Working together for environmental management: the role of information sharing and collaborative learning

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ABSTRACT

Resource management issues continually change over time in response to co-evolving social, economic and ecological systems. Under these conditions adaptive management, or 'learning by doing', offers an opportunity for more proactive and collaborative approaches to resolving environmental problems. Effective collaborative management requires different stakeholders associated with environmental problems to develop and enact solutions co-operatively, as opposed to acting as advocates purely in their own interest. However, because environmental issues are generally characterised by conflicting social perceptions, it is often difficult to ensure adequate stakeholder participation in developing and managing information to support collaborative decision making and subsequent change 'on-the-ground'.

An initial framework for a collaborative approach to managing information within an adaptive management approach is outlined at the beginning of this study. This is the Integrated Systems for Knowledge Management (ISKM) approach. This thesis is developed through a six-year action research inquiry into its implementation. This involves one main case study (tussock grasslands) and two smaller, but related, ones (black stilt; Tb vector control).

Consistent with an action research approach, the inquiry developed as it was influenced by the different organisational and social issues that emerged during the case studies and by the subsequent analyses that were made. These included how to manage: forums that support constructive community dialogue; environmental conflict; evaluation processes that meet the needs of the different parties involved; multi-stakeholder information networks; and the integration of both 'soft' and 'hard' inquiry processes within research and development initiatives. The thesis concludes by showing how these different process issues are linked in practice. A final version of ISKM is outlined, but it is suggested that this will only work if it is implemented in an environment characterised by high social capital. Action research is seen as a process that both helps the development of this social capital, and provides lessons into how it can be expanded. Moreover, building capacity for the use of participatory learning processes should be part of the method: that capacity cannot be assumed to be there. The role of evaluation in building capacity for participation, and measuring process success is highlighted. Finally, it is suggested that further insights should be drawn across action research case studies so that more valuable and robust lessons in supporting collaborative environmental approaches can be gained.

ACKNOWLEDGEMENTS

The completion of this thesis, and the underpinning work described here, was made possible through the support and assistance of many people and organisations. I acknowledge the support and funding provided by Landcare Research. I thank my supervisors John Overton, Ian Valentine and Ockie Bosch, who played an important role both as a group, and individually. John Overton provided the best home this thesis could have had through the School of Global Studies, and guided it through the final stages of completion. Ian Valentine inspired me to journey down the path of systems thinking. Ockie Bosch developed and managed the main research framework without which this study could not have happened — setting a model for the integration of 'soft' and 'hard' research. His role as one of the central co-researchers in the overall inquiry process described here has been invaluable, with some of the most useful 'critical reflection' occurring during our many five-hour drives between Alexandra and Christchurch. Over the past three years the overall inquiry process has been enriched with the contribution of Margaret Kilvington. Her friendship and support during the projects we've worked on, workshops we've co-facilitated, and during the writing up of this thesis, has been really appreciated. Inevitably, perhaps, my work and thinking through both the different projects described here and bringing some wider lessons out through this thesis has blurred the distinction between home and office. I thank my partner, Nicky Woodward, for her patience as I have undertaken my journey over the past six years, as well as for her support and friendship. This inquiry has gained from our many discussions exploring the area of individual and community change. Special thanks must go to our children, Brigitte, Michael and Casey, for their patience, support and continual optimism that one day this thesis would be finished. I also thank my parents for providing me with the start that made this possible. A number of other friends and colleagues have provided valuable inputs and support. In particular, I thank Kathleen Delate, Nancy Grudens Schuck and Margot Parkes for their contribution. I acknowledge the special role that MAF Policy, and particularly Morgan Williams, played in initiating this study through their support for the Hieracium Management Programme. Participatory action research such as described here is not possible without the support and goodwill of all those involved, and I record my appreciation for all those who have put their time and effort into the projects described here. Finally, I thank the many organisations who have funded the different projects involved. More specific acknowledgements to individuals and organisations are provided in the various chapters.

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CHAPTER 1

Introduction, structure and outline

This thesis represents an inquiry into how an adaptive management ethic and practice that supports the concept of sustainable development can be initiated and implemented in complex, regional or large-scale contexts. An action research inquiry process is used to find improved ways of managing collaborative or multi-stakeholder approaches to environmental management, and to develop an integrated information framework to underpin subsequent decision making. The research involves one main case study (tussock grasslands) and two smaller, but related, ones (black stilt, and bovine Tb vector control).

> *At least three significant problems face any author of a case study describing an actual experience. First it is quite impossible for any account of a study to approach the richness of the study itself. This would be true even if we abandoned the would-be-scientific approach and wrote a novel out of the experience. For the novel would be from the author's point of view. That is the second problem; there is no study, as any kind of unitary object, only a set of happenings in which a number of people took part, happenings which each participant and each observer will interpret in his or her own way. Thirdly, any limited written-down account of a study will be defenceless against comments which suggest that it should have been done more quickly, or better, or that some other approach would have been more effective. Such comments are not very interesting, since they are in principle in capable of refutation, but they do illustrate what a tender flower a related case history is.* (Checkland 1985b p. 822).

Research context

The main case study around which this thesis revolves began with a research and development initiative in mid-1994 to address the problem of an invasive weed (*Hieracium* spp.) in the grazed tussock grasslands of the South Island high country (mountains) of New Zealand. Consistent

with an action research process, an initial framework for supporting a collaborative approach to addressing this problem is outlined at the beginning of this study. This is the Integrated Systems for Knowledge Management (ISKM) approach.

What is significant about this case study is not that it has resulted in a regional adaptive management approach to tussock grasslands management — it hasn't — but rather that those involved (researchers, farmers, conservation managers and local government staff representatives) have learnt more about the issues involved, and continue to seek ways to resolve them within the framework of adaptive management. Moreover, the programme has now expanded from its original focus on *Hieracium*, to cover more general issues of tussock grassland management and seek to better integrate conservation and pastoralism in this scenic region. Within this context the corresponding evolution of the ISKM framework is documented, along with the insights and generalisations that emerged as the study progressed. Finally some suggestions are made to guide further action research initiatives in this area.

Although the tussock grasslands form the main backdrop for this project, relevant experience has been gained in other projects I have been involved in during this time. One of these looked at how to improve the identification and uptake of bovine Tb vector control technologies, and another involved conflict resolution about the management of a rare wading bird. However, in both these cases the issues under investigation are related back to the main case study. The links between these different issues are explained further in the content of the relevant chapters. An Internet site was also developed to illustrate the different skills involved in change management and to network among professionals in this area.

Methodology

Action research has been chosen as an appropriate methodology for this study. This is consistent with an intervention-based approach where the focus is action to improve a situation and the research is the conscious effort, as part of the process, to formulate public knowledge that adds to theories of action that promote or inhibit learning in behavioural systems. One of the key characteristics of this approach is collaboration, which enables mutual understanding and consensus, democratic decision making and common action. The process that the researcher uses

to guide those involved can be described as a spiral of action research cycles consisting of phases of planning, acting, observing and reflecting.

In this thesis these cycles can be seen to have taken place at a number of levels, each involving different 'learning' groups. The main learning group should be seen as the core research team involved in the implementation of the ISKM framework within the case studies described here. For the past six years this core team has comprised Dr Ockie Bosch (who managed the tussock grasslands research described here, and is also one of my thesis supervisors) and myself. Over the past three years we have been joined in this work by Margaret Kilvington (a social researcher). However, in the sense that the research described here is participatory, so our involvement in the different case studies has provided the opportunity to actively collaborate with a wide number of co-researchers — individuals, community groups and agency and local government representatives. Finally, this thesis provides my own broader reflection on the lessons that have been learnt through my own participation in the different initiatives reported here and how they fit together.

My main involvement within these linked case studies has been that of an action researcher, although this has involved me in different roles. I have, for instance, been involved in activities ranging from accession and collation of farmer information, to facilitation and conflict management, to the design and development of Internet websites. However, during the course of this study I have maintained a consistent focus on how to improve the use of collaborative approaches in environmental management.

The professional background that I bring to this study comprises five years in the development and execution of agricultural communication, extension and education programmes, and a further five years managing a commercial sheep and beef farm in New Zealand. I have also worked for two years in the area of environment and development with the Environmental Liaison Centre International and UNCHS(Habitat) based in Nairobi, Kenya. For the past six years I have been employed by Landcare Research as a social researcher.

My personal values that I bring as an action researcher to the project are guided by two fundamental principles. Firstly, that there is a need to democratise the knowledge process — so people normally shut out from research and information become involved in the research itself,

learning how to obtain information and how to use it. And secondly, that my work has a social change emphasis — whereby the goals of research are to engage in action that reverses inequalities, empowers the have-nots, and ultimately transforms society so decision-making becomes more transparent and democratic. Within these broad principles my work is bounded within an environmental research institute, such that its focus is on finding ways to improve people's relationship to the environment, and promote environmental decision making based on the improved use of sound technical information.

Thesis structure and outline

What follows is best regarded as an illustration of action research using actual experiences. This is, as Checkland (1985b p. 822) points out, 'the best that can be hoped for, given the impossibility of capturing the actual richness of an intervention in human affairs'. The documentation of the lessons or insights that were gained along the way are shown here through a series of already published (or submitted) material. Each of these publications (in one case, a website) documents a research activity or intervention, and can thus be regarded as the expression of one action research 'plan—act—reflect' cycle and the basis of a chapter in this thesis. Overlaying this are a few pages of my own wider 'reflection' provided at the beginning of each chapter to introduce each publication and illustrate where it fits in the larger plan-act-reflect cycle of this thesis.

Papers and reports from other forums have not been re-edited for this thesis, although every effort has been made to ensure consistency in formatting. Figures, tables and boxes have, however, been renumbered according to chapter and chapter position to assist the reader. To save duplication all references are attached in one section at the end of the thesis[1].

Chapters two and three provide a context for this study and detail the inquiry methodology. Subsequent chapters concerned with specific issues arising through the course of the study are ordered chronologically, although at times they overlap. A simple time-line has been included in each chapter to provide a sense of how this study has evolved. This time-line is meant to

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[1] Where previously published or presented papers have been included in this thesis there may be slight differences in reference format styles. Permission to reproduce already published or submitted material has been obtained where appropriate.

illustrate the period during which a serious and well-documented attempt was made to address an identified issue — in some cases the issue may have been identified earlier, and/or subsequent work may have been undertaken. This is an attempt to bound an open inquiry process for the sake of clarity. An abstract (and, where appropriate, a time-line) for each chapter is appended below to provide the reader with an overall sense of the main content and structure.

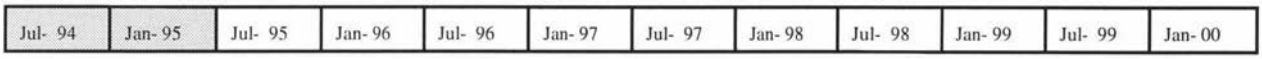
Chapter 2: The role of adaptive environmental management within sustainable development

This chapter sets out the wider context within which this inquiry is set. The need for new approaches to natural resource management arises from the relatively new, problematic demands posed by the concept of sustainable development. This chapter examines these changes through the outcomes of two major United Nations conferences. The importance of information, integration and participation are noted. Next an outline is provided of the way in which science has changed to involve people more closely in research and development. Particular attention is paid to the challenges being posed for science as it seeks to more explicitly deal with the human dimension of natural resource management. The potential for adaptive management as an approach to more closely link research with management and policy is discussed. Finally this chapter outlines some key social and institutional barriers to achieving this potential.

Chapter 3: The role of action research in improving the realisation of adaptive and people-centred environmental management

This chapter begins by outlining the underlying concepts of action research in more detail. Some differences between action research and mainstream science are then explained, particularly to justify its use as an appropriate methodology to the research and development challenges outlined in earlier sections of this chapter. Some more practical details of practising action research are then discussed. Finally, the process of critical reflection in action research is highlighted, and an illustration given of how it can help in getting people to think more deeply about the use of environmental practices.

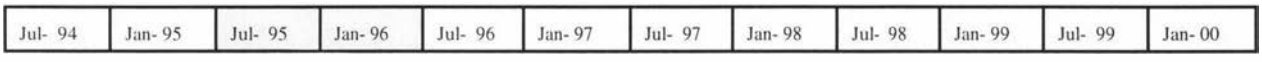
Chapter 4: Getting started: a case study in community-based adaptive management or 'learning by doing'



Allen, W.J., Bosch, O.J.H., Gibson, R.G. & Jopp, A.J. (1995) Co-learning our way to sustainability: Integrating local and scientific knowledge through an evolutionary research approach to support land management decision-making. Paper presented at Malama Aina 95, 1st International Conference on Multiple Objective Decision Support Systems (MODSS) for Land, Water and Environmental Management, Honolulu, Hawaii, 23–27 July 1995.

This chapter provides the background to the start of the wider case study reported in this thesis, which can be seen to have begun with the two-year Hieracium Management Programme (HMP). This involved a participatory research initiative to address the issue of an invasive weed (*Hieracium* spp.) in the grazed tussock grasslands of the South Island high country. The first version of a framework (ISKM) that can help the introduction of an adaptive approach to more closely link management and research is outlined, along with a framework for researching the facilitation of its implementation. Supporting material is presented that addresses challenges of sustainability and the emerging paradigms of research that are emerging in response.

Chapter 5: Sharing experiences and developing 'useful knowledge'

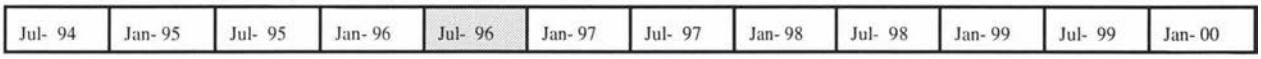


Allen, W.J. & Bosch, O.J.H. (1996) Shared experiences: the basis for a cooperative approach to identifying and implementing more sustainable land management practices. Pp. 1–10 in Proceedings of Symposium "Resource management: Issues, visions, practice" Lincoln University, New Zealand, 5–8 July 1996

The background to the second version of ISKM, and a re-evaluation of the need for such an adaptive programme approach, are discussed in this chapter. This highlights the importance of seeing the outcome of research as to develop 'useful knowledge' rather than a 'decision support system (DSS)'. This change in focus is also set against the emergence of a growing split over the past 200 years between science and management. The need for improved forums for communication is shown, along with examples. Finally, some lessons are provided from

experience with science farmer workshops to show the need to develop a common language although, as pointed out, this will sometimes require the use of less commonly used communication approaches such as pictures.

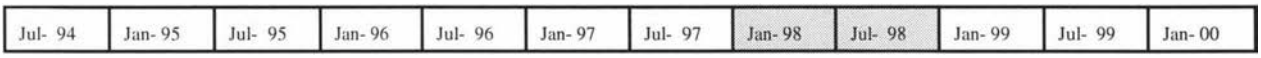
Chapter 6: Evaluating multi-stakeholder research and development programmes



Allen, W.J. (1997) Towards improving the role of evaluation within natural resource management R&D programmes: The case for 'learning by doing'. *Canadian Journal of Development Studies XVIII, Special Issue*: 625–638.

This chapter opens with a discussion of the need for new approaches to evaluation, particularly in programmes which involve a number of different interest groups. Some implications for science of these more participatory approaches are highlighted, particularly the need to be more questioning of hidden underlying assumptions. The ways in which society's perception of land use has evolved over recent years are offered as a catalyst for a new participatory approach to evaluation. Finally, the results of a participatory evaluation of the HMP are presented, to illustrate how formative and participatory evaluation can be used in the light of current issues facing both evaluators and natural resource managers. This shows the need to develop improved ways of evaluating such multi-stakeholder programmes to provide better shared understanding and agreement about goals.

Chapter 7: Addressing conflict in multi-stakeholder situations

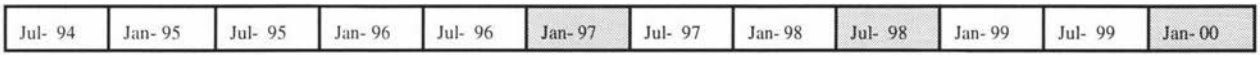


Allen, W., Brown, K., Gloag, T., Morris, J., Simpson, K., Thomas, J. & Young, R. (1998). Building partnerships for conservation in the Waitaki/Mackenzie basins. Unpublished Landcare Research Contract Report LC9899/033, Lincoln, New Zealand.

The importance of conflict as a condition for learning is discussed, as are some of the challenges posed for action researchers as they manage processes which are conflict-laden. Involving the right groups from the beginning is suggested as an important step in multi-stakeholder projects

wishing to minimise conflict. An example is provided of an actual conflict management exercise involving a rare wading bird (black stilt), a conservation agency and farmers. The suggested approach differs from the more conventional approach to conflict where the aim is to 'solve' the problem; here it was to initiate a process which would facilitate ongoing communication and begin to build trust between the two parties as part of an ongoing process to help them manage adjoining land and local wildlife. The accompanying chapter report documents the approach and outcomes from this exercise.

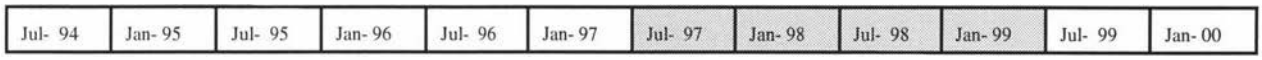
Chapter 8: Social and organisational issues with adaptive management for environmental management



Allen, W.J., Bosch, O.J.H., Kilvington, M.J., Harley, D.G. & Brown I. Monitoring and adaptive management: resolving social and organisational issues to improve information sharing. (Submitted: *Natural Resources Forum*, 2000)

Although the HMP concluded in June 1996, its work carried on within the expanded tussock grasslands research programme, which still emphasised the need for adaptive management and ISKM as a framework. However, despite the availability of an Internet-based Management Information System (MIS) and monitoring tools for measuring community species in the tussock grasslands, these tools are not being used. This chapter highlights an ongoing participatory inquiry processes into this lack of use. This, in turn, illustrates the difficulties with implementing environmental management technologies — which often have a significant public-good component. It highlights the need for a more co-ordinated approach to adaptive management involving agencies, researchers and land managers, and draws attention to some of the emerging social and organisational issues entailed. Some solutions to overcome these problems related to information sharing are then suggested.

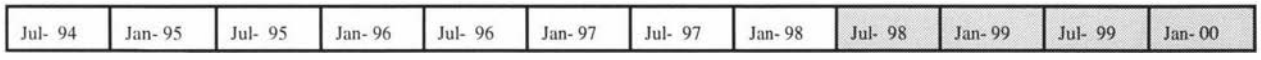
Chapter 9: Helping groups to learn enthusiastically — roles for information, the Internet, and agency support



Allen, W., Bosch, O., Kilvington, M., Oliver, J.& Gilbert, M. (2000) Benefits of collaborative learning for environmental management: Applying the Integrated Systems for Knowledge Management approach to support animal pest control. *Journal of Environmental Management* (In press)

This chapter looks more closely at the application of ISKM through a case study to improve the use of information within bovine Tb vector control, paying particular attention to the lessons that emerged within different steps. Some considerations about the growing role of, and potential for, using groups as a mechanism to manage and foster change in natural resource management are highlighted. The role of social capital (social networks, norms and trust) in supporting the process of learning is highlighted, and a model is presented to categorise group development in these terms. The accompanying paper draws attention to different approaches to extension, and how their use in practice should often be seen as complementary. The third version of ISKM is presented, emphasizing the need to put more effort into building relationships and clarifying goals as a starting point for collaborative initiatives. Finally the paper looks more closely at the potential role of the Internet in supporting information management and networking. The need for action research to learn case studies across lessons and programmes is also noted.

Chapter 10: Developing an Internet presence and the value of networking



Allen, W. (2000) NRM-changelinks: Improving Community Participation in Environment & Development. Available from <http://nrm.massey.ac.nz/changelinks/> (Accessed 4 October 2000)

The use of the Internet for managing a diverse range of information is illustrated through the accompanying website, and it is used here as a case study example. The growing need for this sort of support for action researchers is shown. Different approaches to support interest-based communities and peer-based communities with the Internet are highlighted. Finally, benefits from using the Internet as a component within a wider networking strategy are discussed.

Chapter 11: The need to link 'soft' and 'hard' research activities within multi-disciplinary science teams

Jul- 94	Jan- 95	Jul- 95	Jan- 96	Jul- 96	Jan- 97	Jul- 97	Jan- 98	Jul- 98	Jan- 99	Jul- 99	Jan- 00

Allen, W.J. & Kilvington. M.J. (1999) Why involving people is important: The forgotten part of environmental information system management. Paper presented at 2nd International Conference on Multiple Objective Decision Support Systems (MODSS) for Land, Water and Environmental Management, Brisbane, Australia, 1–6 August 1999.

The importance of ensuring that the 'participatory' component of a science programme is integrally linked with other aspects of the research, and that the outcomes of stakeholder involvement are fed into the research design to influence subsequent activities and strategies, is discussed. It is also suggested that the value of such participatory work can be increased if it is implemented as action research; this can also help to derive more generic lessons for environmental management. Learning is observed to not only require relevant and timely information, but also processes for shared understanding, moderating conflict and providing a supportive environment. Case studies are used to outline a useful role for action research practitioners within multi-disciplinary research teams. These show that efforts to share information need to build trust and confidence between information providers and users if they are going to be successful.

Chapter 12: Concluding reflections and planning the next research cycle

This chapter summarises the aims and activities of the work undertaken through this action research inquiry, and briefly reviews the outcomes of this work as a means of demonstrating relevance. Future areas of activity with the potential to leverage improved information flows within environmental research and management are suggested as: i) improving participation and the use of local knowledge in the research process; ii) improving the dissemination and use of this knowledge in the wider community through improved networking and collaboration; and iii) capacity building — supporting these approaches — through participatory monitoring and evaluation. A fourth version of ISKM is outlined, along with the suggestion that this should be implemented in an environment characterised by high social capital. Action research is seen as a process which both helps the development of this social capital, and provides lessons into how it

can be expanded. Moreover, building capacity for the use of participatory learning processes should be part of the method, that capacity cannot be assumed to be there. The role of evaluation in building capacity for participation and measuring process success is highlighted. Finally, this chapter points to the need to draw out lessons across action research case studies, and suggests some challenges for action research to support large-scale collaborative learning initiatives.

CHAPTER 2

The role of adaptive environmental management within sustainable development

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This chapter sets out the wider context within which this inquiry is set. The need for new approaches to natural resource management arises from the relatively new, problematic demands posed by the concept of sustainable development. This chapter examines these changes through the outcomes of two major United Nations conferences. The importance of information, integration and participation are noted. Next an outline is provided of the way in which science has changed to involve people more closely in research and development. Particular attention is paid to the challenges being posed for science as it seeks to more explicitly deal with the human dimension of natural resource management. The potential for adaptive management as an approach to more closely link research with management and policy is discussed. Finally this chapter outlines some key social and institutional barriers to achieving this potential.

> *Everything has been said about development, but almost everything remains to be said and therefore to be explored or rediscovered, because incontestably, almost everything remains to be done.* (Cosmao. 1984 p. 8)

Sustainable development as a policy concept

The need for new approaches to environmental policy and ecosystem management has emerged in line with the evolving concept of 'sustainable development'. Over the past three decades, 'development theorizing has progressed beyond economic parameters based on gross domestic product (GDP) per capita growth, and even the conventional social indicators of literacy, life expectancy and caloric intake ... interventionist frameworks now regularly include such dimensions as sustainable environmental practices, gender equity, respect for human rights and participatory governance' (Beemans 1996). While conventional approaches to agriculture have in the past tended to employ narrow economic or productivity criteria to measure their success,

today the questions have been broadened to simultaneously evaluate the health of relevant systems in terms of ecology, ethics and equity (Dahlberg 1991 p. 338).

These major changes in the way the issues of economic growth, human development and environmental protection are approached can be highlighted through the outcomes of two major United Nations conferences. The Conference on the Human Environment, held in Stockholm in 1972, provided for the first major discussion of environmental issues at the international level. The subsequent increase in public awareness and understanding of the fragility of the environment was one of the most successful outcomes from Stockholm. However, while it succeeded in placing environmental concerns on the international political agenda, the environment still remained a marginal issue. In particular, little was done to give practical effect to the integration of environment and development in economic policy and decision making, and the health of the planet continued to deteriorate at an unprecedented rate (Wynberg 1993 p.1). In response the World Commission on Environment and Development was established during the 1980s by the United Nations to examine strategies and means by which the world community could deal more effectively with environmental concerns.

The resulting report, *Our Common Future* (better known as the Brundtland Report) was published in 1987 by the World Commission on Environment and Development, and set out the concept of 'sustainable development' as an integrated approach to policy and decision making in which environmental protection and long-term economic development are seen not as incompatible, but as complementary. The Commission's definition of sustainable development is most often quoted as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development, 1987 p. 43). This must be acknowledged as expressing an ideal. For instance, there is no general agreement on what constitutes the needs of the present, let alone those of the future.

Nonetheless, the publication of this report highlighted 'sustainable development' as a political reality, and gave rise to an international consultation process that culminated in the United Nations Conference on Environment and Development (UNCED), held at Rio de Janeiro in 1992. It is true, that given its ambitious agenda, UNCED may not have achieved all that was hoped for. But among its successes must be counted the recognition of the mutual dependencies

between North and South, as well as the clear acknowledgement that the causes of environmental decay are more significant than the effects (Wynberg 1993 p. 4). New pathways were opened for public participation in intergovernmental communications, allowing for increased communication and co-operation between governmental and non-governmental organisations. Indeed, Rio provided a clear role and responsibility for all sections of society, with the recurring message that 'real change is most likely to come with the involvement of ordinary people' (Wynberg 1993 p. 1).

Linking information, integration and participation

As the 1997 Report of the Secretary-General highlights, a comparison of the action plans produced by the Stockholm and Rio conferences illustrates a major shift in our understanding of, and approach to, the problems of long-term human development. 'Where Stockholm adopted an issue-oriented approach to pollution and non-renewable resource depletion, Rio emphasized integrated strategies to promote human development through economic growth based on sustainable management of the natural resource base' (Report of the Secretary-General, United Nations 1997). *Agenda 21*, the action plan that emerged from the UNCED process, represents a statement of willingness to strive for a form of development that recognises the linkages between economic growth, social equity and protection of the environment.

This agenda clearly identifies information, integration, and participation as key building blocks to help countries achieve development that recognises these interacting factors. It emphasises that in sustainable development everyone is a user and provider of information. It stresses the need to change from old sector-centred ways of doing business to new approaches that involve cross-sectoral co-ordination and the integration of environmental concerns into all development processes. Furthermore, *Agenda 21* emphasises that broad public participation in decision making is a fundamental prerequisite for achieving sustainable development.

As these multiple dimensions of development have been taken into account by governments, agencies and other organisations, so we see a different language emerging in development papers and reports. The World Bank defines participation as 'a process through which stakeholders influence and share control over development initiatives and the decisions and resources which affect them', and talks about the need to 'empower' the poor — helping them move from being

'beneficiaries' to 'clients' (World Bank 1996). The United Nations Development Program (UNDP) coined the term 'sustainable human development' to describe the very human-centeredness of sustainable development (UNDP 1996). Within Canada's International Development Research Centre (IDRC), Vice-President Pierre Beemans (1996) suggests that development is 'change that improves the conditions of human well-being so that people can exercise meaningful choices for their own benefit and that of society'.

These definitions are significant in that they show how — in theory at least — there was a significant move by the mid-90s to promoting a more embracing development paradigm that placed people at the centre and sought to ensure the sustainability of development actions. At the same time placing the emphasis on people more easily enables the recognition of both rich and poor countries as 'developing countries', and does not limit the conditions of human well-being or choices to the conventional economic or social indices (Beemans 1996).

In New Zealand, for example, formal commitment to promoting the sustainable management of natural and physical resources as a guiding policy principle can be demonstrated not only through the government's adoption of *Agenda 21*, but also through the passing of the Resource Management Act (RMA) in 1991 which has as its purpose to promote the sustainable management of natural and physical resources (Resource Management Act 1991 S.5). This Act emerged out of a major review of existing environmental legislation, and consequently replaced over 50 statutes with a single piece of legislation. As defined in the RMA, sustainable management "means managing the use, development , and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while —

> (a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
> (b) Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and
> (c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment." (Resource Management Act 1991 S.5).

This integrated and people-centred approach to sustainable development can also be seen in the *Environment 2010 Strategy*. This Ministry for the Environment publication provides a coherent framework for setting priorities and developing environmental policy. The strategy establishes a

vision for New Zealand's environment to the year 2010, and sets out an agenda to help achieve this which emphasises integration, effective laws and policy, information to underpin decision making and effective social participation in environmental decision making (MfE 1999).

Similarly within science, the Minister of Science, Research and Technology recently released the document, *Blueprint for Change*, which sets out how the Government intends to channel its research resources to facilitate the development of a knowledge society, characterised by knowledge-led innovation. Within this framework a number of target outcomes are set out which are 'deliberately cross sectoral, so that users and providers of RS&T (research, science and technology) will rise above their specific interests and recognise shared national needs' (Minister of Science, Research and Technology 1999 p.10). As is the trend internationally, a sense of empowering people is clearly identified within these outcomes whereby 'families and communities prosper within a culture of self-determination and social responsibility. There is active community participation' (Minister of Science, Research and Technology 1999 p.23).

Against these guides laid out in the new international and national policy settings 'we see that society is *slowly* moving towards fuller, iterative and participatory policy processes rooted in sophisticated research, monitoring evaluation and communication' (Dovers & Mobbs 1997 emphasis added).

Changing models of involving people in research and development

As Ison (1990 p. 8) points out, when contemporary participatory approaches are eventually placed in an historical context they will undoubtedly be seen as part of an emerging discourse, with variations provided by the cultural, historical and institutional frameworks from which they emerged. This view is consistent with the contextual nature of learning: human minds develop in social situations and use tools and representational media that culture provides to support, extend, and reorganise mental functioning (Pea & Brown 1990 quoted in Ison & Ampt 1992 p. 366). In turn, as more people learn of successes from a particular way of doing things — and share this experience — so the wider social system itself learns. This suggests how development paradigms can be construed as proceeding in discontinuous 'spurts' or 'waves', leading to new eras, which are characterised by wider social worldviews and methods of inquiry that differ from those of earlier years (Bawden 1991 p. 46).

Thus we can see how early efforts during the 1970s and 1980s to involve people in agricultural research and development (R&D) concentrated on the use of approaches to provide 'information and technologies' to improve production and productivity in what can be regarded as 'hard systems'. Such systems of enquiry varied from components of the farm system to the farm system itself. As researchers became more aware of the need to involve users more closely, 'consultative' methods such as rapid rural appraisal (RRA) gave way to more 'participatory' initiatives.

As the 'research context' changed in recent years to encompass wider issues of environmental health and equity, so too have agricultural R&D efforts been broadened to look more generally at the wider issues of natural resource management. In turn, these efforts have become more focussed on 'collaborative learning' and 'empowering' to more constructively involve the growing number of stakeholders with legitimate interests in these issues. Increasingly, we are seeing the use of action research and learning approaches to achieve this, and so more closely link science with management and policy to bring about the 'learning and knowledge' needed to help the different groups involved develop a shared understanding and a more co-ordinated response to achieve sustainable development. The research focus in this case is on the 'soft', or human activity, system. Together these different dimensions are illustrated in Figure 2.1 and explained in more detail below.

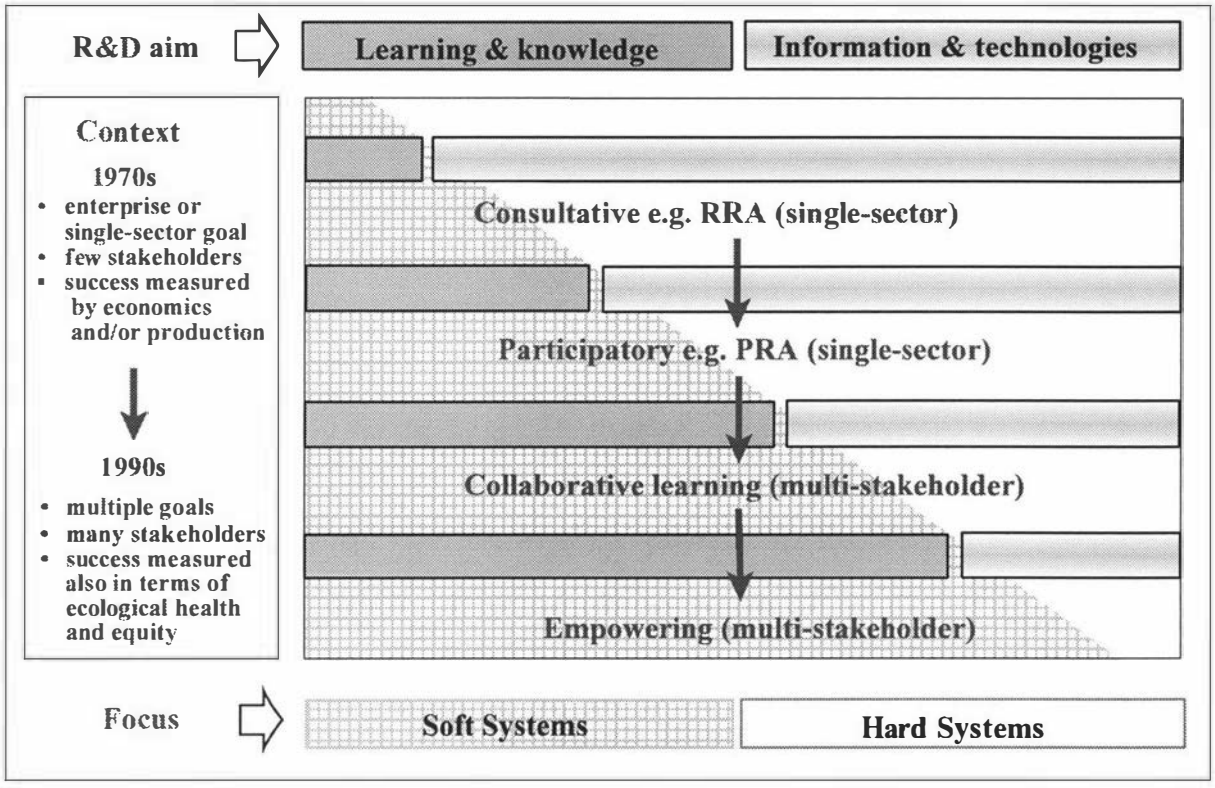

Figure 2.1 Evolution of approaches to involve people in research and development initiatives to improve natural resource management.

Rapid rural appraisal

The forerunners to contemporary approaches to involve people in natural resource research and development emerged from the use of Rapid Rural Appraisal (RRA) to assist agricultural development, particularly in developing countries, in the late 1970s. The importance of understanding the goals and circumstances of the farming family was acknowledged, and the generation of relevant technologies based on this improved understanding was the main aim of this approach. Essentially, RRA provides an array of methods and techniques (participant observation, focus groups, mental maps, etc.) to help researchers better understand the local systems they are trying to improve. As the RRA practitioner then takes this information back to the office or field station where it is used to develop or improve a subsequent technology, this approach can be regarded as 'consultative'.

Similar approaches can be seen in developed country research institutions where, despite a growing recognition of the increasing complexity and social construction of natural resource

management issues, there have been few recent innovations in research methodology other than the development of quantitative modelling and an increased focus on the development of expert systems (Ison & Ampt 1992; Whittaker 1993). Traditional approaches to the development of these models have, as Argent et al. (1999 p. 696) put it, 'involved a researcher, an office, a computer, and some computer code, perhaps with a pile of journal papers, a questionnaire, some monitoring, a considerable amount of thought, and, possibly, a dart board thrown in!' In addition, the research systems in which these DSS have been developed have been, and still are, largely characterised by the linear transfer of technology (TOT) model of agricultural research and development (Russell et al. 1989). The dominant metaphors are those of 'information transfer', 'channels of communication' and 'teaching', most of which arise from mistakenly seeing human communication in the same way as data transferred between computers (Ison 1993a p.157).

This organisational perspective of R&D can be characterised as technological problem-solving in the narrow sense and fails to view real-life problems as a set of changing, interdependent systems perceived in subjectively different ways by different people. Solutions typically focus on the immediate situation and treat only the symptoms of a problem. Not surprisingly, as Dahlberg (1991 p. 338) points out, these approaches tend to be reductionist and based on single disciplines. The primary focus is on the end state, with success being measured through narrow economic or productivity criteria.

Essentially, the above approaches seek to improve hard systems, and 'make possible the efficient achievement of goals or objectives, taking goal-seeking to be an adequate model of human behaviour' (Checkland 1985a p. 765). These approaches are particularly suited to the management of hard system problem situations characterised by 'easy-to-define objectives, clearly defined decision-taking procedures and quantitative measures of performance' (Checkland 1981b p. 288). The underlying question being asked in this sense is, 'Can we do it'? Thus R&D is seen essentially as a problem-solving approach based upon tactical and situation-oriented decision making. The result is an emphasis on changing the physical environment, while leaving the basic value systems untouched (Petak 1980 p. 288).

Participatory Rural Appraisal

At the end of the 1980s Participatory Rural Appraisal (PRA) approaches began to evolve in the search for practical ways to support decentralised planning and democratic decision-making, value social diversity, work towards sustainability and enhance community participation and empowerment. Again this change can more easily be seen to have begun in developing countries. Rapid Rural Appraisal techniques are still used within PRA, but importantly it involves the researcher planning changes to the farming system 'with' the farmer. This approach recognises that the problems facing farmers are not solely biological or technical, and acknowledges the value of local experience and knowledge. It advocates that the best way to incorporate this is through the active involvement of local people in the research process.

In this context, PRA can be described as 'a growing family of approaches and methods to enable local people to share, enhance and analyse their knowledge of life and conditions, and to plan, act, monitor and evaluate' (Chambers & Guijt 1995). The key to their success is that the probability of commitment to and adoption of changed practices is likely to be higher because the stakeholders have helped design the solutions, and understand how to make them work.

A number of terms exist to describe these systems of learning and action. Farmer First, Farming Systems Research & Extension (FSRE), agroecosystem analysis and Farmer Participatory Research are all approaches with strong methodological similarities used within developing country agriculture. In Australasia 'landcare' is the name given to the many voluntary and predominantly rural groups who work together to address land degradation issues. The 1990s were promoted by the Australian Government as the 'Decade of Landcare' and by 1994 there were already over 2000 such groups, involving about one-third of Australian farming families (Campbell 1995 p.127). Other examples of successful practical applications can now be seen in a range of other areas including health, nutrition, poverty and livelihood development programmes.

Implicit within these approaches is a realisation that new sources of 'expert' knowledge and data bases are needed to identify persistent and socially acceptable resource management practices more clearly. In many cases the knowledge required about the past and present states of our natural resources, and about the relationships between social and environmental systems, is held within local communities and other interested groups. Accordingly, it follows that the task of

organising information to understand better the links between natural resource management and ecological dynamics should be a co-operative venture between research scientists, local communities and policy makers. In this sense collaborative approaches to natural resource R&D are, in the first instance, about learning (debate and reflection) and negotiation, rather than the provision of reports and technologies.

Where these participatory initiatives have worked it is because individual communities and groups have shown the benefits of working collaboratively, of developing a collective vision and learning and adapting their management practices together. However, despite the increasing numbers of participatory initiatives in different parts of the world, it is clear that most of these are still only 'islands of success' (El Swaify et al. 1999 p. 37). As Pretty (1998) emphasises, true participatory projects are those that empower people by building skills, interests and capacities that continue even after the project ends. This implies the institutionalisation of such initiatives and the corresponding capacity for activities to spread beyond the immediate project in both space and time. Also much of what is billed as participation is so in name only (Allen 1997 p. 630), lacking genuine engagement with stakeholders. Moreover, in many of these participatory initiatives science has appeared to be bypassed.

> The whole RRA/PRA movement came originally from scientists and professionals seeking a greater awareness of people's needs by asking the right questions in a local-friendly way. The mantle of the inviolability of science was being raised ever so slightly. In contrast, the farmer-first movement swung the whole emphasis to meeting exactly those locally-articulated needs, whatever they may be and through whatever lens of prejudice they may have passed. The formal scientific contribution was demoted; interest groups other than the local community were downgraded; corruption and local political power-play were ignored; and the beneficial possibilities of external interventions were diminished — all in the name of participation. Just as scientists are often prejudiced and simply wrong, a totally bottom-up approach is unlikely to promote the ideals of a sustainable planet (El Swaify et al. 1999 pp. 38-39).

Science has an important role to play in helping the different actors in the natural resource system (such as a watershed or disease environment) see how events and processes in their own enterprise or area are affected by, and contribute to, the larger-scale system dynamic (Jiggins 1993 p.189). As Loevinsohn et al. (1999) point out, key processes — natural, social or economic — are often poorly visible, some occurring on very large or small temporal or spatial scales,

others just difficult to make out. In these situations an aid of some sort is required to help people see more clearly. Making things visible, often through the development of computer models, is not only a valuable mechanism for systematising knowledge, information and experience — a key justification for many research initiatives. It is also 'an important means for initiating participation leading to the higher level of organisation and collaborative learning necessary for the management of larger-scale systems' (Jiggins 1993 p.189).

However, in the main, application of contemporary approaches to improve participation still fails to grasp the nature of the rapidly evolving social forces that are driving natural resource management systems today. For example, there are very few references in the agricultural R&D literature to participatory projects other than those which involve farmers and scientists dealing with agricultural management issues (Allen 1997 p. 634). Yet as communities and agriculture change, the juxtaposition of farming and other rural activities has become a battleground over property rights, water and related nutrient management issues, as well as other community impacts of changing land use (Abdalla & Kelsey 1996 p. 462). In these situations human interactions, behaviour and organisational relationships can be seen to be the driving forces.

Collaborative approaches

More recently attention has shifted towards the use of action learning and research to more explicitly address the human dimension of agricultural and other natural resource management problems (Bawden et al. 1984; Scoones & Thompson 1994). These approaches explicitly recognise that natural resource management in the age of sustainability is not characterised so much by problems for which an answer must be found, but rather issues that need to be resolved and will inevitably require one or more of the parties to change their views (Bawden et al. 1984). They are an approach to deal with 'soft systems', 'in which objectives are hard to define, decision-taking is uncertain, measures of performance are at best qualitative and human behaviour is irrational' (Checkland 1981b p.288).

In response to these issues we are beginning to see increased interest in the application of more 'collaborative' or multi-stakeholder processes that facilitate the wide involvement of individuals, groups and organisations in problem solving and decision making with respect to issues and plans that involve or affect them. These processes also provide an acknowledgement that

decisions related to sound land use will be dependent on the co-ordinated actions of many land managers and agencies, who in turn must act within the confines of a wider regulatory framework imposed by the community at large.

Despite the important role which science can play within natural resource management, researchers need to be aware that ecological information is only one factor affecting the way in which decisions on natural resource management are made — and it is not always the most significant. 'Integration of ecological knowledge with critical socio-economic issues leads to the conclusion that other structural and institutional factors are more limiting to good management than ecological knowledge' (Stafford Smith et al. 1997). Other factors in this regard include political judgement, legal or financial necessity, personal or group bias, and commercial or international pressures. 'In most cases, the scientific argument for ... sustainable use of natural resources is abundantly clear: what remains is to raise awareness of this understanding over competing interests, reinforcing the need for information to emerge from within the decision making environment' (Reynolds & Busby 1996 p. 14).

> Ecologists need to emphasis the very real contribution that ecological understanding can provide to the policy debate (over rangeland management), but must also be humble in recognising that this contribution is a small part of an integrated whole. ... But if ecologists continue to imagine that solutions to the problems of rangeland management are to be found through ecology alone, they will not only be wrong, but they risk becoming even more marginalised from the policy process than they currently are. ... The message is plain: we need to be honest, modest and strategically aware about our place in the spectrum of decision-making on natural resources, but simultaneously insistent that without this input, the value to society of the natural world will continue to decline. However, there is no point in bewailing the Philistines; it is ecologists who have the major short-term vested interest in seeing ecology used in decision making, and so it is ecologists who must go the extra mile to enable this input to be heard (Stafford Smith et al. 1997).

What has become increasingly obvious is that the major obstacles to improved use of information in decision making are social and organisational, not technological in nature, meaning that investments in ecological research and its supporting information technology alone will not provide a solution (Reynolds & Busby 1996 p.13). These authors suggest that one of the

main reasons why environmental information systems fail to be integrated into mainstream decision making processes is that they are often developed apart from management and policy making processes — rather than emerging from within. For information to be appreciated and used, those who are expected to use it must be aware of how and why it has been produced.

It naturally follows that as directions for natural resource management emerge from such collaborative processes, it will still be necessary to utilise more traditional science approaches to help achieve them. These learning-based approaches to problem solving acknowledge a continuum of approaches to address both 'soft' and 'hard' issues as well as more 'basic' research questions, contingent on the nature of the problem (Figure 2.2). And now, more than ever, there is room for all these different approaches. Accordingly, the basic nature of work undertaken by individual scientists will not change, the only difference being that the starting point for scientific endeavours is firmly embedded in the wider community.

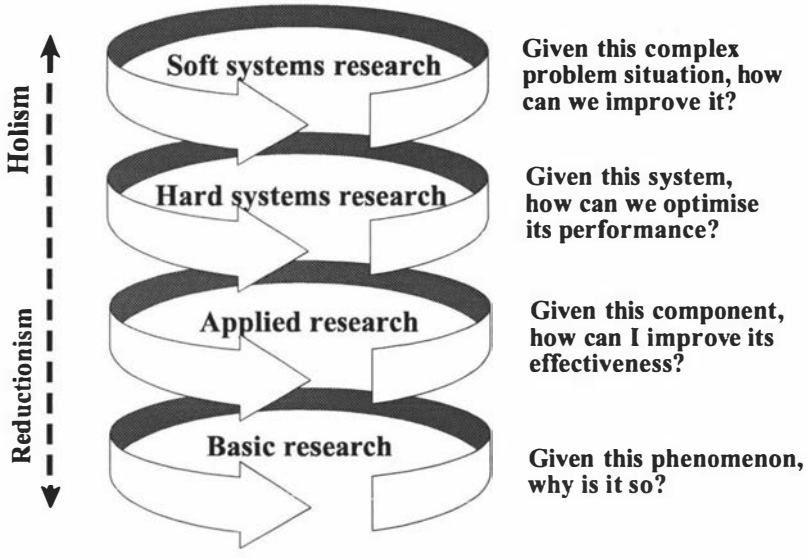

Figure 2.2 Continuum of approaches to problem solving and situation improvement (adapted from Bawden 1991).

Empowerment

This more inclusive approach to natural resource R&D recognises that environmental management is at least as much about managing human activities as it is about managing lands

and waters. As Christensen et al. (1996) point out, ecosystem management is inextricably linked with current trends related to population growth, poverty and human perceptions about energy and natural resources. 'Concerns such as the rights of private property owners and local loss of jobs is unlikely to diminish, and ecosystem management must include strategies that deal positively with those concerns' (Christensen et al. 1996). There is now a recognition that constructive change can only happen and be sustained if the people involved are included and empowered to make decisions. People's participation, the integration of the efforts of institutions and improved flows of information are indispensable to the building of real and lasting capacity for sustainable human development (Capacity 21 Programme 1996).

Empowerment in this sense differs from common usage of the term. It does not mean power-balancing or redistribution, but rather, increasing the skills of individuals, groups and communities to make better decisions for themselves. This idea of empowerment means 'the restoration to individuals of a sense of their own value and strength and their own capacity to handle life's problems' (Bush & Folger 1994 p. 2 quoted in Burgess & Burgess 1997). This capacity is relevant to environmental decision-making, as these authors further explain in a subsequent publication that though empowerment groups gain 'greater clarity about their goals, resources, options and preferences' and that they use this information to make their own 'clear and deliberate decisions' (Folger & Bush 1996 p. 264 quoted in Burgess & Burgess 1997).

In a similar vein, Page and Czuba (1999) suggest that:

> ... empowerment is a multi-dimensional social process that helps people gain control over their own lives. It is a process that fosters power (that is, the capacity to implement) in people, for use in their own lives, their communities, and in their society, by acting on issues that they define as important.

One crucial implication of this definition of empowerment for those concerned with bringing about change in the way we manage our natural resources is that it acknowledges that the individual and the community are fundamentally connected.

> This does not mean that we can point the finger at those with less access to power, telling them that they must change to become more like 'us' in order to be powerful/successful. Rather

individual change becomes a bridge to community connectedness and social change (Wilson 1996). To create change we must change individually to enable us to become partners in solving the complex issues facing us. In collaborations based on mutual respect, diverse perspectives, and a developing vision, people work towards creative and realistic solutions. This synthesis of individual and collective change is our understanding of an empowerment process (Page & Czuba 1999).

Promise of adaptive management

In response to these acknowledgements and challenges, many contemporary research efforts are concentrating on creating new approaches to more closely link science, management and policy at an ecosystem level. As Jiggins (1993 p.189) points out, these efforts represent a search for a R&D model and practice that combine the features of: i) management-based experimentation and innovation; ii) natural resource system management on scales larger than individual enterprises and communities; iii) methods for bringing about capacity for action among multiple agencies and actors (with typically divergent, not to say antagonistic points of view and interests); and iv) facilitation of the social processes and organisational capacity to accomplish these.

One promising initiative is in the area of adaptive management (AM), or adaptive environmental assessment and management (AEAM), which is emerging through the integration of ecological and participatory research approaches (Lee 1993; Gunderson et al. 1995; Bosch et al. 1996a; Dovers and Mobbs 1997; Christensen et al. 1996; Allen et al. 1998b). Adaptive management in this sense refers 'to a structured process of "learning by doing" that involves much more than simply better ecological monitoring and response to unexpected management impacts' (Walters 1997). The major direction initially taken in AM was quantitative modelling workshops wherein teams of scientists and resource managers collaborated in developing and evaluating alternative options in reasonably discrete management contexts such as smaller catchments, forest areas, or where the range of management issues was bounded (Walters 1986; Grayson et al.1994). More recently, as Dovers and Mobbs (1997) point out, there have been important developments in the linking of two areas which were previously largely unrelated. These are applying the adaptive concept in more complex, regional or large-scale contexts, and combining the ecological insights of 'traditional' AM with social learning and institutional perspectives.

