discussion group member? ☐ Yes ☐ No

Name of group: _____

If not, have you belonged to one in the past? ☐ Yes ☐ No

40. In what year were you born? 19_____

41. Gender: ☐ Male ☐ Female

***** IMPORTANT *****
We require several farmers for case study research relating to farmer learning.

If you would be prepared to be involved in a study of farmer learning please provide your:

Name: _____

Address: _____

Phone number: _____

Appendix 2

MASSEY UNIVERSITY

College of Sciences

1997 "Northland Dairy Cow Nutrition" Workshop

Evaluation

	Learning outcome					Gain in knowledge				
I am now be able to:	not confident				confident	learnt little				learnt a lot
1. Explain the key metabolic pathways linking the main dietary components in feed to dairy cow production.	1	2	3	4	5	1	2	3	4	5
2. Calculate the energy and protein requirements of cows in different physiological states, and to be aware of the limitations of using mineral concentrations as a basis for cow requirements.	1	2	3	4	5	1	2	3	4	5
List the main factors that determine the potential voluntary feed intakes (VFI) and list the factors that may limit the attainment of VFI in practice.	1	2	3	4	5	1	2	3	4	5
3. Identify potential problems (health and production) arising from feeding different feeds based on their nutrient composition data from references and laboratory reports.	1	2	3	4	5	1	2	3	4	5
4. Identify potential problems (production and health) by monitoring cow performance, and identify appropriate remedial (and/or preventative) actions involving changes in feeds (supplements) and/or management.	1	2	3	4	5	1	2	3	4	5
5. Calculate the likely extra return from a given change in ration.	1	2	3	4	5	1	2	3	4	5
6. Describe the difference in philosophy between our dairy grazing management systems of the last three decades, and those being used to achieve high production and high profit through increasing both per cow and per hectare performance;	1	2	3	4	5	1	2	3	4	5
7. Identify key issues in pasture management and supplementary feeding systems that will influence dairy farm production and profitability.	1	2	3	4	5	1	2	3	4	5
8. Integrate pasture management and supplementary feeding systems to reach the objectives set by individual farmers (e.g. optimise total profit or per cow or per hectare; achieve high pasture utilisation; achieve high per cow or high per ha performance).	1	2	3	4	5	1	2	3	4	5

9. Please note three aspects of the workshop that you felt were well done:

10. Please note three aspects of the workshop where there could have been some improvements

11. If the course did not meet your expectations, please outline why:

12. Any other comments

Appendix 3

MASSEY UNIVERSITY

College of Sciences

1998 "Preferred Future" Workshop

Evaluation

1. What is your role in the dairy industry? (Please circle the most appropriate option)
    1. Dairy Farm owner/operator
    2. Sharemilker
    3. Manager/contract milker/herd manager
    4. Employed farm staff
    5. Spouse/partner
    6. Agribusiness representative
    7. Other _____

2. In the next five years, how likely are you to: (Please circle the most appropriate option)

Expand your herd by more than 29%	Not very likely	Somewhat likely	Moderately likely	Very likely
Exit the dairy industry	Not very likely	Somewhat likely	Moderately likely	Very likely
Use a consultant regularly	Not very likely	Somewhat likely	Moderately likely	Very likely
Have a comprehensive strategic plan for your farming business	Not very likely	Somewhat likely	Moderately likely	Very likely
Have an on-going system for monitoring the health of your farming business	Not very likely	Somewhat likely	Moderately likely	Very likely

3. Which statement bests describes your employment status/use of time? (Please circle the most appropriate option)

1. Employed on farm and elsewhere
2. Employed full time on farm
3. Employed full time off farm
4. Not employed

4. Gender (Please circle the most appropriate option)

1. Male
2. Female

5. Total area farmed in the 1996/97 year: _____ hectares

6. Total number of cows milked in the 1996/97 season: _____ cows

7. What calving pattern did you have in the 1996/97 season? (Please circle the most appropriate option)

1. All spring
2. All autumn
3. Split Spring/autumn

8. Total production for the 1996/97 season: _____ kgms

9. Number of people working on the farm

	Full time	Part Time
Family members		
Non-family members		

10. Within the last year, did you: (Please circle the most appropriate option)

Monitor key control points (e.g. production per cow; feed cost per kgms)

1. Yes
2. No

Set written short-term goals

1. Yes
2. No

Set written long-term goals

1. Yes
2. No

Work with an advisory team on your farm

1. Yes
2. No

Work with a financial professional to plan for the future

1. Yes
2. No

11. What year were you born? _____

12. What is the highest formal education qualification you have? _____

13. How did you learn about this workshop? _____

14. As a result of this workshop, how prepared do you feel you are to do the following in the next 6 months in your dairy operation? (Please circle the most appropriate option)