This emerging form of adaptive management has some important features suiting it to the demands required by contemporary R&D models stated earlier. 'Information is central, the focus is on integrating natural system and institutional social dimensions, and it is absolutely and inevitably multi-disciplinary. Crucially, it is the only approach to policy and management where ecology has played and is playing a core role' (Dovers & Mobbs 1997). AM thus 'satisfies a widely perceived need to give more prominence to ecological imperatives, at a time when economics provides the dominant model for the design of the future' (Jiggins and Röling 1999). Moreover, in its emerging form, AM recognises the limitations of an 'expertise' model of science — particularly in complex decision contexts with multiple interests, values and property regimes (e.g. Lee 1993; Dovers and Mobbs 1997). As a number of reviewers argue, the integration of research insights at the ecosystem scale can only be accomplished within a democratic, collective decision-making process, the combination of both science and politics being a prerequisite for effective learning (e.g. Lee 1993; Funtowicz & Ravetz 1994; Jiggins & Röling 1999).

However, despite the logic and appeal of AM as an approach to help decision making in complex, regional or large-scale ecosystem contexts, its success in practice has been rather less than spectacular (e.g. McLain & Lee 1996; Walters 1997). There is emerging concern that the long-term effectiveness of such approaches is limited by a number of barriers, most of which can be classed as social and institutional rather than technical (e.g. Campbell 1995; McLain and Lee 1996; Yaffee 1997; Pretty 1998; Allen et al. 2000). These include the continued reliance on a linear transfer of technology (TOT) model of R&D, fragmented information and knowledge systems, a tendency to discount non-scientific forms of knowledge, institutional cultures within research and policy making that work against genuinely participatory approaches, and a failure to provide appropriate processes to promote the development of shared understandings among diverse stakeholders.

It is these social and institutional issues, and how to overcome them, that are the subject of this thesis inquiry. Through the case studies outlined here the primary action research learning group (myself, Ockie Bosch and Margaret Kilvington) have sought to identify insights and approaches which can help agency staff, iwi, science programme leaders, and other interested groups to constructively change people's relationship to their environment, and encourage them to make more use of underpinning science as they go about their decision making. This research has used

an action research approach (see Chapter 3) to find improved ways of managing collaborative or multi-stakeholder approaches to environmental management, and to establish the development of an integrated information framework to underpin subsequent decision making.

CHAPTER 3

The role of action research in improving the realisation of adaptive and people-centred environmental management

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As indicated in Chapter 2, we can look towards the body of knowledge that has been generated through action research for guidance in developing frameworks for the new approaches that seek to emphasise sustainable policy orientations and people-centred research and development. Accordingly this chapter begins by outlining the underlying concepts of action research in more detail. Some differences between action research and mainstream science are then explained, particularly to justify its use as an appropriate methodology to the research and development challenges outlined in earlier sections of this chapter. Some more practical details of practising action research are then discussed. Finally, the process of critical reflection in action research is highlighted, and an illustration given of how it can help in getting people to think more deeply about the use of environmental practices.

> *... if one wants to find out about the plant nutrient which is limiting growth to such an extent that there is no obvious pathology in its absence then the research needs to conduct experiments under rigorously controlled environmental conditions. The experimenter cannot participate with the nutrients in their 'dance in plant nutrition, nor is it sensible to examine the effects on the 'dance' of a multitude of factors working at once. The experiment must be conducted in a reduced and highly controlled world observed by afar by the observer! If, on the other hand one wants to actively explore with rural communities how they might design their own, more sustainable futures, then the method of enquiry needs to be participant-observer and the complexity of the situation must be embraced. There is no other sensible way to proceed.* (Bawden 1991 p. 33)

Action research outlined

Action research (AR) comprises a family of research methodologies which aim to pursue action and research outcomes at the same time. It therefore has some components which resemble consultancy or change agency, and some which resemble field research. The focus is action to improve a situation and the research is the conscious effort, as part of the process, to formulate public knowledge that adds to theories of action that promote or inhibit learning in behavioural systems. One of the key characteristics of this approach is collaboration, which enables mutual understanding and consensus, democratic decision-making and common action (Oja & Smulyan 1989 p.12).

In this sense the action researcher is a practitioner, an interventionist seeking to help improve client systems. 'This help takes the form of creating conditions in the behavioural world of the client system that are conducive to inquiry and learning. Lasting improvement requires that the participatory action researcher help clients to change themselves so that their interactions will create these conditions for inquiry and learning' (Argyris et al. 1985 p.137). Hence to the aims of contributing to the practical improvement of problem situations and to the goals of developing public knowledge we can add a third aim: to develop the self-help competencies of people facing problems.

Within this broad definition there are four basic themes: i) collaboration through participation; ii) acquisition of knowledge; iii) social change; and iv) empowerment of participants. The process that the researcher uses to guide those involved can be described as a spiral of action research cycles consisting of phases of planning, acting, observing and reflecting (Masters 1995). As Oja and Smulyan (1989 p. 14) point out, the underlying assumption of this approach (which can be traced back to Lewin's writing in 1948) is that effective social change depends on the commitment and understanding of those involved in the change process. In other words, if people work together on a common problem 'clarifying and negotiating ideas and concerns', they will be more likely to change their minds if research indicates such change is necessary. Also, it is suggested that collaboration can provide people with the time and support necessary to make fundamental changes in their practice which endure beyond the research process (Oja & Smulyan 1989 pp.14–15).

Thus the role of the action researcher is identical to that proposed for contemporary facilitators in helping communities identify and adopt more sustainable natural resource management practices (e.g. Pretty & Chambers 1993; Pretty 1998). These facilitators may come from the community or they may be research or agency staff. However, their most effective role will be to engage the wider community in developing the participatory attitudes, excitement and commitment necessary to work together on jointly negotiated courses of action to bring about improvements and innovation for individual and community benefit. While this role is similar in some ways to consultancy, action research provides a means which is more rigorous, and which allows for the development of public knowledge to advance the field.

In turn, by establishing conditions for the development of others, the action researcher acquires increasing skills in such things as the ability to build shared vision, to bring to the surface and challenge prevailing mental models, and to foster more systemic patterns of thinking. To paraphrase Senge (1990a p. 9) action researchers are responsible for building frameworks and networks through which people are continuously expanding their capabilities to shape their future. That is, action researchers are 'responsible for developing a learning environment which challenges the status quo and generate liberating alternatives' (Argyris et al. 1985 p.xi). 'The general aims of AR are frequently expressed in terms of orienting process criteria (e.g. participation, emancipation), rather than in the form of objectives to be achieved, and it seems worthwhile to continue to stress these characteristics to differentiate AR from other approaches to social change' (Altrichter et al. 1991 p.6). These characteristics are well captured by Zuber-Skerritt's (1992 p. 15) CRASP definition of action research as: '**Critical** collaborative enquiry by **Reflective** practitioners, who are **Accountable** in making the results of their enquiry public, **Self-evaluative** of their practice, and engaged in **Participative** problem solving and continuing professional development'.

This broad outline of action research sketched above is capable of encompassing and learning from a variety of research and intervention methods in a number of fields. Today we can identify clear applications of AR in such fields as organisational management, community development, education, agriculture and participatory evaluation (Deshler & Ewert 1995). The term 'action research' itself can be regarded as an umbrella term that includes several traditions of theory and practice. 'It is broad enough to include, as examples, the critical action research approach of Carr and Kemmis (1986), the soft systems methodology of Checkland (1981a), and perhaps even the

evaluation of Guba and Lincoln (1989)' (Dick 2000). Other terms including participatory research, action learning, praxis research, participatory inquiry, collaborative inquiry, action inquiry, and co-operative inquiry are also used in the literature.

Differences between action research and mainstream science

As indicated in the previous chapter (Figure 2.2) although research approaches for addressing 'soft system' problem situations (such as action research) should be seen as complementary to other science approaches, there are some significant differences between action research and more mainstream science approaches. As the name implies, action research represents a form of inquiry into how human beings design and implement action in relation to one another. Hence, it is a science of practice – a concept which contrasts strongly with the mainstream science tradition. 'We are accustomed to distinguishing between theory and practice, between thought and action, between science and common sense' (Argyris et al. 1985 p.1). Accordingly, while researchers attempt to bridge these conceptual chasms, the debate over whether or not action research is a science, or whether it could or should aspire to scientific status continues (e.g. Susman & Evered 1978; Checkland 1981a; Argyris et al. 1985). While, as Checkland and Scholes (1990 p. 4) observe, these problems have not been too inhibiting to practitioners in the field, a comparison of some of the main points of difference between action research and mainstream science are useful particularly in justifying its use as an appropriate methodology to the R&D challenges outlined in the previous chapter.

For more than 100 years the positivist conception of science has dominated the practice of physical, biological and social sciences. The underlying basis for this mainstream approach is the consideration of scientific knowledge to be obtainable only from sense data that can be directly experienced and verified between independent observors (Susman & Evered 1978 p. 583). While this epistemology was designed with the natural sciences in mind (particularly physics) proponents argue that it characterises all sciences insofar as they are scientific; and this has also been the predominant opinion among the social sciences (Argyris et al. 1985 p.12). However, the difficulties of relying on this approach to solve social problems are well illustrated by the moon-ghetto metaphor cited by Rosenhead 1989 p. 4), 'while science has enabled us to control the soft landings of space craft on distant planets, it has not helped us solve the "lesser" problems associated with urban slums'.

In particular, positivist science has proved to have some deficiencies when it has been removed from the closely defined laboratory setting and asked to cope with the kind of organised complexity facing humanity and the life sciences in the 'real' world (for a more complete discussion of this topic see Checkland 1981a). In fact Lewin's concern that mainstream science was not helping in the resolution of critical social issues was the driving force behind his development of action research (Susman & Evered 1978). In mainstream social science, implementation has been seen as a problem of application, of practice, perhaps of politics — but not of theoretical science (Argyris et al. 1985 p.19). From the perspective of action research, however, implementation is not separable from crucial theoretical issues.

In traditional research, the researcher 'makes every effort to remain objectively remote from the system being studied' (Bawden 1991 p.37). He or she is separated from the system being studied by a 'hard' boundary and the system is reduced to one, or only a few parts, with the rest of the system assumed to be held constant. This research is appropriate in many circumstances, particularly in the bio-physical sciences. On the other hand, action research involves taking action in social systems of which the researcher is unavoidably a part. 'Indeed, it is the activity of the (researcher)-observer joining with other participant-observers, that enables the system to become a researching system in the first place!' (Bawden 1991 p. 37). These involve the study of 'soft' systems without clearly defined boundaries between the researcher and the system.

Because the research involves complex and dynamic problems, exploring the social process of learning about situations is inextricably linked with the acts of changing those situations. In these systems the researcher must actively participate with others in the critical exploration of complex and dynamic issues of implementation which relate to the relationships between individuals, groups and their physical and socio-cultural environments. Furthermore, success in social change is not achieved simply by making the right decision at a particular time, but rather through developing a social process that facilitates ongoing learning (e.g. Korten 1980; Whyte 1989).

Thus, while as Argyris et al. (1985 p.18) remind us of continuities in the core features of mainstream science and action research including hard data and public testing, there are crucial differences as well. For one, action research sits squarely within the tradition of qualitative research methodology, rather than the more mainstream quantitative research paradigm. As Bunning (1995) points out, one reason for this is that action researchers seek to influence the

phenomena being studied during the action research process itself, in the belief that the true nature of social systems become most evident when you seek to make changes to them. Because of this interventionist approach, the experimental standardisation of positivistic research is neither possible or desirable. Similarly, because action research thus addresses whole system issues which are invariably multi-variate (and somewhat indeterminate!) these are best approached within a qualitative and holistic framework, rather than a reductionist, and quantitative framework.

Another contrast between action research and mainstream science is that action research is focussed on what could be, rather than what is. 'New thinking in action research seems to take the social construction of reality seriously. The emphasis is on possibility rather than prediction. From a constructivist perspective (action research) can contribute to people realising their values — envisaging a preferred future and organizing effectively to achieve it' (Elden & Chisholm 1993 p.127). As these authors go on to point out, this highlights how action researchers are not 'value neutral', but rather concerned with selecting problems to solve that would both contribute to general knowledge and practice solutions concerning democratic, humanistic values. In this way, action research is change oriented and seeks to bring about change that has positive social value (e.g. healthy communities, environmentally sound management).

These points and others which contrast the differences between mainstream science and action research are outlined in Table 3.1.

Table 3.1 Comparisons of positivist science and action research (Susman & Evered 1978 p. 600)		
Points of comparison	**Positivist science**	**Action research**
Value position	Methods are value neutral	Methods develop social systems and release human potential
Time perspective	Observation of the present	Observation of the present plus interpretation of the present from knowledge of the past, conceptualisation of more desirable futures
Relationship with units	Detached spectator, client system members are objects to study	Client system members are self-reflective subjects with whom to collaborate
Treatment of units studied	Cases are of interest only as representatives of populations	Cases can be sufficient sources of knowledge
Language for describing units	Denotative, observational	Connotative, metaphorical
Basis for assuming existence of units	Exist independently of humans	Human artifacts for human purposes
Epistemological aims	Induction and deduction	Conjecturing, creating settings for learning and modelling of behaviour
Criteria for confirmation	Logical consistency, prediction and control	Evaluating whether actions produce intended consequences
Basis for generalisation	Broad, universal and free of context	Narrow situational and bound by context

Another point of distinction concerns the issue of participation in the research process. It is already clear from the above discussion that action research is by definition participatory. However, the implications of this — particularly in the way that research is written up — reveal clear differences in the relationship of the researcher and the researched within different research paradigms. Moreover, this distinction enables us not only to see the difference between mainstream positivist science and action research, but also clear differences between action research and more mainstream qualitative and interpretivist social science approaches. These differences are well discussed by Kemmis (1991 pp. 58–60), and are summarised in Box 3.1 from this account.

Box 3.1 Relationship of the researcher and the researched within different research paradigms

Positivist methods address the people being researched in the third person — as 'them' (or 'he/she' or even 'it'). The researcher takes a stance which is believed to be objective and aims to explain people's actions — and believes that if their actions can be reliably predicted under certain circumstances, then this is the same as having explained their actions. 'Behind this mode of viewing the other in the research act is the will to control circumstances and consequences through the control of the actions of people' (Kemmis 1991 p. 59).

Interpretivist methods are different in that the researchers address the people being researched in the second person as 'you'. They view the people being researched with the respect due a person who is a knowing responsible subject. They aim to understand people's actions, and often have an interest in educating those researched about the meaning, significance and consequences of their actions in the context of the social and historical circumstances under which they act. Unfortunately, as Kemmis points out, given the conventions of report writing the people who were 'you' during the study' become 'them' in the report. 'Another order of social relationships in the research act is suddenly revealed; the researcher is the knowledgeable observer, the outsider' (Kemmis 1991 p. 59).

In contrast to both these approaches, action research addresses the people being researched as 'I' or, more typically, as 'we'. The researcher in making the results of the research public sometimes speaks 'for' such people or 'with' them. 'In this case, the stance of the researcher cannot be described as either "objective" or "subjective"; it is both ... in the sense that one treats oneself and one's fellows (and the social structures of which one is a part) both as subjects and objects in a process of critical reflection and self-reflection' (Kemmis 1991 p.56). In action research, the researcher aims to develop or improve people's actions understandings and situations through collaborative action.

Fundamental, then, to action research is the concept of 'learning by doing' in which learning is perceived as experiential and reflexive. It recognises that people learn through the active adaptation of their existing knowledge in response to their experiences with other people and their environment. As the dynamics of a social system are often more apparent in times of change, learning and change can enhance each other.

Practising action research

While the above discussion of action research has concentrated on aim, there is also a need to specify the approaches and processes that the action researcher — as a 'change agent' — uses to achieve these aims in practice. Clearly, the present which is already determined by its own past is hard to change. However, as Dick (1996) points out, the one exception to this is the change agent's own behaviour. 'By act of will you can change your own behaviour. If you change your own behaviour in interaction with others, you can then change the relationships and the processes and actions that characterise it' (Dick 1996). In short, the action researcher has little option but to work with processes and relationships. That is all that is available. But through them the mechanisms for participation, more democratic and transparent decision-making processes, and the prevailing culture, can be influenced.

In this sense the action research project begins with a process of communication and agreement between people who want to change something together. In terms of the aims of action research outlined earlier, this joint and bounded undertaking aims to build up the participating actor's capacity to act, and support them in improving their problem situations in a self-reliant and empowering manner. As Schwedersky & Karkoschka (1994 p. 35) point out, as we think in these terms, the notion of the project as a mechanistic operation designed to reach a preconceived 'end' or 'solution' is transformed into a concept of collaboration as a 'process'. Together those involved cover a certain amount of ground, and as the actors come to a crossroads in the process they think together about which way they might go next.

However, some people are more suited to, and interested in, participating in an action research change inquiry than others. As Bunning (1995) points out, because of downsizing, reduction in organisational levels and increased accountability, there are higher levels of stress and pressure around than ever before. While it is precisely those symptoms that indicate that change and development is needed, if people are not provided with the capacity to participate, successful change is unlikely to develop. Similar pressures can also be seen in the wider community (particularly rural communities), which impact on participation.

Thus more will be learnt by a few genuinely committed co-researchers dedicated to exploring change within a smaller case study approach, than may be gained by engaging with a larger number of less willing participants in a bigger inquiry. Bunning (1995) suggests the following profiles (Table 3.2) provide a guide to selecting co-researchers for effective participation in the action research group:

Table 3.2 Profiles of effective and ineffective participants in an action research process

Effective co-researchers	**Ineffective co-researchers**
Inner directed (tends to independence of thought and expression)	Outer directed (looks to other, particularly seniors, for guidance)
Developmentally oriented (Busy, but always open to something new)	Survival oriented (focussed on meeting current work demands)
Reflective philosopher (willing to step back and reflect on things)	Short-term doer (task oriented with short time perspective)
Effectiveness oriented (Interested in strategic issues)	Efficiency oriented (interested more in operational issues)

Thankfully, for the action researcher, the idea of learning collaboratively is not new — although as pointed out above some people are more effective than others. 'Most of us, if we wish to learn a new skill or broaden our perspectives on an issue, will seek out some collaborative learning environment such as a club or training programme. Similarly, talking an issue through is a natural process for many people. We gain new insights as we express our own views and we subsequently modify our views as other people provide us with new ways of looking at the issue at hand' (Kilvington et al. 1999 p. 14). However, as these authors observe well-functioning groups do not happen by accident, and skills in managing group dynamics to keep the group moving in a positive direction are therefore central to the successful practice of action research. Awareness of what is happening to a group and access to the skills necessary to address this are crucial to the long-term viability of groups and their success in achieving their goals.

Similarly, the process of learning by building on experience is a natural one for most people and action research provides a framework for formalising and making this process more effective. 'In brief, it consists of an iterative and cyclic approach of action and research with four major phases: plan, act, observe and reflect' (Zuber-Skerritt 1991 p. xiii). The basic underlying assumption which underpins theory and practice is the existence of an experiential-based learning cycle (from Kolb et al. 1979) that people can learn and create knowledge: i) on the basis of their concrete experience; ii) through observing and reflecting on that experience; iii) by forming abstract concepts and generalisations about what to do next; and iv) by testing the implications of these concepts in new situations — which will lead to new concrete experiences, and hence the beginning of a new cycle. As a number of reviewers point out, this model is similar to other conceptions of basic adaptive processes, or problem solving, creativity, and decision making (e.g. Bawden et al.1984; Ison & Ampt 1992). A more comprehensive form of the action research cycle from Susman & Evered (1978 p. 588) is shown in Figure 3.1.

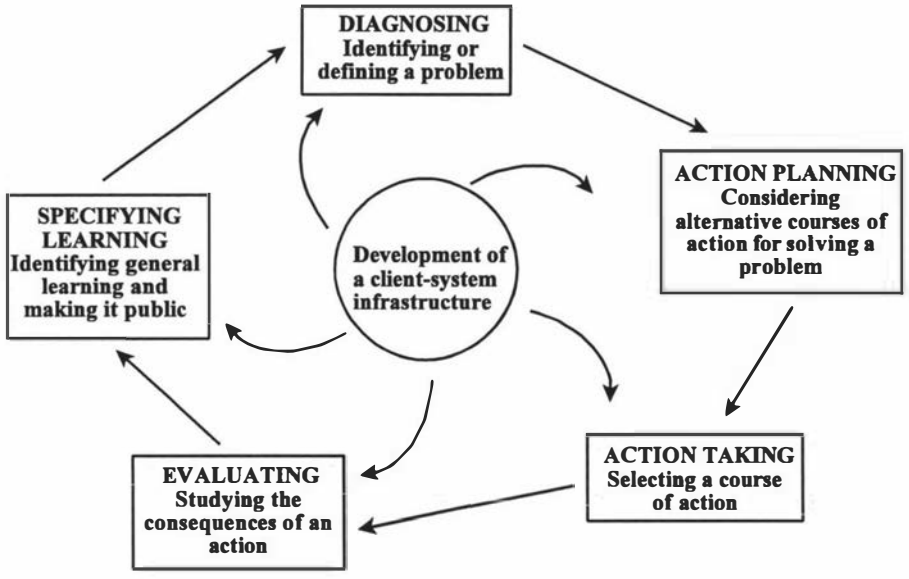

Figure 3.1 Phases within an action research cycle (adapted from Susman & Evered 1978)

While Susman & Evered (1978 p. 588) consider all five phases to be necessary for a comprehensive definition of action research, they do acknowledge that action research projects may differ in the number of phases carried out in collaboration between the action researcher and the client system. In particular they point to the case where the researcher may only be involved in collecting data for diagnosis and feeding this back to the client system. Another example

involves the researcher evaluating the actions undertaken by the client system and feeding data back to it. Also different schools of action research describe this cyclical process using lesser or greater number of steps. For example, Zuber-Skerritt (1991 p. xiii) refers to four phases, while Checkland's (1981a) Soft Systems Methodology (SSM) outlines seven steps or phases.

In addition to the difference in the number of phases within each cycle, contemporary applications of action research also enable the use of different techniques for data and information collecting especially in the diagnosing and evaluating phases. These may include the use of questionnaires, semi-structured interviews or focus groups, with the choice often largely dependent on the researcher's skills and backgrounds. Literature reviews as well as records, memos and reports from the client system will also be commonly used.

The reason for the flexibility in method design is because action research is designed to deal with and respond to 'real-world' situations, unlike mainstream research where you can — and should — start with a precise research question. Given a precise research question, a study can then be designed to answer it, also with precision. However, given the nature of the social systems, action research design cannot be fully detailed in advance and then rigorously and inflexibly implemented. Rather the research design is emergent, meaning it develops progressively, influenced by the events that take place during the project and by the progressive analyses that are made. In action research the use of the elements that bring rigour into mainstream research (control, standardisation, etc.) would defeat the purpose. 'The virtue of action research is its responsiveness. It is what allows you to turn uncompromising beginnings into effective endings. It is what allows you to improve both action and research outcomes through a process of iteration' (Dick 1993). As in many mainstream science procedures, the use of repeated cycles enables the action researcher and his/her colleagues to converge on an appropriate conclusion (Figure 3.2).

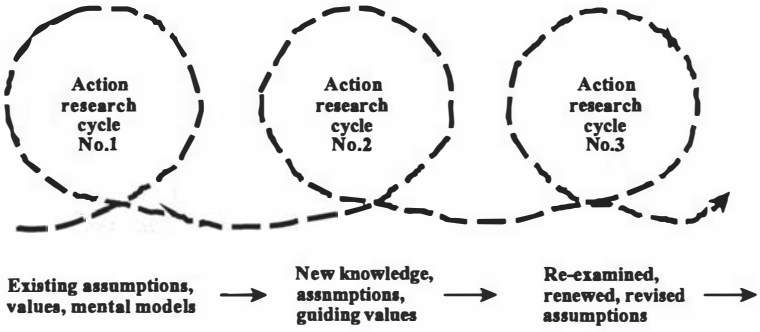

Figure 3.2 Evolving theory of practice through the iterative nature of action research (Adapted from Damme 1998).

It is by being deliberate and intentional about this process that you can maximise your learning. The rigour in action learning lies in the quality of the data and the interpretations of this to help people think about (reflect on) how they can improve the situation in question.

> At each of the steps you learn something. Sometimes you are recalling what you think you already understand. At other steps you are either confirming your previous learning or deciding from experience that your previous learning was inadequate. This is equivalent to what Gummesson (1991) calls the 'hermeneutic spiral', where each turn of the spiral builds on the understanding at the previous turn. It is these — the responsiveness to the situation, and the striving after real understanding — which define action research as a viable research strategy (Dick 1993).

The process of reflection in action research

In summary, action research tends to be cyclic, participative, qualitative and critically reflective. All of these features (except the last) involve choices to be made by the researcher in the context of the problem being studied (Dick 2000). It is this process of critical reflection that distinguishes action research from everyday inquiry (Bunning 1995; Wortley 1996), and also makes it particularly suitable to help develop 'constructive change' in areas such as environmental management. Indeed, in the sense that action research seeks alternatives to the status quo that will both illuminate what exists and inform fundamental change, it is a form of critical theory and seeks to stimulate critical reflection among human agents so that they may more freely choose whether and how to transform their world (Argyris et al. 1985 pp.70–71).

As Kemmis and McTaggert observe, to do action research one must plan, act, observe and reflect 'more carefully, more systematically, and more rigorously than one does in everyday life: and to use the relationships between those moments in the process as a source of both improvement and knowledge' (1988 p. 10). It is the act of reflection in this process, on one's own views as well as those of others, that provides the basis for learning — enabling all those involved to develop a more holistic perspective of any given situation, within which they can best make their particular contribution.

The challenge for the action researcher lies in the fact that learning can be difficult, even at an individual level. Accepting new information that challenges the way we think and the things we do is, even with the best of will, difficult to undertake, to accomplish, and to sustain (Michael 1995). Finding out about problems also implies that we may have to act to correct them. What often stops us doing this is an anxiety, or the feeling that if we allow ourselves to enter a learning or change process, if we admit to ourselves and others that something is wrong or not right, we will lose our effectiveness, our esteem, and maybe even our identity. Most of us need to assume we are doing our best at all times, and it may prove a real loss of face to accept and even 'embrace' errors. Adapting poorly, or failing to realise our creative potential may be more desirable than risking failure and loss of esteem during the learning process (Allen & Kilvington 1999).

Because of this, 'learning, which mostly upsets beliefs and habits in individuals and organizations, is hardly likely to be embraced easily and enthusiastically, even though there is a growing, and sometimes powerful, recognition of the need for change' (Michael 1995 p. 470). Indeed, as Argyris et al. (1985 ch. 3) point out, individuals and organisations have a number of defensive reactions that resist change — or learning — by preventing open dialogue and the integration of new information which may challenge their existing worldviews (values, assumptions, paradigms, etc.). These defenses include making some subjects 'undiscussable' (Argyris et al. 1985 p. 87), or an unawareness that their 'espoused theory — the world view and values people believe their behaviour is based on — is different to their 'theory in use' — the worldviews and values implied by their behaviour (Argyris et al. 1985 p. 82).

Accordingly, as Aryris et al. (1985 pp. 84-85) suggest, the first response to any inquiry into a mismatch between intention and outcome is likely to be to search for another strategy that will satisfy the 'governing variables', the belief systems and values which the individual or organisation is trying to maintain. For example, if a land manager views his/her enterprise solely in terms of sheep production and notes that the vegetation condition of the land is deteriorating, the action strategy will likely be to try a different grazing regime. In such a case when new strategies are used to support the same governing variable (i.e. the land as a sheep production system) this is called single-loop learning (Figure 3.3). A similar science example might arise in response to a funding agency's requirements for a scientist to be more participative. The response might be to find a 'friendly' group of people to work with that are happy to acknowledge the scientist as the 'unquestioned expert' — the governing variable.

However, another possibility is to change the governing variables themselves. For example, rather than try a new grazing strategy, the land manager may choose to initiate a more open form of enquiry. The associated action strategy might then be to look at how the enterprise could function as a tourism, or forestry, system, for example. The scientist may choose to involve appropriate stakeholder groups in a more collaborative approach, changing the role of science to one of a co-researcher and recognizing that the role of 'expert' is more a matter of perspective. These cases are called double-loop learning (Figure 3.3), and involve more fundamental shifts in people's belief systems and values. In this way they can often minimise the gap between espoused and theory-in-use.

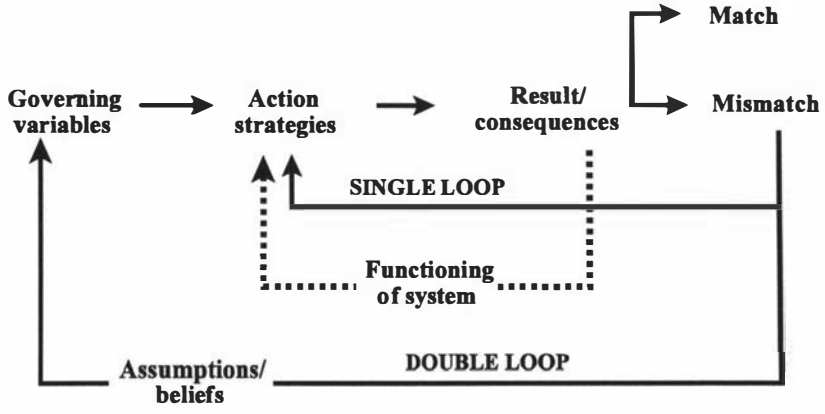

Figure 3.3 Single- and double-loop learning (adapted from: Argyris et al. 1985)

Double-loop learning is all about thinking about what it is you are doing in a way that forces you to explore the underlying patterns of your learning behaviour. All of us have been learning for years and in that time we have developed certain patterns of learning behaviour. However, as Argyris et al. (1985) have observed, people describe one type of behaviour that they think they use when asked, but when observed they actually use a different type of behaviour. What this means is that most of us have built up a pattern of behaviour that we use to learn, but are unaware of what that pattern is. We think we know, but what we describe is not what we actually do! If we are to understand and improve how we learn, we must become explicitly aware of what we do, not what we think we do.

Reflective practice is a technique to help us think about how we think. It is the practice of observing ourselves learning. In one loop we are doing the learning and in the second loop we are observing ourselves doing the learning. We are watching what we do, how we do it, how we feel as we do it, all while we are doing it.

Accordingly, Mezirow (1991, quoted in Bunning 1995) draws attention to the need to address three elements through the reflective process: i) content, the substantive issues involved; ii) process, how such issues were raised and addressed; and iii) premises, which are the values, assumptions, paradigms and whole framework of individual and collective mindsets, which inevitably influenced what was attended to and what was not, and other issues such as goals, process and interpretation.

Developing double-loop problem-solving approaches is thus a critical part of changing people's actions in respect to the environment. However, it also requires the action researcher to deal with the defenses of individuals and organisations — which is no small undertaking! In many cases this will mean having to address situations in which participants may feel embarrassed or threatened. However, as Grudens-Schuck (1998 p. 61) points out, unless research and education programmes build specific processes for confronting people about unworkable theories and organisational defenses, the use of local knowledge and interpretations of events cannot be a sound foundation for collaborative learning and positive change.

Using action research for environmental change

The growing use of action research within environmental R&D initiatives explicitly recognises that natural resource management issues (such as biodiversity protection and enhancement) are not characterised so much by problems for which an answer must be found, but rather by issues which need to be resolved and will inevitably require one or more of the parties to change their views. The underlying assumption of these approaches is that effective social change depends on the commitment and understanding of those involved in the change process. In other words, if people work together on a common problem 'clarifying and negotiating' ideas and concerns, they will be more likely to change their minds if their 'joint research' indicates such change is necessary. Also, it is suggested that collaboration can provide people with the interactions and support necessary to make fundamental changes in their practice which endure beyond the research process.

Similarly, exploring the social process of learning about situations is inextricably linked with the acts of changing those situations. 'Certainly surveys and other social research results are useful, but so is information on why different people see things as they do, and the political relationships between stakeholders. It is by bringing these aspects into the open, and stimulating debate between the different groups through action research approaches that the social parameters — so neglected in most analyses — are automatically brought into the process' (Bosch et al. 1999). Thus, action researchers are change agents seeking to influence the phenomena being studied during the action research process itself, in the belief that the true nature of social systems (social, cultural and institutional considerations) become most evident when you seek to make changes to them.

CHAPTER 4

Getting started: a case study in community-based adaptive management or 'learning by doing'

Time period in which main work on this issue carried out:											
Jul- 94	Jan- 95	Jul- 95	Jan- 96	Jul- 96	Jan- 97	Jul- 97	Jan- 98	Jul- 98	Jan- 99	Jul- 99	Jan- 00

Allen, W.J., Bosch, O.J.H., Gibson, R.G. & Jopp, A.J. (1995) Co-learning our way to sustainability: Integrating local and scientific knowledge through an evolutionary research approach to support land management decision-making. Paper presented at Malama Aina 95, 1st International Conference on Multiple Objective Decision Support Systems (MODSS) for Land, Water and Environmental Management, Honolulu, Hawaii, 23–27 July 1995.

This chapter provides the background to the start of the wider case study reported in this thesis. This can be seen to have begun with the two-year Hieracium Management Programme (HMP), a participatory research initiative to help address the issue of an invasive weed (*Hieracium* spp.) in the grazed tussock grasslands of the South Island high country. The first version of a framework (ISKM) that can help the introduction of an adaptive approach to more closely link management and research is outlined, along with a framework for researching the facilitation of its implementation. Supporting material is presented that addresses challenges of sustainability and the emerging paradigms of research that are emerging in response.

> *Any discipline which is concerned with rational intervention in human affairs ... must both establish theory and engage in practice. Theory and practice will exhibit a groundless relationship, each generating the other, with neither being prime. This mutual development of theory and practice calls for action research in real situations, research in which the researcher has to allow the situation to take him (her) where it will, research whose focus is the change process itself rather than some hypothesis under test.* (Checkland 1985b p. 821)

The beginnings of this thesis inquiry can be seen to have emerged from the Hieracium Management Programme (HMP). This programme involved a two-year research and development initiative in the tussock grasslands of the South Island which began in mid-1994 to

address the problem of an invasive weed (*Hieracium* spp.) in the grazed tussock grasslands of the South Island high country (mountains) of New Zealand.

> It is particularly appropriate to use an agricultural example to highlight issues in natural resource management, because as Dahlberg (1979) points out, agriculture represents the basic interface between people and their environment. From this perspective, the grasslands of the South Island high country present a number of advantages for those concerned with the improvement (or evaluation) of research and development (R&D) programmes. The high country comprises a microcosm of the major resource management issues surrounding extensively grazed ecosystems worldwide. Today, there is a pragmatic recognition of the worldwide trend towards a more holistic, multi-use, multi-value view of such extensively grazed grasslands. Grazing has increasingly become a variable component or even been abandoned in some areas, a change that highlights the diverse values that these grasslands are now expected to serve. In New Zealand these not only encompass traditional pastoral considerations but extend to national aspirations concerning issues such as indigenous Maori land rights, preservation of biodiversity and natural landscapes, sustainable management, tourism, and recreation.
>
> Moreover, the economic and ecological sustainability of at least one-third of this region has been questioned by a recent governmental review. Concerns included land degradation, weeds (particularly *Hieracium* spp. - an introduced forb), pests (particularly rabbits) and the ability of farmers to manage for market and climatic variability (Martin *et al.*, 1994). In terms of issues relating to achieving sustainable resource management, the South Island high country not only encompasses a wide range of contrasting situations, but also is increasingly characterised by conflicts over resource use between different interest groups. In addition, even as changing social and economic policies continue to shape resource development opportunities, the move away from centralised planning by government is increasingly requiring communities to deal with their own social, economic, and environmental needs on a regional basis. (Allen 1997 pp. 630-31).

The degree of the *Hieracium* problem is well set out in the following paragraph by the research leader, Dr Ockie Bosch, and other members of the HMP programme. Their assessment of the problem also encapsulates the need for a new R&D model capable of engendering a more collaborative approach to overcome environmental problems.

> Over the past four decades Hieracium species have spread significantly throughout much of the high country, and appear likely to continue to increase at the expense of both native biota and

> introduced forage species (Scott 1984). They are most common on pastoral lands, and have a detrimental impact on farming enterprises through an associated decrease in productive capacity. Conservation values are threatened in a similar manner ... Against this background, it was evident that a new approach was required to deal with the challenges that *Hieracium* posed to sustainable land management. Such an approach required a greater emphasis on linking research with management and policy, and on maximising the use of current community knowledge. (Bosch et al. 1996b p. 161).

Hieracium Management Programme

The starting point for this proposed new approach emphasised an adaptive management process to more closely link research with management and policy. The key to this approach was the recognition that the development of sustainable management (e.g. grazing) strategies requires an emphasis on experimental rather than descriptive ecology, and that this could not be achieved by scientists working in isolation from the community. This is well set out below in this excerpt from an early research strategy presentation:

> Given the climatic and ecological variability of the South Island high country, it is physically impractical to undertake a rigorous experimental approach to test different grazing regimes under all the different environmental conditions. A more practical approach involves forming partnerships with land managers to extend research across many different situations in the high country. What farmers do as they normally manage their land, observe what happens and adapt their management accordingly is little different than the approach taken by the experimental scientist who applies different treatments under different conditions and measures the outcome. Through this informal 'experimental approach' land managers have built up a vast amount of knowledge through years of experience. ... Involvement of land managers in the research process will lead to improved bi-lateral communication, and an improved perception by farmers, researchers and other stakeholders of the ecological, economic and sociological problems in the high country. This will not only help ensure that future research is relevant, but will encourage land managers to take ownership of the research, ensuring the direct use of results by the grazing industry and conservation managers. (Bosch 1994 pp. 5-6).

Accordingly the HMP research proposed to integrate existing local and scientific knowledge into an accessible and user-friendly decision support system (DSS), containing both management guidelines and supporting ecological information. This involved a three-step process of: i)

accessing existing farmer and science information through the use of interviews and questionnaires; ii) synthesising and developing a draft DSS; and iii) using this material to underpin workshops (or community dialogue processes) that would more actively involve farmers and researchers in developing the structure and content of a first version DSS. The programme staff comprised Dr Ockie Bosch and myself. Other researchers were contracted to the programme as necessary. The HMP was guided by a steering committee comprising three scientists (including Dr Bosch) and three farmers. My own role in the first year of this programme involved me as a co-opted member of the steering committee, and also in capturing and synthesising information provided by farmers. The latter activity extended to developing a first framework of a DSS to display this information. The workshops were subsequently held during the second year of the programme.

Simultaneously, a linked research programme (also led by Dr Bosch) was involving researchers and farmers in the development of condition assessment models for measuring (monitoring) and interpreting vegetation change (see http://www.landcare.cri.nz/redis/). With the development of these two components — an integrated knowledge system and user-friendly monitoring tools — the research team (perhaps naively) thought that the hardest work of establishing the conditions for a community-based adaptive management programme, which would enable the use of local knowledge and the adoption of a continual enhancement process to information management, would have been achieved. Instead, the search for ways to support such a programme continue today, and the action-research-based exploration of the social and institutional issues involved has provided ample grounds for this thesis inquiry.

A framework for change

What was significant about this research programme in terms of action research methodology was the Programme Leader's (Ockie Bosch) insistence and support in documenting the research ideas and approach from the beginning of the programme, rather than is more usual to wait until the research is completed before writing it up. As Peter Checkland points out, the phrase 'action research' is, of course, a useful cloak for interventions which amount only to action: 'To do better than this it is essential to declare in advance the methodological framework which the research will follow. Only by doing this can explicit lessons be extracted, a point much neglected in the literature of social science' (Checkland 1985b p. 821). In an earlier paper, Checkland

(1985a p. 758) suggests that in doing this it would be useful to make a distinction between, on the one hand, a basic set of ideas, and on the other, an approach for applying those ideas in some organised way to some particular area of application (Figure 4.1).

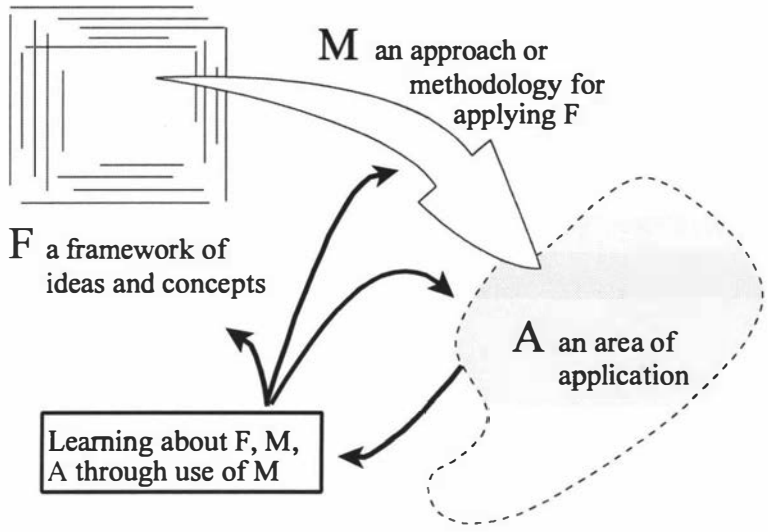

Figure 4.1. General framework for action research (from Checkland 1985a p. 758)

In this research framework, F is a framework of ideas and concepts; M is a methodology — the way of applying these ideas and concepts; and A is the area, or case study, they are applied to. In his paper, Checkland notes that A is indicated without sharp boundaries to remind us that, when A is about human affairs, the application of F through M may lead us into byways not initially expected. In this thesis, F started with the outlined research steps, M represents a number of participatory approaches (interviews, workshops, steering groups, etc.) which were employed, and A is the area of application — the case studies described here.

Two papers were written during this initial year of our research which documented our ideas and approaches. The first was Bosch et al. (1996a) and this is reproduced in this thesis as Appendix I. The second, Allen et al. (1995) was written for presentation at Malama Aina 95, First International Conference on Multiple Objective Decision Support Systems (MODSS) for Land Water and Environmental Management. Honolulu, Hawaii, 23–27 July 1995, and forms the main body of this chapter. This paper was subsequently revised and published as:

> Allen, W.J., Bosch, O.J.H., Gibson, R.G. & Jopp, A.J. (1998b) Co-learning our way to sustainability: An integrated and community-based research approach to support natural resource

management decision-making. Pp. 51–59 in *Multiple objective decision making for land, water and environmental management.*(Eds: El-Swaify,S.A. & Yakowitz, D.S.) Boston, USA: Lewis Publishers.

What is central to this thesis, in all of these papers, is the outline of a series of steps to facilitate the identification and introduction of sustainable land management practices (Allen et al. 1995, Bosch et al. 1996a; Allen et al. 1998b). This framework for adaptive management can be seen to be the forerunner of what became ISKM (Integrated Systems for Knowledge Management), and the development of this approach is shown as the thesis progresses, serving as one measure of the learning involved during the course of the case studies.

In its initial form the ISKM framework emphasises the integration of local and science knowledge as a starting point for problem solving, with the need to start with by gaining local knowledge. The importance of putting information in context through the use of community dialogue, or learning, processes is acknowledged. Thus although these early ISKM versions are characterised by a DSS as the central output (e.g. Figures A2 & 4.3), they do acknowledge that an information system cannot be simply regarded in terms of its transfer component, but is rather a wider social system. The ongoing requirements for learning posed by adaptive management are provided for by the inclusion of steps for integrating new science findings and land-manager-based monitoring and adaptive management.

The accompanying paper in this chapter also sets out many of the supporting ideas and concepts which underpin the ISKM framework. The difficulty of defining sustainability is acknowledged, rather it is suggested that a learning process is required which involves finding out about complex and dynamic situations, followed by taking action to improve them and evaluating the results of this action. Sustainability, as Sriskandarajah et al. (1991) point out, becomes a measure of the relationship between the community as learners and their environments, rather than an externally designed goal to be achieved.

The growing trend towards taking a more holistic, multi-use, multi-value view of our natural resources is noted. In turn, it is suggested that this requires new approaches for linking research with management and policy. The traditional linear transfer of technology (TOT) model (Figure 4.2) of research and development is observed to struggle in enlisting the active co-operation of

the communities they were supposed to serve in this new age of sustainability. It is suggested that a more appropriate model can be developed by seeing research, dissemination (technology/extension) and users as forming elements of a larger knowledge system (Figure 4.2). It is pointed out that this system can be best viewed as a 'social' system through which people interact to develop knowledge and worldviews.

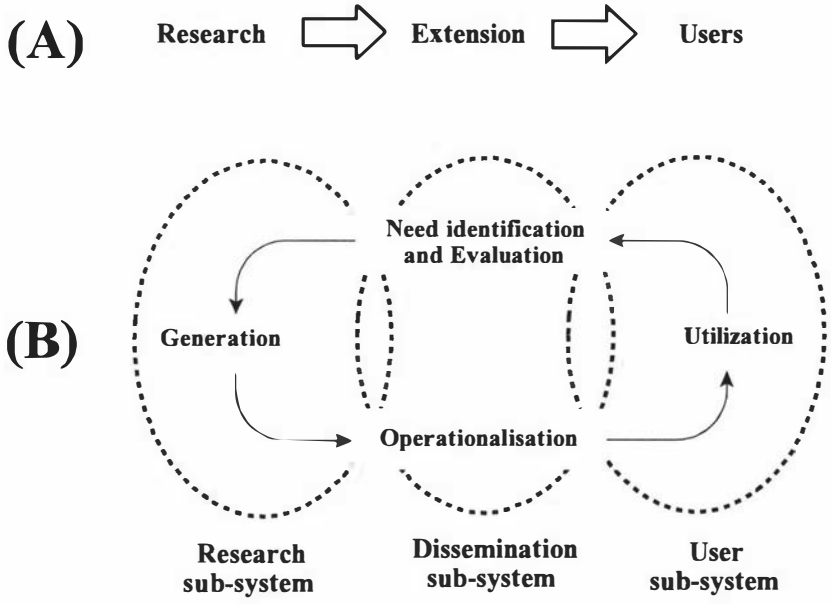

Figure 4.2 Different approaches to extension: (A) TOT model; (B) A knowledge system emphasizing more interactive flows of information (Adapted from Roling 1988 p. 202).

Within this wider view of how we could go about things, this chapter points out that fragmentation of both local and science information, and its resulting inaccessibility, is a major barrier which has negative impacts on its subsequent use. This highlights the problem within science whereby new research continues to be undertaken, without the adequate documentation and structuring of the results of research already undertaken. The use of hypertext based decision support systems as a focal point for structuring this existing knowledge is suggested. However, it was considered that these should be seen as ongoing, and developed with more involvement from the community as a way to increase relevance and user confidence.

Finally this paper, rather optimistically perhaps, concludes with a vision of an expanded process of monitoring and adaptive management which includes the community learning, not only different land uses, but also about policy initiatives. More accurately, it is also acknowledged

that such a participatory research initiative 'places new demands on individual land managers, the community and science to learn together how to best manage (our natural resources) in a sustainable manner'.

CHAPTER 4

Co-learning our way to sustainability: Integrating local and scientific knowledge through an evolutionary research approach to support land management decision making

Allen, W.J., Bosch, O.J.H., Gibson, R.G. (Landcare Research) & Jopp, A.J. (Mt Difficulty Station)

Abstract: This paper describes the development of a participatory research initiative to facilitate the identification and introduction of sustainable land management practices in the high country of New Zealand. Research, extension and users are viewed as components of one information system. It builds on principles of experiential learning and systems thinking. The development of a comprehensive knowledge-based decision support system (DSS), is central to the approach. Because the approach recognises that rangelands are open and evolving systems, it emphasises the importance of active adaptive management. This fosters a learning environment which minimises conflict, and promotes constructive and voluntary land management change.

Introduction

Sustainability is an elusive goal. The notorious vagueness of the term, and its scope for varied and seemingly legitimate interpretation by different parties, appear to make it all but useless as an operational guide (O'Riordan, 1988). One has only to consider simple questions — sustain what? how? for whom? over what time period? measured by what criteria? — to appreciate that sustainability can never be precisely defined. Regardless of the ambiguity of the term, however, there appears to be a general consensus that achieving sustainability will place new demands on individuals, society and science.

Getting serious about sustainability means acknowledging the intricate interdependency of environmental, economic and social issues on a finite planet. Within this broader context, science and technology are seen as providing means to achieve ends that are continually redefined by major social concerns. The challenge facing science is how best to structure and undertake research to meet the diverse - and often apparently conflicting - needs of society, local

communities and individual land users. In an uncertain and constantly changing environment, science must strive to develop the understanding, knowledge, forums and learning environments to better inform and support more sustainable decision-making.

This paper outlines a community-based research initiative which aims to meet these challenges in the South Island rangelands of New Zealand. This approach views research, extension and users as components of one information system. It builds on principles of experiential learning and systems thinking. The development of a comprehensive knowledge-based decision support system (DSS), providing ready access to the information required by land management decision-makers at all levels, is central to the approach. Because the programme is based on the concepts of open and evolving systems, it emphasises the importance of active adaptive management, and is inherently participatory and multi-disciplinary. Accordingly, the approach fosters a learning environment which minimises conflict, and promotes constructive and voluntary land management change.

Programme context

As Dahlberg (1979) points out, agriculture represents the basic interface between people and their environments. From this perspective, the grasslands of the South Island high country present a number of advantages for those concerned with examining issues related to sustainability. The high country totals 6 million hectares, around 40 percent of the South Island, and comprises a microcosm of the major issues surrounding rangeland ecosystems worldwide. Pastoral farming is undertaken on around 3.4 million hectares, with the balance comprising mainly government-managed conservation estate. The landscape is diverse, ranging from fertile valley floors to fragile river flats, from intermontane basins to mountain slopes that reach far above the treeline. It contains a continuum of natural and semi-natural vegetation in situations ranging from semi-arid to humid. In addition to market and climatic variability, land managers have to cope with low or unreliable production, complex ecosystems and large management units.

Today, there is a pragmatic recognition of the worldwide trend towards a more holistic, multi-use, multi-value view of the rangelands (e.g. Brubaker, 1984; Hess, 1992; Holmes, 1994). Grazing has increasingly become a variable component or even been abandoned in some areas, a

change that highlights the diverse values that rangelands are now expected to serve. In New Zealand, these not only encompass traditional pastoral considerations but extend to national aspirations concerning issues such as Maori land rights, preservation of biodiversity and natural landscapes, sustainable management, tourism and recreation.

The economic and ecological sustainability of at least one-third of this region has been questioned by a recent ministerial review. Concerns included land degradation, weeds (particularly *Hieracium spp.* - an introduced forb), pests (particularly rabbits) and the ability of farmers to manage for market and climatic variability (Martin *et al*, 1994). And in terms of sustainable resource management, the South Island high country not only encompasses a wide range of contrasting situations, but is also characterised by conflicts in resource use between different interest groups. Accordingly, the search for environmentally sound approaches to socio-economic development involves complex interactions of people, economics, ecological systems, property rights and intergenerational considerations.

Methodological challenges

The theoretical foundations on which rangeland R&D policies and practices are based are undergoing a paradigm shift. Conceptually, traditional approaches are generally based on reductionist scientific methodologies and often on the expertise within single disciplines (Dahlberg 1991). Despite a growing recognition of the increasing complexity and social construction of rangeland problems, there have been few recent innovations in research methodology other than the development of quantitative modelling and an increased focus on the development of expert systems (Ison & Ampt 1992; Whittaker 1993). In addition, the research systems in which these DSS have been developed have been, and still are, largely characterised by the linear transfer of technology (TOT) model of agricultural research and development (Russell et al. 1989). The dominant metaphors are those of "information transfer", "channels of communication" and "teaching", most of which arise from mistakenly seeing human communication in the same way as data transferred between computers. (Ison 1993a).

Despite the vast amounts of time and money that have been and are being spent on rangeland R&D, the results as Hadley (1993) points out, are often illusory or counterproductive. For example, in African countries conservation attempts have largely been ineffective (Bosch 1989a),

and few range management projects have had a discernible, positive and permanent impact on the way communal rangeland is used (Behenke & Scoones 1991). In New Zealand, the slowness with which landuse and land administration have responded to changes in ecological conditions has been noted by O'Connor (1986). Perhaps most telling, the majority of these development initiatives have failed to enlist the active cooperation of the communities they were supposed to serve.

Recognition of such failures has triggered attempts to rethink approaches for linking research with management and policy. Increasingly, alternative approaches are based on concepts of open and evolving systems. They are participatory in nature. There is a growing acceptance of the need to build on principles of experiential learning and systems thinking (Bawden et al. 1985). Research, technology (extension), education and users are therefore recognised as forming elements of one agricultural information system (Roling 1988). Such a system must be seen as going beyond the TOT paradigm. An information system, in this sense, cannot be usefully regarded only in terms of its transfer component (often a computer-based DSS). Rather, it is a "social system", within which people interact to create new knowledge, and broaden their perspective of the world (Land & Hirschheim 1983; Ison 1993b). Given the diverse set of decision environments inherent in the rangelands, such a system will, to an increasing extent rely on information technology for its function.

Because there can never be perfect knowledge of ecological processes within non-equilibrium systems, the concept of sustainable land use changes as knowledge expands (Burnside & Chamala 1994). As evolving economic, technical and social systems impact on management they also contribute to changing definitions of sustainability. Accordingly, successful resource management must be based on a process of active adaptive management, or "learning by doing" (Walters & Hilborn 1978; Westoby et al. 1989), to match the dynamism of a rangeland environment which will continually require the setting of new management targets (Lefroy et al. 1992).

A framework for managing complexity

A research framework that facilitates an ongoing process of "learning by doing" has been designed, and is being implemented in the South Island high country (Figure 4.3). Such a framework needs to be able to capture the existing knowledge, both scientific and local, held within the community. The information must be structured and presented in a form that allows users ready and direct access to the knowledge base as a decision-making and learning aid. The process also has to allow for new knowledge to be added as it becomes available, and it must recognize and address the multiple social perspectives that characterise rangeland environments throughout the world.

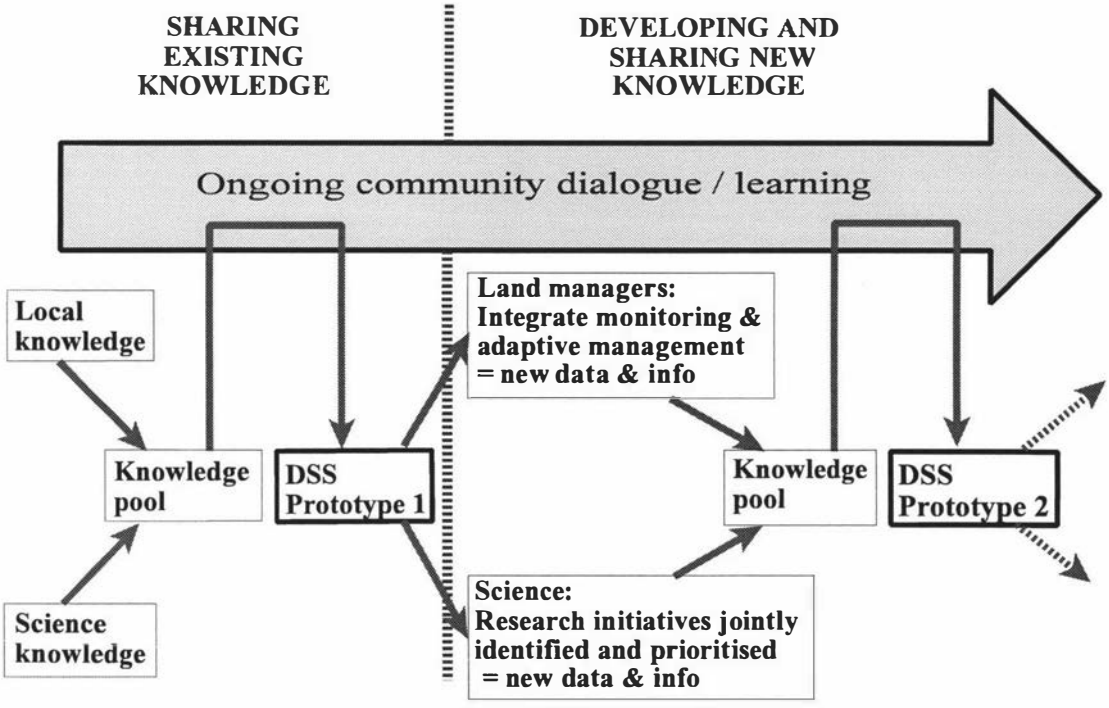

Figure 4.3 A framework to facilitate the identification and introduction of sustainable land management practices *(Note: this should be seen as ISKM ver. 1.2).*

As Figure 4.3 illustrates, these efforts are designed to maximise the knowledge available to decision-makers at any time. The first challenge is to share existing knowledge. This requires accessing and amalgamating information held by both the community and science. The further challenge is to develop processes which allow the sharing and evaluation of the collated information, and provide for an exchange of views among the various parties. This ensures that

the information is understood in the context in which it was provided, and makes it possible to develop a comprehensive and relevant management-decision support system (DSS). Community discussions are designed to reduce conflict through clarifying issues and encouraging a "learning" environment which will lead to constructive and voluntary change. New research initiatives often develop from this process.

Importantly, the process is ongoing and allows the substance and context of the required information flows to be rethought and reprovided continually. As land managers (farmers, foresters, conservation field officers, etc.) adopt new strategies and measure the results of their actions, they continually take information from - and gain new information to add to - the management DSS. In a similar way, research organisations can use the information base to help define research priorities; and research results can also be effectively transferred to the end user.

As mentioned above, the framework includes two major components, the sharing of existing knowledge and the development and sharing of new knowledge. The requirements to achieve these are outlined below.

Sharing existing knowledge

Initial considerations

Years of experience have provided land managers with a wealth of knowledge on their local systems. This information, unfortunately, is rarely documented and not readily available to land managers on a collective basis. Similarly, much of the valuable knowledge that scientists have accumulated is fragmented, held in different databases and not always readily available.

The challenge facing resource managers is to bring local and scientific knowledge systems together into a single accessible and structured focal point. This focus could be in the form of a DSS which could be seen as a cognitive tool to support the learning process (Jonassen, 1992), by providing both land managers and scientists with more opportunities to inform and stimulate each other. As Jonassen (1992) points out, the challenge is to provide an environment and vehicle that stimulates the user to think harder about the subject matter under consideration, while generating thoughts that would be difficult without the tool. This DSS will also aid land

managers in land use decision making, without their having to rely only on fragmented bases of knowledge and experience.

The development of such a comprehensive DSS raises additional considerations. The traditional linear approach to DSS development usually begins with a feasibility study which may involve the users in transforming an ill-structured problem into one that is well defined - a conversion from 'soft' to 'hard' (Miles 1988). Such a study will also result in the complete specifications of the system to be identified before design and construction (Thierauf 1988). However, given that our knowledge of natural systems is, and will always be, incomplete, a more flexible prototyping approach is needed. This is especially useful when DSS development is seen as a process that can be enhanced by the use of iterative 'soft' systems methodologies involving processes of feedback and learning among all the different participants in the situation under inquiry (Miles 1988).

Prototyping also encourages an interactive process where DSS developers and users collaboratively discover new requirements and refinements, which are then incorporated in succeeding versions. In this way, the development process allows the user to learn and experience the system at an early stage. This process is important because it encourages user confidence in subsequent working versions (Brittan 1980). Prototyping further lends itself to a modular approach, and can produce a system which can actually be used much earlier than DSSs developed through more traditional linear approaches.

Capturing existing community knowledge

Beginning with local knowledge of management goals, problems and solutions was an important starting point. As already mentioned, land managers have collectively accumulated a vast amount of experience in local environments. Involving them from the outset ensures better access to their knowledge and understanding of the problems they face in the real world. In turn, sharing understanding and knowledge between scientists and farmers, allows scientists to gain a better appreciation of the opportunities and problems facing land managers in the real world. This is more likely to lead to the development of a structured and comprehensive knowledge-base that is relevant to community needs (Blokker 1986). Not only is there likely to be greater commitment

on the part of users to systems which they have co-developed, but also a greater understanding of any changes needed to make it work (Dearnley & Mayhew 1983).

In the high country, farmers represent the biggest single group of land managers, and decisions they take now will heavily influence the future state and value of the rangelands. Accordingly initial efforts concentrated on involving farmers. An essential prerequisite to accessing existing high country farming knowledge involved forming a Steering Committee to ensure farmers equal participation in the research process. The role of this committee is essentially one of systems management (Roling 1988), it acts to develop links and mediate between conflicting interests. This committee comprises three farmers and three scientists, and its efforts have mobilised a substantial farmer involvement within the research process in a number of ways. These include the wide distribution of newsletters, media coverage, seminars, letters and fieldday displays. These and other processes followed during the development of a framework for the comprehensive management-DSS are outlined in Figure 4.4.

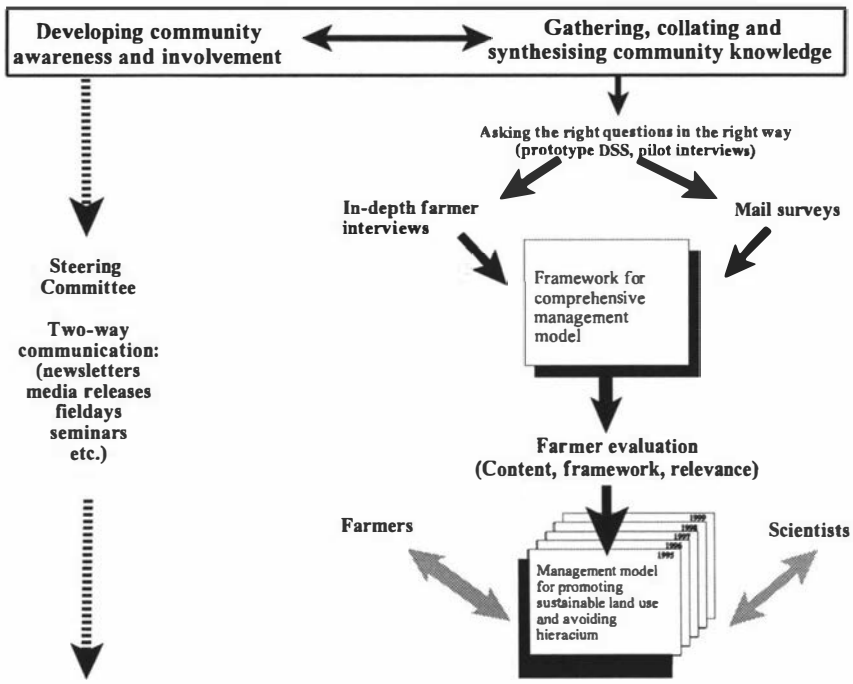

Figure 4.4 A process for involving local land managers in a participatory research initiative.

As Figure 4.4 illustrates, the knowledge base held by local farmers was accessed using in-depth interviews and comprehensive mail surveys, offering all high country farmers the opportunity to share their thoughts and observations through the programme.

Developing the technical component

The information acquired through these processes was then structured to develop the framework for a first DSS prototype using LEVEL5 OBJECT software (Information Builders 1993) as a platform. The resulting model outlines various strategies for achieving land-user-derived goals (from increasing forage production to enhancing natural values). Given the diversity of ecological regions represented within the programme area, an important facet of model construction is involving farmers in the initial definition of representative ecological units. The model also helps to illustrate the links between different sub-systems within the wider environment from which the information was provided. As the land managers pointed out, sustainability issues need to be addressed simultaneously at a number of different levels of decision-making. Information is therefore displayed as it relates to different system hierarchies from block/field goals through individual enterprise objectives to catchment/community goals.

The DSS is designed to integrate a diverse array of information sources and provide users with a more holistic perspective of a complex situation. It is perhaps best viewed as a library incorporating a wide range of experiential knowledge, expert systems, DSSs, software packages and databases. It is constructed to allow the user to define and then select a management goal. By answering simple questions and being prompted to provide further information with the help of associated models and specialist packages, the user can create new information (allowing for ecological diversity, etc.) relevant to the issue under investigation. Prompts act to provide a pathway towards the provision of management advice. Through the use of hypertext (Carascal et al. 1995) the user can obtain further explanation and clarification of the assumptions behind selected answers, along with the ability to access associated subject areas. In some cases this will simply require access to another part of the system, but it is envisaged that in the future access will also be provided to external information sources through links such as Internet. These related abilities are important as they allow users to assess the reliability of the decision support on their own terms (Stafford Smith & Foran 1990), and to create a personal learning environment (Jonassen 1992).

The science contribution

In this context the term 'science' refers specifically to the knowledge generated by traditional science providers. Through the efforts of scientists, science organisations have for many years accumulated large amounts of information on various attributes of natural systems, although these databases often explain little about the application of the information. The addition of this existing information and its use in evaluating manager-defined strategies, both to assess their potential us in different situations and to determine their possible impact on the wider environment, was regarded as a valuable opportunity for scientists to share their knowledge with users. This therefore leads to the inclusion of scientifically-derived options, strategies and risks.

In many cases, the problem is not so much that the science has no immediate use, but that the scientific understanding has not been translated into practical application. For example, the apparent inability of policy makers and land managers to make use of range condition knowledge must, at least partly, be attributed to a lack of tools to make sense of and interpret monitoring data in a useful and efficient way (Gibson et al 1995). However, if land managers are to be encouraged to become formally involved in the monitoring and adaptive management process they also require access to user-friendly tools for monitoring. As described above, the DSS platform therefore provides for the inclusion of a variety of stand-alone software packages.

In this example, the condition assessment module of the Integrated System for Plant Dynamics (Bosch et al. 1992) has been modified for direct inclusion in the DSS platform. As this is combined with land-manager and science supplied strategies for achieving different vegetation management goals, it forms the basis for a modular DSS which allows for active adaptive vegetation management.

Placing knowledge in context

Given the complexity and different social perceptions of many agricultural and environmental situations, an essential component of the process focuses on placing contributed information 'in context'. Facilitated workshop formats provide the opportunity for the farmers to evaluate and add to the information they supplied during the initial data gathering process (Figure 2). Science workshops and farmer/scientist workshops perform a similar role. Because of the participatory

nature of the process, apparently contradictory management strategies supplied by land managers are not displaced without the approval of those who practise them. In a similar manner to the sharing of local knowledge, scientific knowledge is not used to displace that of land managers, but rather acts to complement local knowledge. Diversity is encouraged, rather than undervalued.

This ongoing community dialogue is best viewed as a mosaic of social interactions, operating at different points within a hierarchy of decision-making levels. Discussions of how best to achieve pastoral production goals primarily involve groups comprising farmers and scientists. Issues such as the management of particular landscapes will involve a wider range of interest groups. In turn, as communication flows between different sectors of the community are expanded and improved, this should also reduce the level of conflict surrounding a number of high country land management issues. The process encourages a learning environment which promotes constructive and voluntary behavioural change.

It is envisaged that the process will be broadened to include policy makers within this integration. This means that policy makers will better interpret the results of various rangeland inquiry activities, and will be more likely to take those findings into account when formulating policy. A greater input from policy makers should also lead to research initiatives relevant to policy considerations.

This participatory process is crucial, if we are truly to develop a shared understanding of how others see the world and how that shapes the way they act in it (e.g. manage their land, carry out their research, formulate policy). It is also important if we are to begin to guide the planning of different sectors of society towards a more coordinated set of environmental goals. This process will also lead to new and relevant research initiatives because the community will have the opportunity to explain and identify their information and technical needs as they work more closely with researchers. It will also provide a mechanism to deal with resource-related conflicts that are focussed more on values than on facts. In this regard, there is increasing evidence that a shared understanding of the values of key groups may actually help balance the views of opposing groups (Druckman et al. 1988; Korper et al. 1986).

The development and sharing of new knowledge

With the combination of existing knowledge (scientific and local) and currently available monitoring tools, the resultant prototype can be effectively regarded as the first working version of the DSS. However, as already noted, for such a knowledge-based system to advance sustainable land management successfully in the long term it needs to evolve as society and the environment change.

An ongoing role for land managers

In normal practice, land managers manipulate ecosystems primarily to achieve a management objective, rather than to find out how the system works. However, as a number of researchers observe, a management action can also be regarded as an experiment (Walters & Hillborn 1978; Dankwerts et al. 1992). As land managers measure the outcomes of their management actions they continually gain new "experimental results". These results provide new information whereby the knowledge base held in the DSS is re-evaluated and expanded in collaboration with scientists and other stakeholders (Figure 1), encouraging a learning environment. In turn the enhanced DSS provides a broader foundation to assist with future land management decision making.

To continue with our example of vegetation management. The development of sustainable grazing management strategies requires an emphasis on 'experimental' rather than descriptive ecology. However, given the climatic and ecological variability in the South Island high country of New Zealand, it is logistically impractical for scientists to undertake a rigorous experimental approach to assess the effects of different management strategies (effect of spelling periods, rotational grazing, set-stocking, etc.) under all the different environmental conditions. The linked concepts of monitoring and adaptive management make it possible for land managers to become involved in such a large-scale experimental approach (Bosch et al. 1995a).

Involvement in the participatory processes of monitoring and adaptive management in this way, means that individual land managers acquire greater technical expertise - building on both collective local knowledge and an associated scientific awareness of their physical environment. At the same time, by achieving specific objectives for improving their resource position through

a collective effort, land managers develop greater confidence, which, in turn ensures the uptake needed for the process to continue.

The education and training of local people forms the basis of any such participatory research process. However, this function should not be seen as the responsibility of extension workers and other employees of technical agencies only. In many instances it is best carried out by community-based organisations (Roling 1988). In the South Island high country much of the training in DSS use at farm-level has been organised and carried out by a farmer-initiated community body (Bosch et al. 1995a).

It is planned that in the future the knowledge held by other sectors of the high country community (tourism, horticulture, recreationalists, etc.) will be included in the ongoing process of monitoring and adaptive management. Ultimately this concept of 'learning by doing' could also be broadened to include policy initiatives. As Rondinelli (1983) argues, all social development activities must be seen primarily as experiments and dealt with as complex and uncertain ventures in which the participation of those who are expected to benefit is essential.

Further refinement of the DSS by land managers will take place through demand-driven focused projects, such as the 'large-scale grazing management experiment' described above. These projects start from the need to meet a community objective which may be either financial, ecological or social. To achieve this community objective realistically, people must receive direct personal benefit in some way. This, in turn, ensures ongoing involvement as the benefits of participation in the process are seen.

An ongoing role for science

At any given time the research process can play an important role in helping the community and scientists to determine new research priorities jointly (Figure 1). Because it acts as a framework to display existing knowledge it helps identify knowledge gaps, and assists in prioritizing new research initiatives. This is a continual process as evolving knowledge, technologies and value systems inevitably change our perceptions and provide new areas and issues for research (Stuth et al. 1991).

At the same time new local knowledge through monitoring and adaptive management will add to the range of strategies to be evaluated, and strategies and options will continually change in response to social, economic and ecological pressures. This creates a role for ongoing research to determine the wider applicability and environmental implications of management options and strategies.

Concluding remarks

Involving the community in participatory research is essential if sustainable land management issues are to be resolved in a constantly changing environment. Adaptive management approaches, such as those described here, provides science with the opportunity to learn from the experiences gained within enterprise and catchment-level systems. Participatory research allows scientists a better feeling for how their research field fits into the total system, and provides an appreciation of management concerns and issues. At the same time, formal involvement in the linked processes of monitoring and adaptive management mean that land-managers acquire greater technical expertise — building on both collective local knowledge and an associated scientific awareness of their particular environment.

Through active adaptive management this approach represents an effort to design for uncertainty and to obtain benefits from the unexpected. Through participatory research it offers an educational experience which not only serves to determine community needs, but provides the community with the opportunity to develop solutions to their own problems. Providing greater understanding of the system helps the community adapt to change and, as Stuth et al. (1991) point out, can help determine what components are most affected by change target research priorities better. Rather than accept that our future will be determined by the status quo, an important fundamental aspect of the research process is the shaping of the perceptions of those involved such that they develop a holistic perspective, within which they can make their particular contribution (Bawden et al. 1985).

This participatory research initiative places new demands on individual land managers, the community and science to learn together how to best manage the South Island high country in a sustainable manner.

Acknowledgements: The authors would like to acknowledge the support and funding that has been provided to this research programme by MAF Policy (NZ) and Manaaki Whenua - Landcare Research NZ. Research such as described here, is not possible without the support of the community, and we would like to record our appreciation for the efforts of all those in the HMP Steering committee and those in the high country farming community who have acted as our co-researchers.

CHAPTER 5

Sharing experiences and developing 'useful knowledge'

Time period in which main work on this issue carried out:											
Jul- 94	Jan- 95	Jul- 95	Jan- 96	Jul- 96	Jan- 97	Jul- 97	Jan- 98	Jul- 98	Jan- 99	Jul- 99	Jan- 00

Allen, W.J. & Bosch, O.J.H. (1996) Shared experiences: the basis for a cooperative approach to identifying and implementing more sustainable land management practices. Pp. 1–10 in Proceedings of Symposium "Resource management: Issues, visions, practice' Lincoln University, New Zealand, 5–8 July 1996

The background to the second version of ISKM, and a re-evaluation of the need for such an adaptive programme approach, are discussed in this chapter. This highlights the importance of seeing the outcome of research as to develop 'useful knowledge' rather than a decision support system. This change in focus is also set against a growing split over the past 200 years between science and management. The need for improved forums for communication is shown, along with examples. Finally, some lessons are provided from experience with workshops involving scientists and farmers to show the need to develop a common language although, as pointed out, this will sometimes require less commonly used communication approaches such as pictures.

> *To conceive of knowledge as a collection of information seems to rob the concept of all its life ... Knowledge resides in the user and not in the collection. It is how the user reacts to a collection of information that matters.* (Churchman 1971 p.10).

During the second year of the HMP the initial ISKM framework, outlined in the previous chapter, was significantly revised. One contributing factor was the observation that although the programme had always been talked about and presented as a collaborative effort, which would use facilitated workshops as a mechanism to involve interested farmers and scientists in developing the final version of management guidelines and underpinning ecological understanding — most people were waiting for the HMP science staff to complete the work and come up with some 'answers', or alternatively appeared relatively disinterested in the work. The initial presentation of the approach obviously put too much emphasis on the development of a

DSS, which appeared to be subsequently interpreted by farmers that the programme's main aim was 'science' rather than 'farmer' focussed. What eventually prompted a rethink by the science staff was the complete absence of farmers at a well-advertised local meeting one afternoon.

Renegotiating the collaborative approach

In response we convened a meeting of Central Otago farmers to renegotiate the issue of whether or not a collaborative research approach was desired, and if so, to determine the next steps that needed to be taken by both farmers and researchers. Rather than presenting our approach as a given, a decision was made to use a more open facilitated technique to ask farmers how they wished to see science carried out. This, in turn, was regarded as a way of evaluating the appropriateness of the ISKM approach. Accordingly, during this meeting I used a current/preferred scenario technique to help the farmer participants in outlining the current problems they had with research, and to develop those features they wished to see undertaken by research. The resulting mind maps are shown in Figures 5.1 and 5.2 below.

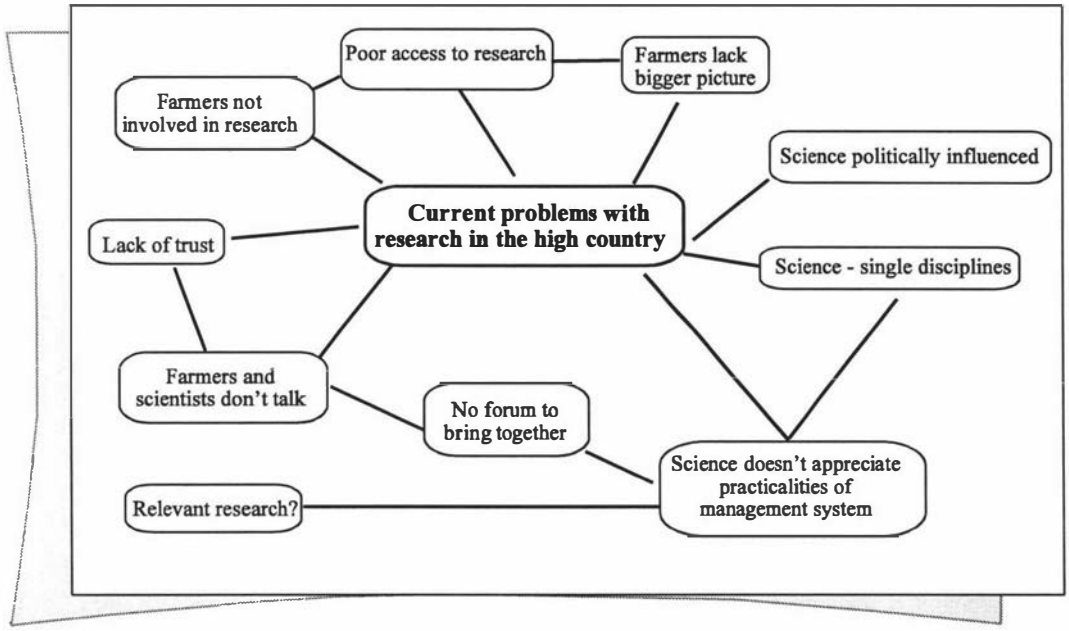

Figure 5.1 Current problems with research in the high country (edited mind map developed by participants at Alexandra 19/3/96).

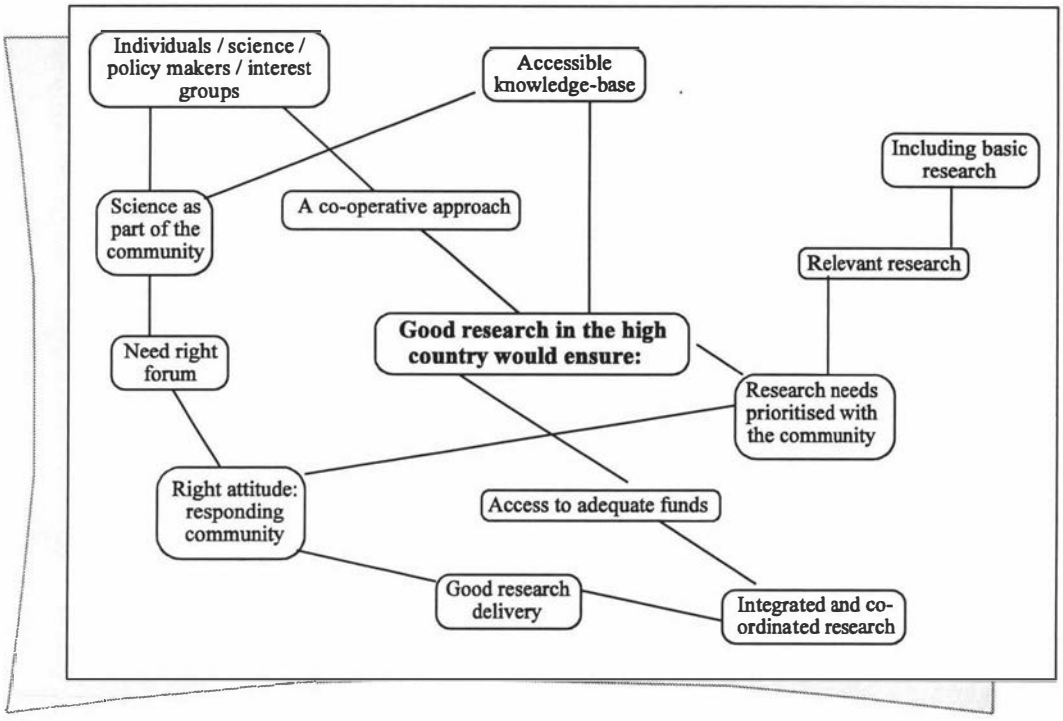

Figure 5.2 How participants would like to see research in the high country (edited mind map developed by participants at Alexandra 19/3/96).

Prior to the meeting the HMP staff had been discussing the problems caused by the perception that the programme was more interested in developing a DSS than solving problems. However, when Tony Jopp (HMP Steering Committee chairman) listened to the discussion of what we hoped the programme would do he pointed out that what ISKM was really about was developing 'useful knowledge'. Given this 'reframing' of the ISKM framework, participants were then asked to re-evaluate the desired factors they had outlined in their preferred scenario (Figure 5.2). During the subsequent discussion it was agreed that this framework has the potential to meet most of the desired outcomes. This provided some buy-in from farmers to the research process, and confirmation that the HMP was on the right track.

A final workshop session focussed on identifying relevant areas of research in addition to Hieracium that could be tackled with this framework. These were then prioritised and the meeting concluded with a number of farmer volunteers agreeing to take the next phase of this participatory research back into the community to look at the following issues: grazing management, burning, conservation and water quality. It was envisaged that these farmer volunteers could co-ordinate farmer input to build on the information that had already been

collected from the rural community through the semi-structured interviews conducted under the HMP.

Collectively then, this meeting and the preparations for it led to the second version of ISKM shown in this chapter paper (see Figure 5.7). Modifications include: i) an initial scoping phase; and ii) 'useful knowledge' as the main outcome, with the DSS as a by-product of this.

During this year (1995/96) my main role in the HMP was as a facilitator of the different workshops that were held. In addition to the one already mentioned, a further three workshops — or community dialogue processes — were subsequently held in different parts of the high country 'to work through the synthesised material on *Hieracium* and develop some consensus on a final structured format for presenting the knowledge-base' (HMP newsletter April 1996 p.1). Also during this period I was involved in converting the original computer-based HMP decision support module from a stand-alone package developed with object-orientated software to an Internet-based version. This included adding the information gained during the workshops.

Workshop format and lessons

During the HMP workshops a decision tree approach was used to unlock and structure existing knowledge. This is detailed in Bosch et al. (1999). The decision tree approach is illustrated in Figure 5.3, as it would be developed on a whiteboard during a workshop session. The session begins with defining the management goals and targets for the issue under consideration. These are written on the left-hand side, and participants are asked how they would achieve these goals (from their own experience and knowledge). The various options and best management practices are listed on the right-hand side as they are supplied by participants. These steps are not only needed at the beginning, but they are also relatively easy for participants to respond to. The example shown below also illustrates the holistic way in which the programme sought to deal with *Hieracium*. That is, farmers do not manage for *Hieracium* alone, but rather address it as one problem within a wider goal — in this case as part of the management of a tussock grassland community.

Once this is done, the facilitator returns to the top of the options/actions list, and initiates a second round of discussions among participants with a question such as, 'To achieve goal x, you

could use this option or strategy under all circumstances and conditions?'. This will normally unlock a reaction from participants that the effective use of the particular option or strategy will depend on a number of factors, e.g. rainfall zone. These factors that could influence decision making (i.e. cause branches in a decision tree) are then written down in the middle section of the whiteboard.

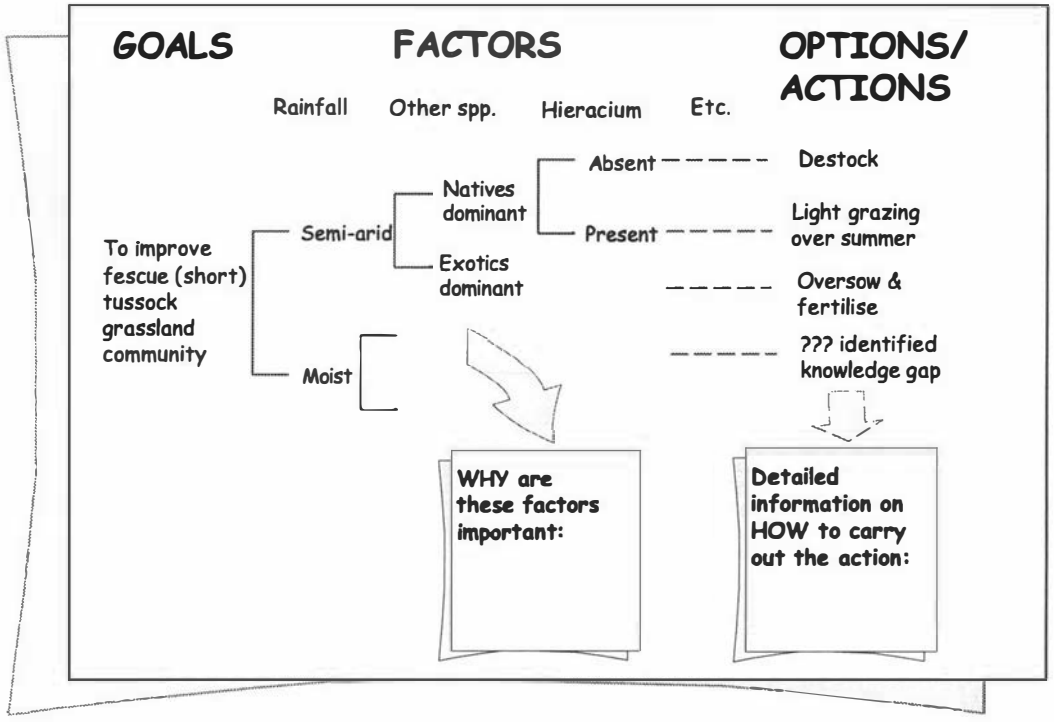

Figure 5.3 Example of a decision tree being developed during a workshop, indicating the points at which 'why' and 'how' questions could unlock information in a structured way.

The facilitator then asks why these factors are important, and how they will influence decision making. The reasoning of participants is recorded on tapes or directly entered onto a word processor for later use as additional information or help files in information packages (e.g. manuals, leaflets, computerised decision support systems). Information on how a particular factor will influence decision making is used to draw the branches of the decision tree. For example, if rainfall zone is important, the actual boundaries at which different options would apply are recorded on the decision tree. Unknowns should be recorded as question marks on the trees.

Once there is agreement on which strategy or option would apply under what circumstances, information is sought from the participants on how the strategy should be carried out. The level

> of detail recorded must be adequate to allow any end-user to implement the action without further help (than is available in the information system).
>
> This process is repeated for all options or actions for each management goal initially identified. The decision trees, additional information, and question marks form the basis for further refinement with knowledge from scientists and other experts, the identification of questions and research gaps, and for easy processing into manuals or computerised information systems. Participants (end-users) see at the end of the session their hand in the design and content of the information system, which would lead to better uptake or acceptance of the information. An important principle, however, is never to summarily dismiss any piece of information given by an individual, even if most participants disagree on its applicability. (Bosch et al. 1991).

While the idea of bringing people together to develop a common understanding of issues and what might be an appropriate set of responses sounds easy enough, in practice one of the main challenges turned out to be the development of a common language. For example, it was immediately apparent that everyone had their own idea of what different states of tussock grassland were. Although not planned, this problem was largely overcome in the second of these meetings when Roger Gibson (a Landcare Research ecologist) sketched out the diagram shown in Figure 5.4. The time involved in both agreeing on (and often renegotiating) roles and goals, and developing a common language can be seen as contributing reasons why participatory approaches take time.

Another challenge is providing participants with a common understanding of the wider context within which information is presented. This is particularly evident when the results of research findings are being presented to farmers. These are usually developed during an inquiry into a small part of the wider land management enterprise. In these cases it is helpful to show how the research findings relate back to the wider system, and to highlight who is most likely to use the research findings. In some cases these may be used by the land manager, but in other cases it may be of most use for other researchers.

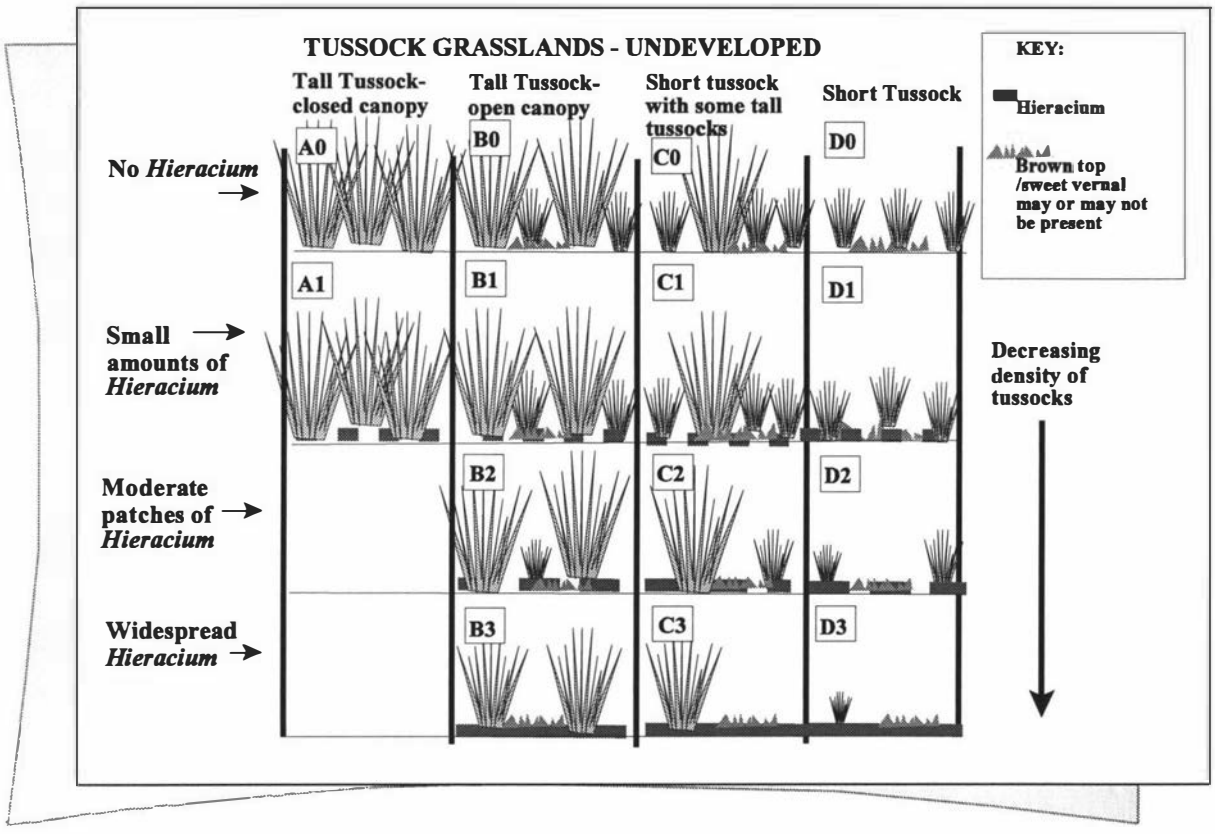

Figure 5.4 Pictorial representation of tussock states developed through HMP workshops.

Writing the paper, that is subsequently provided in this chapter, provided an opportunity to reflect on these issues related to running multi-stakeholder community-dialogue processes. The paper also provides a broad perspective on how the links between science and management have become increasingly strained over the past two centuries. The implications are then looked at in terms of the different questions being asked of science in recent years as the emphasis of questions being asked has changed from production to sustainability. Equally importantly, the lessons gained through running these early workshops provided a base by which to improve the effectiveness of subsequent forums.

Shared experiences: the basis for a cooperative approach to identifying and implementing more sustainable land management practices

Allen, W.J. & Bosch, O.J.H. (Landcare Research)

Abstract: Given the complexity and different social perceptions surrounding many resource management issues, the challenge facing science is to develop understanding, knowledge, forums and learning environments to better inform and support more sustainable decision-making. An essential component of any process to achieve these aims will focus on placing contributed information 'in context'. This paper describes the importance of community dialogue processes to support the identification and adoption of more sustainable land management. The benefits of a cooperative approach the planning of different sectors of society towards a more coordinated set of environmental goals are outlined.

Introduction

Over the past decade, the challenges facing those who have the responsibility for making sound resource management decisions have multiplied. The underlying concept of resource management is influenced by a pragmatic recognition of the worldwide trend towards a more holistic, multi-use, multi-value view of the wider environment. Within this broader context, science and technology should be seen as providing means to achieve ends that are continually redefined by major social concerns. These challenges, in turn, provide the basis for a new era in research and development (R&D), whereby scientists, land managers, policy makers and other interested parties can learn together how best to manage our natural resources in a sustainable manner.

This paper begins by arguing that the links between science and management have become increasingly strained over the past two centuries. The changing eras of land use in New Zealand are discussed in the context of their implications for research and development. A community-based research framework is outlined which provides more opportunity for land managers (farmers, conservators, etc.) and scientists to share the benefits of their experiences and

observations. The manner in which this cooperative approach emphasises the importance of community dialogue processes to support the identification and adoption of more sustainable land management practices is described. The paper concludes by documenting some of the lessons learnt from the implementation of this research initiative in the South Island high country.

Changing perspectives

As Ruckelshaus (1989) points out, sustainability was the original economy of our species. "Pre-industrial peoples lived sustainably out of necessity; if they did not, if they expanded their populations beyond their available resource base, sooner or later they starved or had to migrate. The sustainability of their way of life was maintained by a particular consciousness of nature. These peoples were spiritually connected to the animals and plants on which they subsisted - they were an integral part of the landscape, not set apart as masters.'

Without wishing to romanticise the outcomes of pre-industrial land management, or imply that preindustrial people were always good ecologists, it is possible to see many of their practices and value systems as providing models/lessons that could benefit us today. The important point here is not whether our pre-industrial ancestors made mistakes or not - they undoubtedly did - but rather, whether those that practised land management were able to learn from those mistakes. For these people, local knowledge and scientific knowledge were the same thing. Their conventional, or operational, ecological wisdom evolved in response to lessons learnt from land management, which in turn was strongly embedded in tradition and spirituality. For these traditional peoples their resource management practices were part of and indistinguishable from their culture. Moreover, because their land-management systems were small and relatively autonomous they tended to provide an ideal learning environment: what worked, what didn't, and how the different sub-systems linked together.

Perhaps not surprisingly, with the emergence over the past 200 years of our current urban and industrial society there has been a corresponding cultural lag in ecological wisdom. At the same time, our science knowledge has become increasingly divorced from local knowledge. This lag in our operational ecological wisdom was publicly acknowledged in the 1960s, and made popular by authors such as Rachel Carson in *The Silent Spring* (1962). Indeed, only two centuries ago,

our collective power to transform the environment was relatively local and contained. The sheer magnitude of the earth — given that it took a year to go round it in the best of ships — must in itself have seemed adequate to insure that our transformations were limited.

Today, all that has changed and the accelerating power of science and technology has radically transformed the face of our planet — for good and for bad. More than half the world's population is now urbanised. Polio and other diseases have been defeated. Artificial fertilizers simultaneously ensure high-yielding crops, and threaten water quality. We have transcended the bonds of gravity and the limited vision of the past to venture into outer space. And along the way we have reshaped nature itself. These changes to natural resource systems, characterised by major environmental change since European settlement, are easily visible in countries such as New Zealand and Australia.

While changing land use practices and management may appear a daunting task, we should remember that it is something that happens quite regularly in response to different societal concerns and aspirations. Indeed, so marked are these changes in many rural areas that it seems reasonable to suggest that there have been a number of different eras of land management, each dominated by a different way of seeing the world (Bawden 1987). These different eras are outlined in Figure 5.5 as they relate to the South Island high country.

Each era is characterised by the way in which people view land management, and thus the way they practice and research it. However, as Bawden points out, the issue is more complicated than it appears, in two ways. Each perspective complements rather than replaces its predecessors, making for increased complexity. And with the addition of each new perspective, the number of parties with an interest in the management of these lands also increases, making for even more uncertainty or ambiguity. For most of this century scientists working in the New Zealand high country were at least confident in the knowledge that they were researching aspects of what was generally regarded as a largely extensive pastoral system. Today, there is a pragmatic recognition of the worldwide trend towards a more holistic, multi-use, multi-value view of the rangelands. And whether that is an agricultural, tourism or conservation system, or some combination of all these, is increasingly undefined and debated.

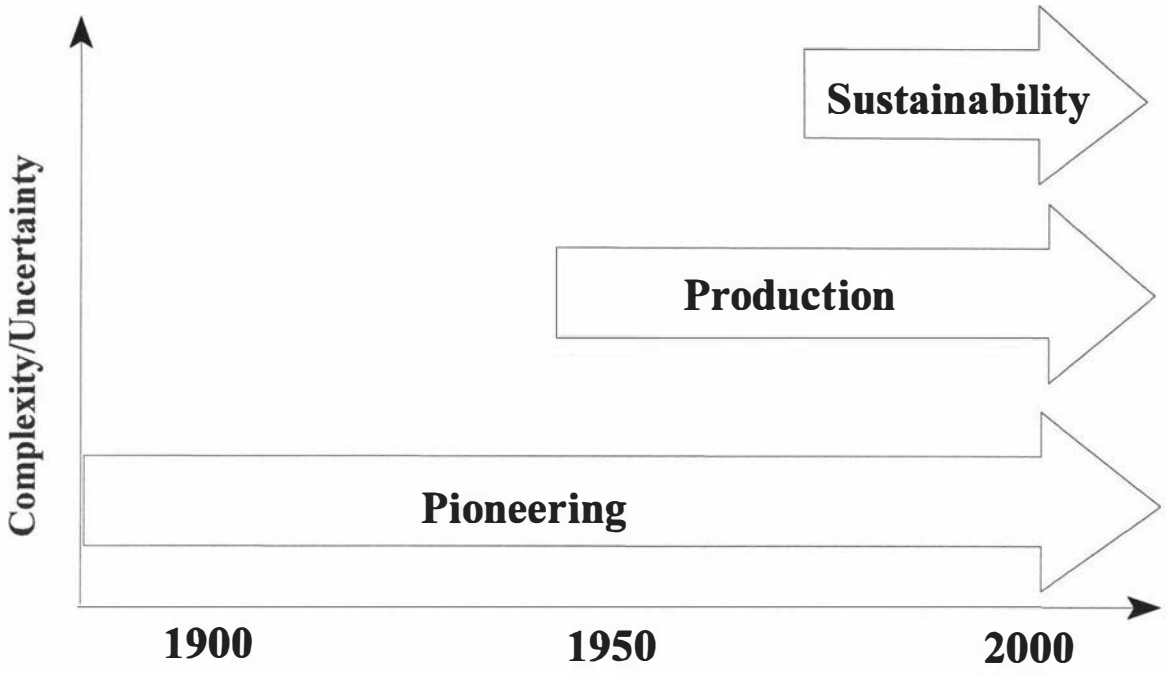

Figure 5.5 Changing eras of land use in the South Island high country of New Zealand (Adapted from Bawden 1987).

The eras of Pioneering and Production were characterised by an emphasis on components of farming and other resource management systems, rather than on the systems themselves. The concern was for "fixing up' the less effective parts, rather than inquiring into the nature of the relationships between the parts (Bawden 1987). Intuitively, of course, few people would deny that we live in a finite and interconnected world in which physical, biological, social and environmental phenomena are all evolving interdependently. As we no longer live in small, relatively autonomous land management units, however, we have little choice but to reduce it to smaller pieces which we can examine separately. Accordingly, our perspective and knowledge of the world is necessarily divided into different subjects (or disciplines), and these change as our knowledge changes.

However, because our education and science is based on this division into distinct subjects, it is easy to forget that these divisions are man-made and arbitrary. Indeed, as Checkland (1981a) observes, 'it is not nature which divides itself up into physics, biology, psychology, economics, sociology, etc., it is we who impose these divisions on nature. And these divisions become so ingrained in our thinking that, the power of reductionist science aside, it is not surprising that we find it hard to see the unity that underlies the divisions'.

And so in this current age of sustainability, even while we continue to become more and more technologically proficient, our ignorance about the nature of what we are doing becomes increasingly apparent. In the grassland component of the high country of New Zealand's South Island, science has provided much of the knowledge and technological advancement required to improve rangeland productivity. And in this, as Figure 5.6 clearly shows, it has been successful. Given knowledge and technology backed by public support in the form of incentives and subsidies, high country productivity measured by stock units/hectare increased significantly. However, in the age of sustainability the questions are different! Today we have farmers that publicly question whether they are farming "sustainably' .... and challenge science to define the land management practices that need to be implemented to be "sustainable'. And as we grapple with those challenges and what they mean, it appears we need new ways of looking at the world and integrating management and research.