Complete a SWOT analysis	Does not apply	Not prepared	Somewhat prepared	Moderately prepared	Well prepared
Develop written short-term goals	Does not apply	Not prepared	Somewhat prepared	Moderately prepared	Well prepared
Develop written long-term goals	Does not apply	Not prepared	Somewhat prepared	Moderately prepared	Well prepared
Communicate more effectively with employees	Does not apply	Not prepared	Somewhat prepared	Moderately prepared	Well prepared
Define critical success factors	Does not apply	Not prepared	Somewhat prepared	Moderately prepared	Well prepared
Develop a strategic plan	Does not apply	Not prepared	Somewhat prepared	Moderately prepared	Well prepared

15. For which of the following, if any, do you feel you need more information about, or more feedback on? (Please circle the most appropriate option)

1. Writing a mission statement	Yes	No
2. Setting SMART goals	Yes	No
3. Critically assessing strengths, weaknesses, opportunities and threats (SWOT)	Yes	No
4. Completing an external (PEST) analysis	Yes	No
5. Defining critical success factors	Yes	No
6. Developing a strategic business plan	Yes	No
7. None of the above	Yes	No

Then and Now

16. Listed below in the centre are techniques for profitable businesses. On the left hand side of each one circle how important you thought it was BEFORE the workshop. Then on the right, circle how you feel now, AFTER the workshop.

Before the workshop it was:					After the workshop it is			
Not important	Somewhat important	Moderately important	Very important	**Write a mission statement**	Not important	Somewhat important	Moderately important	Very important
Not important	Somewhat important	Moderately important	Very important	**Set goals for dairy operation**	Not important	Somewhat important	Moderately important	Very important
Not important	Somewhat important	Moderately important	Very important	**Critically assess S, W, O & T**	Not important	Somewhat important	Moderately important	Very important
Not important	Somewhat important	Moderately important	Very important	**Benchmark against other operations**	Not important	Somewhat important	Moderately important	Very important
Not important	Somewhat important	Moderately important	Very important	**Define critical success factors**	Not important	Somewhat important	Moderately important	Very important
Not important	Somewhat important	Moderately important	Very important	**Develop a strategic business plan**	Not important	Somewhat important	Moderately important	Very important
Not important	Somewhat important	Moderately important	Very important	**Work with an advisory team**	Not important	Somewhat important	Moderately important	Very important
Not important	Somewhat important	Moderately important	Very important	**Comprehensively analyse the health of your business**	Not important	Somewhat important	Moderately important	Very important
Not important	Somewhat important	Moderately important	Very important	**Completing an external (PEST) analysis**	Not important	Somewhat important	Moderately important	Very important

17. Since the beginning of the workshop, to what extent have you been able to do each of the following? (Please circle the most appropriate option)

Write a mission statement	Thought about or discussed	Started writing	Completed writing	Not yet started	Did regularly before workshop
Set SMART goals	Thought about or discussed	Started writing	Completed writing	Not yet started	Did regularly before workshop
Critically assess S, W, O & T	Thought about or discussed	Started writing	Completed writing	Not yet started	Did regularly before workshop
Define family financial needs	Thought about or discussed	Started writing	Completed writing	Not yet started	Did regularly before workshop
Define critical success factors	Thought about or discussed	Started writing	Completed writing	Not yet started	Did regularly before workshop
Develop a strategic business plan	Thought about or discussed	Started writing	Completed writing	Not yet started	Did regularly before workshop
Completing an external (PEST) analysis	Thought about or discussed	Started writing	Completed writing	Not yet started	Did regularly before workshop

The learning experience

18. We would value your opinion on the following statements. For each question, please circle the most appropriate level of agreement.

This was an enjoyable learning experience	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Attending this workshop has given me greater confidence to plan for the future	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Attending this workshop has given me greater confidence in my ability to learn new business management concepts	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Attending this workshop has helped me to realise the value of investing time in learning new farming skills	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I would attend another workshop run in a similar manner if the topic related to my business goals	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I will promote similar courses to farm staff &other dairy farmers	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

19. To help us plan for the future, name one or two exercises that you remember were explained or demonstrated well in the workshop:

_____

_____

20. Name one or two exercises that you remember were explained or demonstrated poorly in the workshop:

_____

_____

21. Is there anything we forgot? Please use this space to comment:

This evaluation has been adapted from The "Dairy-MAP" programme, Pennsylvania State University.