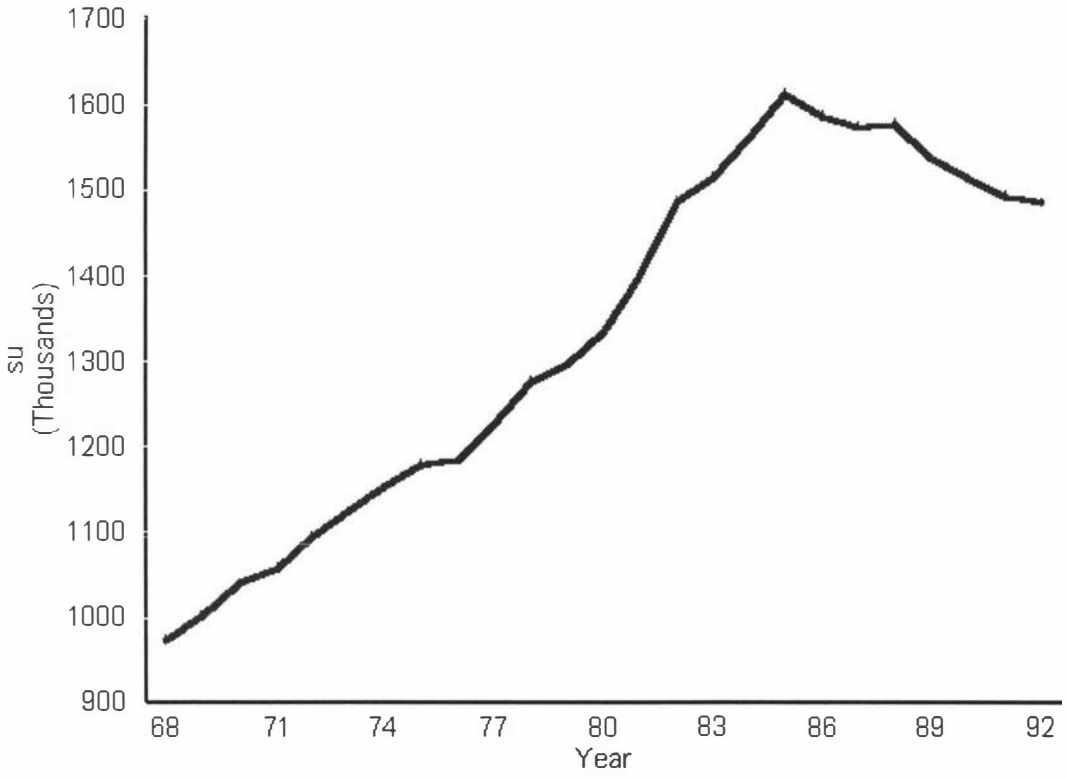

Figure 5.6 Stock unit changes on 187 high country leasehold properties between 1968 and 1992.

In general, taking a given system to be considered, we seem to have a good track record in improving performance - measured against narrow economic or productivity criteria. However,

when the questions are broadened to evaluate the health of relevant systems not only in terms of economics, but also in terms of ecology, ethics and equity — some glaring gaps in our knowledge and methodologies are exposed. In the age of sustainability we are concerned with the interface between natural and social environments. In turn, this requires us to deal with subjective debate and conflict because of the increase in complexity, uncertainty of purpose, and ambiguity in interpretation over the systems we are dealing with.

Integrated Systems for Knowledge Management (ISKM)

ISKM is an approach designed to support an ongoing process of constructive community dialogue and to provide practical resource management decision support for land managers and policy makers (Allen et al. 1995; Bosch et al. 1995a, 1996a). This framework is currently being used in the South Island high country of New Zealand to help communities (policy makers, land managers and other interest groups) share their experiences and observations to develop the knowledge needed to support sound resource management decision-making. Accordingly, it brings fragmented local and scientific knowledge systems together into a single, accessible focal point. Facilitated community dialogue processes are used to structure this knowledge and information providing decision support appropriate for different levels (e.g. site, catchment, region). This approach recognises that natural resource management is increasingly characterised by apparently conflicting social perspectives and emphasises processes to provide those involved with a better understanding of other points of view.

The focus of the ISKM framework (Figure 5.7) is to provide an organised set of principles (methodology) which will guide our actions as we go about "managing" real-world problem situations. It builds on principles of experiential learning and systems thinking, and is applicable to developing the knowledge and action needed to change real situations constructively. In practice, the process is cyclical and highly iterative with many steps likely to be carried out simultaneously. There are also numerous entry points. The framework can, however, be usefully viewed as having two distinct phases, as illustrated below:

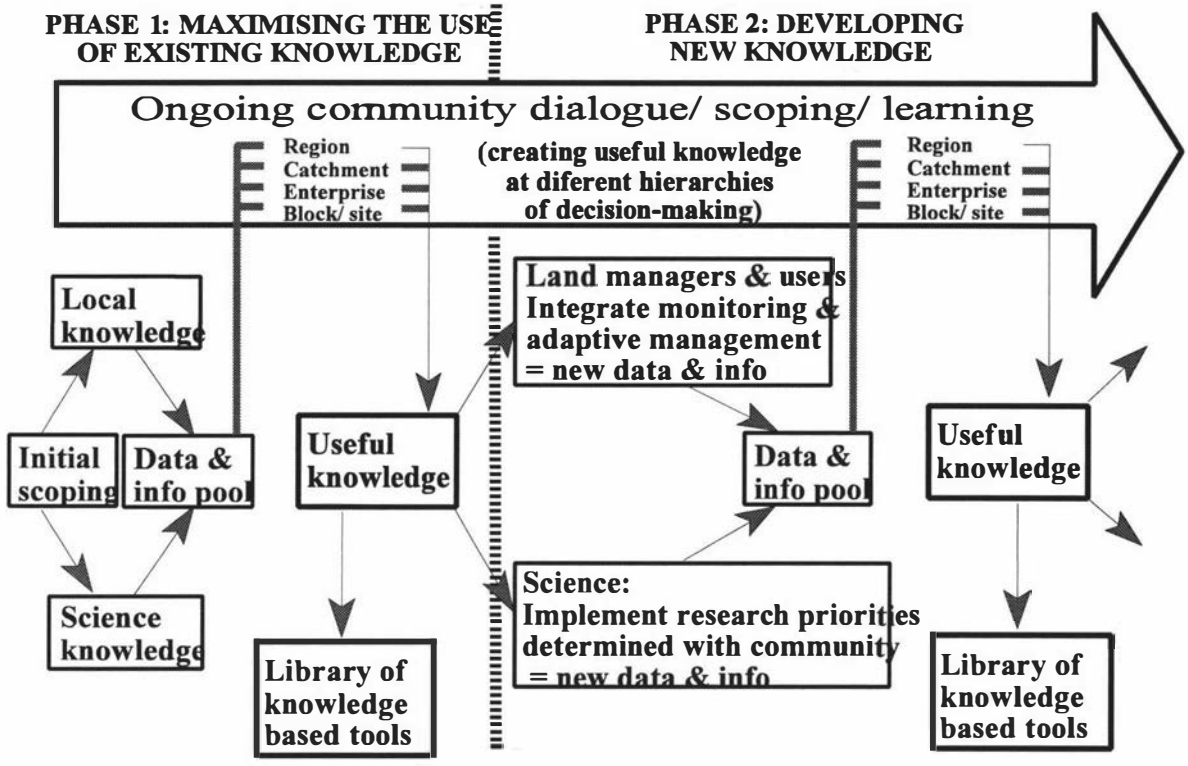

Figure 5.7 ISKM *(version 2)* - a participatory research framework to facilitate the identification and introduction of more sustainable land management practices (Source: Allen et al. 1995; Bosch et al. 1996a).

Maximising the use of existing knowledge through community dialogue

The first phase of the approach emphasises developing a common understanding of any perceived issue or problem. This entails an initial scoping process to define clearly the nature of the system under consideration, and the needs and opportunities facing the different interest groups that may be involved.

Because this involves all interested parties in the research process from the outset, it is more likely to lead to the development of opportunities and outcomes relevant to community needs. It provides a basis for the design of appropriate processes (interviews, focus groups, questionnaires, etc.) to unlock and access the relevant existing data and information from both local and research communities. This information is then brought together in a central data and information pool and structured to allow its sharing and evaluation by all those concerned.

Just as this process encourages those involved to set clear goals and objectives, so it provides a sound basis for the development of useful and user-friendly tools to enable land managers to monitor and interpret the outcomes of their management actions (Gibson et al. 1995). In turn, the process supports the successful implementation of relevant monitoring programmes as land managers become involved in the interlinked processes of monitoring and adaptive management.

Improving communication flows

Given the complexity and different social perceptions of many agricultural and environmental situations, the process actively supports improved communication flows among all those involved to develop the 'useful knowledge' needed to provide practical decision support.

Facilitated workshops provide a learning environment within which participants develop a shared understanding of how others see the world and how that shapes the way they act in it (e.g. manage their land, carry out their research, develop policy). Importantly, the process recognises the contextual nature of information. A strategy or goal suggested by a farmer, policy maker or environmental group will always have been derived from within a particular social, economic and ecological setting. Scientific results are similarly derived from a particular context, which will include factors such as scale, site and the researcher's personal worldview. Accordingly, the community dialogue process is designed to seek the active cooperation of participants in developing a common understanding of the context in which any individual piece of information becomes relevant.

Generating useful knowledge

The ongoing community dialogue is designed to produce useful knowledge to help all those involved in the process. It achieves this in a number of ways:

- It provides those who participated in the process with immediate access to new ideas and perspectives which may help them re-evaluate their current management or policy strategies. At the same time, it helps develop a shared understanding which can reduce the level of conflict that currently surrounds many resource management issues.

- It automatically aids the identification of new and relevant research initiatives as knowledge gaps are identified. Importantly, these activities also provide farmers, conservators, policy makers and others with the opportunity to provide researchers with a greater appreciation of their information and technical needs.

- It also provides the community with the resources necessary to develop a structured library of knowledge-based tools, providing support for monitoring, interpretation and management, that is relevant to the needs of decision-makers, and consequently more likely to gain their acceptance.

Developing new knowledge: an ongoing process

Importantly, the ISKM framework allows the substance and context of the required information flows to be updated as more knowledge becomes available, and different goals can be set. As land managers and policy makers adopt new strategies and measure the results of their actions (formally adopting the linked concepts of monitoring and adaptive management), they will continually gain new information that can be shared with scientists, policy makers and others. In a similar way the ongoing flow of new data and information from science activities can again be shared with decision-makers.

The process is thus iterative, with each repetition serving to maximise the knowledge available at any time to support decision-making by those in the community. The addition of different modules and issues will arise from the need to meet a community objective, which may be financial, ecological or social, or some combination of these. As those involved cooperate to develop the necessary knowledge and knowledge-based tools, new issues will be raised and the process expanded.

Learning the lessons

As this paper has argued, involving the community in participatory research is essential if sustainable land management issues are to be resolved in a constructive and cooperative manner. It is increasingly becoming recognised that the way we "see' the world, determines what we "do' to it (e.g. Maturana & Varela, 1972; Bawden et al. 1985; Ison, 1993a). If we are to develop a

cooperative approach then it is important for scientists, policy makers, land managers and other interest groups to share their experiences and so discover new ways of looking at the world. Against this background, ISKM represents an approach which attempts to provide the necessary learning environments enabling all those involved to develop a more holistic perspective of sustainable land management, within which they can best make their particular contribution.

In the South Island high country the ISKM framework was initially used to help the community find practical land management strategies to address the problem of an invasive weed, *Hieracium* spp.. But, using this approach to look at the problem from the point of view of management also highlights how ecological, social and economic issues are inexorably linked. No-one manages for *Hieracium* alone. For example, farmers are primarily concerned with managing for goals such as increased stock production or available forage supply, while conservators will place an emphasis on management to protect a particular species or threatened ecosystem. Both these groups will also be concerned with other issues such as watershed and landscape management. Accordingly, the ISKM process is now being used in the high country to address a number of related issues such as conservation, grazing management, burning and water quality.

As we bring different knowledge systems together through this process, it becomes clear that what you look for is what you get. As Chris Argyris (1985) and his colleagues point out, depending on the community in which they operate, each different interest group will look for different facts and solutions in accord with their own set of norms for inquiry.

For example, we find scientists concentrating on determining the effects of grazing on *Hieracium* (describing and accounting for somc phenomenon). In contrast, farmers ask more focussed questions such as the effects of different grazing regimes (rotational grazing vs set stocking, different grazing intensities and frequencies, etc.), and are concerned with applying the answers to real-life contexts "amidst all the complexity and multiple dilemmas of values they pose' (Argyris et al. 1985). In issues relating to conservation in the high country, conservators often place a high priority on protecting individual species - such as a rare lizard, while when farmers are asked to list conservation issues in order of importance it is unlikely that a lizard will even feature.

These examples show how better communication processes could help different groups in their quest for sustainable resource management, by: i) developing a shared understanding which would reduce unnecessary conflict, ii) generating useful ideas which are more likely to be adopted and applied, and iii) identifying relevant research opportunities.

Much of the apparent conflict surrounding many resource management issues relates to the fact that different interest groups fail to appreciate the perspectives and values inherent in the actions of others. If these groups can be encouraged to share their experiences and viewpoints there will be a greater understanding of why these differences exist. In the example provided above, it may be unlikely that farmers will ever regard a lizard as an important component of a farming system. However, through improved communication they will develop an appreciation of why conservators are concerned with a decrease in the population of this particular lizard. Equally important, the more active involvement of groups with different perspectives, such as farmers in a conservation issue, may well provide useful ideas and strategies that lie outside the normal perspective of those with the primary responsibility for managing any particular resource.

Collaboratively developing new management options and strategies in this way is one of the biggest advantages of participatory ventures. Participatory research provides all interested parties with the opportunity to learn from the experiences gained within enterprise and catchment-level systems. This provides all those involved with an appreciation of management concerns and issues, and allows groups such as scientists and policy makers a better feeling of how their contributions fit into the total system. The result of such cooperation automatically leads to the design of relevant research that will directly benefit both land managers and policy makers.

However, closer collaboration and better understanding of different perspectives can only be achieved if we take the time to develop a common language. For example, in developing management strategies to reduce or avoid *Hieracium* invasion it became clear that the amount of *Hieracium* currently present in any particular area is an important factor to be considered. The problem was that individual descriptions of *Hieracium* spread and abundance differed according to plant communities. Rephrasing this question to account for the 'stage of invasion' rather than "spread and abundance' provided all those involved with a common concept (language) applicable to *Hieracium* dynamics in most plant communities. In a similar way, the difficulties of describing the range and various states of plant communities that characterise the high country

was made possible by developing a series of simple 'pictures'. And, in turn, with a common language to look at issues such as *Hieracium*, grazing and conservation, it became apparent that vegetation dynamic processes throughout the high country are very similar. This has important implications for participatory approaches as farmers and scientists from different areas can now, with a common language, more easily share and build on their collective experiences.

Although co-operative ventures such as those described here may not yet offer definitive solutions to such elusive issues as sustainability, they can begin to offer a variety of knowledge-based tools and possible courses of action to enable the community to make better informed decisions. In turn, as communication flows between different sectors of the community are expanded and improved, the level of needless conflict surrounding a number of land management issues should be minimised. Accordingly, this participatory approach represents a framework through which different segments of society can cooperate to develop and work towards a more coordinated set of environmental goals.

Acknowledgements: The authors would like to acknowledge the support and funding that has been provided to this research programme by MAF Policy (NZ) and Manaaki Whenua - Landcare Research NZ. Research such as described here, is not possible without the support of the community, and we would like to record our appreciation for the efforts of all those in the HMP Steering committee and those in the high country farming community who have acted as our co-researchers.

CHAPTER 6

Evaluating multi-stakeholder research and development programmes

Time period in which main work on this issue carried out:											
Jul- 94	Jan- 95	Jul- 95	Jan- 96	Jul- 96	Jan- 97	Jul- 97	Jan- 98	Jul- 98	Jan- 99	Jul- 99	Jan- 00

Allen, W.J. (1997) Towards improving the role of evaluation within natural resource management R&D programmes: The case for 'learning by doing'. *Canadian Journal of Development Studies XVIII*, Special Issue: 625–638.

This chapter opens with a discussion of the need for new approaches to evaluation, particularly in programmes which involve a number of different interest groups. Some implications for science of these more participatory approaches are highlighted, particularly the need to be more questioning of hidden underlying assumptions. The ways in which society's perception of land use has evolved over recent years are offered as a catalyst for a new participatory approach to evaluation. Finally, the results of a participatory evaluation of the HMP are presented, to illustrate how formative and participatory evaluation can be used in the light of current issues facing both evaluators and natural resource managers. This shows the need to develop improved ways of evaluating such multi-stakeholder programmes to provide better shared understanding and agreement about goals.

> *Participatory monitoring and evaluation (PM&E) is a different approach which involves local people, development agencies, and policy makers deciding together how progress should be measured, and results acted upon. It can reveal valuable lessons and improve accountability. However, it is a challenging process for all concerned since it encourages people to examine their assumptions about what constitutes progress, and to face up to the contradictions and conflicts that can emerge.* (Guijt & Gaventa 1998).

The Hieracium Management Programme finished in June 1996. As indicated in the previous two chapters, this work resulted in the development of a participatory framework, Integrated Systems for Knowledge Management (ISKM), to guide and generate a more co-operative and adaptive

approach to tussock grassland management. Moreover, first working versions of the technical components to implement of this approach had been achieved through the development of a management information MIS module of *Hieracium* management (see http://tussocks.net.nz/hmp/) and vegetation condition assessment models which would enable farmers to become more formally involved in the linked processes of monitoring and adaptive management (see http://www.landcare.cri.nz/redis/).

However, despite these achievements, it was apparent that the different groups involved did not regard the HMP as a resounding success. From the point of view of those — including the researchers involved — who saw the programme as a basis for what would become 'an ongoing process for adaptive management' to collaboratively address tussock grassland issues such as those posed by *Hieracium*, it was clearly an unfinished exercise. Equally, a number of people did not place such an emphasis on process, but rather had been looking to the HMP to develop new (and preferably straightforward) 'answers' to the problem. Not surprisingly, given the programme goals of bringing together 'existing' knowledge, no such answers eventuated. Moreover, there was also an impression by others that the programme was not 'good science', lacking rigour in the traditional way that science is usually perceived.

Another issue that the completion of the HMP raised was that, although the programme had pointed to the need to use an ongoing process of monitoring and adaptive management to address high country problems, the programme ceased before such a process could be put in place. While the funders had only agreed to fund this programme for two years, there was nonetheless a feeling on the part of some in the community that science had 'let them down'.

This raised the question of how the programme should be evaluated. Nor is this just an isolated issue for the HMP, but rather is grounded in a wider context, which Lincoln (1992) refers to as 'trouble in the land':

> The debate is about serious questions such as: **primacy** — whose work will be considered the most valuable?; **legitimacy** — shall we allow the dissemination of work which is not standard, conventional scientific inquiry?; **research and evaluation funding** — will we agree that even non-mainstream or emergent-paradigm work ought to be funded as a way of adding to our knowledge-base?; about **publications and research outlets** — will we make certain that

unconventional inquiries are fairly reviewed? It is about who gets respect as a researcher and who does not. (Lincoln 1992 p. S6).

This debate is particularly important in the environmental, or natural resource, management areas as science programmes are increasingly being developed as collaborative approaches in conjunction with different stakeholders. In these programmes the concept of science is as Wadsworth (1998) points out, broadened from the conventional view of research which sees itself proceeding along a straight line — commencing with a hypothesis and proceeding to a conclusion, which may then be displayed in a model or published in a paper. This broadened view of science (Figure 6.1) will include a number of questions, such as those posed within action research inquiries, related to the development of the hypotheses themselves, and the subsequent implementation of the resulting 'new ideas' — otherwise they remain merely 'interesting ideas' or 'just academic'.

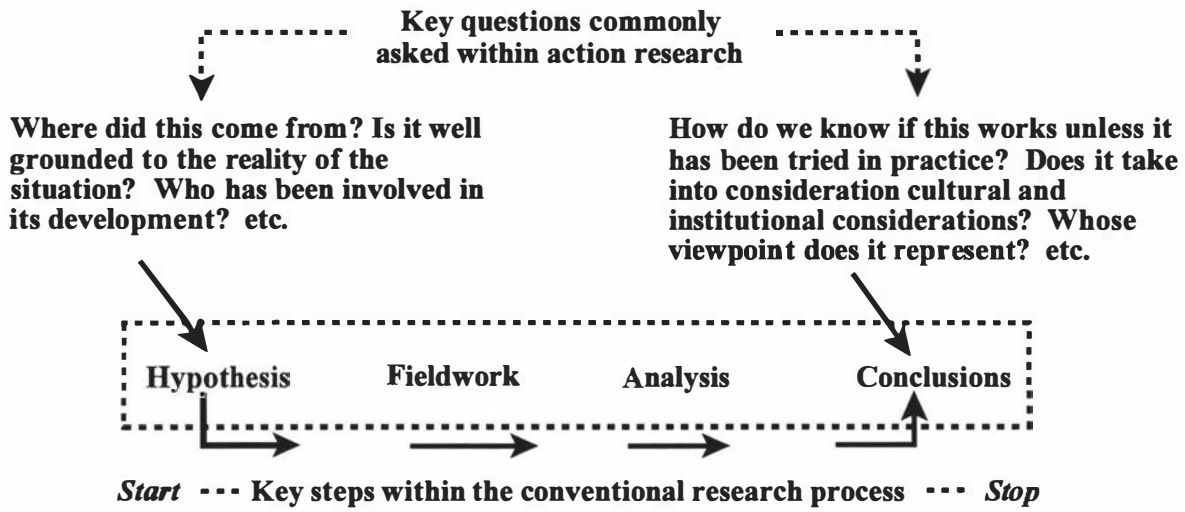

Figure 6.1 Steps within the wider research process showing complementarities between action and conventional research (Adapted from Wadsworth 1998).

Clearly, there are many scientists, and science programmes, who take a wide view of research. 'More and more, researchers and practitioners are sharing evaluation theories and methods that demystify the science of evaluation and follow collaborative problem solving and dispute resolution principles such as inclusion, cultural sensitivity, shared definitions, empowerment of the end user, etc.' (Ashton 1998). However, because what is portrayed here as the action research

component remains largely hidden in conventional research proposals and published conclusions, their application in design and practice can often be seen to be less rigorously reviewed than the design and practice of other research steps shown here. Accordingly, if science wishes to ensure the relevance and rigour of collaborative research initiatives within multi-stakeholder situations, then it needs also to overtly use evaluation approaches that ensure that programmes are looked at within this broader research context, and in a way that is transparent to all.

Moreover, evaluation processes have long been stand-alone components of many programmes, projects, or activities. Just as frequently, however, evaluation has been ignored or made an add-on at the end of a process (Ashton 1998). Partly this is because many projects can be seen to be well defined — at least from the funder's point of view — and the successful delivery of the output is, in itself, all the evaluation that is needed. This is certainly true of many science projects where the output is a delivered 'answer' provided in the form of a report or paper.

Another consideration for those concerned with evaluating such collaborative initiatives is to recognise that different stakeholders will have different reasons and expected outcomes from their involvement. Because the steps involved in such programmes are often funded and undertaken by different involved parties (e.g. scientists, agency staff, community or landholder groups), it is also important that each party can be helped to see how their contribution is meeting their own goals, as well as contributing to the overall aim.

This chapter paper represents the results of a Landcare Research-funded project in which I was responsible for identifying and implementing an evaluation model that could help resolve these issues in respect of the HMP. The paper highlights how, as the area of collaboration or participation matures, accountability is becoming increasingly important. The funding community, in particular, is asking for rich definitions of success and for valid assessment of it. At the same time action researchers, and others managing such processes, are seeking how to inform their project partners, the funding community and policy makers about the nature and long-term impact of their work.

The need for multi-stakeholder approaches in the area of environmental research and development is a recent event, and this is highlighted in relation to emerging eras of land management in the South Island high country over the past 50 years. These can be seen as

dealing with questions of production, productivity and sustainability, respectively. However, these issues are more complicated than they appear because each emerging perspective (or world view) complements rather than replaces its predecessors, making for increased complexity. Thus the increased use of multi-stakeholder approaches that facilitate the wide involvement of people in problem solving and decision making with respect to issues and plans that involve or affect them is a natural progression for societal inquiry.

The suitability of action research for the evaluation of such approaches is discussed in the paper. The iterative cycle of planning, reflection and subsequent action inherent in these approaches is seen as a major benefit. It is also suited in the sense of strengthening relationships as it is one more area within which different parties are brought together to gain a shared understanding, problem solve and reach agreements on new directions for long-term gains and intervention impacts. It can help different groups to articulate their needs and goals, as well as provide a forum for surfacing differences and seeking common ground. Action research is, most essentially, 'a systematic process by which goals are interactively and integratively determined and articulated from within the context of that to be evaluated' (Rothman 1998).

In the sense that action research is an iterative process it does not only have to be used for providing an end-of-project analysis of success or failure; rather its strength is that it can be used to allow the different parties involved to set benchmarks along the way to measure short-term outcomes, to learn from surprises and make use of them at opportune times. In addition, while maintaining a normative involvement in social change, action research is also designed to simultaneously learn from its own practice and provide improved models which can be used in other situations.

As a practitioner then, the action researcher 'becomes another third-party intervener whose specialty is helping the different parties frame realistic goals, measure progress towards operationalising them, recognise when a change of strategy may be required, and extract insights from their hard labours' (Ashton 1998). In these cases the action researcher does not have the answers, but raises the important questions that can help people look at their activities in a different way and broaden their opportunities to develop improved approaches for issues such as environmental management.

Towards improving the role of evaluation within natural resource management R&D programmes: the case for 'learning by doing'

Allen, W.J. (Landcare Research)

Abstract: The increasing use of participatory development approaches in recent years pose new challenges for decision-makers and evaluators. Because these programmes are designed to be responsive to changing community needs, one of the most pressing challenges is to develop participatory and systems-based evaluative processes to allow for ongoing learning, correction, and adjustment by all parties concerned. This paper outlines one such evaluation process, and uses a case study in New Zealand to illustrate its benefits in the light of current issues facing both evaluators and natural resource managers.

Introduction

The past decade has witnessed dramatic changes in the role that the public may play in decisions relating to natural resource management. There is now widespread recognition, in name at least, that participatory development is critical for achieving sound resource management. However, this kind of development requires a more flexible and evolving process to planning for change, and poses new challenges for decision-makers and evaluators alike. As Narayan (1993) notes, this requires major institutional reorientation at the policy level to ensure responsiveness to local demand, and to empower and enable communities to act. At the programme level, it means detailed outlines for action can no longer be drawn up at the outset since problem-solving is based on partnerships and cooperation, and not the quest to achieve some externally identified goal. Inevitably, the reality is that whatever aims are finally chosen, implementing the solutions to reach them will involve a long process of difficult dealings with a great variety of individuals, groups, and institutions who can make them fail or succeed (Mermet 1991).

One of the greatest challenges is to build mechanisms into this process to allow for learning, correction, and adjustment by all parties concerned. To do this will require the development of clear sets of objectives and indicators of success which promote accountability and participation, and which can be monitored and evaluated by the relevant decision-makers at all levels. This is

the role of evaluation outlined by Cronbach et al. (1981), which holds that evaluation needs to improve the welfare of society by contributing to the political (decision-making) processes that shape social actions. In this regard an evaluation is no different to any other monitoring programme. It will pay off only to the extent that it collects the results of past actions, interprets them to provide ideas pertinent to decision-making, and enables people to think more clearly about their actions as a result (Bosch et al. 1996c). In particular, as Cronbach et al. (1981) point out, there is a need for evaluation processes that break away from concern with specific programmes, agencies, or communities to consider a social problem as a whole and the multiple lines of attack on it. This is especially true in the area of natural resource management, where resource managers must strive not only to align different perspectives, but also to engender an attitude which will support the social and institutional reform required to help communities identify and adopt sound management practices.

Against this background, this paper will use a case study to examine how the role of participatory and systems-based evaluation processes can be used to help society address the above concerns, and guide different interest groups to work more cooperatively to achieve a common set of resource goals. The Hieracium Management Programme (HMP) was initiated to address the problem of an invasive weed (*Hieracium* spp.) in the South Island mountain lands (high country) of New Zealand. However, as with many resource management issues, the apparent 'problem' is often most usefully viewed as a visible symptom of a 'problematic situation'. Accordingly, the programme objectives were not focussed on *Hieracium* as such, but rather *Hieracium* was treated as just one component of the wider, more complex difficulties facing those concerned with sustainable land management. The HMP set out to address this using the Integrated Systems for Knowledge Management (ISKM) participatory research approach, to facilitate the implementation of monitoring and adaptive management processes at different levels of decision-making throughout the region (Allen & Bosch 1996; Bosch et al. 1996a&b; Allen et al., 1998b[2]). Over the past three years, the HMP has involved the active participation of a number of interest groups including farming groups, local government, scientists from different disciplines and institutes, and a range of central government funding bodies.

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[2] In press at time of this publication

Because evaluation is basically an idealised problem-solving process that we use to learn about our world so we can take more informed actions (Shadish et al. 1991), this paper will begin by introducing the reader to the problem situation in which the HMP is sited. Then to provide the context for the current challenges facing evaluation, the changing ways in which society has structured its agricultural 'problems' over the past 50 years will be briefly reviewed. Within this context an example of a participatory and systems-based evaluation process which can help address these challenges, the Snyder Evaluation Model (Dick 1997), will be introduced. The paper will conclude by illustrating the use of this model in practice, and using the results to highlight a number of issues pertinent to the evaluation of natural resource management programmes today.

Changing problem contexts for evaluation

It is particularly appropriate to use an agricultural example to highlight issues in natural resource management, because as Dahlberg (1979) points out, agriculture represents the basic interface between people and their environment. From this perspective, the grasslands of the South Island high country present a number of advantages for those concerned with the improvement (or evaluation) of research and development (R&D) programmes. The high country comprises a microcosm of the major resource management issues surrounding extensively grazed ecosystems worldwide. Today, there is a pragmatic recognition of the worldwide trend towards a more holistic, multi-use, multi-value view of such extensively grazed grasslands. Grazing has increasingly become a variable component or even been abandoned in some areas, a change that highlights the diverse values that these grasslands are now expected to serve. In New Zealand these not only encompass traditional pastoral considerations but extend to national aspirations concerning issues such as indigenous Maori land rights, preservation of biodiversity and natural landscapes, sustainable management, tourism, and recreation.

Moreover, the economic and ecological sustainability of at least one-third of this region has been questioned by a recent governmental review. Concerns included land degradation, weeds (particularly *Hieracium* spp. — an introduced forb), pests (particularly rabbits) and the ability of farmers to manage for market and climatic variability (Martin 1994). In terms of issues relating to achieving sustainable resource management, the South Island high country not only encompasses a wide range of contrasting situations, but also is increasingly characterised by

conflicts over resource use between different interest groups. In addition, even as changing social and economic policies continue to shape resource development opportunities, the move away from centralised planning by government is increasingly requiring communities to deal with their own social, economic, and environmental needs on a regional basis.

At first glance, the aim of introducing an active adaptive management ethic into a rural region with the help of a programme such as the HMP may sound overly ambitious. However, while changing the value system which underlies land use practices and management may appear a daunting task, we should remember that it is something that happens quite regularly in response to different societal concerns and aspirations. Indeed, so marked are these changes in many rural areas that it seems reasonable to suggest that there have been a number of different eras of land management. Each is dominated by a different popular perception of land use, and thus the way people go about practising it (Bawden 1991). These different eras are outlined in Table 6.1 as they relate to the South Island high country over the past 50 years. Of course, the way that we have generated the knowledge to address emerging agricultural problems has always been changing in a similar way, leading to new institutional approaches which are characterised by fields of enquiry which differ from those of earlier times (Rhoades 1989). However, as Bawden points out, these issues are more complicated than they appear because each emerging perspective (or world view) complements rather than replaces its predecessors, making for increased complexity. This is how learning, which embraces new assumptions about the way we know, as well as explicit new world views about how our environment could and should be treated, can lead to development being construed as proceeding in discontinuous 'spurts' or 'waves' (Bawden 1991).

Table 6.1 Changing eras of land management and emerging fields of enquiry in agricultural research and development in the South Island high country (Ian Valentine, pers comm.).

Era of land management	Context	Participants	Focus of institutional R&D efforts	Range of institutional problem-solving methodologies
Production	Maximising available resource use	Farmers and scientists	Improving components	Reductionist science
Productivity	Resource limitation: increasing efficiency of resource use	Farmers and scientists	Whole farm	Reductionist science + Hard systems
Sustainability	Resource conservation	Farmers, scientists and an increasing range of public interest groups	Regional resource allocation and use	Reductionist science + Hard systems + Soft systems

Since early European settlement in the mid 1800s, extensive pastoralism has been the predominant land use in the high country. During the early years farming was in an establishment phase, with the farm focus very much on survival. However, following World War II a combination of good market conditions accompanied by the development and uptake of new technologies — aerial topdressing, trace elements, inoculated seed, etc. — ushered in a new era of production. In response to rising costs and declining terms of trade from the late 1960s, farmers increasingly looked to efficiency as well as production effectiveness. The success of land management efforts was judged almost solely in terms of simple production and economic measures, and not just by farmers. Indeed, during the late 1970s and early 1980s farmers were actively encouraged to take advantage of production technology by considerable public support in the form of incentives and subsidies.

In response to the production-oriented questions of the 1950s and 1960s, agricultural R&D efforts were based around the use of reductionist methodologies — particularly applied science — to 'fix' or improve components of farming and related resource management systems. However, as the base land resource became a limiting factor in the productivity era, researchers began to pay increasing attention to the 'whole farm' as an integrated production unit. This, in turn, led to the adoption of systems-based methodologies aimed at optimising the financial returns of each unit of production. Unfortunately, as Ison and Ampt (1992) observe, despite the growing recognition of the increasing complexity and social construction of agricultural problems in later years, there have been few recent innovations in research methodology other

than the development of quantitative modelling and an increased focus on the development of expert systems.

However, in the emerging era of sustainability the questions are different. Beginning with the publication of books such as *Silent Spring* (Carson 1962) we have become more concerned with the relationships between things. Public interest groups are no longer content to evaluate rural systems such as the high country merely in terms of economics and production, but are increasingly looking towards measures of ecological health, environmental ethics, and equity. Today there are a range of public pressure groups that increasingly voice their concerns about issues such as the effect that agricultural practices are having on the environment, or conflicting land uses. We also have farmers who publicly question whether they are farming 'sustainably' .... and challenge science to define the land management practices that need to be implemented to be 'sustainable'. However, one only has to consider simple questions — sustain what? how? for whom? over what time period? — to appreciate that sustainability can never be precisely defined. And as we grapple with those challenges and what they mean, we appears to need new ways of looking at the world and integrating management and research.

More recently attention has shifted towards the use of action learning and action research to go beyond what have been predominantly hard system approaches (Bawden et al. 1984; Scoones and Thompson 1994). These soft system approaches explicitly recognise that natural resource management in the age of sustainability is not characterised so much by problems for which an answer must be found, but rather issues which need to be resolved and will inevitably require one or more of the parties to change their views (Bawden et al., 1984).

However, in the main, the application of these learning-based participatory approaches within agriculture still fail to grasp the nature of the rapidly evolving social forces that are driving rural systems today. There are very few references in the agricultural R&D literature to participatory projects other than those which involve farmers and scientists dealing with agricultural management issues. Yet as communities and agriculture change, the juxtaposition of farming and other rural activities has become a battleground over water and related nutrient management issues, as well as other community impacts of changing land use (Abdalla & Kelsey 1996). Only a decade ago, those working in the New Zealand high country were at least confident in the knowledge that they were dealing with what everyone knew was a largely extensive pastoral

system. Today, whether the high country should be regarded as an agricultural, tourism, or conservation system, or some combination of all these, is increasingly problematic and contentious.

In response to these issues we are beginning to see the increased use of multi-stakeholder processes that facilitate the wide involvement of people in problem solving and decision making with respect to issues and plans that involve or impact on them. This multi-stakeholder approach recognises that natural resource management is increasingly characterised by apparently conflicting social perspectives, and emphasises processes to provide those involved with a better understanding of other points of view. It also appreciates that decisions related to sound land use will be dependent on the coordinated actions of many land managers and agencies, who in turn must act within the confines of a wider regulatory framework imposed by the community at large.

Participatory and systems-based evaluation

Clearly the multi-stakeholder perspective challenges the common perception of what a 'programme' is. This perspective clearly recognises that each group of participants has its own viewpoint on the issue, and its own reasons for becoming involved in the project. As Schwedersky and Karkoschka (1994) point out, it is traditional to observe programmes within an operational cycle, from planning via implementation through to evaluation. However, to take into account the various perspectives and interests of the participants, it is necessary to look beyond this cycle. Inevitably, 'the programme' can be regarded as a number of sub-projects, each of which is 'steered' by a different group of participants in accordance with their values and aspirations. In the real world, 'co-operation' is a far more realistic goal than 'consensus' (Macadam, pers. com.). It is unlikely that groups with different interests, objectives, and values will work as members of a larger 'community' team. But with the help of appropriate participatory and systems-based processes it may be possible to help meet the different needs of those involved and develop 'win-win' strategies.

Of course, many of the participatory processes that are in use in the development field are inherently evaluative. This is particularly true for all those processes that have built on principles of action research and learning — with its iterative cycle of planning, reflection and action.

However, if we are serious about guiding different interest groups to work more cooperatively towards a common set of environmental goals, then we also need processes that are explicitly systems-based. Systems thinking provides a framework for how information can be arranged and understanding developed. Rather than emphasising discrete elements and properties (e.g. roles and values), systems thinking emphasises relationships and context. These properties are ideally suited to multi-stakeholder situations where the aim is to help participants see how different activities and relations of cooperation between different parties fit together within a wider social programme.

The Snyder Evaluation Model

The Snyder Evaluation Model is one such evaluation process which can be regarded as systems-based and participatory. This model lends itself to involving participants as co-evaluators through a three-stage process of evaluation: process, outcome, and short-cycle. Each of the three evaluation forms draw upon a systems model of how a project operates (Figure 6.2). Resources are consumed by activities which produce both intended and unintended immediate effects in the pursuit of ideals and objectives, which in turn are intended to contribute to some vision of a better world.

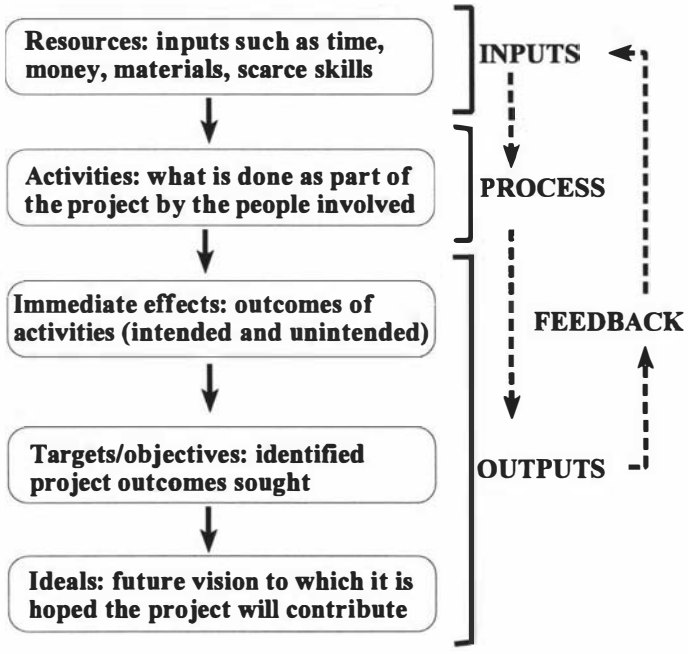

Figure 6.2 The Snyder Evaluation Model, showing how the different elements of a project can be seen within a general systems model.

As Dick (1997) points out, each process provides a different form of evaluation, and each builds on the understanding and insights gained during earlier stages. The activities involved in each of these processes has been summarised by Dick (1997) as follows.

> The *process evaluation* enables the evaluator and the stakeholders to develop a better understanding of the functioning of the programme. In particular, it allows the stakeholders to understand the links between resource use, programme activities, the intended and unintended immediate effects of those activities, the predetermined objectives which are pursued, and the contribution of the programme to some overall and long-term vision.
>
> The *outcome evaluation* enables the participants to apply the understanding which they develop in the process evaluation to assess which of their goals are being achieved, and how well this is being done. It also allows the development of performance indicators which can be used to set up ongoing feedback and monitoring.
>
> The *short cycle* evaluation, in turn, uses the understanding and the performance indicators gained in the two earlier phases to set up the feedback loops which can be used to enable a programme to become self-improving.

Process evaluation

The HMP provides a good example of how contemporary programmes in resource management are increasingly going to involve different interest groups and agencies working in cooperation. In order to achieve this they must have a common vision to work towards. Accordingly, the evaluation began by asking participants to generate the ideals that the programme could be expected to lead towards if it were 'spectacularly' successful. Through this exercise a list of ideals was developed and prioritised by the group. The most important of these were established community processes to help learning, accredited total quality management (TQM) farming systems, improved information flows to help decision-making, enabling legislation and, as a direct result of these, positive physical indicators of improved management. Although these ideals can be described as broad or vague — there was no mention, for example, of *Hieracium* - this in itself is the key to building political accommodation in such a way that different interest

groups such as farmers, environmentalists, and local government can agree to work cooperatively. It also acts to ensure that the focus is not on a particular problem to be solved, rather it encourages participants to think about a problem situation to be improved, thereby broadening the range of solutions that may subsequently be suggested.

In a similar way the remaining programme elements were defined through the use of mind maps (e.g., the mind map developed for targets is shown in Figure 6.3), and the links between the elements are then compared and adjusted. Targets, activities, effects and resources are, of course, much more tangible than ideals, relating as they do to already defined actions. Accordingly, these elements mainly related to the shorter-term programme aim of helping address the specific issue of *Hieracium* - within its ecological setting in the tussock grasslands.

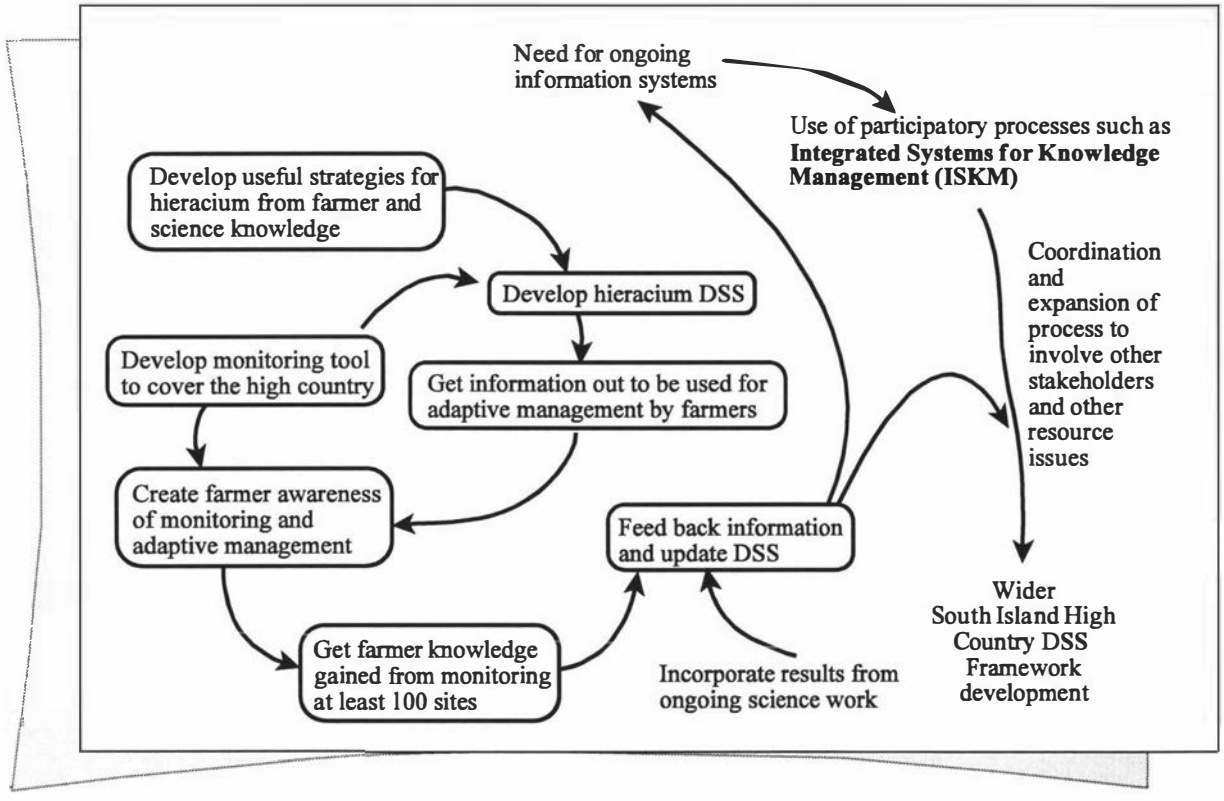

Figure 6.3 Edited version of HMP objectives mind map generated by participants during the use of the Snyder Evaluation Model.

One of the main strengths of the process lies in simply defining the different elements involved in the programme (targets, activities, and resources), providing all those present with a good overview of what all the different groups involved in the programme were doing, and how all

these activities could be linked to work towards a common set of ideals. A further useful exercise, particularly when the evaluation is carried out with a diverse group, is to involve participants in describing related activities and targets that they are involved in even though these can often be regarded as separate from the programme under evaluation.

Developing the immediate effects is another particularly insightful activity, within this particular evaluation leading to useful discussion on a number of issues that relate to the use of participative processes in general. These included the positive benefits achieved by legitimising farmer knowledge, and the problems caused by the high expectations that surrounded the launch of the project within the community. It also highlighted issues that have arisen because some interest groups were not involved in the programme early enough, and the problems that 'soft' systems participatory processes pose to funders seeking to evaluate them from within the more traditional 'hard' systems perspective. Importantly, it provides an ideal opportunity for the facilitator to challenge participants with apparent inconsistencies between what people say they do, and their behaviour in practice. These activities, in turn, act to enhance the learning potential of the evaluation (Argyris 1985).

The examination of the links between elements lies at the heart of this section of the evaluation. In this case the exercise led to a number of discussions to potentially improve the manner in which some activities are carried out, and identified new activities that need to be initiated. However, it also highlighted two major problems which face programmes looking to initiate and 'institutionalise' an adaptive management or learning culture within the community - funding and coordination. In general, there appears to be a trend among institutions to provide 'seeding' money for community-based projects, which is often justified by the belief that once the benefits become apparent, those in the community who benefit will ensure the funds to maintain the initiative. Unfortunately, in regard to natural resource management, the very issue of how costs and benefits are shared between individuals and the wider community remains contentious. In addition, there are few guidelines when it comes to creating an appropriate institutional framework that promotes the coordination of management activities undertaken by many loosely connected, but interdependent groupings and agencies (McLain & Lee 1996). These issues are highlighted in Figure 6.3 where none of the ongoing HMP activities (those within boxes) have funding beyond the next twelve months, and the activities relating to the coordination and expansion of the process are conspicuously absent.

Nonetheless, as Dick (1997) points out, by the completion of the process evaluation, stakeholders should understand the links between adjoining elements. And in this regard the evaluation that participants did of the evaluation process itself bore this out. Replies to questions relating to the usefulness of the session specifically endorsed the process, particularly in relation to the understanding they had gained of how things fitted together, and surprise that everyone was in agreement with the same set of ideals. As one participant said of the day, it provided 'the opportunity to all be reading from the same sheet of music'. In contrast, questions relating to the least successful aspect of the day drew no criticisms of the evaluation process, but rather attracted responses to the various negative aspects of the programme mentioned above.

Outcome evaluation

If we are serious about community-based, adaptive management approaches we will require clear sets of indicators of success which promote accountability and cooperation, and which can be monitored and evaluated. As Narayan (1993) points out, the key questions managers face are what should be monitored and evaluated, and what processes should be utilised. This is particularly true in relation to participatory initiatives which are in danger of being seen in an adverse light by policy makers and funders as 'vague'. The prevalence of this perspective was both highlighted in the HMP evaluation discussed here, and is also being observed by other researchers (Anyanwu 1988). There are a number of reasons for this, not the least of which is the open-ended approach to problem-solving inherent in participatory processes which does not sit well with conventional institutional planning processes.

During this evaluation the different parties involved appeared reluctant to develop relevant and rigorous measures of the outcomes of their own activities. In this regard, it must be acknowledged that given the current funding available to the HMP, it is hardly surprising that summative evaluation activities are not high on the agendas of those involved. Rather, given the committment from the parties involved for the continuation of the programme, much of the subsequent discussion built on the insights gained during the process evaluation phase to develop alternative funding options. Nonetheless, as other researchers have pointed out, this reluctance for rigorous summative evaluation is a common occurrence, and does pose a major challenge for evaluators. Indeed, Sechrest and Figueredo (1993) observe that it is probably not in the nature of organisations and systems to seek summative evaluations of their own activities; 'The results of

summative evaluation and even the rationale for doing it at all call into question the very reason for the existence of the organisations involved.'

Yet we must remember that even within community-based approaches funders and policy-makers remain accountable for their actions. Moreover, communities and individuals tend to take on more responsibility within community development approaches for implementing their own solutions, and if they want to be taken seriously must also demonstrate their accountability. Clearly, this will happen only to the extent that the results of their actions can be measured and communicated to others.

Related to this issue of accountability is the controversy over the respective merits of quantitative and qualitative approaches to evaluation (Sechrest & Figueredo 1993). Certainly, as these researchers observe, there has been a marked increase in the use of qualitative evaluation over recent years. However, as the participants in the HMP evaluation pointed out, in the end such processes must strive to demonstrate measureable improvements in the situation. Accordingly, this step of the evaluation emphasises the use of both qualitative and quantitative indicators to reinforce each other and increase both the rigour and the relevance of the evaluation. The key to this lies in developing packages of indicators to measure progress towards any particular ideal (Cronbach et al. 1981; Dick 1997). As Cronbach et al. (1981) point out, when just one indicator is used for an important outcome, the critic can plausably ask, 'would a different measure tell the same story?'.

Conclusion: towards a self-improving programme

As the participants in this evaluation are acutely aware, there can never be a final solution to natural resource problems. Evolving ecological and socio-economic systems will continue to require changes in action plans and long-term goals, requiring more than one-off evaluations. This can be well catered for by the use of the third, or short cycle, stage of the Snyder Evaluation Model which uses the indicators developed during the outcome evaluation, or some of them, as feedback on an ongoing basis. This builds ongoing evaluation into the programme's very operation, and ensures that feedback is provided to the people most able to make use of it for system improvement. Because sustainability issues need to be addressed simultaneously at a

number of different levels of decision-making (Allen et al. 1998b[3]), the evaluation model also provides a means to ensure indicator packages are relevant to different system hierarchies from block/field goals through individual enterprise objectives to catchment/community goals.

This is particularly important in the area of natural resource management where the impact of policies depends in good part on the performance or reaction of people not under the direct control of any one policy maker. Timely communications are likely to be of more help to decision makers than 'final' ones (Cronbach et al. 1981). Proposals for actions are reshaped as experience is gained, and as more participants become concerned about a particular issue, cost, or benefit. In this sense, all social development activities must be seen primarily as experiments, and dealt with as complex and uncertain ventures in which the participation of those who are expected to benefit is essential (Rondinelli 1983).

Because of this, participatory development takes time, and relies on the quantity and quality of the feedback and learning developed. As Sechrest and Figueredo (1993) point out, this requires the use of, and commitment to, an iterative model of testing, feedback and revision. The example they cite required ten years of continuing commitment and support from the funding agency, and a matching commitment from the investigators.

> The essence of Tharp and Gallimore's (1979) evaluation succession model is that one learns from one's mistakes. They started off their first year with what they thought was a reasonably good reading programme. However, when that programme proved unsuccessful they did not set about finding another programme to test. They asked themselves why what seemed like a good idea did not work at all, and they also asked other people (teachers, parents, even children). Then they built that feedback into the activities of the second year of the programme, etc. .... Few agencies, certainly not those of government, are likely to be in a position to make that kind of long term commitment, and few investigators would be able and willing to stick with the same project for 10 years — especially over the first several discouraging years. (Sechrest & Figueredo, 1993).

Still, if we are going to develop programmes and approaches that are truly effective in our society, we must get beyond the notion of a quick fix, particularly when the expressed issue is

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[3] In press at time of this publication

likely to be merely a symptom of a larger underlying issue resulting from social change. This hidden nature of underlying social issues, and the myriad issues that arise as symptoms, makes it necessary for the would-be natural resource manager to help communities understand the interlinked nature of many apparent resource issues, and help them apply technical information in a larger context of shared understanding. In this context, sustainability becomes a measure of the relationship between the community as learners and their environment, rather than some externally designed goal to be achieved (Sriskandarajah & Digman 1992). Participatory and systems-based evaluation models, such as the one described in this paper, can play a key role in this process by creating an effective learning environment for those involved.

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CHAPTER 7

Addressing conflict in multi-stakeholder situations

Time period in which main work on this issue carried out:											
Jul- 94	Jan- 95	Jul- 95	Jan- 96	Jul- 96	Jan- 97	Jul- 97	Jan- 98	Jul- 98	Jan- 99	Jul- 99	Jan- 00

Allen, W., Brown, K., Gloag, T., Morris, J., Simpson, K., Thomas, J. & Young, R. (1998). Building partnerships for conservation in the Waitaki/Mackenzie basins. Unpublished Landcare Research Contract Report LC9899/033, Lincoln, New Zealand.

The importance of conflict as a condition for learning is discussed, as are some of the challenges posed for action researchers as they manage processes which are conflict-laden. Involving the right groups from the beginning is suggested as an important step in multi-stakeholder projects wishing to minimise conflict. An example is provided of an actual conflict management exercise involving a rare wading bird (black stilt), a conservation agency and farmers. The suggested approach differs from the more conventional approach to conflict where the aim is to "solve' the problem; here it was to initiate a process which would facilitate ongoing communication and begin to build trust between the two parties as part of an ongoing process to help them manage adjoining land and local wildlife. The accompanying chapter report documents the approach and outcomes from this exercise.

One of the most reliable indicators of a team that is continually learning is the visible conflict of ideas. In great teams conflict becomes productive. There may, and often will be, conflict around the vision ... the essence of the 'visioning' process lies in the gradual emergence of a shared vision from different personal visions. Even when people share a common vision, they may have many different ideas about how to achieve that vision ... The free flow of conflicting ideas is critical for creative thinking, for discovering new solutions ... Conflict becomes, in effect, part of the ongoing dialogue. (Senge 1990b p. 249)

The 'conflict of ideas' which Senge refers to in the above quote involves the clash among personal visions. Instead of an organisational team we could as easily substitute a group of stakeholders who have come together to address their goals, values and strategies in respect of a common perceived environmental issue. In Senge's view conflict is not seen as an obstacle to collaborative learning, but rather as a means through which learning occurs. In fact, conflict is essential for creativity and problem solving. In particular, the successful development of double-loop learning as outlined as a desired outcome for environmental action research (see Chapter 3) represents a form of conflict management in which different stakeholders are helped to inquire into the reasoning behind the positions they take, and the meaning of these positions for them.

Thus 'conflict is like a soup which must be kept boiling if it is to cook, but cannot be allowed to boil over' (Rothman & Friedman n.d.). From this perspective the role of the action researcher is to control conflict, and those in conflict — sometimes reducing or resolving it, but sometimes even stimulating it. However, 'when conflict is not well managed it may result in negative consequences such as polarisation of views, breakdown in working relationships, and irrational or violent behaviour' (Orlando 1993 p. 368).

Although Chapters 4 and 5 referred to the use of ISKM to help 'communities' share their experiences and observations to develop the knowledge needed to support sound resource-management decision making, the HMP project through which it was developed involved mainly farmers and scientists. Indeed, as Allen and Kilvington (1999) note, science staff in most, if not all, previous high country research initiatives have tended to work separately with Department of Conservation (DOC) staff and local farming families, or solely with one or other group. In part this is a tactic to avoid dealing with possible conflict. However, the need for emerging research initiatives to involve different stakeholders, and manage conflict, is well illustrated in the tussock grasslands of the South Island high country in which this programme was set.

> As these two groups collectively manage all the tussock grasslands in this area, and as one of the main land-use debates revolves around determining trade-offs and synergies between conservation and pastoralism, there is little doubt that both groups would have been better served by science had they been provided with more well-facilitated opportunities to come together and discuss the implications of emerging research findings. (Allen & Kilvington 1999).

This is consistent with our own experiences through the HMP. It is easy to argue that there was little need to involve DOC staff in the project. It was after all funded by the Ministry of Agriculture and Fisheries with the aim of bringing farmer knowledge into the research process. However, the need — and the desire — to involve DOC in the process was often discussed by the program staff and steering committee members; but during these discussions the conflict that would be caused by bringing these two groups together was always seen as a barrier. It was generally agreed that although the concept was good, more would be gained by making a start with farmers otherwise we would spend all our time arguing and get nothing done.

However, the dangers of not involving relevant groups from the beginning, and the need to deal with conflict was well illustrated as the HMP finished, and the next significant phase of developing the ISKM process was continued in the high country with funding from .... the Department of Conservation (DOC)! During 1996 DOC Head Office staff became interested in the ISKM approach to sharing information and adaptive management. Landcare Research was subsequently contracted to develop an Internet-based Conservation Information System for the Tussock Grasslands (for use by local DOC conservancies), of which *Hieracium* could be seen as one module within this larger system (Allen et al. 1998c).

Clearly the first step in developing any such system (particularly under a participatory approach) is to visit the actual people on-the-ground that will be using the system and gain an understanding of their needs. However, the reception we got when we visited one Conservancy Office was frosty, to say the least. As became clear, this was a direct result of the fact that as a research group we were known to have worked almost exclusively with farmers (through the HMP and related MAF-funded research) for the previous two years. Accordingly, we were regarded as being 'farmer-oriented' not 'conservation oriented'. It was also, in part, a reaction to a project being funded and called for by Head Office without any consultation with the staff that were to use it. These are good lessons to take into account in the design of future collaborative initiatives. (See also Chapter 8 for a more detailed discussion of the role of this DOC-funded initiative to the overall case study.)

In hindsight this was my first real experience with a conflict situation in relation to my own research work. Although over the next few months our relationship with the Conservancy staff

was to improve as we were prepared to listen, and demonstrated a desire to develop a system that met their needs, it raised the issue of needing to be overt in dealing with conflict — and for these skills to be important in multi-stakeholder processes.

This chapter report covers a subsequent conflict management exercise that I managed with the aim of resolving relationship difficulties between the DOC staff and local landholders in the Waitaki/Mackenzie basins. This project was funded by the DOC Twizel Area Office to increase the involvement of local landholders within the Black Stilt (Kaki) Recovery Programme. At the time I was involved it was obvious that relationships between the DOC and landholders in the Waitaki/Mackenzie basins had been strained for some time. Also, the manner in which local conservation values were being dealt with through the development of local district plans contributed significantly to this tension.

In response to these issues some landholders had taken the step of denying DOC access to their property, preventing staff from carrying out activities related to the black stilt and other conservation projects. Many important black stilt habitats are on farmed or adjoining land, and farmer support is important if recovery tasks at these sites are to be achieved and conservation benefits obtained.

This is included as a case study in this thesis because it provides a good example of the role of conflict management in environmental management situations, particularly those where a collaborative approach to address an issue is a desired goal. While it is not directly related to the management of tussock grasslands, it is set in high country and involves the same parties. Within the context of the development of ISKM this chapter also highlights the need to incorporate 'relationship building' as a starting point. The entry point for working with communities is dependent on good relationships at an individual, as well as an organisational, level. For people to work together trust must be built up. Also building this trust and dealing with conflict is an ongoing process that must be continued.

In terms of action research this conflict management exercise was carried out through three iterative cycles. The initial objective posed by DOC staff was to manage a conflict resolution process to gain better access to bird habitat on private land, and to increase private landholder

involvement in recovery efforts. However, when landholders were canvassed to ascertain their support for a meeting to resolve these issues, it became apparent that they saw issues over the black stilt as symptoms of a wider problem of 'lack of trust' between farming families and DOC.

This is consistent with Orlando's (1993 p. 368) observation that the real issues causing the conflict will at times be hidden, and that in some instances the 'expressed' reasons for the conflict may in fact, be traced back to underlying hidden — or unspoken — reasons. However, if the conflict situation is to be handled constructively, it is important to deal with the emotional component first.

In response, a second plan-act-reflect cycle was initiated with DOC staff. The initial aim of addressing the issue of access to the black stilt was postponed, and instead a series of workshops were held to improve relationships between local DOC staff and landholders. Common ground was reached during these workshops and a number of positive steps to improve working relationships were identified and implemented. Building trust in this way is one of the main reasons why successful participation processes take time. Importantly, in this case, both parties regarded this exercise as being a first step in a much longer process.

This approach to conflict management can be contrasted with the more common practice of conflict resolution, where the emphasis is on finding a mutually agreeable settlement of an immediate dispute (Burgess & Burgess 1997). In contrast, the approach taken here is more consistent with action research where it seeks to empower the parties to better understand their own situation and needs, as well as those of others. 'While such empowerment and recognition often lay the groundwork for a mutually-acceptable settlement, such an outcome is not the primary goal. Rather, the parties' empowerment and recognition are the main objectives of such a transformative approach' (Burgess & Burgess 1997).

Indeed if action researchers put too much emphasis on developing agreements and fostering improved working relationships at all costs, they run the risk of reinforcing the status quo of the existing system. Conflict resolution in this sense lends itself to single-loop learning, which merely focusses on changing individual and collective action strategies, while leaving the underlying values and norms unchanged. As Rothman & Friedman (n.d.) note, this may be

counter-productive in facilitating double-loop learning, which involves a far more critical inquiry into and changing of underlying goals, values and standards for performance, as well as strategies and assumptions.

The third cycle involved the writing of the report presented in this chapter as a final step in the process. It was jointly authored by myself as facilitator, two DOC representatives, and four farmers. The suggestion to also include two women among the latter group came from the farmers, and represented an acknowledgement that women often do have different perspectives on environmental and conservation-oriented issues and play different roles in their subsequent management than men. This is highlighted in other areas related to environmental and land management such as organic farming. For example as Liepins and Campbell (1998) point out, 'women's social positions as the carers and reproducers of family, farm and community structures mean they are strategically placed to more frequently consider and support the implementation of organic farming because of their multiple experiences as farmers, family members, primary health carers, consumers and community networkers.' These perspectives and roles are crucial to learning and highlight the need to more actively identify and involve different stakeholder groups through our research processes.

Building partnerships for conservation in the Waitaki/Mackenzie Basins[4]

Will Allen(Landcare Research), Kerry Brown (Department of Conservation), Tony Gloag (Buscot Station), Jim Morris (Ben Avon Station), Karen Simpson (Balmoral Station), Jane Thomas (Killermont Station) & Rob Young (Department of Conservation)

An initiative to improve relationships between the Department of Conservation (DOC) staff and local landholders in the Waitaki/Mackenzie basins was facilitated by Willy Allen (Landcare Research, Alexandra) in winter 1998. This project was funded by the DOC Twizel Area Office to increase the involvement of local landholders within the Black Stilt (Kaki) Recovery Programme. This report has been co-authored by DOC Area Office staff, local landholders, and the Landcare Research facilitator. It reviews the outcomes of the activities undertaken through this exercise and points the way forward.

Background

Relationships between the Department of Conservation and landholders in the Waitaki/Mackenzie basins have been strained for some time. More recently, the ways in which local conservation values have been dealt with through the development of local district plans have contributed significantly to this tension. In response to these issues some landholders have taken the step of denying DOC access through their land, preventing staff from carrying out activities related to the black stilt and other conservation projects. Many important black stilt habitats are on farmed or adjoining land, and farmer support is important if recovery tasks at these sites are to be achieved and conservation benefits obtained.

Against this background the Black Stilt (Kaki) Recovery Programme provided funding for a relationship improvement initiative, which aimed to bring landholders and local DOC staff together to resolve differences, improve understanding, and achieve better access for management. This process involved separate pre-workshop discussions with individual

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[4] The formatting in this report has been amended to fit that of this thesis. Some sections have been omitted to minimise duplication, and appendices have also been omitted.

landholders and DOC staff, and two 'looking to the future' workshops involving both local DOC staff and members of the local farming community. Subsequent to these workshops a conservation open day was jointly organised by DOC staff and landholders.

Building relationships for conservation

Pre-workshop perspectives

Prior to the "Looking to the future' workshops, discussions were held with a number of local landholders on an individual basis and DOC staff as a group to help gauge the level of support for this initiative, and to help establish the direction that should be taken.

Landholder views

While the landholders talked with were not selected at random, they covered a range geographically from Omarama to Burkes Pass. They also covered a spectrum in their relationship with DOC, which could be described as ranging from supportive/neutral through to one farming family who did not at that time allow Department staff on their land. In all cases, the responses were very similar. The main points raised can be summarised as follows:

- The issues over black stilts are symptoms of a wider problem of 'lack of trust' between farming families and DOC. Other comments indicated annoyance that DOC was spending so much money on black stilt preservation (given the perception 'that it was going to breed itself out of existence anyway') when there were so many other more important issues urgently requiring DOC money.

- Any facilitation exercise to reduce DOC/landholder tensions needed to involve all basin landholders, not just those with black stilts on their properties.

- The problem is not just between the local farming community and the Twizel area DOC office, and we need to make a distinction between the Area office, the Conservancy

office, and Head office. Communication between these three DOC structures, and their subsequent communications with landholders, needs to be improved.

- In many instances DOC staff need to pay more attention to their dealings with landholders. Some landholders, for example, said that they would prefer to be rung by DOC staff a few days before, rather than having people just turning up on the property.

- There were a number of specific concerns raised in relation to the level of consultation and the decision-making processes involved in addressing conservation issues, although it was appreciated that DOC was but one of many players in this wider picture. Examples include the lack of consultation over local district plans in relation to the inclusion of Protected Natural Areas (PNAs) and the tenure review 'process'.

- A general perception was the lack of a concept of any sort of 'conservation partnership' in practice.

- There was a general appreciation of the Twizel Area Office leadership.

- While acknowledging that DOC goals may at times differ from pastoral goals, landholders acknowledged their stewardship responsibilities and their commitment to conservation.

Department of Conservation views

Two meetings were also held to provide Twizel Area Office DOC staff with an opportunity to talk about issues as a group without landholders present. Most staff were able to attend both of these meetings. The main points raised can be summarised as follows:

- To effectively fulfil their conservation duties, they needed good relations with landholders to gain access to necessary areas. This is particularly important in the high country where individual landholders may control a high percentage of land that is pivotal for the management of particular conservation values.

- Staff highlighted that conservation can not be packaged independently of the community, and identified the need for partnerships.

- There is a need for processes and mechanisms for staff to use to develop better working relationships with landholders. Key to these were forums to ensure both sides listened to each other, appreciated different viewpoints, and shared information in order to achieve a better learning environment.

- Local issues were a good place to start.

- A recognition that DOC had to do more advocacy work in respect of its own image so people had a clearer picture of its mandate and operating procedures, as well as a need to clearly identify what landholder expectations of DOC actually involved.

- A need to improve some aspects of communication within the Department itself.

- DOC's presence in Twizel provides social and economic benefits for the local community.

It needs to be stressed that the individual comments reported above should not be taken at face value or quoted outside the context in which they were made. The important point about the preceding discussion is that it indicates areas of DOC/farmer communication and relationships that could be improved.

Common to both groups was the acknowledgement that the conflict that surrounds these issues takes a personal toll on the people involved. At the least, these involve landholders giving up time to try and deal with them, and in many cases the worry that this causes also takes a personal toll on landholders and their families. Similarly it is difficult, for some local DOC staff who are trying to do specific local conservation jobs (to which they have a very strong personal commitment) to have to 'wear' the frustrations of landholders with DOC at other levels over which they have no control or even contact. Although these reactions are not commonly talked

about they are nonetheless very important to the way landholders and DOC staff see these issues and, in turn, can affect their future relations and responses to each other.

All those involved in these pre-workshop discussions agreed that a facilitation exercise to reduce general conflict would be useful. It was pointed out that it would need to involve 'farm families', not just 'landholders'. It was also seen as a way for landholders and DOC staff to get to know each other, especially 'over a few drinks at the end'. In regard to the overall benefit most saw this exercise **as a useful starting point**, in the sense that relationships have to be worked at: 'they are not one-off problems to be solved'.

'Looking to the future' workshops

The mediation exercise itself comprised two DOC/farming community workshops, which were titled as 'Looking to the future'. Two separate meetings, at Tekapo (3 June) and Omarama (4 June), were held to cover the area geographically. Although both workshops were different in terms of the detailed discussion that took place, they did follow a common outline. A copy of the minutes from these meetings is provided as an appendix to the full report (Allen et al. 1998a). These workshops were co-facilitated by Will Allen and Gay Pavelka. Having two facilitators provided the resources to enable both parties to undertake some exercises separately, which proved useful for generating ideas, reflection, and debriefing.

Workshop summary

Both workshops began, and continued for some time, with a wide-ranging discussion of issues that have an impact on current DOC/farmer relationships. In this regard there was a clear acknowledgement that a number of these issues could not be resolved without additional input from groups and organisations not represented at these workshops. Key among these issues was the forthcoming district plan, both in terms of the problems it has caused and how it so vividly illustrates the need to establish appropriate consultation processes at the start of such exercises - not the end. A number of other ideas were also widely discussed including the need to look at: (a) a range of options for protecting conservation values; (b) involving the community; and (c)

developing appropriate processes for dealing with issues such as access, personality conflicts, weed control, etc.

However, by providing an opportunity for people to talk about their angers and frustrations, and to get to know each other better, these workshops provided the opportunity to identify areas of common ground. This included a recognition that both groups had worthwhile knowledge to share, a desire to work together through a 'collaborative' or 'partnership' approach wherever possible, and a common commitment to both conservation and the local area. Perhaps most importantly, participants at both workshops publicly expressed their desire to work more closely together. A number of suggestions for subsequent actions that would help this progress were suggested. At the time of writing this report two of these initiatives had already been taken up. These were:

- An open field day to introduce some local DOC projects to the community.

- The publishing of a local Twizel Area Office newsletter to keep people informed about local conservation issues on a regular basis.

A full list of suggestions made during the workshops can be found in the workshop minutes (Allen et al. 1998a p. 17). In addition to those above they included:

- For both DOC and local landholders to actively seek opportunities for the Department to have a more visible presence at local events (e.g. Omarama Shears).

- Finding ways to introduce new DOC staff to the local community.

- Taking advantage of mutual concerns to jointly seek support for some projects (e.g. black stilts, weed/pest control, river beds, monitoring and research, Tb vectors).

- Involving DOC more closely in Landcare Group discussions and activities.

Workshop reflections

Collectively, these separate discussions and the workshops highlight that there are both opportunities and barriers (see Tables 7.1a&b) that need to be recognised by staff at the Twizel Area Office, as they seek to develop closer working partnerships to manage local conservation issues. Equally, these potential opportunities and barriers need to be recognised by farming families as they look at how collaborative approaches can be more commonly adopted. By sharing issues such as these, the potential working group as a whole can then discuss possible ways around the barriers, and ways in which land managers and agency staff can best participate in collaborative ventures.

Table 7.1a Opportunities for conservation partnerships facing the Twizel Area Office

- There is a lot of common ground shared between local farming families and Twizel DOC staff, particularly around their commitment to work for local conservation issues and the good of the Upper Waitaki/Mackenzie basins.
- There are a number of individuals in both groups who have demonstrated their commitment through these workshops to putting effort into developing closer working relationships. As these begin to show benefits, group dynamics will enable this effect to spread.
- The Area Manager is highly respected within the local community, and will be instrumental in initiating efforts to develop stronger DOC/community working relationships.
- The recent DOC restructuring will enable the development of closer contact between Area Office staff and the local community.
- The Twizel Area Office has more resources to put into developing stronger community links with the recent appointment of a Community Relations Officer.
- There is a big potential for improving relations by sharing information. For example, within the black stilt project DOC should involve interested landholders in evaluating the rationale for the current plan and invite their suggestions on improving it for this coming season (i.e. make them a stronger part of the project if possible). Other projects could also use this approach.

Table 7.1a Barriers to conservation partnerships facing the Twizel Area Office

- There are a number of past examples of conservation-related issues that have adversely affected relations between landholders and the Department. In some cases these may have been unrelated to local staff, but the consequential breakdown in relations and trust can affect Department staff as a whole. Past history is one of the most important influences on community attitudes.
- Not all staff or farming families have participated in the workshops and subsequent open day.
- A lack of knowledge on the part of both landholders and DOC staff of each other's areas of expertise, operations, and challenges.
- While the respect accorded the Area Manager can be regarded as a strength, the fact that so few DOC staff have developed similarly strong community relationships is also a weakness that needs to be urgently addressed.
- Although the Department is committed to building community involvement in conservation and using a partnership approach wherever possible, this area still needs more organisational support.
- Resource limitations are still a problem in terms of staff time, budgetary constraints, and lack of appropriate personal communication training.
- Lack of staff continuity making it difficult for local landholders to 'get to know' them as individuals.

As evidenced by discussions during the workshops, the current district planning process is a major factor affecting relations between the Department and local landholders. Tenure review is another significant and ongoing process, which is seeing property rights being negotiated throughout much of the high country. As a result of exercises such as these, relationships between landholders and DOC are likely to be in a state of flux for some years to come. This will inevitably have an overriding impact on farmer/DOC staff working relationships at the local level, even when these are on issues primarily unrelated to these contentious processes (e.g. black stilt recovery).

Nonetheless, as these workshops demonstrated, there is still lots of potential to improve working relationships and the effectiveness of conservation solutions in regard to local issues. Key to this, as both parties noted, is the development of stronger personal relationships. 'It's easier to talk to

someone that you know, and say hi to when you meet in town', was the way one participant put it.

Black Stilt and Project River Recovery open day

An open day held in August 1998 was in direct response to landholder recommendations made at the Tekapo "Looking to the future' workshop. It was organised jointly by landholders and DOC and centred on the history, successes and issues, faced by the Black Stilt and Project River Recovery programmes. Included in the day were visits to the aviary site and the Tekapo Delta. The response to this day was very positive and provided a pilot for future events on a regular basis.

This type of event allows the development of both personal and working relationships between the participants. Although potentially an event that would happen two or three times a year, it provides an excellent basis to initiate and develop such relationships which can then carry on into more regular day-to-day contact. It was suggested that the next open day be held on a landholder's property.

The way forward

In summary, the key themes that came out of both these workshops were the expressed desires by both parties to develop more collaborative (or partnership) approaches to conservation management, and in so doing to improve relations and build up 'trust'. This call is in line with DOC's goals of encouraging informed community participation in conservation decision making, and actively involving individuals, groups, and organisations in managing conservation. It is also something that as a district, we have some experience in, and there are already examples to use.

However, although these partnerships have been developed by the efforts of individuals (be they DOC staff or landholders) as part of their efforts to address a particular problem, the lessons learnt have not always been documented for others to use. There is, accordingly, a need to review some of these successful examples and the mechanisms by which they were achieved in order to help develop future approaches.

Local landholder and DOC co-operative approaches

There have been several examples of co-operative approaches developed in the Waitaki/Mackenzie basins over the past 8 years. These include:

- Ruataniwha wetland covenant area developed in conjunction with Malcolm and Roseanne Walls for black stilt and other wader species.

- Lake Poaka wetland development in conjunction with Simon Cameron. This project is currently being established and involves the development of a wetland area for black stilt and other wader species management.

- The Ben Avon purchase and covenant in conjunction with Jim Morris. This involved the purchase of Ben Avon lagoon and covenanting of an adjacent area of oxbow features.

Different mechanisms for dealing with different issues

The Department and landholders clearly need to identify a range of different mechanisms that can be used to deal with issues of different magnitude and complexity. There is clearly a substantial difference between pursuing a collaborative approach to improve an already well-functioning situation, and resolving an existing conflict. In the latter case the need for effective facilitation of meetings and expert mediation of conflicts is definitely greater. Suggestions here include:

- The establishment of processes to encourage more collaborative problem-solving (i.e. to involve all parties **before** an answer is found.
- The need to develop clear, open lines of communication at all levels.
- The need to feel free to discuss issues face-to-face, before they become problems.
- Using landholder mediators from other districts for smaller issues.
- Using totally independent mediators for larger issues.

WE need to get together and work out strategies that work for us.

Learning from others: key steps to successful collaboration

The idea of government agencies and communities working together to develop conservation management strategies is by no means new, and there are many examples of partnerships which exist in various forms in a number of countries. While successful approaches are those that have been individually tailored to each situation, there are some common elements that make these collaborative approaches work. A number of guides for those interested in reading more about the lessons learnt through many of these initiatives are listed in the full report (Allen et al. 1998a). However, as a starting point for reviewing the examples of local initiatives outlined above, a brief summary of key points distilled from these overseas lessons is provided here.

Partnership approaches in summary

Loosely defined (there is no generally accepted definition), these collaborative approaches refer to situations in which some or all of the relevant stakeholders are involved in a substantial way in management/decision-making activities. The underlying basis behind these approaches is that the goal of effective conservation is beyond the reach of any one agency or community. Neither party working alone has the resources, such as expertise, funds, labour, and authority, which are required to get the job done in the most effective manner. By working together, pooling resources and knowledge, the possibilities for conservation are maximised.

Also implicit in the term partnership is the concept of common good: the trust that it is possible to follow a course of action that harmonises different interests while responding, at least to some extent, to all of them. Typically such arrangements also are consensus-based with decision-making power being shared in some way among the various stakeholders. They strive to combine local knowledge with that of science, and stress negotiation rather than litigation in situations of conflict.

Establishing and implementing a collaborative planning exercise can be viewed as a three-phase process consisting of overlapping phases of pre-planning, planning, and change. These are illustrated in Figure 7.1.

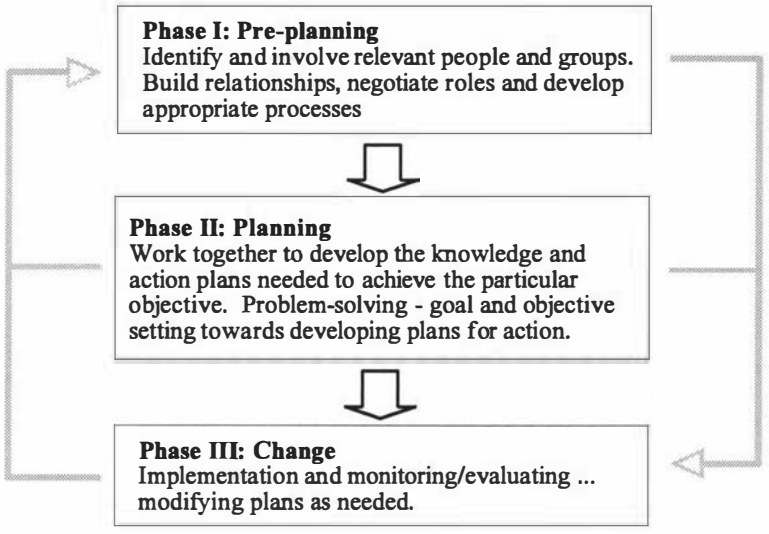

Figure 7.1 The different phases involved in establishing a conservation partnership

In the **pre-planning** phase the initiating party sets out to identify the stakeholders and build up a healthy personal and working relationship with them. In the **planning** phase people get together and use appropriate processes for determining what needs to be done. And finally, **change** occurs as these plans are implemented and adjusted in the light of regular monitoring and evaluation.

Pre-planning

The foundation of any successful collaborative or partnership approach is the development of relationships that make it easy for people to talk about their needs, share information, and work together. Establishing this trust is one of the main reasons why successful participation processes take time. However, in a local situation such as in the Waitaki/Mackenzie basins it is fairly obvious relationships are not developed separately for each proposed working relationship. It is important to acknowledge that, just as with personal relationships, one of the most important influences on community attitudes is previous experience. On occasion, people are extremely reluctant to enter into a second participatory process ..... 'we've already tried that and look what happened!'.

What is required in terms of the district as a whole is for individuals from each group to get to know each other, and in particular to work and pay attention to building open and trusting relationships. During the workshops this point was highlighted by both landholders and DOC staff, and a number of suggestions were made that would help improve this situation. These included:

- Taking advantage of DOC's involvement in landcare groups to introduce a larger number of staff members to landholders.
- That DOC staff not only phone up to plan a visit to properties, but also take extra time to phone afterwards and share information that they may have gained.
- For DOC staff to offer to take landholders out with them on projects.

In general, participants noted that improved communication is the key to developing constructive working relationships and minimising conflict (see Table 7.2). Nonetheless, conflict can be a beneficial starting point in that it affords the opportunity for people to highlight the issues that they are dissatisfied or frustrated with. It also provides an opportunity for people to reassess their actions, and stimulates the search for new solutions.

Table 7.2 Some basic guidelines for communicating differences

- Don't argue your position. Instead, simply state your needs and concerns.
- Don't question the other person's values or logic. Instead, listen.
- Don't make assumptions, interpret, or analyse the other position. Instead, ask for clarification.
- Don't fight back or get defensive. Instead, ask them to clarify their criticisms.
- Don't focus on personalities. Instead, focus on problems.
- Don't fight for a single solution. Instead, encourage brainstorming new ideas.
- Don't avoid confrontation or be submissive. Instead, stand up for your own feelings and concerns, but be open to others, too.

Planning

The strength of collaborative processes lies in the creative approach to problem solving that involving different groups can bring. Face-to-face negotiations allow the different parties to more fully explore the issues, and collectively come up with solutions that work. Constructive discussion and planning takes time, so there is a need to build enough time into the process for people to learn about each other, overcome their differences, and begin to 'speak the same language'. Then, more time is needed to resolve problems and disagreements.

Key points when discussing a problem situation are that ecological objectives should not be considered in isolation from community social and economic needs, and that these will not be identified without local involvement. Similarly, there is a need to note all the issues raised in these discussions, no matter how simplistic or controversial they may appear. And enough time needs to be given to consider all sides of the argument to avoid discussion becoming biassed towards more vocal or powerful interests. Key steps in setting collaborative goals, objectives, and action plans could involve some or all of the following:

i) Identify the key environmental, economic, and social issues with input from landowners and local residents:
   - acknowledge the wider political context and identify outside influences.
   - review stakeholders and expand partnership, if necessary.

ii) Identify common motivations, interests, and concerns:
   - what is working now? what isn't working?
   - clearly and concisely state issues and problems.
   - use field trips as part of problem identification.
   - establish where community benefits and conservation goals might overlap.

iii) Identify common goals and objectives to address issues and problems, while giving consideration to factors such as:
   - does this group have the authority to make desired changes?
   - what other groups or individuals are already doing, to avoid duplicating efforts.

iv) Document the goals and objectives in writing:

- clearly and concisely state goals and objectives.
- quantify and qualify statements as much as possible.

v) Prioritise challenges and opportunities:

- are they workable?
- is there a general willingness to tackle the issue?
- how do costs compare to benefits?
- start with a relatively small project that is highly visible and has a high potential for success.

vi) Jointly develop action plans and collectively delegate responsibilities for accomplishing goals and objectives.

Change

As people start doing whatever has been decided, it is important to provide opportunities and resources to evaluate progress on an ongoing basis. Constant re-evaluation is particularly important in long-term projects not only to ensure that the project stays on track, but also to help reinforce that continued involvement is worthwhile. Tracking successes can be combined with a number of other initiatives to avoid 'burn-out' and maintain enthusiasm and motivation among the different partners. A number of tips to help maintain continued involvement are shown in Table 7.3.

Table 7.3 Maintaining enthusiasm and motivation for collaborative conservation approaches

- start with small, manageable projects that are likely to be successful, or break major projects into manageable 'chunks'.
- document and acknowledge positive change to give participants a sense that they are making a difference.
- maintain a stable structure to reassure members that the partnership is accountable to them, and that something will get done.
- build on sources of community pride.
- demonstrate that the benefits of collaboration will offset any loss of autonomy — for example, make explicit what member organisations and individuals stand to gain; identify specific benefits.
- continually revisit/stress successes, achievements.
- make it fun — have a social hour after meetings; plan social events.

Collaborative conservation management should not be seen as the development and strict application of a plan, or set of rules: rather it is a process that requires ongoing review and improvement. **Its most important result is not a management plan, but a working partnership, capable of responding to changing needs in an effective way.**

Finally, it must be remembered that partnerships should be flexible, and designed to grow. There is no need to involve reluctant stakeholders in the beginning, and in some cases it may be that new stakeholders only get identified along the way. What is important is that the partnership can change to accommodate this growth. Community involvement helps create ownership, and accordingly a feeling of accomplishment in working together to solve a problem. This group dynamic will, in turn, encourage other individuals to participate both from the community and government agencies.

Training needs

The training needs identified here all relate to the development of skills and processes that can more effectively help both groups to work together, and deal with communication, collaborative approaches, and change management. It is suggested that local land managers be advised should any of these courses be provided locally. This could be done through the Area Office newsletter.

- **Interpersonal and group communication skills**

There are a number of courses that provide training in specific areas, which are useful for working in community-based and participatory situations. Skills include active listening, assertive communication, negotiation, facilitation, relationship building, and conflict resolution.

- **Managing partnership and other participatory processes**

Terms such as 'partnership', 'participatory', 'consultation', and 'community-based' are notorious for meaning all things to all people. The opportunity to attend workshops in this area would be useful for community leaders and key DOC staff who are likely to initiate or manage these sort of processes, so that they can develop a broader understanding of collaborative group processes and the range of outcomes that can be expected.

- **Stress management**

Working with people can be stressful; this is equally true for landholders and agency staff. Talking about your problem to someone else often helps, but sometimes the problem is too hard to resolve. Providing the training, which would give a number of people in the workplace or community a basic understanding of debriefing skills, can provide effective assistance in this regard.

Concluding comments

Working together is both challenging and rewarding. As the Department and local communities pursue this path there are several points worth remembering:

- The community, particularly those such as landholders who use conservation resources, do not want to be seen as part of the problem of conservation value loss, but as part of the solution.

- It is important to listen rather than becoming defensive when criticised. At early meetings people may have many 'gripes' that they want to get off their chest. The natural tendency is to defend one's position, but that can lead to people feeling they are not being listened to; and they just repeat their points more heatedly. If a defensive position is maintained by people in authority, the arguments can escalate until community members eventually walk away.

- Many decisions concerning conservation management are taken against a backdrop of considerable scientific uncertainty and limited information, meaning that centralised decisions can lack credibility. In contrast, where decisions are taken collaboratively, the credibility gap can be largely overcome, not withstanding informational deficits.

- It is not necessary to convince everyone to change all at once. Change, in both agencies and rural communities occurs frequently through 'word of mouth' so, if the process works for a few people, others will follow.

- It is important to notice the changes that do occur and reinforce them. Too often when one has a clear picture of what is required to improve a particular conservation problem, one can overlook the small changes people are making that are necessary, but not obvious, steps along the way.

- Many collaborative approaches depend upon the good work, energy, and commitment of one or more individuals and/or on the presence of dedicated projects. If the individual(s)

are transferred or stop contributing, or if the project ceases to function, the process may be blocked or simply fail. These risks point to the need for institutionalising the process: making it as independent as possible from individuals and outside inputs as soon as possible.

Recommendations

The main outcome of this exercise was the common appreciation of the need for Twizel Area Office DOC staff and local landholders to build on the groundwork developed through the 'Looking to the future' workshops and subsequent activities and seek to develop closer working relationships. The recommendations here will help contribute to this, and are presented in order of priority.

- **Increase opportunities for landholders and DOC staff to work together**

The Department staff need to involve willing landholders in helping refine current solutions around the sharing of information and perspectives in relation to local conservation programmes such as the Black Stilt and Project River Recovery. Similarly, landholders should seek to more closely involve DOC Twizel Area Office staff in local Landcare Group discussions and activities. Attention should also be paid to identifying areas where community benefits and conservation goals overlap (e.g. ecotourism and black stilt recovery efforts). To help with this process it is also recommended that staff at the Twizel Area Office work jointly with local landholder representatives to:

- **Review local case studies of landholder/DOC partnerships**

Identifying and documenting what has worked and why, will provide lessons to guide the promotion of the establishment or expansion of partnership approaches in the future.

- **Identify and agree on mechanisms for DOC and landholders to deal with issues of different magnitude and complexity.**

It was stressed by both DOC staff and landholders that they need to find approaches that work locally and are agreed on by both parties. Suggestions have been included in this report (section 6.2), and these now need to be taken further and discussed at forums such as landcare meetings.

- **Develop a joint DOC/landholder commitment to further open days**

Building on the success of the August open day it is suggested that DOC commit to running these 2/3 times each year. These should be planned and organised jointly with landholders, perhaps alternating between Tekapo-, Twizel-, and Omarama-based venues.

- **Provide appropriate training in community-based conservation approaches**

While it is recognised that 'working with people' is not for everyone, it is important that the Twizel Area Office supports key staff working in this area by providing ongoing training opportunities in group process and collaborative-problem-solving skills. These skills are equally important for land managers who wish to promote these approaches.

A final recommendation was developed at the 'looking to the future' workshops:

- **That DOC encourages tertiary-based ecology courses to provide appropriate training in community-based conservation approaches**

Because it is impossible to separate the ecological aspects of conservation management from related social aspects (involving adjacent land uses, local communities, and other sectors), it was felt that DOC, as a primary employer of graduates, could work to encourage university and other appropriate ecological training courses to provide an introduction to the importance of the social context in which our ecological problems and issues are found.

Acknowledgements: We would like to thank the Twizel Area DOC Office for providing funding and time for this project, and Gay Pavelka for co-facilitating the workshops. We also acknowledge the in-kind contribution from all those who attended the workshops at their own time and expense.

CHAPTER 8

Social and organisational issues with adaptive management for environmental management

Time period in which main work on this issue carried out:											
Jul- 94	Jan- 95	Jul- 95	Jan- 96	Jul- 96	Jan- 97	Jul- 97	Jan- 98	Jul- 98	Jan- 99	Jul- 99	Jan- 00

Allen, W.J., Bosch, O.J.H., Kilvington, M.J., Harley, D.G. & Brown I. Monitoring and adaptive management: resolving social and organisational issues to improve information sharing. (Submitted: *Natural Resources Forum*, 2000)

Although the HMP concluded in June 1996, its work carried on within the expanded tussock grasslands research programme which still emphasised the need for adaptive management and ISKM as a framework. However, despite the availability of an Internet-based Management Information System (MIS) and monitoring tools for measuring community species in the tussock grasslands, these tools are not being used. This chapter highlights an ongoing participatory inquiry process into this lack of use. This, in turn, illustrates the difficulties with implementing environmental management technologies — which often have a significant public-good component. It highlights the need for a more co-ordinated approach to implementing adaptive management involving agencies, researchers and land managers, and draws attention to some of the emerging social and organisational issues entailed. Some solutions to overcome these problems related to information sharing are then suggested.

> *Placing the spotlight on technology and information call us to refocus our attention on the capacities of individuals, organizations, and networks, as only these can implement and institutionalize sustainable practices.* (Anderson 1999 p.137).

As outlined in Chapter 5 the original HMP programme concluded with the development of the first versions of ISKM, and first working versions (of an Internet-based MIS for *Hieracium* and vegetation condition assessment models for tussock grasslands) of the technical components

proposed for the implementation of this approach. During the next two years (June 1996 to June 1998) alternative funding from local regional councils provided for continued work on the development of the vegetation condition assessment models. Also during this period the Ministry for the Environment funded a major extension exercise which involved the use of field days to introduce and 'extend' these models to high country farmers. These field days were co-ordinated by a farmer-based community group, and jointly run by scientists and farmers.

During the same period, as indicated in Chapter 7, the Department of Conservation (DOC) also initiated the development of an expanded version of the Internet-based MIS to develop a Conservation MIS for the tussock grasslands as a whole. Additional funding was also provided by the Office of Crown Lands, whose role it is to administer the Crown leases which are held over much of these lands. Funding provided by the Ministry for the Environment also enabled local landholders to participate in this project.

From June 1998 to June 2000, science support for both the vegetation condition assessment models was primarily undertaken by the Tussock Grasslands Research Programme. This was the main research programme in the high country during this period, and was particularly focussed on how to integrate production and environmental goals. The programme was funded by the Foundation for Research, Science and Technology (FRST) — New Zealand's main government science-funding body — and managed by Dr Ockie Bosch. The Department of Conservation has also continued concurrent funding for the Conservation MIS during this period.

Against this background the accompanying chapter paper focusses on the social and institutional considerations required to support the linked concepts of monitoring and adaptive management in the tussock grasslands, and more closely integrate the use and enhancement of the technical components with management. One of the key factors initiating this research was the acknowledgement that, despite the availability — and promotion — of the condition assessment models, few farmers were using them. Moreover, where they were being used by farmers, no sharing of the results was occurring. Another reason was that the development of the MIS was raising a number of non-technical issues, particularly related to sharing, acknowledgement and ownership of information.

To address these issues a number of workshops were held involving different stakeholder groups. In May 1997 and again in March 1999 two workshops were held to bring farming groups together with researchers and regional council staff to look at how vegetation monitoring was being used, and how it could be used including its links with the MIS. In December 1998 a workshop was held with a range of DOC staff from different levels of management to assess the Conservation MIS development and decide on future steps. My role in these workshops was as a facilitator.

The chapter paper was written as a collaborative reflective exercise following these workshops. This not only involved Ockie Bosch, Margaret Kilvington and myself as researchers, but also involved two other perspectives from people who have been closely involved with efforts (including the case study documented here) to implement monitoring and adaptive management practices in the tussock grasslands. These were Don Harley, who was a local landholder, and Ian Brown from the Otago Regional Council.

The paper summarises recent literature related to monitoring and adaptive management, and sketches out the background to the case study described above to provide a context. The paper also provides a diagram of what can be regarded as the third iteration of ISKM (see Chapter 8 for more detail). The main change is the inclusion of entry and contracting in the first step, which provides more instruction on the importance of stakeholder identification and building relationships for change as an entry to the process than has been evident in earlier versions.

Both sets of farmer workshops arose in response to the reaction of farmers to the local regional council's efforts to promote the use of a vegetation condition assessment model, and in particular the different perceptions that farmers had regarding the reasons that this monitoring should be undertaken. While some were clearly motivated by the idea that vegetation monitoring would provide more information to help them understand their resource base, others were less altruistic. For some it raised the possibility of a way to make money, perhaps selling the results back to local government for use in state-of-the-environment reporting. Others saw its potential as a good thing in terms of proving the 'sustainability' of current practices, while the alternative viewpoint was concern that it may only serve to highlight that current practices were unsustainable. In terms of sharing the results of on-farm monitoring data with third parties (such as local government agencies), a number of people were quite open in voicing their fears that

their information might be used incorrectly, or against them, if released. Accordingly, these workshops developed from council's desire to address these factors and hire an outside facilitator to bring council, farmers and scientists together to discuss these things.

The subsequent discussion, outlined in the accompanying chapter paper, shows the outline of information flows that would enable an adaptive management approach to provide increased understanding and knowledge for the different groups involved. This is similar to ISKM, and in itself provides another validation of the research steps set out in this framework. However, it goes further and indicates the activities that remain to be done in this particular social setting for the process to become ongoing and self-improving. In particular, it highlights the need for clear protocols for information use to be developed as part of a process for building trust and confidence between information providers and users.

The importance of participation, adequate community forums where information could be discussed and the need for an MIS component to capture decision support material were reinforced during these discussion. And in both these and the DOC workshop attention was paid to the need to look at how improved information networks could be leveraged through the use of the Internet, including to those without direct computer or Internet access.

In the main, however, the DOC workshop concentrated more on development issues related to the Conservation MIS. As background to this discussion a number of factors which highlighted the Department's interest in supporting such a system were outlined (Unpublished minutes: Tussock Grasslands MIS meeting 8/12/98):

> It was pointed out that the recent restructuring means that area staff now have more information needs/requirements to support them in areas where they now have more decision making powers. The users suggested above do not have ready access to a large body of knowledge (e.g. as is held by research libraries), nor do they have a lot of time to request, read and analyse information. This problem is made more extreme by the way in which new information is provided as individual pieces (e.g. scientific papers) and it is often difficult to see where this fits into the bigger picture. This highlights the need for this type of MIS, especially as the nature of the Department's work requires information to be integrated. Also, it was felt that there is a pressing need to improve ways of transferring knowledge from science to management.

> Accordingly this system needs to help them access information faster, and avoid duplication of effort whereby different staff are looking for the same pieces of information. It needs to help people sourcing information (such as published papers) and put the resulting conclusions 'in context'.

This meeting also highlighted a number of points relating to information accreditation:

> It was stressed that the information on this system needs to be credible, pointing out where recommendations are supported by recognised science results. It was felt that anecdotal comments needed to be clearly flagged as such. Similarly, while monitoring results from the farming community were recognised as a potentially useful source of new management information, these need some form of external accreditation. There is a need to spell out very clearly what filtering mechanism will be used in putting information up to ensure credibility.

Finally, those at the meeting talked about the needs for others to use and contribute to this system. These other users will include researchers, farmers, regional councils, and other interested agencies. It was felt that to fully involve such a range of groups in using and contributing to a shared system it needed to be renamed to emphasise its potential role in 'tussock grasslands management', rather than just 'tussock grasslands conservation'. Another suggestion made in this regard was to obtain a unique virtual domain name for the system that is independent of any one group. This was subsequently done, and the resulting renamed Tussock Grassland Management Information System can now be seen at http://tussocks.net.nz .

Given their emphasis on improving the situation, the workshops themselves can be seen as collaborative or participatory exercises that implicitly integrate an action research process. Equally they can be viewed as involving a formative evaluation or, in the case of farmer workshops, as a conflict management exercise. The process encompasses a needs/capacity assessment or background study on the factors leading to the problems to be addressed. It asks the parties what success will look like, and how might we achieve and measure it? And, it acknowledges the need for ongoing evaluation processes to ensure continuous improvement. Finally, these discussions also served to highlight a number of broader lessons that relate to how to address other social and organisational considerations that can affect the success, or otherwise, of such multi-stakeholder information networks. These included issues related to system ownership, and how to institutionalise the process, and the networks.

Monitoring and adaptive management: resolving social and organisational issues to improve information sharing in natural resource management

Will Allen, Ockie Bosch, Margaret Kilvington (Landcare Research), Don Harley (Cambrian Station) and Ian Brown (Otago Regional Council)

Abstract: Adaptive, or 'learning by doing', approaches are often advocated as a means of providing increased understanding within natural resource management. However, a number of organisational and social issues need to be resolved if these approaches are to be used successfully. A case study in the South Island high country of New Zealand is used to review what is needed to support an ongoing community-based monitoring and adaptive management programme. First, the case study is described, paying attention to the social context of the resource management problem. The results of a workshop which explored this problem are then outlined, along with a proposed information flow suggested by participants. Requirements for future steps to resolve these problems (such as information protocols and a multi-stakeholder information system) are discussed. Finally, some broad lessons are drawn from this exercise that could help others developing similar approaches.

Introduction

Issues of natural resource management emerging in the last 20 years are highly complex, and the task of assimilating and managing the information needed to promote best management practices (BMPs) has become increasingly difficult. The changing nature of resource management adds a further complexity. Solutions need to be monitored closely during implementation to confirm their effectiveness, and to help refine future actions. In addition, as economic, technical and social systems continue to evolve and affect management decisions, they will also contribute to changing the definition of what is best management practice. Accordingly, successful resource management must be based on the linked processes of monitoring and adaptive management, or 'learning by doing'.

Similar learning-based approaches are well established within the field of organisational and agricultural management. Within business, the linked processes of monitoring and adaptive management are accepted as an integral component of decision making, and represent a conscious attempt on the part of organisations and agricultural enterprises to improve productivity, effectiveness, and innovativeness in uncertain economic and technological market conditions (Senge et al. 1994). However, learning-based approaches are not yet widely used to support the longer-term decision making needed for the management of natural resources. In particular resource management monitoring, while commonly undertaken, is rarely linked with subsequent management decision making. One of the more common reasons for monitoring is to meet a regulatory requirement, for example, environmental agencies may be required to comply with State of the Environment reporting, or an individual land manager may have lease requirements. Another is to obtain data as a protection against action by a regulatory agency or other interest groups.

More recently the importance of using monitoring to learn how land-use practices affect natural resource trends has also been recognised. Increasingly the emphasis is on helping land managers to gain understanding to manage the land for which they have a primary responsibility. It is, after all, the decisions they take today that will heavily influence the future state of the lands that they manage. This recognition is leading to the development of more collaborative — often referred to as community-based or participatory — approaches towards monitoring and management (e.g. Burnside & Chamala 1994, Bosch et al. 1996c, Allen 1997, Abbott & Guijt 1998). These approaches recognise that science alone cannot provide all the answers, and must be combined with a structured process of local participation that emphasises shared learning and locally-relevant indicators. The challenge is to bring local and scientific knowledge systems together to provide both land managers and scientists with more opportunities to inform and stimulate each other (Bosch et al. 1996a) Any framework to achieve these must be capable of:

- integrating existing local and scientific knowledge into guidelines for best management practice;
- incorporating tools with which land managers can monitor and interpret the outcomes of management actions;
- continually capturing new information gained through research (scientists), and the adaptive management and monitoring process (land managers);

- transforming this new data and information into useful knowledge to expand our understanding of best practice.

Although adaptive management approaches have been advocated for environmental management situations for around 20 years (Holling 1978; Walters & Hilborn 1978), their success in practice has been rather less than spectacular (McLain & Lee 1996; Dovers & Mobbs 1997). There is also a growing appreciation that, given the multi-stakeholder nature of most environmental situations, the more immediate barriers to overcome are organisational and social, rather than technical. These barriers include a tendency to discount non-scientific forms of knowledge, institutional cultures within research and policy making that work against genuinely participatory approaches, and a failure to provide appropriate processes to promote the development of shared understandings among diverse stakeholders (e.g. Campbell 1995; McLain & Lee 1996; Pretty 1998).

We use a case study in the South Island high country of New Zealand to review what is needed to support an ongoing collaborative monitoring and adaptive management programme. First, the case study is described, paying attention to the social context of the resource management problem. The results from workshops which were held to explore the establishment of an adaptive management approach are outlined, along with a proposed information flow suggested by participants. The requirements for future steps to resolve these problems (such as information protocols and a multi-stakeholder information system) are discussed. Finally, some broad lessons are drawn to help others developing similar approaches.

Case study context: the South Island high country of New Zealand

It is particularly appropriate to use an agricultural example to highlight issues in natural resource management, because as Dahlberg (1979) points out, agriculture represents the basic interface between people and their environment. From this perspective, the grasslands of the South Island high country present a number of advantages for those concerned with the improvement (or evaluation) of research and development (R&D) programmes. The high country comprises a microcosm of the major resource management issues surrounding extensively grazed ecosystems worldwide (Allen 1997). Today, there is a worldwide trend towards a holistic, multi-use, multi-value view of such extensively grazed grasslands. Grazing has increasingly

become a variable component or even been abandoned in some areas, a change that highlights the diverse values that these grasslands are now expected to serve. In New Zealand these encompass national aspirations concerning issues such as indigenous Maori land rights, preservation of biodiversity and natural landscapes, sustainable management, tourism, and recreation, as well as traditional pastoral considerations.

The South Island high country not only encompasses a wide range of contrasting situations, but is also characterised by conflicts over resource use between different interest groups. However, as recently as a decade ago, those working in the New Zealand high country were at least confident in the knowledge that they were dealing with what everyone knew was a largely extensive pastoral system. Today, whether the high country should be regarded as an agricultural, tourism, or conservation system, or some combination of all these, is a matter of contention.

Public interest groups are no longer content to evaluate rural systems such as the high country merely in terms of economics and production, but are looking towards measures of ecological health, environmental ethics, and equity. A range of public pressure groups increasingly voice their concerns about issues such as the effect that agricultural practices are having on the environment, or conflicting land uses. We also have farmers who publicly question whether they are farming 'sustainably' .... and challenge science to define the land management practices that need to be implemented to be 'sustainable' (Allen & Bosch 1996). However, although science is continuously adding to our knowledge, the complexity and diversity within the South Island tussock grasslands makes it impossible for scientists alone to interpret and develop the required comprehensive knowledge base (Bosch et al. 1996c).

Local land managers and resource management agency staff recognize that land-user-based monitoring is needed as part of an adaptive management approach if we are to manage our natural resources successfully. For example, in 1994 the High Country Committee of Federated Farmers put together a farmer resource kit with details on various monitoring methods that individual farming families can use on their properties. A report by the Parliamentary Commissioner for the Environment (1995) stated that ongoing monitoring by land managers is essential to increase the understanding of issues affecting tussock grasslands. The same report also stressed that decision makers and land managers need to promote and adopt management approaches that are based on both research and monitoring.

In response to these calls an ongoing community-based research programme to encourage adaptive management as an approach to improving understanding of the tussock grasslands in the high country was initiated.The Integrated Systems for Knowledge Management (ISKM) (Bosch et al. 1995a&b; 1996a; Allen et al. 1995; Allen & Bosch 1996) was used as the framework for this research programme. The ISKM framework focusses on strengthening participation and self-help in natural resource management projects. As such, it is not a new project type or innovative development concept, but rather a specific approach that emphasises a number of key steps applicable to developing the knowledge and action needed to change problem situations constructively.

The ISKM framework (Figure 8.1) consists of familiar processes used in other fields of cooperation, and was designed around basic management actions. The first three of these involve: establishing a climate for change with the different parties involved and setting goals and objectives, searching for information, and developing a shared understanding and action plans to address the issue. These action plans also need to be supported by appropriate monitoring tools and processes that can help managers check that they are working, and to guide their responses if changes are needed. The fourth step in ISKM involves the development of a management information system which captures decision making information for the benefit of the wider community of stakeholders. This can be as simple as meeting minutes, but given the complexity of many natural resource issues computer technology will become increasingly relevant. Finally, ISKM stresses the need to develop feedback loops to maximise the benefits from monitoring and evaluation and develop a collaborative-learning/self-improving environment.

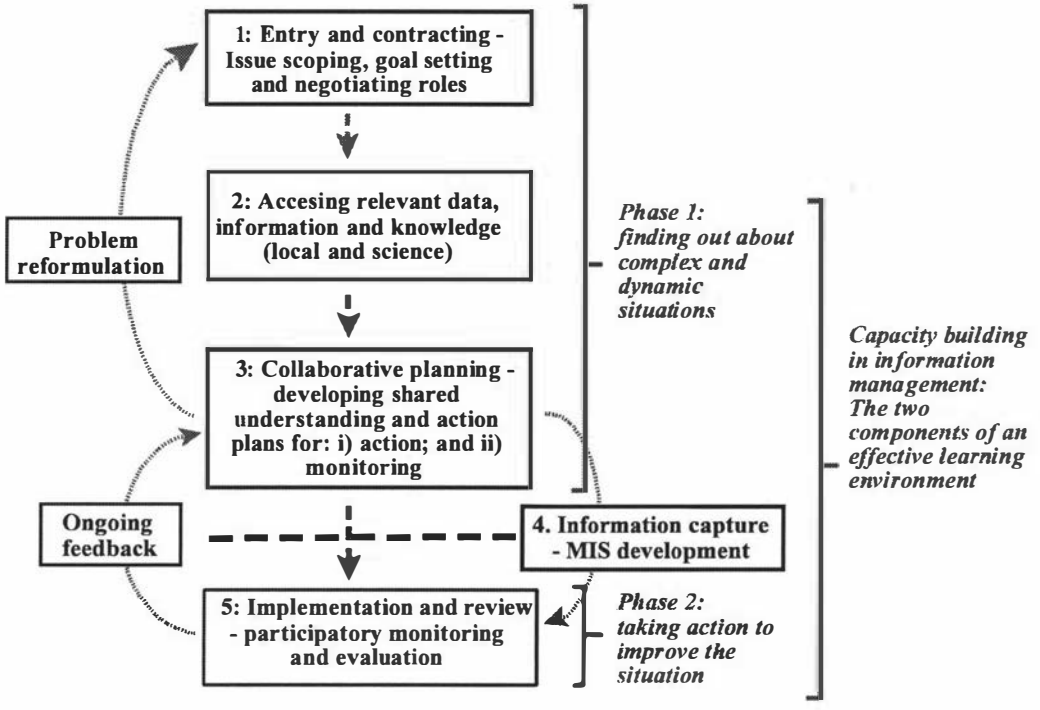

Figure 8.1 ISKM (ver 3.1) — a participatory research framework to facilitate the identification and introduction of more sustainable resource management practices. The two phases interact to create an effective learning environment.

Over the past six years the activities outlined in the first four steps in the ISKM framework can be seen to have been undertaken in respect to the South Island tussock grasslands, albeit with funding obtained through a range of projects. The implementation of these activities have often been managed by different groups, and involved farmers, conservation managers, policy makers in local and national government, and researchers from a number of different institutions.

One of the key activities undertaken during this time is the development of a Tussock Grasslands Management Information System (MIS) to provide background ecological knowledge and best practice guidelines for different vegetation states. This information system draws on both farmer, conservation manager and science knowledge which has been discussed at forums with representatives of these different groups. The resulting MIS (http://tussocks.net.nz) is Internet-based, and has been designed as an open-ended system that can be continually updated as new information becomes available through research and monitoring (Bosch et al. 1999).

In addition, support for ongoing farmer-based monitoring has been provided through a concurrent research project involving scientists and farmers in the development of Condition Assessment Models for measuring (monitoring) and interpreting vegetation change in the different ecological areas within the tussock grasslands. These models describe the major vegetation changes that could occur in a particular area under different management practices and climatic conditions (Gibson & Bosch 1996). This information is contained in a user-friendly computer tool (REDIS) that enables land managers to interpret the results of monitoring by indicating where a particular site is situated along a condition gradient (Gibson & Bosch 1999).

These models were subsequently made available to individual land managers through landcare groups in the high country. Training was provided to help land managers identify key indicator plant species and to use the software package. However, while the models were relatively well received by land managers, there is no certainty that their use will ensure the ongoing feedback and sharing of information (step five of ISKM) that is required if we are to successfully answer questions about ecological sustainability in the high country.

Key issues around information management

To deal with this substantial gap in the information system required for monitoring and adaptive management, a number of workshops have been held over the past two years with representatives of major stakeholder groups (farmers, local government, and researchers). These workshops were developed as formative participatory evaluation exercises, to determine future programme direction. This feedback provides an important component of ongoing resource management approaches where proposals for action are necessarily reshaped as experience is gained and as more of the stakeholders become concerned about a particular issue, cost, or benefit (Allen 1997). Each workshop began with a semi-structured discussion session in which participants were: i) encouraged to talk about the general issues, concerns and opportunities that sharing information/community-based monitoring raises for them; and ii) to build on these points and develop an appropriate framework.

Information flows and concerns

Participants acknowledged that an adaptive approach to management and sharing of the information gained through this was crucial to an improved understanding of tussock grasslands dynamics. The motivating factors of pride in land management and a concept of stewardship were acknowledged as a major incentive to become involved. However, the risks to individual land managers over possible misuse of data and information were also seen as a potential barrier.

Being proactive in proving sustainability is another factor which could encourage community-based monitoring and adaptive management. Community responsibility was cited as a reason for becoming involved by some farmers, although an unwillingness to learn that there might be a problem clearly puts some others off. Many of the external (i.e. off-farm) social pressures and influences cited by participants are driven by the recent international public interest towards sustainability. International markets increasingly requiring proof of sustainability are also a motivating factor, although the effect of low commodity prices (reducing farm income) can work against this.

Who benefits and who should contribute to the cost of such a collaborative exercise is a major issue. The concept of a collaborative learning-based approach to the management of the high country has emerged mainly from sustainability, rather than production issues. The downstream benefits of improved management understanding through public knowledge jointly developed by land managers and government-funded scientists, provide an argument for the wider community shouldering more responsibility for monitoring costs. This, in turn, points to the need for institutional support for collaborative approaches to natural resource management.

A framework for information flows

Workshop participants developed an outline of the information flows that would enable an adaptive management approach to provide increased understanding and knowledge for the different groups involved (Figure 8.2). This is similar to ISKM, and in itself provides a validation of the research steps set out at the beginning of the programme. However, it goes further and indicates the activities that remain to be done in this particular social setting for the process to become ongoing and self-improving.

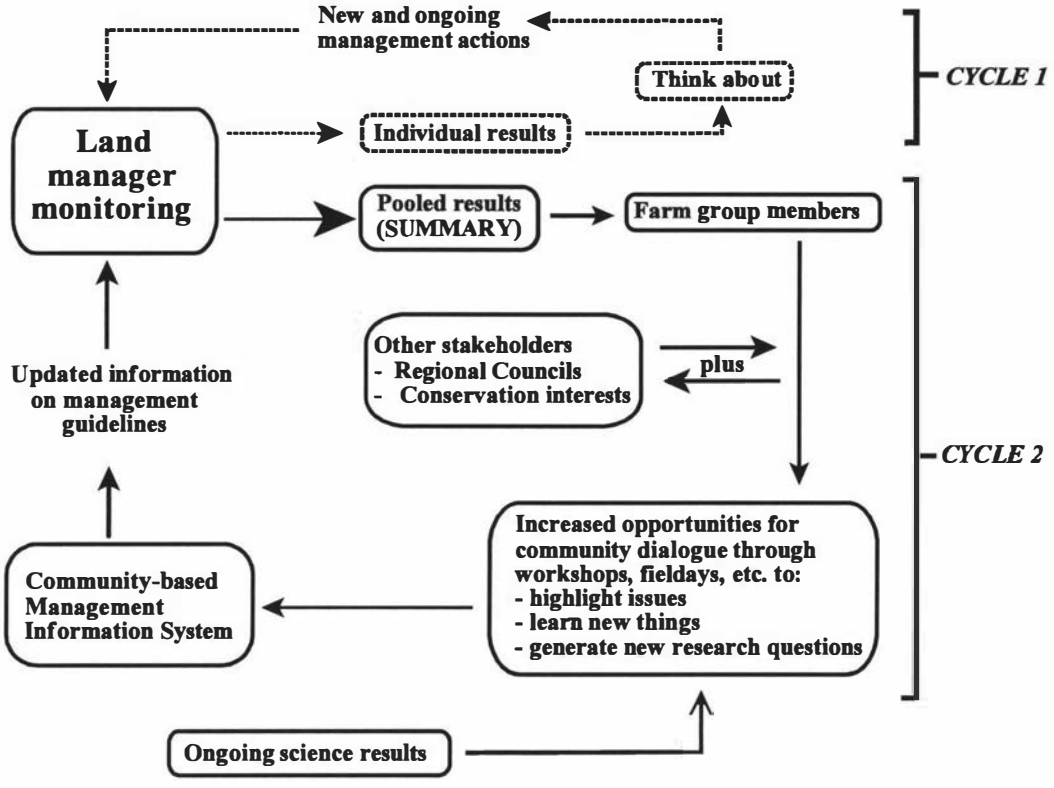

Figure 8.2 A conceptual model of information flows within a community-based monitoring programme (Cycles 1 and 2 - see text).

This discussion began by revisiting the goals of this community-based monitoring programme in the South Island high country. Clearly, farmers will always use monitoring results from their own properties as a basis for considering future management options (Cycle 1). However, the question that emerged through this discussion was whether or not individual use of the Condition Assessment Models in this way would provide enough benefits to encourage the use of the monitoring tool independently of a more collaborative approach to information sharing. It is significant that land managers made no mention of shorter-term financial gains as an incentive during either workshop. This is due largely to the nature of the condition assessment model, which measures species change rather than available forage, which is the measure required for feed budgeting within a farm planning cycle of up to a year. It was also pointed out that the first question an individual will have when he/she looks at their own farm results is whether or not the trend indicated is similar to the results appearing on neighbours' properties, to ascertain the influence of climatic effects.

This discussion led to the development of Cycle 2, which was concerned with sharing the results among different stakeholders, and hence adopting a more multi-stakeholder approach. It was noted that as this requires farmers to become involved in monitoring as part of a wider learning exercise, rather than to provide results that would directly feed into day-to-day management planning, it would only appeal to some farmers. A useful first step in this regard was seen as pooling the results from the farmers that were involved locally within a farming (e.g. landcare) group. It was felt that this could easily be done by whoever is managing the data, and such pooling would help differentiate between trends that were due to climatic effects and those that were due to management.

Farmers felt they would gain more by involving others (such as local government policy makers) as partners in such a learning exercise, rather than treating them as adversaries. This was represented by a complementary step. An external audit for such farmer-based monitoring programmes was also seen as important to develop accountability, and build trust in the results by other stakeholders. The use of such monitoring systems could also form the basis for a future quality assurance accreditation scheme, to improve market access.

The provision of community forums for information sharing was seen as another necessary step through which different stakeholders could more effectively share, and understand, this information. In this way the system would provide a pathway for scientists to help analyse information from on-farm monitoring and offer more insight on the lessons that can be learnt. These forums were also seen as providing an opportunity for scientists to share the results of their own research with the wider community, and to work more directly with land managers to identify new research priorities. Moreover, by providing an environment for a number of groups to collaboratively learn about the tussock grasslands, it seemed possible to share costs and bring in skills that might otherwise lie outside the means of any individual farming group.

Participants saw that it was important to disseminate the lessons further. Accordingly, another useful step is to capture and make readily available the new knowledge gained through the whole process, thereby adding to the community's existing public knowledge base. The problem that was left unresolved at these workshops was who should maintain and facilitate this resource, given its joint development and wide base of information providers and users. Finally, as the workshop discussions confirmed, one of the major challenges to developing an effective multi-

stakeholder information network is supporting the active participation of stakeholders, and resolving the social and organisational issues associated with collaboration.

Issues with sharing information: the next steps

The issues that this evaluation raised over sharing and managing information are those which appear to have prevented the successful implementation of other international examples of regional or catchment-based adaptive management initiatives. While this remains an ongoing process, some initial thoughts on what these social and organisational challenges mean for the programme, and possible ways to resolve them are outlined below.

Protocols for sharing information

Although the information system described in this paper is designed to build trust and confidence between information providers and users, in the shorter term strong emotions associated with information often create a barrier to its availability (Allen & Kilvington 1999). Among science researchers much personal self-worth and commercial worth is linked to the information generated. Fear over misrepresentation affects the willingness of researchers to offer their information for use in systems over which they have no future control. Many other stakeholders may have similar fears, with some justification, that their information might be used incorrectly, or against them, if released.

In the tussock grasslands of the South Island high country, only a decade ago, the research emphasis was directed towards improving the efficiency of an extensive pastoral system. Indeed, there are few references in the agricultural research and development literature internationally to participatory approaches other than those that comment on farmers and scientists dealing with agricultural management issues (Allen 1997). However, today, given increasing public interest in the high country, research is increasingly directed towards issues of sustainability, and hence meeting the needs of a range of stakeholder groups concerned about the impact of natural resource management practices. In many cases, such stakeholders have for some time considered themselves in opposition to one another.

Land managers are aware that some groups may seek to use farm-based monitoring data against them, rather than as part of a collaborative learning exercise. One way forward is to develop information protocols that safeguard such use (see Box 8.1).

Box 8.1 Draft protocol for sharing information from monitoring with third parties
(Provided by Don Harley, Hawkdun Land Management Group)

To specify data ownership:

Information stored on central database is the property of the group and individual owner, and to be controlled by the land management group or its agent.

To protect individual privacy:

The site data and property identification are to be coded to retain anonymity and are not to be divulged to third parties without the property owner's consent.

To enable the benefits of sharing data within the group:

However, unless otherwise specified by the individual, pooled results can be released in summary form.

To provide for working in with other parties (e.g. local government):

Where joint/collaborative arrangements with third parties exist, then third parties share ownership and access to the results for the sole purpose of that specified in the arrangement.

Similar concerns have been raised regarding access by scientists to private research sites to look at soil and vegetation trends. In one recent case access was denied, largely because farmers were unsure about what use would be made of the subsequent research findings. However, because the project process was prepared to openly address this conflict, and bring in the appropriate skills, the situation was able to be resolved. The subsequent conflict management exercise resulted in the establishment of information management protocols, which enabled the research to proceed. These protocols protected the rights of landowners to be advised of research results prior to their being released to third parties, and provided for discussions of the implications of research results by the different stakeholders involved before publication (Allen & Kilvington 1999).

Such protocols could also include transaction costs (the flow of data is encouraged when these are low), permitted/excluded uses, and disclaimers (in the event of incorrect data and to avoid liability). However, protocols are only a starting point to building goodwill, trust, and fairness in sharing information.

Managing multi-stakeholder information systems

A first version of a Tussock Grasslands Management Information System is currently being developed with the support of a range of different user groups. This will enable structured information to be captured and made available to those unable to directly participate (Bosch et al. 1999). While the notion of a centrally-based information system seems an ideal way of resolving the tensions over disparate information sources, such a system will often be unsustainable in multi-stakeholder situations such as this where, quite understandably, stakeholders expect to retain full control over their own data and information. An alternative is to promote a network concept which conveys the reality that the information system is a collection of participating stakeholders rather than a particular information project or item of technology (Figure 8.3).

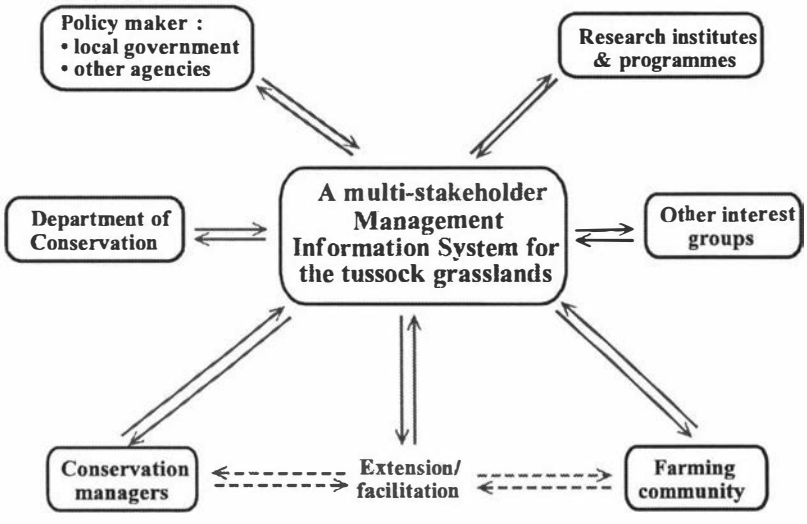

Figure 8.3 A network of information providers and users in the high country.

Given the decentralised grouping of agencies, land managers, and other individuals within the natural resource management arena, the Internet is emerging as a valuable tool in information management. It allows different groups or organisations to maintain control over their own

information, while sharing a common 'gateway'. Internet technology will inevitably play a role in future information systems, not least because it offers a unifying platform on which the collection of information for both internal and external use can be provided. The potential of the Internet to promote collaborative learning and problem solving has been pointed out by a number of researchers (e.g. Carrascal et al. 1995; Allen et al. 2000a).

However, while a start has been made and information is currently being shared among farmers and researchers from a number of different institutions, developing a shared system in this way is raising new issues. Fears of misrepresentation, misinterpretation, and misuse of data and information that has been provided for collective use must be allayed. This involves constant negotiation with researchers, policy makers and local landowners. Questions of security of information, how to credit information, and how to release and circulate draft information, all have to be worked through with all the contributing stakeholders.

This approach also provides new challenges for extension. Not all farmers, community members or conservation managers are going to be directly involved in such a collaborative research approach to high country management, nor should we regard all those who become directly involved in such participatory processes as direct users of such a multi-stakeholder information system. There are also a number of individuals who do not have, or necessarily want, access to computing and Internet facilities. Increasingly, however, people do belong to a range of groups (e.g. landcare, NGOs). These groups are serviced by facilitators and group leaders, and act to develop an effective cooperative environment for information exchange and learning. In this way there is potential for such facilitators and group leaders to be seen as the interface between the Internet-based information system and individuals. In itself, the Internet has the potential to form a powerful and immediate link between group facilitators, group leaders, researchers, and other relevant agency staff. Strengthening this link will contribute towards more effective sharing of information among the diverse range of groups involved in natural resource management.

A major consideration is how to institutionalise the process so it continues beyond the life of the research programme. The difficulty centres around who has the mandate to provide ongoing support for such a system, and whether it should be undertaken by one or multiple groups. In turn, these questions are related to how different groups regard the goal of such an information system — is it just to benefit land managers, or is it a public good?

Concluding comments

Clearly the multi-stakeholder perspective taken within this South Island high country initiative challenges the common perception of what a 'programme' is. It recognises that each group of participants (scientists, funders, land managers, policy makers, etc.) has its own viewpoint, and its own reasons for becoming involved. As Schwedersky and Karkoschka (1994) point out, it is traditional to observe programmes within an operational cycle, from planning via implementation through to evaluation. However, to take into account the various perspectives and interests of the participants, we must look beyond this cycle. Inevitably, 'the programme' can be regarded as a number of sub-projects, each of which is 'steered' by a different group of participants according to their values and aspirations. In the real world, 'cooperation' is a far more realistic goal than 'consensus'. It is unlikely that groups with different interests, objectives, and values will work as members of a single 'community' team. But with the help of appropriate participatory and systems-based processes it may be possible to help meet the different needs of those involved and develop 'win-win' strategies.

As Allen and Kilvington (1999) highlight, the key to implementing such systems is to develop a clear understanding among all the different participants about the goals and objectives. One of the main points that has come out of this evaluation is that a monitoring system such as that described here is primarily designed to facilitate a collaborative approach to improving our understanding of what is happening in rangeland ecosystems. As such it is more likely to interest a small number of farmers from all over the high country who wish to more closely link their management results with the more formal scientific research process. In this sense, these farmers cannot just be seen as system users, rather they become 'co-researchers' in developing public good knowledge, and consideration needs to be given to how their input can be best supported.

In the broadest sense, such open-ended information systems as described here are intended to improve efforts to share information by building trust and confidence between information providers and users. Such systems can empower a wide range of individuals, groups, and organisations to work together and support decision-making change within a framework of collective information production. The guidelines and strategies developed by the stakeholders will draw on a larger base of information than is available to any one of the parties acting alone. They are thus likely to result in more effective outcomes. The probability of commitment to, and

adoption of, changed practices is also likely to be higher because stakeholders have had a hand in designing them. However, in seeking to develop an information system that is truly part of the broader social system by which information is translated into knowledge and action, we need to pay attention to social and organisational as well as technical issues. As Allen and Kilvington (1999) point out, future multi-disciplinary approaches need to include personnel with complementary skills in the management of participation and conflict, and the integration of biophysical and social aspects of problem solving.

Acknowledgements: The authors would like to acknowledge the support and funding provided by Otago Regional Council and Landcare Research. Participatory action research such as described here is not possible without the support and goodwill of all those involved, and we record our appreciation for the efforts of all those who have put their time and effort into the projects described here. We thank Grant Hunter and Grant Norbury for their helpful and perceptive comments on early drafts of this paper.

CHAPTER 9

Helping groups to learn enthusiastically — roles for information, the Internet, and agency support

Time period in which main work on this issue carried out:											
Jul- 94	Jan- 95	Jul- 95	Jan- 96	Jul- 96	Jan- 97	Jul- 97	Jan- 98	Jul- 98	Jan- 99	Jul- 99	Jan- 00

Allen, W., Bosch, O., Kilvington, M., Oliver, J.& Gilbert, M. (2000) Benefits of collaborative learning for environmental management: Applying the Integrated Systems for Knowledge Management approach to support animal pest control. *Journal of Environmental Management* (In press).

This chapter looks more closely at the application of ISKM through a case study to improve the use of information within bovine Tb vector control, paying particular attention to the lessons that emerged within different steps. Some considerations about the growing role of, and potential for, using groups as a mechanism to manage and foster change in natural resource management are highlighted. The role of social capital (social networks, norms and trust) in supporting the process of learning is highlighted, and a model is presented to categorise group development in these terms. The accompanying paper draws attention to different approaches to extension, and how their use in practice should often be seen as complementary. The third version of ISKM is presented, emphasising the need to put more effort into building relationships and clarifying goals as a starting point for collaborative initiatives. Finally the paper looks more closely at the potential role of the Internet in supporting information management and networking. The need for action researchers to learn lessons across case studies and programmes is also noted.

The phenomenon of small groups of farmers working together, exchanging experiences, acting as a forum for group extension, sometimes linked through computer networks, taking collective action and discussing decisions, raises exciting design possibilities for information systems ... research should generate stronger statements about their use and the design of interventions for establishing and supporting them. (Röling 1988 p. 206)

While the case study work in tussock grasslands management referred to in the previous chapter continued, Landcare Research also conducted a research programme to assist the identification and uptake of effective Tb vector control strategies through a case study that complemented ferret control efforts in North Canterbury. This work had a dual focus, not only in looking at how to improve the provision of, and access to, sound information for decision-making, but also in encouraging the use of that information to change behaviour. The programme was funded by the Animal Health Board (AHB) — the national pest management agency for the control of bovine Tb — and carried out in two year-long phases from July 1997 to June 1999. My own involvement in this case study was as an action researcher during both years, and as programme leader during the second year.

The reflective material presented in this thesis aligns with the dual aims of the research outlined above. The accompanying chapter paper focusses on how to improve the provision of and access to sound information repuired for decision-making, and was finalised as a collaborative reflective exercise following the completion of this case study. This not only involved Ockie Bosch, Margaret Kilvington and myself as researchers, but also brought in the perspectives of John Oliver (AHB) and Malcolm Gilbert (farmer and Chair, North Canterbury Tb Management Committee). Of equal importance to the lessons being developed through this paper were the findings related to group motivation contained in an accompanying report (Kilvington, Allen & Kravchenko 1999. Improving farmer motivation within Tb vector control. Landcare Research Contract Report LC9899/110) which was written as a result of work done in the second phase of this project, and is included within this thesis as Appendix II.

As indicated earlier, what can be usefully regarded as the third and most current version of ISKM is illustrated in both Chapter 8, Figure 8.1 and in this chapter as Figure 9.5. They differ slightly in that the version presented in this chapter has only 4 steps, reflecting that in many ways the act of getting people to provide information can be thought of as part of the community dialogue/collaborative planning process. Moreover, the accompanying chapter paper explores what is involved in each of the ISKM steps in much more detail than was provided in the Chapter 8 paper.

The paper begins with a discussion of the challenges facing extension, in its wider sense as '... the science of the planned change of voluntary decisions through information systems' (Rolings

1988 p. ix). This discussion acknowledges that there are a number of different extension approaches (Figure 9.1).

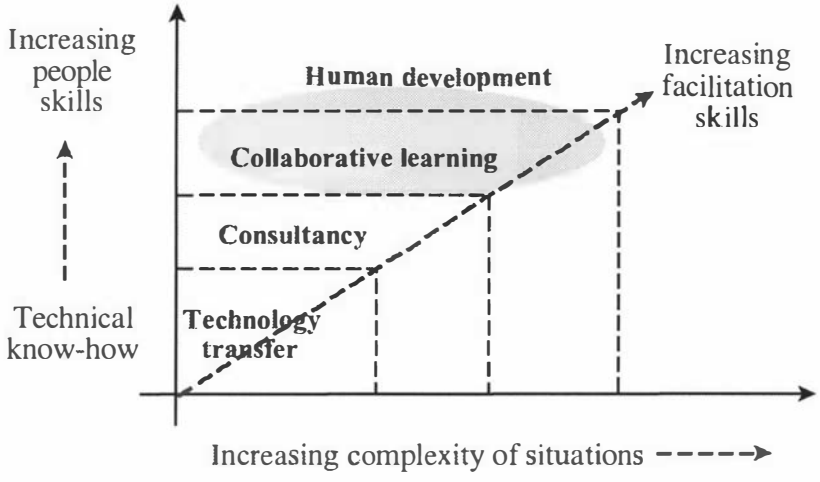

Figure 9.1 Complementarity of differing extension paradigms (Adapted from Coutts 1994 sourcing Van Beek & Coutts 1992). The area being discussed in this thesis is shown as shaded.

Accordingly, this helps us see that the use of linear TOT approaches to extension are not necessarily 'wrong'. There are very clear examples where this approach to technology transfer is highly successful. It does mean that we must recognise a continuum of extension paradigms. A useful framework has been proposed by Bloome (1991 quoted in Coutts 1994 pp. 5–6). His proposal was that extension can be classified under four paradigms: technology transfer; problem solving (or consultancy); informal education (or collaborative learning); and human development (Figure 9.1). Further, Bloome sees these differing views as complementary, rather than in conflict — each relevant to different needs and situations.

The major evolution of ISKM highlighted in this paper, compared to the second version (Figure 5.7), is the much greater emphasis put on the need to build relevance, trust and a constructive climate for change from the beginning of any collaborative project. It suggests that this involves a number of steps including identifying and involving relevant people, building relationships, and establishing the ground rules for working together. While the other steps remain essentially the same, this case study provides for an improved understanding of what is involved in the implementation of ISKM as a whole, and more ideas of how the implementation of each of the steps can be improved.

The importance of seeing information as part of a wider social system was highlighted by an evaluation exercise run at the beginning of the research programme. In this evaluation the local Tb Management Committee were asked to identify the activities they felt were crucial if the Tb problem was to be effectively addressed. The subsequent diagram (Figure 9.2) and discussion confirmed the relevance of this project, and others related to information management and sharing, to a range of representatives working in related areas of bovine Tb control (Allen & Bosch 1998). It clearly recognises the role of current management and related research efforts into both disease and vector control (the shaded area). At the same time, it highlights the need to address many of the challenges to providing good information within a more effective collaborative learning environment.

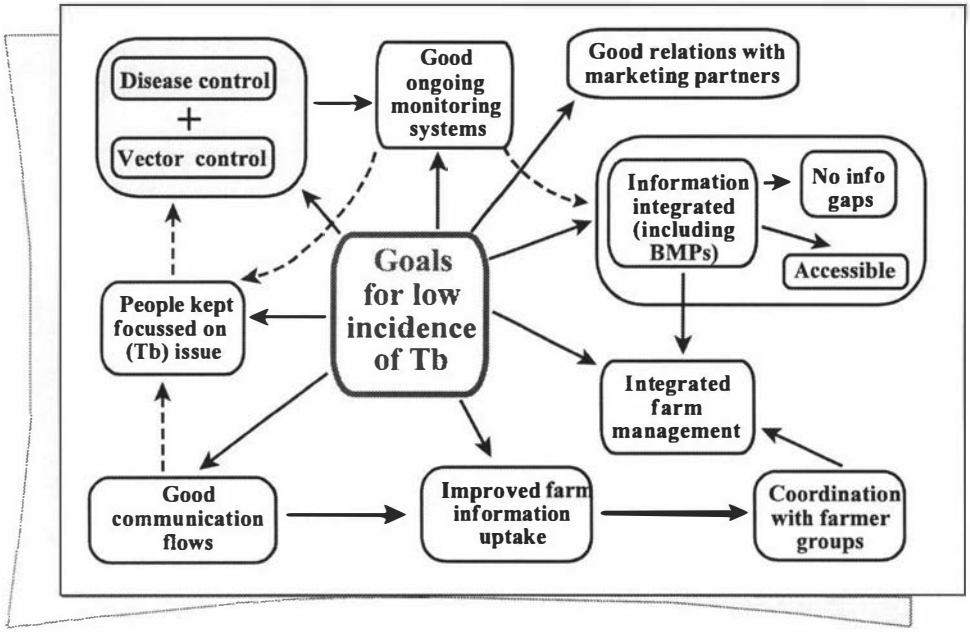

Figure 9.2 Goals that a successful programme to manage bovine Tb needs to achieve (edited diagram from North Canterbury Tb Management Committee meeting 15/5/97).

A number of goals identified in the above diagram related to the need for improved communication, learning and information/technology transfer and exchange. These, in turn were felt necessary to lead to changed behaviour 'on the ground' in the form of integrated farm management that takes account of the need to include Tb vector control. As one farmer said: 'We need to get farmers to realise that they need to maintain their efforts into vector control, in the same way that they need to maintain their efforts into drenching the hoggets.'

What participants in this evaluation also noted, however, was that although these latter areas are all seen as vitally important, little is known, and little research is carried out on how to set goals and action plans and monitor achievements. In turn, because it is hard to specify the necessary actions and their resulting outputs in quantitative terms, it is difficult to write objectives and allocate money for activities (e.g. summarising information through pamphlets, motivating farmer group members). Newsletters, field days and late-night phone calls are essential activities, but because outputs are hard to quantify, these tend to be omitted from formal operating plans, and consequently remain largely underfunded. Much voluntary effort is expended in these activities.

The need to bring together and structure information from different sources so that it is more easily accessible was clearly identified. Developing improved monitoring systems for both disease and vector control was another area seen as vital. Although it was recognised that much data (particularly related to disease monitoring) are being collected, participants felt that more effort was needed to structure the results and make them more widely available to help different decision-makers. Collectively the points made by participants at this evaluation helped confirm the relevance for the research initiative outlined here. Also, the fight against bovine Tb provides a good example of how contemporary programmes in resource management will increasingly involve different interest groups and agencies working in co-operation on several closely linked fronts.

As we (the researchers) moved on to stages of information gathering and community dialogue, we could also begin to see the potential for using multiple case studies within a wider action research cycle to draw out broader and more robust experiential lessons (Figure 9.3). For example, in the HMP case study introduced in Chapter 3, we suggested that 'beginning with local knowledge of management goals, problems was an important starting point' for accessing existing knowledge. In this second case study we had the opportunity to 'test' this generalisation in a different setting by starting with science knowledge. However, as documented in the paper we found that this provided a narrower context for guiding 'best management practice' than was required in practice.

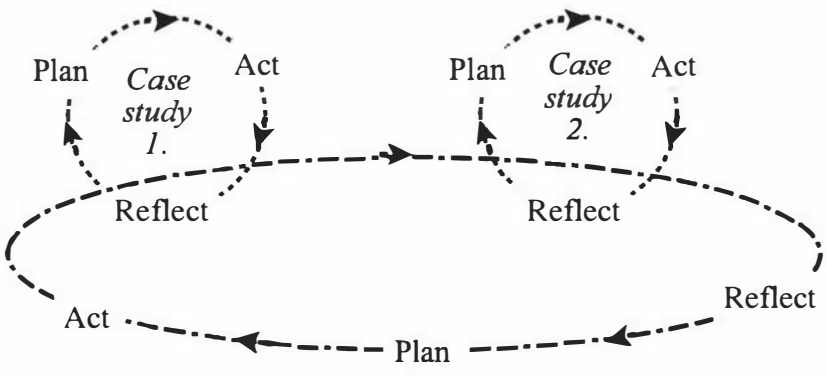

Figure 9.3 Use of expanded action research cycles to learn lessons across case studies.

This work also provided additional thoughts (to complement similar Internet initiatives concurrently undertaken in the tussock grasslands) regarding the potential role of the Internet to help leverage the improvement of information management within natural resource management. It was interesting that while scientists generally appeared to see the use of web-based information as yet one more way of 'getting the right information out there', a number of farmer group leaders indicated that their 'vision' of the Internet was as a focal point around which to build more opportunities for farmer– scientist discussion and learning. Some group leaders and facilitators also recognised the need for Internet-based material to provide a community resource which could be easily updated, and shared with other farmers — who may not have Internet access — through their involvement with groups.

Moreover, while scientists involved in pest management saw the development of 'best practice' guidelines for pest control as a technical question, the farmer group leaders saw 'best practice' as a twofold question encompassing both technical issues (strategies for pest control) and social issues (how we get people to do the work). This latter point also raised wider questions about the growing role of, and potential for, using groups as a mechanism to manage and foster change in natural resource management. Many factors are driving this shift. A predominant one is that many tasks (such as reducing ferrets in a locality) are just too big for individuals to handle alone. Another is the recognition that groups can be more effective in solving problems and learn more rapidly than individuals. However, while groups may be an essential ingredient within natural resource change efforts, their presence certainly does not guarantee success.

In turn, these questions were the catalyst for a second focus of work within this project, which looked at how the Animal Health Board (AHB) can improve farmer motivation, with particular emphasis on how this can be achieved through LIP (Local Initiative Programme) farmer-based vector control groups. The ensuing report (Kilvington et al. 1999 reproduced here as Appendix II) looks more closely at motivation and identifies the use of well-managed and supported farmer groups as a leverage point for improving farmer participation in ferret control activities. It suggests that these groups have the potential to harness the positive aspects of social pressure and provide a vehicle for improved information sharing, collaboration, motivation and networking.

Frequently, elements such as motivation, information and learning are only associated with voluntary policy approaches. However, as this report notes, these linked support-approaches can equally be seen as making a significant contribution to reinforce other policy mechanisms including regulation and economic-based incentives/disincentives. Other issues relating to the successful support of group-based approaches identified here include: awareness of what is happening to a group, understanding of a group's needs for resources and leadership, and access to the skills necessary to address this. Moreover, as outlined in Chapter 5, encouraging people and groups to participate in monitoring their own progress in these areas and evaluating achievements is a way of strengthening motivation as well as improving how they work together and build relationships for change.

In the development and organisational learning literature the social networks, norms and trust which facilitate this co-operation for mutual benefit are referred to as 'social capital' (e.g. Schuller & Field n.d.; Baker n.d.; Pretty & Frank 2000). Tom Schuller and John Field paraphrase Coleman in highlighting the links between social capital (i.e. relationships) and learning:

> As developed by James Coleman and others, the idea of social capital has come to play an important role in helping explain educational attainment (Coleman 1988, Coleman 1994). For Coleman, the concept of social capital complements that of human capital; indeed, it helps explain variations in the levels of human capital in any given society. Coleman's conclusion is, briefly, that high levels of human capital tend to arise when individuals can draw on 'the set of resources that inhere in family relations and in community social organisation and that ..... can constitute an important advantage for children and adolescents in the development of their human capital' (Coleman 1994: 300). This is an appealing conclusion, not least because it directs attention to such 'soft' variables as social networks and values, rather than focusing primarily

upon the 'hard' variables that tend to form the bedrock of human capital thinking. (Schuller & Field n.d.).

The literature relating to social capital and development is extensive, and further examination of this is beyond the scope of this thesis. However, from this brief discussion we can see social capital as the framework that supports the process of learning through interaction. A key requirement for social capital to be present is the formation of networking paths that are both horizontal (across agencies and sectors) and vertical (agencies to communities to individuals). The quality of the social processes and relationships that social capital supplies — within which learning interactions take place — is especially influential on the quality of the learning outcomes in collaborative approaches.

It was clear from our work in this project that many groups measured their team performance outlined almost specifically in relation to their ability to deliver on the main goal of controlling Tb vectors. However, as Kilvington et al. 1999 Appendix II point out, this emphasis on the bigger goal tended to obscure the less obvious measures of success that groups had achieved along the way both in terms of tasks (smaller on-the-ground activities) and process (their development in managing and improving the way the members worked together).

In particular, we need to remember that it is these latter process issues — including the development of social capital — that are key to the long-term survival of groups. Some will become highly effective, growing and diversifying their activities to better support the wider aims of sustainability, while others will either cease after completing a specific task, or struggle on in name only. The following model (Figure 9.4) illustrates one way of categorising group process development. Teams at later stages (towards the right of the diagram) are taken to be more resilient and more adaptive — capable of contributing to the innovations desired for social and institutional culture change (e.g. improved environmental understanding and management). All stages relate measures of group or individual status to performance or outcomes.

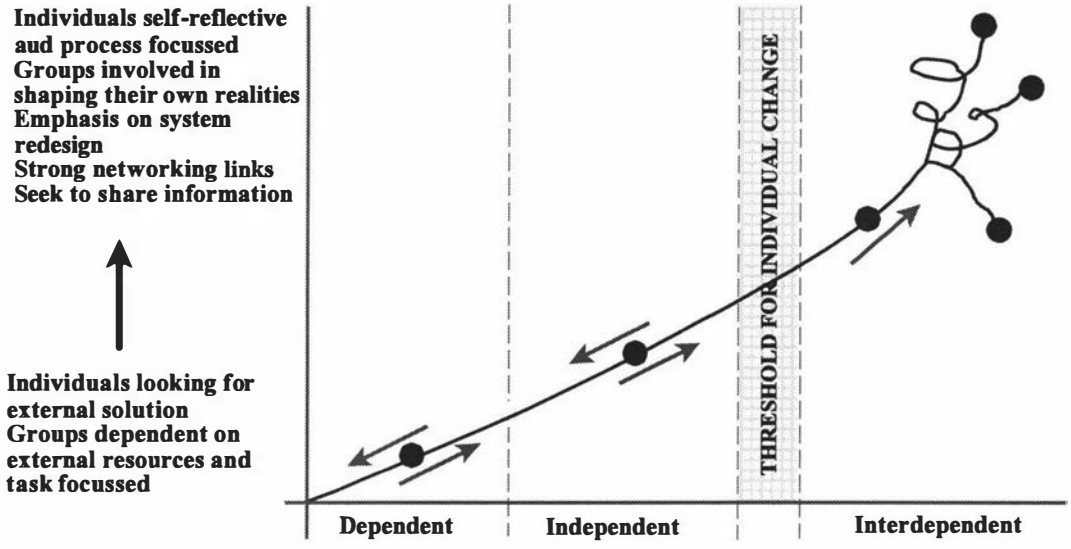

Figure 9.4 Stages in group maturity (adapted from Pretty & Frank 2000).

As Pretty & Frank (2000) explain, this model of group stages is essentially progressive, indicating that one stage can lead to another. Progression, though, is not taken as inevitable, with outcomes at any point leading to the group moving on, going back to a previous phase, or staying in one place. These authors go on to define each group in terms of a number of identifying characteristics.

The dependent phase can often be seen when individuals agree to form a group, often in response to a crisis or prompting (from management). They can see benefits in working as a group, but are likely to spend much of their time looking back at what has happened, rather than forward. Individuals are still likely to be looking for external solutions (albeit new ones) so dependency remains high, particularly on external consultants and resources. They are task focussed, measuring success by 'getting the job done'.

The second phase sees growing independence, combined with a realisation of new emerging capabilities. Members are increasingly willing to invest their time in the group itself as trust grows, although the focus is still on task rather than process. At this stage groups are likely to develop links with internal and outside groups. This is a stronger and more resilient group stage, but is still likely to break down once members feel they have achieved their original aims.

The final phase illustrates a turning point for groups or teams, where they are much more aware of the value of the group itself and its capabilities to problem-solve. Individually, members will be characterised by the development of capacities which expect change, are more dynamic, and capable of developing responses to help shape a desired future. Individuals, in this sense, can be seen to have changed — taking a different approach to looking at, and addressing, perceived problems. This change is represented in the above diagram by the shaded threshold area. Groups in this phase will not only focus on task issues but will place an equal emphasis on process. In regard to this latter point group members will continually look to ways of strengthening themselves as a team, and be quite critically evaluative of their own abilities. Groups in this phase will be capable of promoting the spread of appropriate technologies and ideas to other groups, and of initiating new groups themselves. They will be increasingly linked to a range of external alliances.

As Morgan (1999) points out, the tension between building task and process orientation runs through most efforts at development cooperation: 'Many programs tend to oscillate from one perspective to the other, first emphasizing task achievement and the production of program benefits — getting the job done — and then swinging back to a process effort in order to develop more capacity in relation to process issues. Getting the right interrelationship between achieving task benefits and developing effective and sustainable capacity to make the process ongoing is crucial' (Morgan 1999). Equally, as environmental research and development initiatives begin to consider process as well as task issues, similar tensions will have to be addressed.

Benefits of collaborative learning for environmental management: Applying the Integrated Systems for Knowledge Management approach to support animal pest control

Will Allen, Ockie Bosch, Margaret Kilvington (Landcare Research), John Oliver (Animal Health Board) and Malcolm Gilbert (Farmer, Amberley)

Abstract: Resource management issues continually change over time in response to co-evolving social, economic and ecological systems. Under these conditions adaptive management, or 'learning by doing', offers an opportunity for more proactive and collaborative approaches to resolving environmental problems. In turn, this will require the implementation of learning-based extension approaches alongside more traditional linear technology transfer approaches within the area of environmental extension. In this paper the ISKM (Integrated Systems for Knowledge Management) approach is presented to illustrate how such learning-based approaches can be used to help communities develop, apply, and refine technical information within a larger context of shared understanding. To outline how this works in practice we use a case study involving pest management. Particular attention is paid to the issues that emerge as a result of multiple stakeholder involvement within environmental problem situations. Finally, the potential role for the Internet in supporting and disseminating the experience gained through ongoing adaptive management processes is examined.

Introduction

The role of extension, or information management, in supporting the identification and adoption of best management practices within natural resource management is becoming increasingly difficult. Policy makers, scientists and communities alike are having to recognise the interlinked nature of many apparent resource use problems. Successful outcomes are often dependent on the coordinated actions of decision makers at different levels from farm to region. Consequently, many viewpoints and sources of information have to be shared among the different parties involved, and integrated to find solutions that will guide the way forward. A major challenge is

to help different groups of decision makers identify and apply sound technical information within a larger context of shared understanding.

The changing nature of resource management issues creates a further complexity. Because there can never be perfect knowledge of ecological processes within non-equilibrium systems, the concept of sustainable practice changes as knowledge expands (Burnside & Chamala 1994). Solutions need to be monitored closely during implementation to confirm their effectiveness, and to help refine future actions. In addition, as evolving economic, technical, and social systems continue to impact on management decisions, they will also contribute to changing definitions of best management practices. Accordingly, successful resource management must be based on a process of active adaptive management or 'learning by doing'. Such a process will also help create closer links between science, policy making, and management.

This paper uses the control of bovine Tb vectors as a case study to illustrate how collaborative learning approaches can be used along with more traditional linear forms of information transfer to support improved environmental decision making. It begins by describing the social context and challenges facing those involved in the case study, and then identifies possible solutions that can be used to promote a more active form of information management. It then discusses how the Integrated Systems for Knowledge Management (ISKM) approach can help implement such an active or learning-based approach. The potential for using the Internet to support and disseminate experience gained through ongoing adaptive management processes is examined as part of this. Particular attention is paid to issues resulting from multiple stakeholder approaches within environmental problem situations.

Challenges in improving pest control

The control of bovine Tb vectors in North Canterbury, South Island, New Zealand serves to illustrate challenges in information management, namely, those of providing access to sound information for decision-making, and encouraging the use of that information in changed behaviour that results in improved environmental management.

One facet of bovine Tb management requires that feral vectors are controlled. These include possums, deer, pigs, cats, and mustelids. All these mammals are exotic to New Zealand and, in the absence of natural predators, have spread widely, often to the detriment of indigenous flora and fauna (King 1990). More recently, they have been perceived as major agricultural pests because of their role in the spread of bovine Tb. Much research and management knowledge has been gained in their control over the years, particularly about possums, deer, and pigs, which have all been targeted by hunters for their commercial value. Over recent years mustelids (particularly ferrets) have assumed a growing role in contributing to the spread of Tb, particularly in the South Island (Livingstone 1996), thus illustrating the dynamic nature of goal-setting within environmental management.

In the past pest control was largely undertaken by local government agencies. However, in keeping with the international trend towards decentralisation and individual responsibility, more effort is now required from land managers to support and assist in the management of this problem. As part of this change the Animal Health Board, the national pest management agency for the control of bovine Tb, encourages individual land managers — and particularly farmers — to take action against this disease. To this end the Board has facilitated the formation of farmer vector-control groups throughout New Zealand, many of which have been formed in North Canterbury.

While the incidence of bovine Tb was increasing and expanding in North Canterbury there was considerable community motivation to take action. However, other factors serve to complicate efforts to maintain the consistent and long-term efforts needed. For instance, bovine Tb is only visible to farmers when herds are diagnosed as infected. Farmers with newly infected herds are highly motivated to clear them from infection. Once this has been achieved, however, there is a common perception that the Tb problem has been solved, and ongoing enthusiasm for control wanes. Moreover, the cost of infection varies between farm types and is only a problem for farmers with cattle and deer. Other farm enterprises, such as sheep or horticulture, are not affected directly by bovine Tb and so are less motivated to cooperate with their neighbours in undertaking vector control.

Another complicating factor is that ferret numbers are related to the availability of food sources such as rabbits (another introduced pest), a highly visible and expensive problem for many farmers in North Canterbury. Farmers — particularly those that do not have a visible bovine Tb problem — are often more likely to focus their resources on rabbit control in preference to ferret control, because ferrets are seen as a useful form of biological control. In the long term, this emphasis on rabbit control may be a good solution, however, as low rabbit numbers can often lead to reduced predator abundance (Norbury & McGlinchy 1996), and so to possible declines in the incidence of bovine Tb.

A further challenge is the need to gather together, and update, all available information. Although there are a number of individuals in both research and management with immense knowledge in one or more areas of pest management, the information within the industry sector as a whole is fragmented. Moreover, even when best management practices have been drawn up, they are continually superceded because of changing ecological knowledge, legislation, social considerations, and land-use practices. New science and management 'experiments' are continually adding to the pool of knowledge leading to new control approaches, and technology. This means that traditional forms of published guidelines quickly become outdated.

Because information flows within environmental management are often complicated by such issues, the related concepts of 'extension' and 'technology/information transfer' have become problematic in recent years. For most of this century they have been used to refer to what was, at the time, a straightforward process of reaching out to users (usually farmers) with new knowledge developed through science. From this perspective, most research initiatives have been, and still are, largely characterised by the linear transfer of technology (TOT) model of research and development. The dominant metaphors are those of 'information transfer', 'technology transfer', 'channels of communication', and 'teaching', most of which arise from mistakenly seeing human communication in the same way as data transferred between computers (Ison 1993a).

However, as a number of reviewers point out, many of the hidden difficulties and implications related to the dominance of this approach are only now being revealed (e.g., Röling 1988; Russell et al. 1989; Ison 1993a; Allen et al. 1998b). In particular, the linear transfer model of

extension fails to address adequately both the multiple social perspectives that characterise resource management issues, and the requirements of decision makers in a dynamically changing environment.

This does not mean that the use of linear approaches to extension are wrong. There are very clear examples where this approach is highly successful. For example, it is especially suited to commercial innovations that apply equally to all end-users for whom the technology is developed. 'Commercial' in this sense refers to innovations developed primarily to increase productivity and/or reduce costs (e.g. a cheaper/more effective pest control product). However, where technology transfer — the use of techniques methods and approaches — is sought more for environmental reasons (in this case to improve disease management) rather than directly to increase productivity, more active extension approaches are required. Frequently, the costs of adopting such technologies are borne by the individual farmer, while the benefits are social and more widespread. In this case, the on-farm costs of Tb infection are small compared to the risks of international market closure related to the incidence of this disease in New Zealand. With no market signals of this risk, farmer recognition is understandably low, contributing to the variable motivation for Tb control efforts.

The need for more a more active approach to extension

Many environmental technologies today are complex, requiring not just a change in management behaviour but, potentially, a new way of thinking about systems, neighbours, and whole-farm planning. This is consistent with the view expressed by Röling (1993) who argued that moving towards environmental management should be seen as a cumulative and incremental learning process, not as the adoption of innovations.

Underpinning the concept of collaborative learning, which is now being increasingly referred to in organisational development, information system, and extension literature, is the idea of constructivism (Kelly 1955). This challenges traditional approaches to extension that perceived learning to be a passive process. The emphasis was on 'teaching', transferring the information or research results in the most efficient and effective way for end-users to take on board and then apply. From a constructivist perspective it is now generally accepted that people's cognitive

maps (belief structures or worldviews) will shape their interpretation of new information, and that these cognitive maps are influenced in turn by the organisation or community grouping to which these people belong (Huber 1991; Michael 1995). Seen in this light, it becomes clear that if we wish to change people's behaviour (for instance, to improve the effectiveness of current pest management activities) then we face the difficult task of 'helping them see the world in a different light' (Bawden 1991).

That this task will be difficult is explained by a number of researchers, who maintain that people have inbuilt, and largely unconscious, defensive measures to ensure the resilience of their worldview (e.g., Argyris et al. 1985; Michael 1995). Taken together, these concepts provide strong reasons why linear technology or information transfer workshops and media messages are by themselves insufficient mechanisms to promote change. In contrast, emerging extension approaches emphasise a more active participatory approach to information management and decision making in the first instance. While there will always be a place for traditional extension approaches to disseminate information, it is increasingly recognised that developing the base information requires a more collaborative approach between researchers, extension agents, and users.

Given the diverse set of decision environments inherent in the resource management arena, managing supporting information will, to an increasing extent, rely on technology and telecommunications to fulfil its function. However, by focussing on the social and organisational processes involved in creating and using information, rather than on the technological and transfer components, all the different parties involved are more likely to learn together how to identify and adopt more sustainable management practices.

This emphasises the need for embedding learning in real-word situations, where each learner functions as part of a community of practitioners helping to solve real-world problems. This view accepts that a significant component of learning arises from our interactions or dialogue we have with others, and therefore that the thinking of a community of learners is distributed through networks of conversations. In this way, we can still acknowledge the need for linear extension mechanisms to distribute information, while recognising the need to involve user representatives more closely in the research process itself. This user involvement not only helps keep research

and information transfer relevant, it also provides key people in the community with new ideas and perspectives, which they will share with others thus paving the way for improved user thinking and change.

Integrated Systems for Knowledge Management

The Integrated Systems for Knowledge Management (ISKM) approach is designed to support such an ongoing process of constructive community dialogue and to provide practical support for resource management decision making. This framework has been developed in the South Island high country of New Zealand to help communities — in the widest sense of the term (e.g., land managers, scientists, policy makers, and other interest groups) — share their experiences and observations in order to develop the knowledge needed to support sound resource management decision-making (Allen & Bosch 1996; Allen et al. 1998b; Bosch et al. 1996a).

The ISKM framework (Figure 9.5) promotes participation and self-help in natural resource management projects by providing clear communication pathways which support dialogue and action. As such, ISKM is not a new project type or innovative development concept, but rather a specific approach that emphasises a number of key steps applicable to developing the knowledge and action needed to change problem situations constructively. The ISKM framework consists of familiar processes used in other fields of cooperation, and was designed around basic management actions, which include: identifying the problem and setting a management target; searching for information on how to achieve the target; implementing the best management practice available; evaluating the outcome; and adapting the management if required. The approach comprises two main phases.

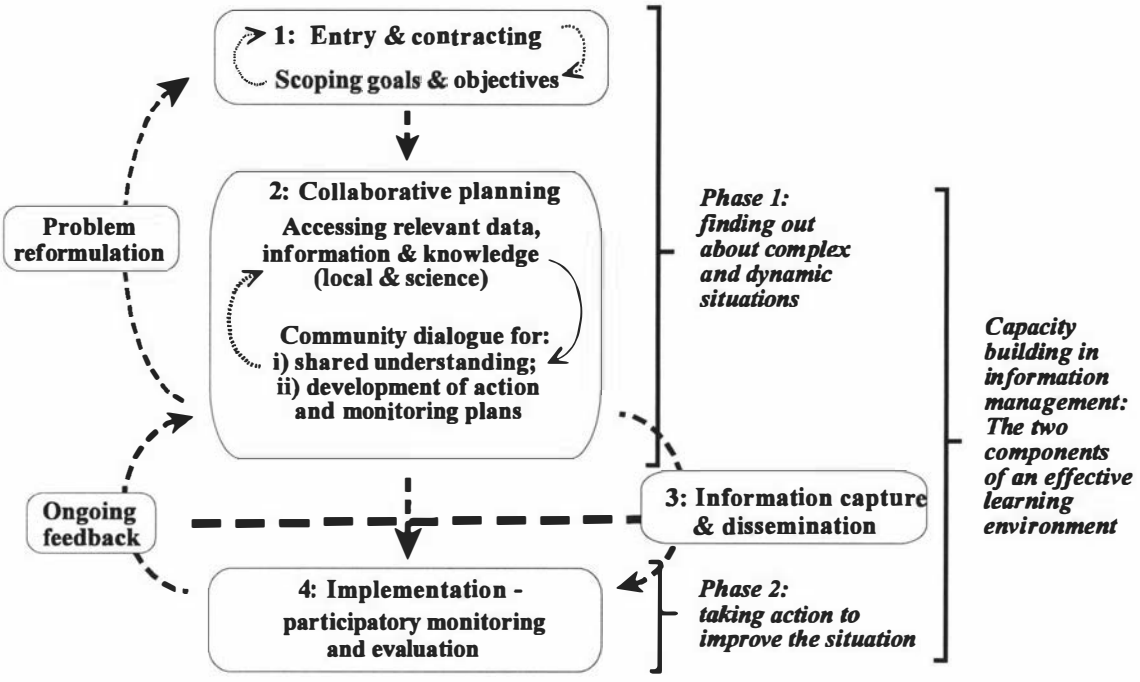

Figure 9.5 ISKM (ver. 3.2) — a participatory research framework to facilitate the identification and introduction of more sustainable resource management practices. The two phases interact to create an effective learning environment.

To guide people in carrying out these steps effectively when managing environmental problems, the approach provides a framework to:

- encourage the development of appropriate processes for community participation,
- bring people together to share their knowledge (local and science) and jointly develop best-management practices and/or action plans,
- develop a management information system (with potential benefits to all those that did not have the opportunity to be directly involved),
- monitor and evaluate the outcomes of actions
- develop feedback loops to maximise the benefits from monitoring and evaluation and hence develop a collaborative-learning/self-improving environment, supported by a continually updated information system.

Entry and Contracting

This first phase includes identifying and involving relevant people, building relationships, and establishing the ground rules for working together. The aim in any successful participatory approach is to build relationships that make it easy for people to talk about their needs, share information, and work together. Stakeholders develop a common understanding of the perceived issue, and collectively decide on their goals and roles. Building this climate for change is the single most important step in initiating any collaborative approach.

The establishment of such a dialogue first requires an initial scoping process to clearly define the nature of the system under consideration, and the needs and opportunities facing the different interest groups involved. It also addresses who should be involved, and what can or should be changed, etc. Because this provides an opportunity to involve the interested parties in the research process from the outset, it is more likely to lead to the development of opportunities and outcomes relevant to community needs.

In our pest management case study, this phase of the project involved the researchers in working with an already established representative advisory group, the North Canterbury Tb Management Committee (comprising farmers, local government and agency representatives). The project goals and the roles of those involved were also agreed in conjunction with the Committee. Key roles in bringing science and local knowledge together in this project involved the project researchers in taking responsibility for contacting and arranging to meet with pest management scientists, and the farmer Chair of that Committee to organise farmer meetings.

Collaborative planning

In its simplest form planning can be seen as a two-step process of problem solving: seeking out information, and using this information to develop strategies to improve the situation. The emphasis on problem formulation ensures a focus on the collation and development of 'relevant' information and knowledge. It provides a basis for the design of appropriate processes (interviews, focus groups, questionnaires, etc.) to unlock and access the relevant existing data and information from both local and research communities.

As Bosch et al. (1996a) point out, it is important to begin with local knowledge of management goals, problems, and solutions. Land managers have collectively accumulated a vast amount of experience in local environments, and involving them from the outset ensures better access to their knowledge. In turn, sharing understanding and knowledge between scientists and land managers allows scientists to gain a better appreciation of the opportunities and problems facing land managers in the real world. This is more likely to lead to the development of a structured and comprehensive knowledge-base relevant to community needs (Blokker 1986).

The importance of this was well illustrated in this case study where we began by asking pest management researchers to develop a guide to 'best management practice'. This resulted in a well-constructed framework covering the technical aspects of ferret control, but which, as the farmers pointed out, failed to recognise that effective pest management not only requires a 'knowledge' of control techniques, but also of how to encourage a majority of farmers to 'undertake' these control techniques. As a result of this, work was subsequently undertaken through this project on the social aspects of gaining collaboration and involvement.

Another key consideration during this process is helping different stakeholders recognise the contextual nature of information. A strategy suggested by a conservator, farmer, policy-maker, or environmental group will always have been derived from within a particular social, economic, and ecological setting. Scientific results are similarly derived from within a particular context, which will include factors such as scale, site, and the researcher's personal worldview. Accordingly, the community dialogue process is designed to seek the active cooperation of different group representatives to develop a common understanding of the context in which any individual piece of information becomes relevant. For example, an important consideration in designing field control operations is determining the appropriate spacing to use between traps. In this case study scientists suggested suitable grid spacings to ensure that the ferret's home range was well covered with control traps. However, North Canterbury farmers pointed out that a grid design for trapping may not be the most practical and cost-effective method in a commercial situation, where trapping often has to be combined with other farm operations. Both groups are correct in the context in which they are working.

Accordingly, facilitated workshop formats can be used to provide a learning environment within which participants develop a shared understanding of how others see the world and how that view shapes the way they act in it (e.g., manage their land, carry out their research, develop policy). Indeed, as Huber (1991) notes, it might be reasonable to conclude that more learning has occurred when more and varied interpretations have been developed, because such development extends the range of participants' potential behaviours.

Information capture and dissemination

Dissemination of information is crucial to the development of a learning-oriented management system. Where a certain item of information is known only to a few people within an organisation, the possibility that others will find it is weak (Huber 1991). Conversely, when information is widely distributed in an organisation, such that more and varied sources for it exist, retrieval efforts are more likely to succeed, and individuals and units are more likely to learn. Given the decentralised grouping of agencies, land managers, and individuals within the natural resource management arena, the challenge noted above is multiplied several-fold. Yet, if we must go through the hard work of acquiring and making sense of information previously discussed, it is logical to maximise our efforts for storage and retrieval.

The use of ISKM and similar approaches provides, for all those directly involved, a learning environment in which 'useful knowledge' is developed through a participatory process. In addition, this knowledge should be captured to benefit potentially all those who have not had the opportunity to be directly involved. This can be done through a range of media such as minutes of meetings, journal papers, memorandums, reports, the media, telephone, facsimile, and (last but certainly not least) face-to-face conversations, as appropriate. In other cases, especially with more complex problems, computer-based decision support programs can provide a decision-tree type format to guide people through the problem-solving exercise. Here, the Internet is emerging as a new system for managing complex information which allows people to create, annotate, link together and share information from a variety of media including text, graphics, images, audio, and video. The potential of such hypermedia-based systems to promote collaborative learning and problem solving is also being advocated by a number of other researchers (e.g., Carrascal et al. 1995; Allen et al. 1988b; Manninen 1999).

In this way the Internet-based system developed for Tb-vector control in our case-study can be seen to act as a medium to collect, structure, and store information. The design was developed through the ISKM collaborative planning phase and encourages the user to define and then select a management goal. By answering simple questions and being prompted to provide further information with the help of associated models (e.g., monitoring packages), the user can create new information relevant to the issue under investigation. Prompts provide a pathway towards the provision of management advice. Through the use of hypermedia links the user can obtain further explanation and clarification of the assumptions behind selected answers, along with the ability to access associated subject areas.

The iterative approach inherent in the ISKM framework encourages an interactive process where DSS (decision support system) developers and users collaboratively discover new requirements, and make refinements to succeeding versions. Through this process the users become authors and presenters of the material within the DSS. As authoring requires analytical thinking about the subject matter in hand, this leads to a deeper understanding (Jonassen 1992). The value in this is obvious when DSS development is seen as a process that can be enhanced by the use of iterative 'soft' systems methodologies emphasising processes of dialogue, feedback, and learning among all the different participants in the situation under inquiry (Miles 1988). This form of DSS development allows the user to learn and experience the system at an early stage, which encourages user confidence in subsequent working versions (Brittan 1980).

The use of hypermedia also allows the capture of a wide variety of supporting information. This enables us to capitalise on the fact that decision making not only relies on 'hard' data such as numbers, facts, and rules, but also on 'soft' information such as tacit knowledge, experiences, critical incidents, stories, and details about why past decisions were made (Schwedersky & Karkoschka 1994). This means users do not have to take decisions for granted, and encourages a learning environment that helps constructive and voluntary behavioural change. In the long term, we would envisage such hypermedia-based systems as designed to integrate a diverse array of information sources and to provide users with a more holistic perspective of a complex situation. One of the main advantages of the Internet in this regard is the ability to link directly with related sites maintained by external providers. Another important feature of the Internet is improved interpersonal communication over long distances through the use of e-mail, bulletin boards, and

discussion groups. By providing networking capabilities in this way the Internet has the potential to broaden the concept of 'communities of practice' (Brown & Duguid 1991).

The research project in our case study does not necessarily regard farmers as direct users of such an Internet-based system. Clearly, not all farmers have access to computing and Internet facilities. However, in North Canterbury the majority of farmers belong to groups organised around the issue of pest management. These groups are serviced by facilitators and group leaders, and act to develop an effective cooperative environment for learning. The facilitators and group leaders are seen as the interface between the Internet information system and farmers. In itself, the Internet has the potential to form a powerful and immediate link between farmer-group facilitators, group leaders, researchers, and other relevant agency staff. Strengthening this link is seen as a key to effective sharing of information among the diverse range of groups involved in natural resource management.

The next steps

This paper has described some of the lessons learnt through following the steps in the first phase of the ISKM process (Figure 9.5). However, for such a socially inquiring information system to advance natural resource management successfully in the long term it needs to evolve as society and the environment change. While we have not yet been reached this stage in this case study, it is still useful to chart out some of the benefits that could be realised through such an ongoing approach. In particular, the strength of iterative processes such as ISKM, is that they allow for the substance and context of the required information flows to be updated as more knowledge becomes available and different goals are set.

As natural resource end-users (e.g., land managers and policy makers) adopt new strategies and measure the results of their actions (formally adopting the linked concepts of monitoring and adaptive management), they will continually develop new information, which can be brought into successive iterations of the process (Bosch et al. 1996c). In a similar way the process can take advantage of an ongoing flow of new data and information from more formal science activities. Accordingly, the nature of work undertaken by individual scientists will not change, the only difference being that the starting point for scientific experimentation is more firmly

embedded, or institutionalised, within the community of practice. The earlier processes of ongoing community dialogue will automatically help identify new and relevant research initiatives as knowledge gaps are identified. Importantly, these activities also provide the community with the opportunity to prioritise their information and technical needs as they work more closely with researchers. Because the ISKM process is designed to provide decision support, it also automatically acts to disseminate research results to those end-users who participate in the process.

The process can therefore become iterative, with each iteration serving to maximise the knowledge available to support decision making by those in the community at any time. The addition of different modules and issues will arise from the need to meet a community objective, which may be financial, ecological, or social, or some combination of these. As all the different groups involved cooperate to develop the necessary knowledge and knowledge-based tools, new issues will be raised and the process expanded.

Concluding remarks

Collaboratively developing new management options and strategies through the ISKM process provides interested parties with the opportunity to learn from local experiences gained within enterprise and catchment-level systems. This provides those involved with an appreciation of management concerns and issues, and gives scientists and policy makers a better feeling of how their contributions fit into the total system. This holistic approach is important because much of the conflict surrounding many resource management issues arises from different interest groups failing to appreciate the perspectives and values inherent in the actions of others. If these groups can be encouraged to share their experiences and viewpoints, there will be a greater understanding of why these differences exist. The use of hypermedia and the Internet provides another pathway to help bring this about.

However, while such participatory approaches to adaptive resource management sound appealing, they bring a new set of challenges for policy makers and scientists who may desire to work more closely with communities (e.g. McLain & Lee 1996; Yaffee 1997; Allen & Bosch 1996; Allen 1997). At the programme level, this means detailed outlines for action can no longer be drawn up at the outset, as problem solving is based on partnerships and cooperation, and not

the quest to achieve some externally identified goal. Proposals for actions must be continually reshaped as experience is gained, and as more participants become concerned about a particular issue, cost, or benefit. This requires the use of, and commitment to, an iterative model of testing, feedback, and revision (Sechrest & Figueredo 1993). Because of this, participatory development and research takes time, which creates problems for research funding. Most current funding systems favour short-term projects with concrete outputs and outcomes.

Because these programmes are designed to be responsive to changing community needs, one of the most pressing challenges is to develop and encourage the use of robust participatory monitoring and evaluative (PM&E) processes. Effective collaborative initiatives are the ones that pay attention to both the task and the process, and so meet the needs of the different participants in both areas (Allen 1999). In this regard the task can be defined as what those involved have to do (e.g. reduce pest numbers). The process is concerned with how people and groups work together and maintain relationships. Experience shows that people often neglect process issues, often in order to concentrate on their task. However, both task and process will suffer if they are split from each other. Because task and process are linked in this way, it is also important to measure progress of both.

Internet technology will inevitably play a role in future information systems, not least because it offers a unifying platform for the collection of information. However, the ability to produce and disseminate high-quality, meaningful information through this communication medium, with low levels of 'noise' and redundancy, is still in its infancy (De Conti 1998). It is harder still for agencies and other information managers to be able to craft good information and then use it to: (i) invite stakeholders to take a more active participatory role in its subsequent management; and (ii) through this to improve planning, policy analysis, and decision making.

If the Internet is to contribute significantly to the development of a learning environment, these processes must be both ongoing and interactive. There are still challenges in establishing a widespread appreciation that information quality is not just a set of outward characteristics or design decisions, but part of a continuous process in which content and presentation are adjusted to meet user needs. In particular this is a challenge for science organisations where traditional quality control means that end-users rarely see research results until they have been peer reviewed by the science community. However, collaborative research implies that end users need

to be involved more closely in all aspects of the research process, not only as peer reviewers but also in commenting on early draft results and presentations.

Future natural resource management projects will increasingly require a greater emphasis on the resources and skills necessary for identifying, gaining access to, building relationships with, and negotiating roles with these different sets of stakeholders. For example, resource scientists seldom have the skills required for communication processes such as entry and contracting. New skills are also needed to develop and work cooperatively in multi-stakeholder networks. In particular, this requires team skills and better recognition of the importance of power sharing, inter-agency collaboration, and local knowledge.

Although co-operative ventures such as those described here will never offer definitive solutions to such elusive issues as sustainability, they can begin to offer a variety of knowledge-based tools and possible courses of action to enable the community to make better informed decisions. In turn, as communication flows between different sectors of the community are expanded and improved, the level of needless conflict surrounding a number of resource management issues should be minimised. Accordingly, this participatory approach represents a framework through which different segments of society can cooperate to develop and work towards a more coordinated set of environmental goals.

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CHAPTER 10

The role of the Internet in supporting information sharing among change management professionals

Time period in which main work on this issue carried out:											
Jul- 94	Jan- 95	Jul- 95	Jan- 96	Jul- 96	Jan- 97	Jul- 97	Jan- 98	Jul- 98	Jan- 99	Jul- 99	Jan- 00

Allen, W. (2000) NRM-changelinks: Improving Community Participation in Environment & Development. Available from <http://nrm.massey.ac.nz/changelinks/> (Accessed 4 October 2000).

The use of the Internet for bringing a diverse range of information together is illustrated through the accompanying website, and it is used here as a case study example. The growing need for this sort of support for action researchers is shown. The different approaches to support interest-based communities and peer-based communities with the Internet are highlighted. Finally, benefits that can be gained by using the Internet as a component within a wider networking strategy are discussed.

> *If we consider the nature of the sector (international development) and accepted views on the best ways to implement 'development' (emphasising partnership, sustainability, etc.), it is surprising how many web 'gateways' are based around one organisation. Despite having ICT[5] instruments that are cooperation-friendly, we do not yet practise what we preach for the sector as a whole. While technology could be an issue, it is likely that institutional factors, especially those linked to notions of 'cooperativity' are to blame. People and organisations are slow to adjust to new opportunities and, in many cases, are just starting to re-think their strategies and to make provisions for greater cooperation.* (ECDPM 2000).

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5 ICTs (Information and communication technologies) encompass a converging spectrum of technologies that have previously been considered distinct — telecommunications, computing, broadcasting and other media.

It is easy to say that successful development can only be achieved by a truly collaborative effort between local community groups, agencies, scientists and policy makers. However, despite ongoing improvements in this area over recent years, we also know that we still have a long way to go in achieving such collaboration — and effectively sharing the required perspectives, information and ideas.

While social scientists and change management practitioners (including action researchers) have long sought to inform and improve the practices of those seeking to bring about such constructive societal change, too little of that research seems to have found its way into practice. Often too, while initiatives in this area have been improved by the efforts of individuals (be they local environmental managers, community leaders, NGOs, agency staff or other end-users) as part of their efforts to address a particular problem, the lessons learnt have not always been documented for others to use.

Another major problem facing the would-be 'change agent' is the breadth of disciplines and areas of expertise that are needed. As previous chapters in this thesis have illustrated, the practice of involving people and building constructive partnerships requires not only a working knowledge of the particular area (agriculture, biodiversity, etc.), but also skills in a diverse range of areas from information management through to conflict resolution. However, what I found during the course of this research was that I had to research these skills individually, and search out appropriate material in each of the respective bodies of literature. For the 'nuts and bolts' aspects of say, managing conflict, or facilitating an evaluation exercise, I had to look in literature which dealt predominantly in these fields in isolation.

It appears that much of the 'participatory' literature tends to be sector specific, and frequently describes efforts used to solve an immediate community problem. This may involve a number of different stakeholders coming together to work on an immediate and visible community problem, such as improving a water supply. The initiation for such a collaborative action may in some case emerge from within the community, or be instigated by an outside agency (as, for example, is the case with many international aid development projects). In terms of science, we most commonly see descriptions of participatory approaches involving researchers and one particular interest group, say farmers. Often too, when the project finishes the different participants disappear from each other's lives, with perhaps the aid workers and researchers moving on to find another group

in need of their expertise. Within these situations, community-based process skills in areas such as facilitation and rapid rural appraisal techniques are commonly used.

However, as these case studies described here have shown, when the focus changes towards the more complex issues surrounding sustainability, a wider range of skills are required to be used and linked. These situations frequently not only involve multiple social perspectives, but they also require more emphasis to be placed on information and its subsequent development. Accordingly, my own efforts described here have also required me to learn and apply skills in related fields such as sustainable development, adaptive management, collaborative learning, action research, facilitation, conflict resolution, information systems design and Internet site development. The development of the NRM-changelinks website represents an attempt to provide easy access to on-line material in these areas, and show how their use in practice can be linked.

The initial impetus was a need in July 1998 to sort out the numerous bookmarks I had collected as I went about researching these different areas. Subsequently, I developed some short introductions to these areas using hypertext as a means to portray more accurately how their use in practice was linked. In its first version then, the NRM-changelinks site was posted on the Massey University site in October 1998 as a way of making this information available to research colleagues and practitioners. This site, then, provides an annotated guide to a range of on-line resources providing papers, handbooks, tips, theory and techniques in these diverse, but related, skill fields. A short introduction to each section outlines the nature of the resource links provided, and provides pointers to other topic areas that are closely related in use.

Feedback from users has indicated that people appreciate the advances it has made in terms of bringing together and inter-relating links to information on theory and practice in these different areas. The other innovation that appears to have been particularly appreciated is the provision of an annotated outline with each of the links, which saves people time in on-line browsing.

Moreover, emerging initiatives point to how the use of the Internet in this way is growing. For example IUCN (The World Conservation Union), the Bureau of the Convention on Wetlands (Ramsar) and the World Wide Fund for Nature are proposing to use the Internet to establish a focal point and information exchange mechanism on participatory approaches and indigenous

knowledge systems (IUCN 2000). This follows a recent survey to collect and review existing information on the collaborative management (CM) of natural resources after which IUCN (1998) noted that there is a felt need among CM professionals for practical information which can be 'used in the field': 'To leverage the capacities of organisations and professionals involved in natural resource management the knowledge generated in the field has to become widely accessible through a global information system fostering effective communication and knowledge exchange among the involved people'.

More recently the World Bank Group in collaboration with a number of other partners has proposed the development of a Global Development Gateway to enable everyone in the development field to share information, communicate more easily, and build communities (GlobalGateway 2000). More detail on this intitiative can be found at the model Gateway site at http://www.worldbank.org/gateway/ .

Over the past 18 months the NRM-changelinks web site (http://nrm.massey.ac.nz/changelinks/) has become one of the larger participatory resources on the Internet in terms of site traffic. Based on statistics between 15 August 1999 and 30 July (Figure 10.1) this site is currently receiving more than 32,000 visitors a year (Site Meter 2000).

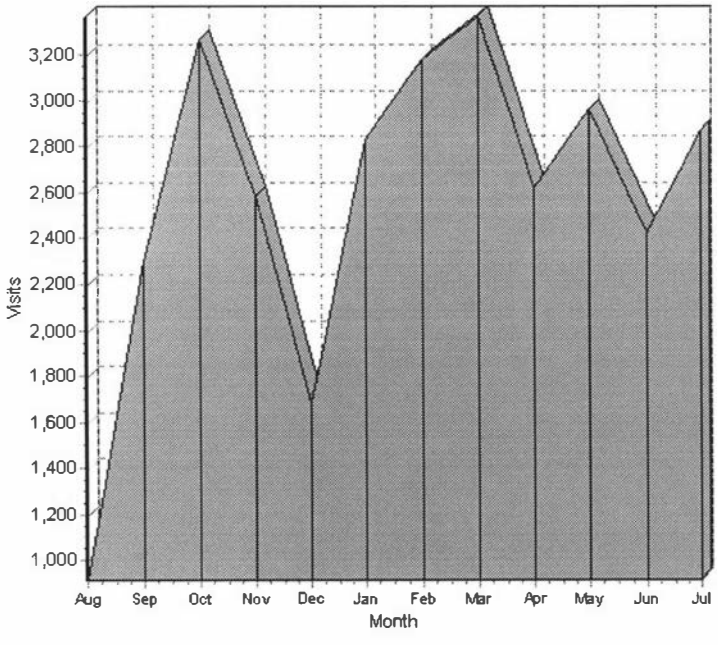

Figure 10.1 Monthly visitors to the NRM-changelinks web site for the period 15 August 1999 to 30 July 2000 (Source: Site Meter 2000).

In the area of sustainable development it is the only web site to be awarded a five star rating (against Resource Description, Resource Evaluation, Guide Design, Organization Schemes and Guide Meta-information) by Argus Clearinghouse (2000) — an independent Internet site-rating agency. Moreover, NRM-changelinks is now promoted as a featured resource by around 150 web sites with some interest in participation (see http://nrm.massey.ac.nz/changelinks/links.html). The largest group of these are mainly development-oriented sites (e.g. IDRC, USAID, FAO, CGIAR, IUCN, WWF), but smaller groupings can also be seen in areas such as action research, biodiversity, capacity development and participatory monitoring and evaluation.

As Stephen Downes (1998) points out, these groupings illustrate the growing trend towards Internet-based communities as collections of people, who although they may be geographically dispersed share a common location on the Internet. What will change in the future is our ability to learn better how to nourish these communities. People will want to do this, he argues because, 'the greater the dedication to the community, the greater the dedication to learning, since learning is the shared experience which defines this community' Downes (1998).

The experience gained in supporting interest communities on-line through the NRM-changelinks example has also contributed to lessons that can help develop the web sites outlined in the other case studies described here. In particular, they show how, by contributing to such websites researchers are not just contributing to the one-way dissemination of material through another media. Rather they are contributing into a linked system, which fosters improved networking, both nationally and internationally. Through going on-line and interacting with different groups and individuals in the course of promoting the site I have also gained a lot of benefits. These not only include the friendships that can develop from on-line contacts, but also through feedback on ideas, access to draft papers providing the latest work of colleagues, and the development of new personal networks.

Equally, not all website use is aimed at interest communities. This will be particularly true in the area of environmental management generally, and will raise new challenges for action researchers. In this regard Downes (1998) also calls our attention to peer-based learning communities, who are in many ways the opposite of interest communities. These will exist not because everyone is vitally interested in the same topic or area of interest (often through work, for example), but because of a shared problem in some particular geographic location. Thus, in

these situations action researchers will be involved in how to develop a shared understanding and co-ordinated action around a particular environmental problem. This will not necessarily be done on-line although, as this work has shown, the Internet may well be used as a mechanism to provide structure for and access to needed information.

http://nrm.massey.ac.nz/changelinks/

Improving Community Participation in Environment & Development

Will Allen

Site outline: The structure of the NRM-changelinks site has developed through the course of my work on the development of collaborative learning approaches that help communities to identify and adopt more sustainable natural resource management practices. It provides an annotated guide to a range of on-line resources providing papers, handbooks, tips, theory and techniques in a number of related, skill fields. How the application of these different skills are interlinked in practice is also illustrated. Although the emphasis of this site is on improving community participation within natural resource management (biodiversity enhancement, conservation, riparian management, agriculture, etc), the approaches outlined here are also useful for those working in a diverse range of development areas such as rural development, health, housing, etc.

A short introduction to each section outlines the nature of the resource links provided, and provides pointers to other topic areas which are closely related in use. A number of on-line papers related to collaborative learning, sustainability and change management are already available on this site, and links are provided to these from the relevant sections.

The attached cd-rom (inside back cover) contains a copy of the NRM-changelinks site as at October 2000. This can be viewed using any Internet browser (e.g. Netscape Navigator or Microsoft Explorer). To make full use of the site gateway external links and some site services it is necessary to be connected to the Internet. Alternatively the site can be visited directly through the Internet at http://nrm.massey.ac.nz/changelinks or http://nrm-changelinks.net .

CHAPTER 11

The need to link 'soft' and 'hard' research activities within multi-disciplinary science teams

Time period in which main work on this issue carried out:											
Jul- 94	Jan- 95	Jul- 95	Jan- 96	Jul- 96	Jan- 97	Jul- 97	Jan- 98	Jul- 98	Jan- 99	Jul- 99	Jan- 00

Allen, W.J. & Kilvington, M.J. (1999) Why involving people is important: The forgotten part of environmental information system management. Paper presented at 2nd International Conference on Multiple Objective Decision Support Systems for Land, Water and Environmental Management (MODSS '99) Brisbane, Australia, l– 6 August 1999.

The importance of ensuring that the 'participatory' component of a science programme is integrally linked with other aspects of the research, and that the outcomes of stakeholder involvement are fed into the research design to influence subsequent activities and strategies is discussed. It is also suggested that the value of such participatory work can be increased if it is implemented as action research; this can also help to derive more generic lessons for environmental management. Learning is observed to not only require relevant and timely information, but also processes for developing shared understanding, managing moderate conflict and providing a supportive environment. Case studies are used to outline a useful role for action research practitioners within multi-disciplinary research teams. These show that efforts to share information need to build trust and confidence between information providers and users if they are going to be successful.

Aids and learning processes need to be considered together, yet here there is a problem. The scientists involved in developing decision support aids — principally from the physical, natural and 'hard' social sciences — are often isolated from those concerned with learning and participatory processes, who come primarily from the 'softer' social sciences ... The isolation is evident in the concepts and theories that each employs. It is also deepened by institutional barriers, between programs and organizations, which impede the level of collaboration needed. Such barriers may also weaken links between those

> *involved in the design of aids and processes and those who make them available to wider user groups in the apprenticeship phase.* (Loevinsohn et al. 1999).

As indicated in Figure 6.1, an important aspect of 'good practice' in participatory ecological research initiatives is that the 'participatory' or 'action research' component of the science programme is integrally linked with other aspects of the research, and that the outcomes of stakeholder involvement are fed into the research design to influence subsequent activities and strategies. While the tussock grasslands case study referred to in this thesis clearly shows we are still learning what is involved in doing this, it can also point to evidence that this mutual reinforcement of 'softer' participatory and 'harder' ecological science is happening.

For example, the observations by farmers in the initial HMP programme regarding the effects of different grazing regimes on *Hieracium* spp. led directly to the establishment of more targeted research experiments. Similarly, as this chapter paper highlights, during the subsequent Tussock Grasslands Research Programme, participatory conflict approaches were used to allay farmer concerns over the use of research results gained from sites on private land. The outcome of these discussions, in turn, led to a programme management decision to formalise a more community-based approach to research dissemination, as outlined in this extract from the ensuing e-mail to programme staff.

> The traditional approach of researchers (doing) experiments, analysing and interpreting data, and publishing it in journals, does not on its own change end-user behaviour. In many cases this can result in making people distrustful of the motives and objectivity of science. To use this approach, especially in the complex and politically-loaded field of resource management where conflicting ideas and beliefs often exist between different stakeholders, may make it become increasingly difficult to do our science. ... We want our research to change behaviour "on the ground" (i.e. outcome-orientated research), but this has to involve the different stakeholders (e.g., Farmers, DOC, policy makers) in this process. We will not release data and information before it has been debated and interpreted within an environment where the relevant stakeholders are given the opportunity to appreciate one another's perspective. This community dialogue will not only help with the technology transfer process, but also with encouraging appropriate use of data and information from all perspectives. (Bosch 1998).

However, while this need to link participatory outcomes with other research activities may seem fairly obvious, in some projects the participatory component remains detached from other parts of the project. As McAllister (1999 p. 6) and Loevinsohn et al. (1999) in the opening quote to this chapter observe, this is particularly true for technically oriented projects. McAllister goes on to note a number of concerns that arise for action research practitioners because of the assumption that a lone participatory component is enough to fulfil the social science requirement.

> Such an assumption fails to recognise the limitations of "quick and dirty" participatory methods and the potential for these to misrepresent or simplify complex social realities. In addition, the concept of participation has been used to 'get local people to do what researchers or project leaders want', rather than as a means for involving local people in project design and strategy (Goebel 1998:279). Another concern is that participatory research becomes 'tool' or 'approach' driven, with more emphasis placed on the application of different methods and approaches (PRA, PAR, multi-stakeholder analysis, etc.) than on the problems that the research is trying to address, and how these approaches can be best used to address them. (McAllister 1999 p. 6).

Certainly, there are increasing numbers of good examples of integrated research emerging, but McAllister's comments certainly do not appear to be related to rare instances. Moreover, this divorce of participatory components from other more technical research components creates particular problems, which work against the successful use of action research within science-based research and development initiatives. The first is that the output of such participatory exercises (see Figure 11.1, Programme A) are merely seen as another way of producing a paper or output that describes some aspect of the situation under inquiry (e.g. biodiversity).

While this will probably be related to the 'human dimension', its use in practice is likely to be limited because it does not link back into research implementation. Moreover, because its value is seen as low by programme leaders — after all, they do not use it within the programme — the time and resources allocated to the human dimensions component are often limited. In turn, both of these factors mean that the plan and reflect components of the action research cycle are often neglected, and consequently the wider process lessons that can be gained from such exercises for use in other situations are not developed.

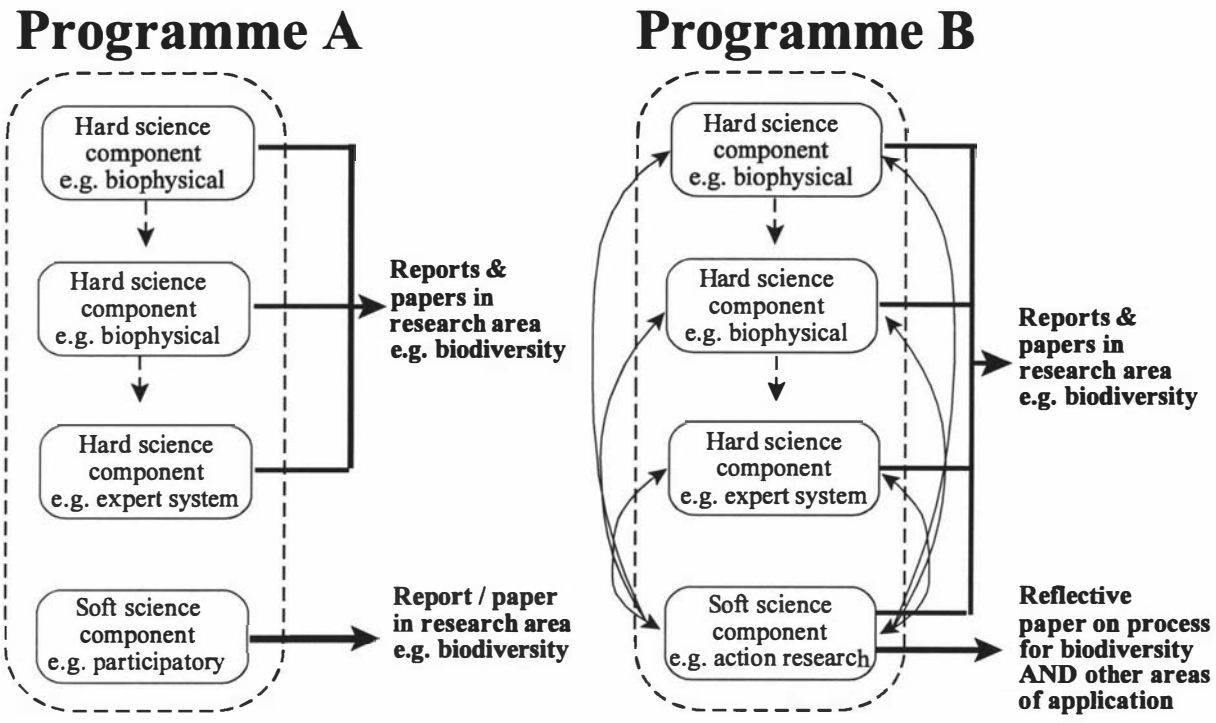

Figure 11.1 Different ways in which research programmes do (Programme B), or do not (Programme A), integrate participatory components to complement more 'hard' or technical components.

However, in more integrated programmes (see Figure 11.1, Programme B), the participatory component will be viewed as complementary to, and reinforcing of, other more technical components. By helping integrate different viewpoints and foster involvement, such participatory components can build a social environment in which there is more interest and ownership in the results of the research. Furthermore, such research can most usefully contribute if it is undertaken within an action research framework, which is itself geared towards successful implementation. This, in turn, will not only contribute to the joint development of improved understanding and insights in the particular project in question (e.g. enhancing biodiversity), but can also lead to an improved understanding of the wider processes that are required to successfully involve people in such a collaborative exercise.

However, successful action research needs the development of a climate which is conducive to learning and change. This in turn is helped greatly by programme leadership which can put the 'change and learning project' on the agenda and keep it there, and ensure that the strategy for doing this is expressed in operational and actionable terms. Moreover, lower levels of leadership need to be similarly enthusiastic about their (and their staff's) participation within the action

research initiative. Ideally then, this requires senior members of the research team to have the desirable characteristics required for their involvement as action research co-researchers outlined in Chapter 3 (Table 3.2). These include being open, self-reflective and strategic.

If carried out successfully, however, an action research approach will provide a wider set of process lessons, which can be made publicly available to help people better undertake similar collaborative endeavours in other areas, and with other environmental issues. By extension, even more valuable and robust lessons can be gained by sharing reflections across programmes and projects. The need for doing this is supported by Ledford and Mohrman (1993 p.168) who point out that learning from single cases is problematic. They go on to say, 'cross-case analysis is better than single case studies for understanding the variety of forms the intervention can take, shedding light on implementation issues, and increasing confidence in the external validity of findings'. While this may require extra effort and resources, the results can be well worth it as Ravetz points out:

> A topic like this, which involves reflecting on a field of practice rather than doing it, can be looked at in two ways. One view is to consider it an irrelevance, or at best an excursion from the real work of the disciplined study. Such a dismissal is the common view among practitioners in most science-based disciplines. The other view is to say that in the absence of such reflections, the discipline is in danger of losing contact with its supposed tasks, and eventually also in danger of losing its clientele. Then such a reflection is considered as an 'added value' activity; although it must be undertaken outside the ordinary routine of practice, it eventually brings benefits to practitioners and to their clients as well. (Ravetz 1997 p.4).

The accompanying chapter paper, then, should be seen against this background. It represents an attempt to reflect on the lessons learnt across a number of participatory endeavours that have been undertaken in Landcare Research over recent years. It begins by briefly reviewing the need for collaborative learning within environmental management. A three-stage process for involving people in such collaborative approaches is outlined, involving: i) entry and contracting; ii) developing information for decision making; and iii) implementation and review. These can be mapped onto the ISKM process as shown in Figure 11.2. How, action research skills (relationship building, facilitation, conflict management, etc.) can then be used to support each of these stages is illustrated with the use of case study examples. These case studies include the tussock grasslands and black stilt ones introduced earlier in this thesis.

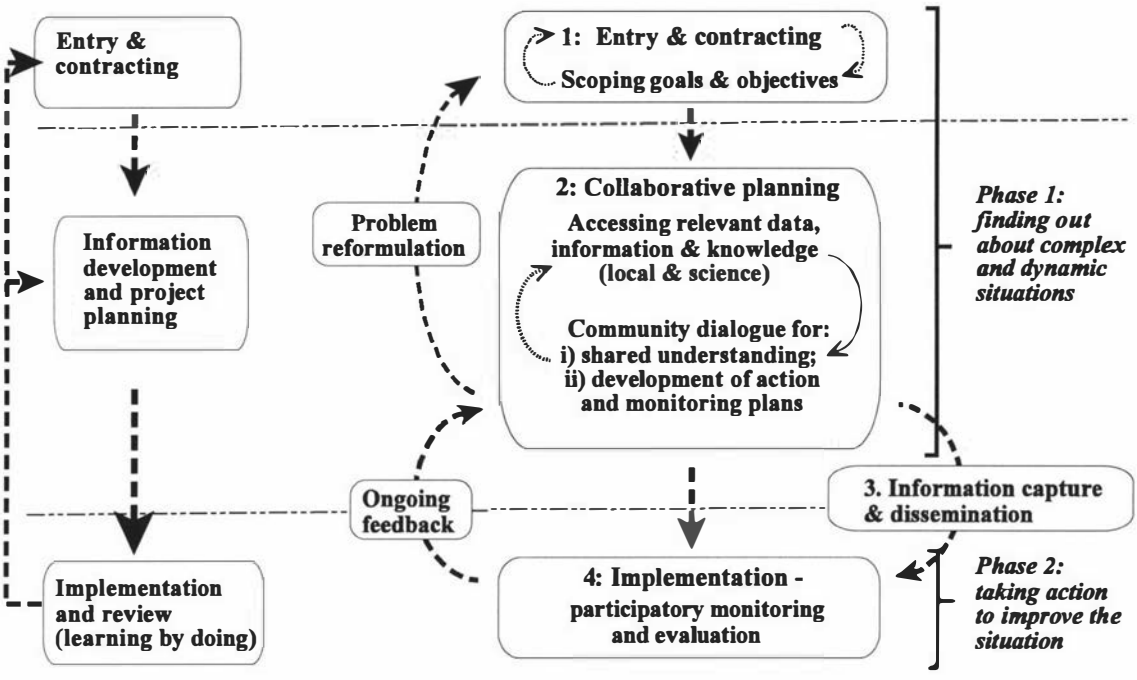

Figure 11.2 Different phases of involving people in the ISKM framework for managing environmental information for decision making.

The steps in ISKM provide a learning process through which many viewpoints and sources of information can be shared among the different parties involved, and integrated to find solutions that will guide the way forward. The iterative nature of the programme also encourages adaptive management.

While relevant and timely information is noted as key to such learning occurring, it is also pointed out that some supporting social processes that are required for this to happen. These include forums to develop a shared understanding around issues, managing a climate of moderate conflict and providing a supportive environment. The supportive environment required is one that is characterised by the elements of social capital referred to in the Chapter 9 reflections section. The linked nature of these social processes is illustrated below in Figure 11.3.

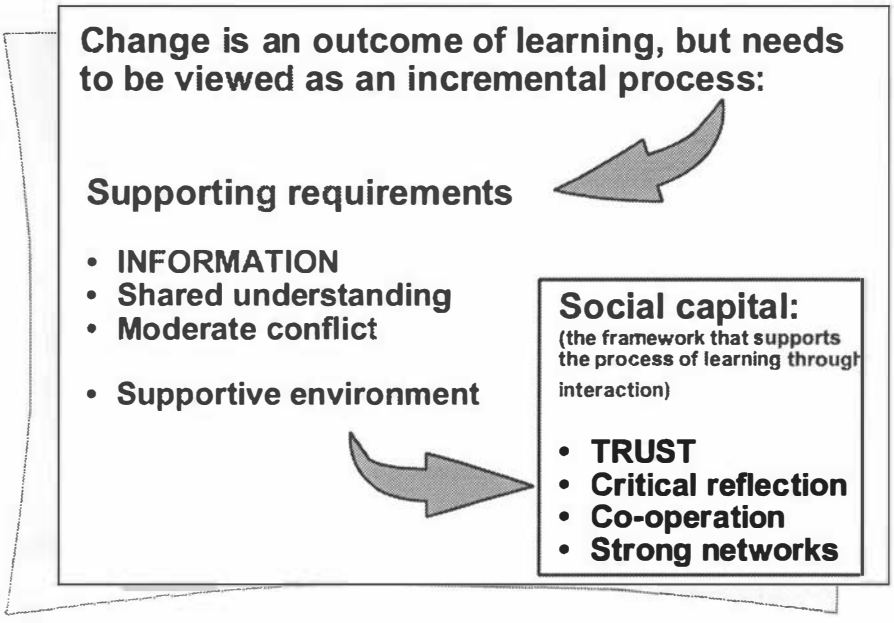

Figure 11.3 Social processes that must support information if learning is to occur (developed by Allen & Kilvington).

In turn, this suggests that if information (e.g. such as that developed in a science programme) is to be appreciated by stakeholders with multiple social perspectives, then those stakeholders must operate in an environment characterised by a high level of social capital. While the paper does not refer to social capital per se, it does conclude by highlighting that the major obstacles to the increased use of information in decision making are organisational, not technical in nature. In particular, it notes the need for supporting social learning processes — such as those explored in earlier chapters of this thesis — to build and maintain trust, place information clearly in its wider context, and develop a social climate that supports the idea of understanding others' points of view and sharing more freely. As part of achieving this broader aim it is suggested that multi-disciplinary research approaches also need to include personnel with complementary skills in action research to involve people who all too often are, as the paper title reminds us, the forgotten part of information management.

Why involving people is important: the forgotten part of environmental information system management

Will Allen and Margaret Kilvington (Landcare Research)

Abstract: Developing information management systems to support decision making on-the-ground cannot take place in isolation of the broader social context within which people generate and utilise information and learn. The technology and hardware components, which are the most visible aspects of such systems, receive most attention from researchers and funders. However, if we want people to use information more effectively to help change the way they look at the world — and how they go about managing its resources — then we must pay equal attention to the social aspects of information systems, in particular to ensure that they support learning. This paper outlines the requirements for collaborative learning, by which the differing perspectives of multiple stakeholders are coordinated to manage complex environmental problems. A process for utilising the principles of collaborative learning for developing integrated information systems to support decision making is discussed. Particular attention is paid to the new skills of relationship building, facilitation, and conflict management required by multi-disciplinary teams developing such systems. Examples to illustrate how these skills could be used in practice are drawn from case studies in resource management in New Zealand.

Introduction

Availability of good information lies at the heart of effective and equitable decision making (Sarokin & Schulkin 1991). Not surprisingly then, over the past 20 years research agencies and environmental managers have been paying ever increasing attention to improving the way technical information is used in natural resource management. Furthermore many environmental challenges are complex and do not respond well to simple solutions that address only a part of the problem. To resolve them, scientists, communities, and policy makers are seeking collaborative approaches that accommodate multiple perspectives and utilise multiple sources of information.

Effective collaborative management (or co-management) requires the many participants or stakeholders associated with environmental problems to develop solutions co-operatively as opposed to acting as advocates purely in their own interest. Participation in decision making encourages stakeholders to buy into outcomes and see them implemented. Since good decision making depends on the availability of sound supporting information, the need for carefully managed participation applies equally to gathering information and developing the systems for managing it as it does to the decision making itself. However, as many reviewers observe, the involvement of people in this way is all too often neglected, especially within information technology enabled projects (e.g. Malhotra 1997).

Effective participation in information management is not always easy to arrange, especially in relation to environmental issues, which are often characterised by conflicting social perspectives. Managing the constructive involvement of stakeholders is a skill that requires as much emphasis as does developing our abilities in technical problem solving and the design of information technology. A major challenge is to promote a more multi-disciplinary approach to the development of information systems. This requires building closer partnerships between technical experts and specialists in change management, relationship building, and conflict resolution.

This paper describes the benefits of collaborative learning, by which many viewpoints and sources of information can be shared among the different parties involved, and integrated to find solutions that will guide the way forward. While information sharing is key to this, we highlight some supporting social processes that are required for this to happen. The paper outlines a three-stage process for involving people in such collaborative approaches. Aspects of relationship building, facilitation and conflict management are illustrated using case studies. Finally, we discuss the need for these skills to be incorporated in multi-disciplinary approaches to information management and problem solving.

Supporting processes for collaborative learning

Collaborative (or organisational) learning is one approach that makes its primary objective changing behaviour by improving the use of information by different groups. In general terms, this refers to the capacity of a group to assess the results of their efforts, rethink how they go

about their tasks, and use new ideas to change established practices (e.g. Huber 1991). Underpinning the concept is the recognition that people learn through active adaptation of their existing knowledge in response to their experiences with other people and their environment.

Within this process, more timely and relevant information is the factor that most reviewers identify as essential to improve learning. However, this is often difficult to achieve in natural resource management, where the wide range of stakeholders means that information is highly fragmented across groups. In general though, access to more information about how any given system functions increases the range of possible responses the stakeholders have to a situation, and extends the basis for comparing options (Huber 1991).

Access to such information can come from a range of sources. Science is a main contributor, and there is also a growing acknowledgement of the need to draw upon local knowledge. Formal monitoring of the results of management actions to confirm (or otherwise) their effectiveness is another key source of new information. However, to promote the sound use of information within a decision-making environment, a number of additional supporting social processes must also be provided.

Shared understanding

Collaborative learning implies that those involved experience a change of mind, or develop new ways of looking at the world. This is a cognitive process in which the richer the media of communication (e.g. face-to-face rather than printed matter) the deeper the sharing, and the greater the potential for learning and behaviour change. Participants must develop a common language about core ideas or technologies to achieve this. Developing this understanding takes time, and needs to accommodate multiple viewpoints as the presence of varied interpretations of information encourages learning (Huber 1991).

The learning process itself is characterised by constructive debate of the merits of alternative goals and technologies, and reflections on the interpretation of underlying evidence and beliefs. This dialogue is what helps stakeholders to change their views, and find a mutually understood and supportable position. Tensions result from the different perceptions surrounding much of the information relied on by different groups, and from contrasts between new ideas and traditional

perceptions. This tension inevitably underlies many current debates over environmental management, and can only be resolved through suitable processes for community dialogue.

Moderate conflict

This may seem a strange addition to the list of factors that encourage learning. However, a number of authors have noted the positive value of conflict in initiating action and learning (e.g. Bouwen & Fry 1991). Conflict can be the catalyst for gaining peoples' involvement in the issue. Furthermore, the process of negotiating through a conflict over differing viewpoints expands peoples' perspectives on the problem, leading to more lateral solutions. Methods of conflict management are available to manage the balance between advantageous and negative aspects of conflict and ensure an overall positive outcome.

A supportive environment

Learning can be difficult, even at an individual level. Accepting new information that challenges the way we think and the things we do is, even with the best of will, difficult to undertake, to accomplish, and to sustain (Michael 1995). Finding out about problems also implies that we may have to act to correct them. What often stops us doing this is an anxiety, or the feeling that if we allow ourselves to enter a learning or change process, if we admit to ourselves and others that something is wrong or not right, we will lose our effectiveness, our esteem, and maybe even our identity. Most of us need to assume we are doing our best at all times, and it may prove a real loss of face to accept and even 'embrace' errors. Adapting poorly, or failing to realise our creative potential may be more desirable than risking failure and loss of esteem during the learning process. Consequently the degree of support offered to individuals and groups during this learning process is one of the most important elements if we are serious about motivating people to learn and change their current behaviour patterns.

Developing collaborative approaches to information management

The challenge is to integrate these social considerations into collaborative approaches for information management. Clearly, the idea of having different stakeholders working collaboratively is by no means new, and there are many examples of successful efforts made in a

number of fields. While successful approaches generally have been individually tailored to encourage stakeholders' involvement in each situation, there are some common elements that make these collaborative approaches work. One approach is to view it as a three-phase social process of: i) entry and contracting; ii) developing information for decision making; and iii) implementation and review (Figure11.4).

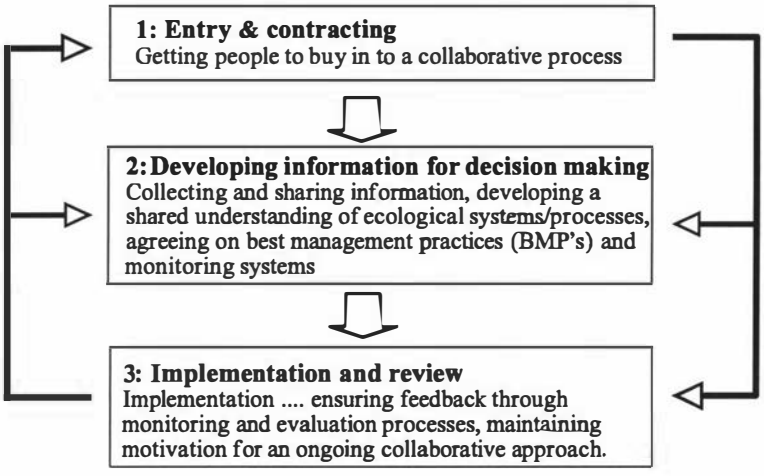

Figure 11.4 Possible steps in a collaborative learning approach

The skills required for managing this process will naturally vary according to the specifics of the initiative, but should be available to multi-disciplinary teams seeking to maximise participation in information management. There is a substantial difference between pursuing a collaborative approach within an already well-functioning situation, and trying to initiate collaboration in a social environment characterised by existing conflict. In the latter case the need for effective facilitation and expert mediation of conflicts is definitely greater. In the following sections we will discuss the three phases of this co-management approach paying particular attention to issues of trust and relationships that may arise within an information management project, and how these might be addressed.

Entry and contracting

This first phase includes identifying and involving relevant people, building relationships, and establishing the ground rules for working together. The aim in any successful participatory approach is to build relationships that make it easy for people to talk about their needs, share

information, and work together. Stakeholders develop a common understanding of the perceived issue, and collectively decide on the project goals and the different roles that groups will undertake. Building this climate for change is the single most important step in initiating any collaborative approach.

Just as with personal relationships, previous experience is one of the most important influences on community attitudes to collaboration. People may be extremely reluctant to enter into a second participatory process if they have been involved in an unsuccessful one in the past — 'we've already tried that and look what happened!'. The emotional part of the conflict (which often forms a hidden barrier to uncovering the real issues) may have to be dealt with first.

A good example of how this challenge can be met was provided by Department of Conservation (DOC) staff as part of their ongoing efforts to protect the black stilt (kaki), a rare New Zealand wading bird. The agency was concerned to gain better access to bird habitat on private land, and to increase private landholder involvement in recovery efforts. However, when landholders were canvassed to ascertain their support for a meeting to resolve these issues, it became apparent that they saw issues over the black stilt as symptoms of a wider problem of 'lack of trust' between farming families and DOC. In response, addressing the issue of access to the black stilt was postponed, and a series of workshops were held to improve relationships between local DOC staff and landholders (Allen et al. 1998a). Common ground was reached during these workshops and a number of positive steps to improve working relationships were identified and implemented. Building trust in this way is one of the main reasons why successful participation processes take time. Importantly, in this case, both parties regarded this exercise as being a first step in a much longer process.

Another major stumbling block in initiating collaborative approaches to environmental management is in identifying and gaining the active involvement of the right people within the process. This means time and resources must be allocated at the project level to achieve this, paying particular care to involve key stakeholders (e.g. farmers, local communities, women, indigenous peoples) who, in the past, have often been marginalised within the collective decision-making process.

However, gaining the involvement of key players is not always easy, and stakeholders may be unwilling to put time and resources into this initial phase of entry and contracting. In contrast to the black stilt project discussed above, the Whaingaroa Catchment Management Project (Kilvington 1998) is an example of an attempt at establishing a collaborative environmental management initiative that was frustrated at the initial entry and contracting stage through a failure to address a fundamental conflict between key stakeholders. The intention of this project was to establish a working group of agency and community stakeholders to address issues such as erosion of the catchment and siltation of the harbour by generating a commonly agreed catchment management plan. Although the management rights of the indigenous community (tangata whenua) and their relationship with the local government environmental management agency were of primary concern to the tangata whenua, that issue was deemed a conflict outside the process of setting up a collaborative community and agency management group. This unresolved conflict resulted in a failure of participation of one of the key stakeholders to the detriment of the project as a whole.

This initial phase is also the stage at which ground rules for groups working together need to be established. This will minimise unnecessary 'process' conflict caused by misunderstandings and lack of agreement on how the rules of dialogue and decision making are set. Intervention in conflict can occur at any stage, but is clearly much more likely to be effective when it is introduced early in a process of getting stakeholders to work together.

Developing information for decision making

If information systems are going to contribute to changed behaviour on-the-ground they need to be developed within the wider decision-making contexts of the organisations and groups involved in natural resource management. An information system, in this sense, is more than just its technological components. Rather, it is a 'social system', within which people interact to create new knowledge, and broaden their perspective of the world (Ison 1993a).

Given the diverse set of decision environments inherent in resource management, information systems that lead to changed behaviour on-the-ground will, to an increasing extent, rely on information technology for their function. Modern technology offers interpretative, scenario-building tools and expert systems to enhance understanding and utilisation of a mixed array of

information and clearly these have a role in this phase of collaborative management. However, equally important is the ability to use these tools to support dialogue between the different stakeholders rather than replace it. Hence particularly important aspects of this phase include: i) how participants share relevant information; and ii) participants' ability to discuss and debate the relevance of information for their own research or management purposes.

Sharing relevant information

Many groups possess information of a technical, cultural, or economic nature thatis of great value for developing environmental solutions. However, the flow of this information between different levels and groups in society is often inadequate. For example, years of experimentation with different management strategies to achieve different goals has provided individual land managers with much knowledge about local land-use systems. Unfortunately, this knowledge is seldom available to the community on a collective basis. Similarly, much of the valuable knowledge accumulated by scientists is fragmented, held in different databases and, consequently, is not readily available, even to other scientists.

Often this information remains fragmented because we do not have the mechanisms to collect it. However strong emotions associated with information also often create a barrier to its availability. Among science researchers much personal self-worth and commercial worth is linked to the information generated. Fear over misrepresentation affects the willingness of researchers to offer their information for use in systems over which they have no future control. Many other stakeholders may have similar fears, with some justification, that their information might be used incorrectly, or against them, if released. In the broadest sense, information systems need to be designed to overcome such fears by building trust and confidence between information providers and users. In many cases, as the following examples show, this will need to be achieved through the development of clear guidelines or protocols for information use.

The implications for emerging research initiatives are well illustrated in the tussock grasslands of the South Island high country. Only a decade ago, research emphasis was directed towards improving the efficiency of an extensive pastoral system. Indeed, there are few references in the agricultural research and development literature internationally that refer to participatory approaches other than those that comment on farmers and scientist dealing with agricultural

management issues (Allen 1997). However, today research funding is increasingly directed towards addressing issues of sustainability, and hence meeting the needs of a range of different stakeholder groups concerned about the impact of natural resource management practices, who had for some time considered themselves in opposition to one another. When scientists in the Government-funded Tussock Grasslands Research Programme (Bosch 1997) initially approached farmers about identifying proposed research sites to look at soil and vegetation trends, access was denied. This was largely because farmers were unsure about what use would be made of the subsequent research findings. However, because the project process was prepared to openly address this conflict, and bring in the appropriate skills, the situation was able to be resolved. The subsequent conflict management exercise resulted in the establishment of information management protocols, which enabled the research to proceed. These protocols protected the rights of landowners to be advised of research results prior to their being released to third parties, and provided for discussions of the implications of research results by the different stakeholders involved before publication (Bosch pers. comm.).

Conversely, in the Whaingaroa Catchment Management Project referred to previously, water quality data held by local landowners were withheld during the process of collecting and collating information on the catchment. The landowners were uncertain as to how this information might be interpreted by other members of the community. The use of conflict resolution skills and the development of clear, commonly agreed protocols for the use of this information would have allayed their concerns.

Making sense of information

Raw information needs to be understood and interpreted so that it becomes useful for addressing the issue under consideration. However, it must be appreciated that information may have different meanings and hence values in different situations. The art of making sense of information has two principal components. Firstly, there needs to be a mutually agreed and clearly understood intended use for the information. This may, for example, be to resolve a particular environmental problem or to attain a particular resource management goal.

The second component is the context within which the information was originally collected which is a key to its strengths and weaknesses. This includes clarifying such issues as: why the

information was collected and by whom?; what is its source?(such as practical experience, observations, science research etc); does the information relate to a specific situation or site? and can it be extrapolated to other situations? Skilled facilitation is needed to ensure that all participants and stakeholders share a common understanding of these two components of new information.

Enormous gains can be made by promoting an understanding of what different stakeholders have to offer to the resolution of complex environmental problems. However, there is often an understandable reluctance on the part of agency and research staff to bring together factions where there is a risk, or perceived risk, of conflict.

For example, staff in most, if not all, of the high country research initiatives that preceded the Tussock Grassland Programme have tended to work separately with DOC staff and local farming families, or solely with one or other group, largely to avoid having to deal with possible conflict. Yet, as these two groups collectively manage all the tussock grasslands in this area, and as one of the main land-use debates revolves around determining trade-offs and synergies between conservation and pastoralism, there is little doubt that both groups would have been better served by science had they been provided with more well-facilitated opportunities to come together and discuss the implications of emerging research findings.

However, poorly handled conflict may prove as damaging a strategy as conflict-avoidance. Bad experiences with former collaborative approaches may severely jeopardise the chances of building constructive future working relationships. Managing successful community dialogue processes requires the creation and managing of safe environments for debate, including finding appropriate times, developing the right questions, and ensuring that the different scales and levels that stakeholders are operating on can be addressed.

Implementation and review

Ongoing, and structured, community dialogue as described above provides those who participate in the process with immediate access to new ideas and perspectives, which may help them re-evaluate their current research, management, or policy strategies. There is still a need to capture, store, and provide this information for the benefit of those who did not have the opportunity to be

directly involved. In this regard, the processes described above also provide the structured resources to support the development of a number of technologically based information components that are relevant to the needs of the wider community of potential users, and consequently more likely to gain their acceptance.

However, as with the other steps of a collaborative approach, there remain a number of issues related more to managing a social system than its technical component. Here, one of the major challenges is to promote the use of this technology as part of a socially based information network which conveys the reality that an information system is a collection of participating stakeholders rather than a particular information project or item of technology.

Clearly, for such a information system to advance sustainable natural resource management successfully in the long term it needs to be continually refined and updated. Many of the issues already raised in this paper will continually re-occur as the process continues. As new science emerges from the work of different groups and agencies, ways of ensuring its debate and dissemination will need to be renegotiated. As we seek to encourage the provision of new information from stakeholders (e.g. community-based monitoring systems), we will also have to provide the climate and assurances that such information will be used constructively to guide new ways forward — and not as a means of penalising the very people that are providing this information.

Participatory evaluation processes are particularly important in these kinds of long-term endeavours, not only to ensure that the project stays on track, but also to help reinforce to researchers and stakeholders alike that continued involvement is worthwhile (Allen 1997; Kilvington 1998). Tracking and acknowledging success can be combined with a number of other initiatives to avoid "burn-out" among the different participants and maintain enthusiasm and motivation.

Collaborative approaches should be flexible, and designed to grow. It may be appropriate to defer involvement of reluctant stakeholders in the beginning, and new stakeholders may be identified along the way. The process must be able to change to accommodate this growth. Community involvement helps create ownership and a feeling of accomplishment in working together to solve a problem. This group dynamic will encourage others from the community and

government agencies to participate and provide and manage the information required for making decisions about sustainable resource use.

Concluding comments

In the broadest sense, information systems such as those described in this paper are intended to improve efforts to share information by building trust and confidence between information providers and users. Transparency in information use, breaking down of barriers to information flows, and demonstration of real and tangible benefits, are the key justifications for developing information management systems. The aim is to help information providers and users work together to address important issues collaboratively.

Under such a collaborative approach the guidelines and strategies developed by the stakeholders will draw on a larger base of information than available to any one of the parties acting alone. Because these are developed against this richer information base, they are likely to result in more effective outcomes. The probability of commitment to, and adoption of, changed practices is also likely to be higher.

Allotting appropriate time and skills to manage conflict and build relationships is an important component of planning projects if the aim is to help different stakeholders share information and develop solutions to shared problems. This should not be avoided, and indeed well-managed conflict can build trust and promote motivation and action. In most of the case studies, closer attention to conflict management would have benefited all parties in their different situations.

Finally, this paper has identified some critical factors in ensuring the success of a collaborative learning approach to improve the use of information within natural resource management:

- effective processes for building and maintaining trust
- the ability to communicate clearly and place problems and information in their wider context
- time to develop a common context or language
- an appreciation that people do not learn easily and without effort
- the infrastructure and IT tools to support sharing the necessary information.

- the need to balance the development of technologically sophisticated information systems with social processes to ensure that such information is effectively shared, understood, and used to change behaviour on-the-ground.

In this paper we have chosen to place least emphasis on the infrastructure such an information management system might use. As the most tangible element of information systems management, infrastructure frequently receives the most attention, while ironically it is possibly the easiest part to work on. In fact, as Reynolds and Busby (1996) point out, 'it has become clear that the major obstacles to increased use of information in decision making are organisational, not technical in nature, meaning that investments in information technology alone will not provide or deliver a solution'. In seeking an information system that is truly part of the broader social system by which information is translated into knowledge and action, we are accepting that there are inevitable challenges. To take up these challenges, multi-disciplinary approaches need to include personnel with complementary skills in the management of participation and conflict, and the integration of biophysical and social aspects of problem solving.

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CHAPTER 12

Concluding reflections and planning the next research cycle

This chapter summarises the aims and activities of the work undertaken through this action research inquiry, and briefly reviews the outcomes as a means of demonstrating relevance. Future areas of activity with the potential to leverage improved information flows within environmental research and management are suggested as: i) improving participation and the use of local knowledge in the research process; ii) improving the dissemination and use of this knowledge in the wider community through improved networking and collaboration; and iii) capacity building — supporting these approaches — through participatory monitoring and evaluation. A fourth version of ISKM is outlined, however, it is suggested that this should be implemented in an environment characterised by high social capital. Action research is seen as a process which both helps the development of this social capital, and provides lessons into how it can be expanded. Moreover, building capacity for the use of participatory learning processes should be part of the method, that capacity cannot be assumed to be there. The role of evaluation in building capacity for participation and measuring process success is highlighted. Finally, this chapter points to the need to draw out lessons from across action research case studies, and suggests some challenges for action research to help in large-scale collaborative learning.

> *In sustainable development, everyone is a user and provider of information considered in the broad sense. That includes data, information, appropriately packaged experience and knowledge. The need for information arises at all levels, from that of senior decision makers at the national and international levels to the grass-roots and individual levels. ... Special emphasis should be placed on the transformation of existing information into forms more useful for decision-making and on targeting information at different user groups. Mechanisms should be strengthened or established for transforming scientific and socio-economic assessments into information suitable for both planning and public information. Electronic and non-electronic formats should be used.* (UNCED 1992 Ch.40 Agenda 21).

Research aims and activities

As outlined in Chapter 1, this thesis represents an action research inquiry into how an adaptive management or 'learning by doing' approach, consistent with the concept of sustainable development, can be initiated and implemented in complex, regional or large scale contexts. In particular the inquiry focusses on the social and institutional issues that arise in ensuring adequate stakeholder participation in generating and managing information to support collaborative decision making and subsequent change on-the-ground. Action research provides an appropriate methodology for an intervention-based approach which is concerned with how the different groups and individuals involved design and implement action in relation to one another.

This starting point highlights that action research is focussed on possibility rather than prediction. Because it is not value neutral it is therefore important to state any underlying values in advance. In this sense, most action research can be seen to be guided by two fundamental principles: i) that there is a need to democratise the knowledge process — so people normally shut out from research and information become involved in the research itself, learning how to obtain information and how to use it; and ii) that it acknowledges a social change emphasis — whereby the goals of research are to engage in action that reverses inequalities, empowers the have-nots, and ultimately transform society so decision-making becomes more transparent and democratic. Within these broad principles my work as outlined in this thesis is undertaken within an environmental research institute, so the focus is on finding ways to improve people's relationship to the environment, and help environmental decision-making to be built on the improved use of technical information.

As a starting point for this research an initial framework of ideas and concepts was outlined as consistent with the aims of adaptive management, and capable of guiding different stakeholder groups to work collaboratively to identify and implement more sustainable resource management practices. What can be regarded as the first version of the Integrated System for Knowledge Management (ISKM) approach (Figures 4.3 and A1.2) sets out a number of steps suggested as necessary components within any approach designed to achieve this. In particular this approach acknowledged that: i) relevant and practical strategies for action could only be developed through a co-operative and integrated process which combined knowledge from both manager experience and conventional science; ii) there was a need to document these for the benefit of the wider

user-community, along with supporting information, through a user-friendly and accessible computer-based information system; and iii) the continuing input of new science and management-based experimentation was needed to maintain the relevance of such an information system over time.

This framework was also shown (Chapter 4) to be supported with underlying concepts of the need for participation, emphasising the importance of local knowledge, experiential learning and systems thinking. This framework was then applied, and refined, through a case study approach to guide the development of ecologically-based research and development efforts. The research involved one main case study (tussock grasslands) and three smaller, but related, ones (black stilt, Tb vector control, NRM-changelinks website development). The tussock grasslands case study began in June 1994 and remains ongoing at the completion of this thesis inquiry in June 2000.

Consistent with an action research approach, the inquiry design was shown to be emergent, progressively developing as it was influenced by the events that took place during the case studies and by the subsequent analyses that are made. Each subsequent chapter represents one plan-act-reflect cycle within this larger inquiry. Thus, within the tussock grasslands case study Chapters 5, 6, 8 and 11 deal with a number of different issues that arose from the implementation of ISKM in a decision-making environment characterised by multiple social perspectives. These were, respectively, how to manage: i) forums which support constructive community dialogue; ii) evaluation processes which meet the need of the different parties involved; iii) multi-stakeholder information networks; and iv) integration of both 'soft' and 'hard' inquiry processes within research initiatives.

Chapter 7 looked at conflict through one of the smaller-bounded case studies using a dispute resolution exercise around the management of a rare wading bird (black stilt). Chapter 9 involved the application of ISKM to improve the identification and uptake of Tb vector control, and also how groups can be supported as part of this process. Finally, Chapter 10 used the experience gained in the development of the NRM-changelinks website to investigate the potential use of the Internet to leverage improved information dissemination and networking. In all of these cases the issues under investigation were related back to how they fit into the larger tussock grasslands case study.

As its name implies, action research inquiries can be viewed as having two main outcomes: action and research. The focus is action to improve a situation and the research is the conscious effort, as part of the process, to formulate public knowledge that casts light on the functioning of the client system or the action research process itself, or both. These outcomes are generated through the iterative use of a 'plan—act—reflect' cycle of collaborative inquiry, which in this thesis is illustrated by each of chapters 4-11. The subsequent material in this concluding chapter provides a wider cycle of reflection which first reviews the 'act' outcomes of these different cycles and then provides some thoughts that emerge from this study to help guide the planning of future inquiry cycles.

Action outcomes

What is significant about the tussock grasslands case study is not that it has resulted in a regional adaptive management approach to tussock grasslands management — it has not yet — but rather that those involved (researchers, farmers, conservation managers and local government staff representatives) have learnt more about the processes and issues involved in working together and sharing information, and continue to seek ways to implement adaptive management.

During this process the ISKM framework has been progressively refined (see Figures A1.2, 1.2, 5.7, 8.1, 9.5 and 12.1, respectively), and it has been used to support the efforts of increasingly larger ecologically-based research programmes. Its initial development and use was undertaken to help a team of researchers (in the wider sense of the term) address the issue of an invasive weed (*Hieracium* spp.) in the tussock grasslands of the South Island high country. Subsequently the ISKM approach was used to underpin the work done of the Tussock Grasslands Programme, which was until June 2000 the major research programme in this area of New Zealand. Through this programme the application of ISKM was extended to address more general issues of tussock grassland dynamics, nutrient flows, and ways to better integrate conservation and pastoralism in this scenic region. This work remains ongoing as the 'montane objective' within an expanded research programme, 'Changing landscapes and restoration of biodiversity', which represents the main focus of New Zealand research into the protection and enhancement of biodiversity in productive landscapes.

Moreover, the design of several major science programmes has been influenced by this work. For example, the importance of ensuring that the 'participatory' component of a science programme is integrally linked with other aspects of the research, and that the outcomes of stakeholder involvement are fed into the research design to influence subsequent activities and strategies as discussed in Chapter 11 is now evident in the Landcare Research-managed biodiversity in productive landscapes (see above) and 'Integrated land and water resource management in complex catchments' programmes. Equally the action research nature of this research to date, particularly as it relates to drawing out public knowledge for use in other environmental management situations, is evidenced by a number of published papers that have addressed those social and institutional factors having an impact on the implementation of ISKM (see for example http://nrm.massey.ac.nz/changelinks/rel_pap.html).

Within the tussock grasslands of the South Island high country several stakeholders from outside the science sector who have demonstrated their commitment to contribute to the ongoing development of the ISKM approach. Key among these are the farming groups who are using the condition assessment model and have agreed to look at how the monitoring results from their properties can be shared as part of a wider 'learning' process. These groups are, in turn, supported in their efforts by the Otago Regional Council. Similarly, the Department of Conservation continues to support the ongoing development of an Internet-based Tussock Grasslands Management Information System (http://tussocks.net.nz/), which is seen as complementing these efforts.

In the Waitaki/Mackenzie basins activities to build trust between the Department of Conservation and the local farming community have been initiated following a conflict management exercise (see Chapter 7). This is part of an ongoing process to help the two groups improve their communication and the subsequent management of wildlife in the district. While both parties would undoubtedly agree that this will be a long process, a subsequent evaluation I undertook with agency staff highlighted improvements that had been implemented (unpublished minutes 9 December 1999). These included the publication of a regular newsletter, the holding of open days jointly organised by the Department of Conservation and local farmers, and an increasing focus on how conservation, farming and tourism activities could be integrated.

In the work funded by the Animal Health Board to improve the identification and uptake of

effective ferret control efforts in North Canterbury (see Chapter 9), the question of how agencies could better support community-based groups to provide a vehicle for improved information sharing and collaborative learning to influence behaviour change was investigated. The subsequent findings are now used to support the functioning of Tb vector control groups throughout New Zealand (e.g. Oliver et al. 2000).

Finally, Chapter 10 documented the lessons learnt through the development of the NRM-changelinks website (http://nrm.massey.ac.nz/changelinks/) as an exercise to look at the potential for Internet-based information sharing and networking in the area of developing collaborative approaches for environmental management. In terms of outcomes, this has now become one of the larger participatory resources on the Internet in terms of site traffic (see site statistics http://www.sitemeter.com/statsappl/default.asp?action=stats&site=webtracks).

Collectively, these examples of outcomes in practice help to verify the findings of the action research inquiry. By definition it is a science of implementation, and as practitioners (science programmes, agencies, community groups, etc.) take up the results they are confirming their confidence in them — or at least, their intent to pursue them to see what happens! This does not, of course, mean that the inquiry is finished, as the approach also aims to leave practitioners with the capacity to question and improve those practices. The same applies to the action research process itself: it is important to show that the process is enabling more targeted questions to be developed as the inquiry progresses.

Emerging research directions

In this regard we can see that, from the rather open-ended approach to the action research inquiry process that began with the Hieracium Management Programme, subsequent activities have become more clearly specified. For example, in the research programmes cited above our future action research inquiries are focussed on three linked areas, which appear to have the potential to leverage improved information flows and collaboration in natural resource management:

- improving participation and the use of local knowledge in the research process,
- improving the dissemination and use of this knowledge in the wider community through improved networking and collaboration (including the use of the Internet),

- and capacity building (supporting the above approaches) — through participatory monitoring and evaluation.

From my own perspective these emerging directions for exploration have developed through the experiences documented in this thesis, and similarly the way in which they will be investigated in practice builds lessons and insights gained from this study. Accordingly, this final chapter can be seen as a wider process of reflection covering the research undertaken over the past six years as a guide to planning the implementation of future action research-based initiatives centred around these activities.

A collaborative approach to managing information

As discussed in Chapter 2, contemporary development-literature promotes a more embracing development paradigm that places people at the centre and seeks to empower stakeholders to influence and share control over development initiatives and the decisions and resources which affect them. Even as macroeconomic policies and trends continue to shape resource development opportunities, the move away from centralised planning by governments is requiring R&D initiatives to work towards empowering communities to deal with their own needs. In this regard, the challenge for researchers is to work with communities and undertake inquiries that begin with the search for solutions to social (community) problems — placing an emphasis on problem context and identification.

Because one of the main issues related to establishing such a collaborative approach within the wider social and institutional contexts of catchments and regions is one of implementation, an action research approach (see Chapter 3) provides an appropriate methodology. This is directly applicable to the study of how individuals and groups design and implement action in relation to one another.

Moreover, there is an increasing realisation that new sources of 'expert knowledge' and databases are needed to identify persistent resource management practices more clearly (see Chapters 4 and 5). In many cases, the knowledge that is required about the past and present state of our natural resources, and about the relationships between social and environmental systems, is held within local communities and implementation and policy agencies. Accordingly, it

follows that the task of organising information to understand better the links between natural resource management, social realities and ecological dynamics should be a collaborative venture between research scientists and the different stakeholders involved.

In this regard, a first version of the Integrated Systems for Knowledge Management (ISKM) framework was outlined at the beginning of this inquiry (Chapter 4) as an approach for supporting such a collaborative approach for managing information. A second version, which included positioning information technology as a supporting rather than a central component was set out in Chapter 5. Subsequently, Chapters 9 and 10 highlighted the growing role of the Internet in allowing people to create, annotate, link together and share information from a variety of sources and media. It appears to have considerable potential in multi-stakeholder situations to extend information-sharing, learning and networking. A third version emphasised the need to build relationships for change and identify clear roles for all the parties concerned at the beginning of such collaborative initiatives (see especially Chapters 9 and 11).

Finally, a fourth version is outlined below (Figure 12.1) which acknowledges that implementation activities and their subsequent monitoring and evaluation should be seen as separate activities. As Chapters 6 and 9 illustrate, effective collaborative environmental initiatives are the ones that pay attention to both the task and the process, and so meet the needs that the different participants have in both areas. The task can be defined as what those involved have to do (e.g. reduce pest numbers). The process is concerned with how people and groups work together and maintain relationships. Experience shows that people often neglect process issues (commonly to concentrate on the task). However, both task and process will suffer if they are split from each other.

Similarly monitoring and evaluation need to be seen as distinct but related activities. Monitoring provides the raw data to answer questions. But in and of itself, it is a useless and expensive exercise. Evaluation puts data to use and thus gives them value. Evaluation is where the learning occurs, questions are answered, recommendations made, and improvements suggested.

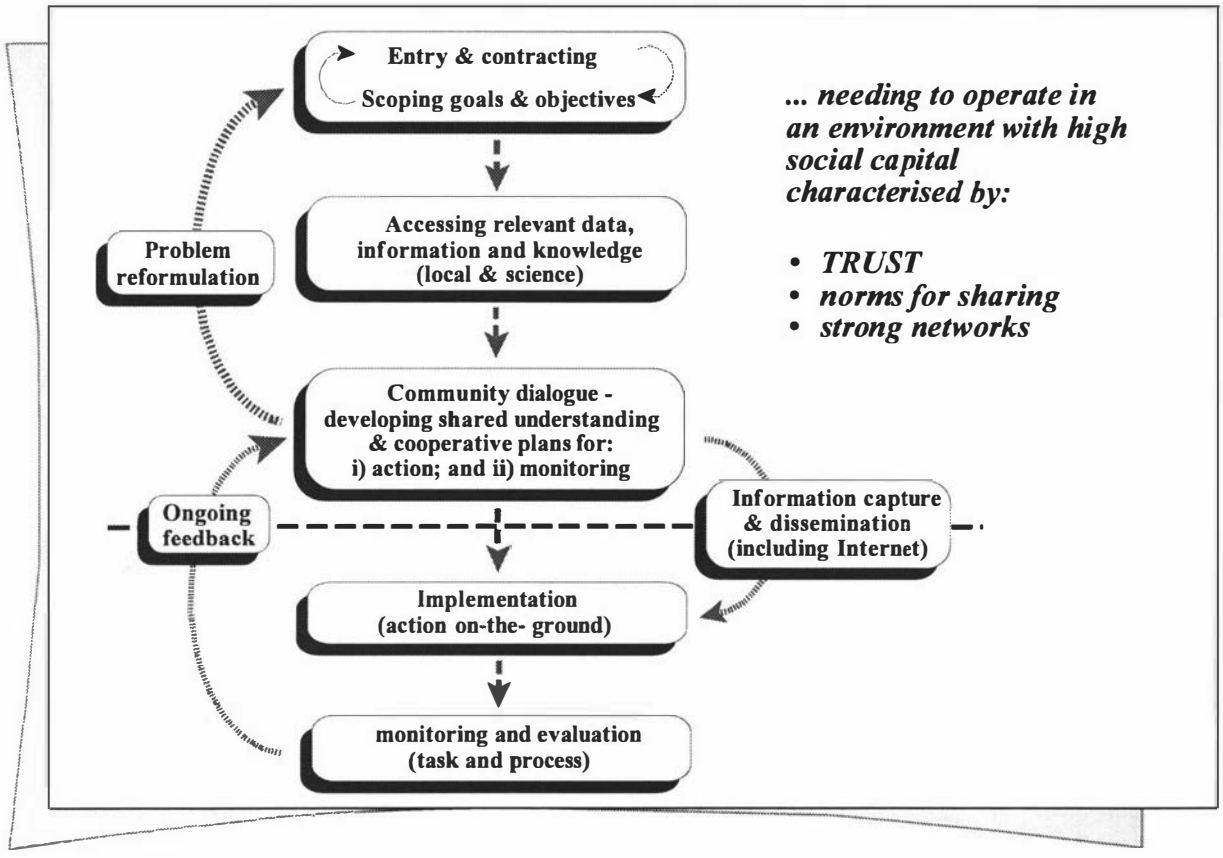

Figure 12.1 ISKM (ver. 4) and its relationship in practice with social capital.

Information management and learning as linked social activities

In practice the use of the steps within ISKM remind us that an information system cannot be regarded only in terms of its transfer component (often a paper, or a computer-based model/DSS). Rather, as Chapters 2 and 4 highlight, such a system is better viewed as a 'social system' within which people interact to create new knowledge, and broaden their perspective of the world. This is a significant perception distinction for science whereby dissemination (information technology/extension) and users form elements of a larger knowledge system (Figure 4.2). This concept is synonymous with the idea put forward in Chapter 8 that learning is socially constructed, occurring through interactions between individuals, between individuals and groups, and between groups of groups. Learners learn to function in a community by developing a shared language and acquiring the community's subjective viewpoint.

Learning, in this sense has two components: its process and the outcomes of that process. Change can be observed as an outcome of learning. This, in turn, must be viewed as an accumulative process which builds on existing practices and norms through interactive learning. While information is central to this process, Chapters 9 and 11 remind us that there are some supporting social processes that are required for this to happen. These include forums to develop a shared understanding around issues, management of a moderate degree of conflict and the provision of a supportive environment. Central to the notion of this supportive environment is the concept of social capital — the framework that supports the process of learning through interaction — and which requires the formation of networking paths that are both horizontal (across agencies and sectors) and vertical (agencies to communities to individuals). The quality of the social processes and relationships that social capital supplies — within which learning interactions take place — is especially influential on the quality of the learning outcomes in collaborative approaches.

Taken one step further, this suggests that this social capital plays an important role in influencing change, and sustaining a social and institutional environment that is ready to adapt. Equally, it explains why change is much harder to achieve in some situations than in others. In many cases stakeholders will lack the culture for participation in multi-stakeholder processes. Thus, building capacity (or social capital) for participation should in many cases be seen as a first step. That capacity should not just be assumed to be there.

Nor is this capacity-building just a function for science. It is something that needs to be built into all development activities — public health, education, environmental management, etc. Thus each sector will contribute to the development of social capital, which will, in turn, provide a richer social environment for subsequent efforts to operate in.

Building capacity for change

In this context efforts for change will need to be centred around supporting groups of people working together. As Pretty (1998) emphasises, true participatory projects are those which empower people by building skills, interests and capacities that continue even after the project ends. This implies the institutionalisation of such initiatives and the corresponding capacity for activities to spread beyond the immediate project in both space and time.

Increasingly the role of groups as a catalyst for change is becoming well accepted in terms of environmental management. These groups may be formally constituted (e.g. a landcare group, or agency team), or they may comprise members of a working group that has come together to undertake a one-off task. Such groups will have been formed for a range of reasons: to build trust between different parties, to develop best-practice guidelines, to establish community monitoring schemes, to develop a shared vision across a district or catchment, or to learn to use the Internet.

However, if we are serious about the need to foster a more collective approach to environmental management that is capable of the transformational change being sought, we have to do more than just work together to undertake specific projects. Roughly put, the collective vision that emerges is one which establishes an ongoing process for sound environmental management within and among the many groups involved in some way (see Chapter 9). For this to happen groups need to develop the capacity to move beyond the completion of task-bounded activities to more actively catalyse change within their immediate membership first, and to spread that culture to others in their respective groups over the longer term.

More than any other activity and by its very nature, building the capacity for groups to mature in this way depends for its effectiveness on participant ownership and commitment. Its success will rely on the use of participatory and formative evaluation exercises (see Chapters 3 and 6) that strengthen the ability of groups and group-members for ongoing self-assessment and correction. It is by engaging in such exercises that groups will be able to progress through the continuum outlined in Chapter 9, moving from dependency to interdependency. The monitoring and evaluation component of environmental research and development programmes, then, needs to be equally about building capacity, diagnosing constraints and opportunities and trying to make programmes grow and expand, as it is about measuring and describing on-the-ground progress against pre-set targets.

Measuring success in collaborative ventures

Evaluation has a value beyond the immediate role of supporting capacity development within the immediate group. Because of their nature, collaborative initiatives are only made possible with support from a number of different parties, all of whom need to be kept informed of progress and outcomes. Funders need evidence that their investments are paying off. In particular, there is a

need to develop intermediate indicators of success (e.g. within the time-frame of funding cycles) for process-oriented initiatives such as capacity building. Equally, other stakeholders who are giving of their time to help the particular effort (e.g. land managers providing information, agency staff facilitating projects) are also important audiences for information about the progress of the initiative. They too need evidence that their input is having an effect — at the least, to maintain their motivation for continued involvement.

Good evaluation is also needed to generate useful feedback to guide implementation. Managers need feedback to assess progress, assist with planning, and guide ongoing refinements to operations. Moreover, such collaborative initiatives are essentially experiments providing opportunities for practitioners and action researchers to test their knowledge and experience. In this way much can be learnt about fundamental and cross-cutting questions concerning the best way to model programmes, or to examine more closely the role that 'social capital' and 'capacity-building' can play in helping achieve more environmentally sound management. This information, in turn, can be fed back to shape future policy and research agendas.

Need for analysis across-case studies

As we go about developing these lessons we also need to remain aware (Chapter 10) that learning from single case studies is problematic. There is, therefore, a need for action researchers to undertake cross-case analysis, which can provide more valuable and robust lessons by sharing reflections across programmes and projects (Figure 12.2). In this way our understanding of the variety of forms that interventions can take will be increased, shedding light on implementation issues, and increasing user confidence in the external validity of findings.

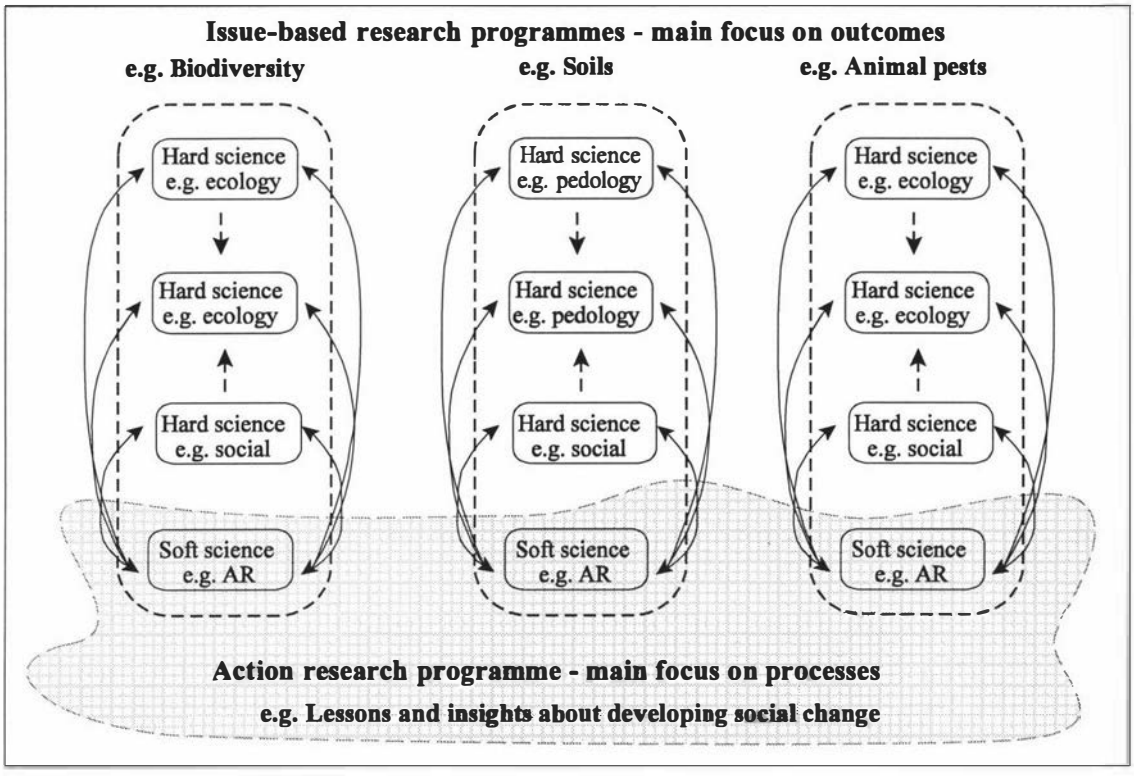

Figure 12.2 An across-case study approach to action research.

Moreover, there are other reasons why the action research component needs to be managed 'in conjunction with' research and development programs, rather than as a totally dependent component. By definition the goal of the action research team is likely in practice to be slightly different from the research or development programme. The latter is more likely to be aimed at developing outcomes in a particular topic area, while the action research component is equally concerned with looking for broader process lessons that can help with implementation issues across topic areas. Within this broader process, therefore, it is also important that science be seen as one of the 'stakeholders', and not as outside the process of change.

Moreover, if too much emphasis is placed on developing agreements and fostering improved working relationships to meet project deadlines it is likely to merely reinforce the status quo of the existing system (see Chapter 6). Action research, in this context, can merely lend itself to single-loop learning, focussing on changing individual and collective action strategies, while leaving underlying values and norms unchanged. In the end, this may be counter-productive in facilitating double-loop learning, which involves a more critical inquiry into and changing of underlying goals, values and performance measures, as well as strategies and assumptions.

Future challenges

As collaborative learning approaches are scaled up they will bring different challenges for action researchers. Most action research efforts that are reported involve the action researcher as closely connected with the changes being studied. However, as Ledford and Mohrman (1993) point out, in large-scale action there is a need to develop a strategy for learning about loosely coupled activities that occur in multiple locations. Increasingly in these situations, the client system will become predominantly policy makers, rather than managers and groups/teams.

This is particularly true in the New Zealand situation where action research studies such as those described in this thesis are undertaken more from the point of view of research, than to fill an extension function. Science programmes neither have the resources, nor the mandate, to undertake environmental extension/education in this area. It is therefore necessary to work alongside agency groups (often local government) who have the mandate and resources to use research findings to 'make a difference' on the ground. To help in these larger scale policy situations, we need better measures of process change as outlined above and some of these will have to be developed using quantitative methods.

As shown in this thesis, good information management and the development of constructive learning environments are key to bringing about change in environmental management. If these changes are to be achieved, individuals and communities must be supportive and directly involved in research and decision making. In these cases action researchers can play a major role in providing the tools and approaches to ensure that policy initiatives can be 'seen primarily as experiments, and dealt with as complex and uncertain ventures in which the participation of those who are expected to benefit is essential' (Rondinelli 1983).

If we assume that in the short term there will be no major shifts in financial resources to the environmental or development sectors, nor will current policies be massively altered to change the status quo, then we need other strategies for empowering people and changing current practices. The use of action research approaches to find out how to improve information flows, and strengthen and harness many existing aspects of social relationships in environment and development, may work to foster constructive change.

POSTSCRIPT (September 2001)

Some final reflections

Since this thesis was submitted more experience has been gained in the implementation of ISKM in the tussock grasslands case study, and there has been more time for reflection. In particular the Internet-based Tussock Grasslands MIS has now been made publicly available providing more lessons about both the Internet and the wider ISKM process. Similarly, the focus of our future action research inquiries have expanded to address the need for social capital highlighted in the closing chapters of this study.

The role of the Internet in ISKM

With the benefit of hindsight, my thesis construction and timing underplayed the achievements and significance in developing an Internet-based MIS as an integral output of the ISKM process. At the initiation of the main tussock grasslands case study in 1995 the researchers began by outlining ISKM (Chapter 4 and Appendix I) as a participatory framework for developing a comprehensive management information system (MIS) to underpin adaptive management. The Internet was chosen as a platform because of its potential for providing access, easy updates, and supporting learning and communication across different groups. However, as evidenced by the content of subsequent chapters, the significance of an Internet-based MIS as an output was perhaps overshadowed by a more process-oriented focus on different aspects of stakeholder involvement in managing information. Moreover, the Tussock Grasslands MIS was only made available for public access on the Internet in June 2000, and that the site was not actively promoted until after this thesis was submitted in October 2000.

One major reason for the delay in implementation was the emphasis placed on trying to develop a comprehensive MIS before releasing it. This was not consistent with the original notion of using a prototyping approach for development (p. 60). Accordingly, the subsequent MIS not only took a long time to develop, its size and interlinking pages also made it difficult to referee. A lesson from

this is to take advantage of the Internet's ability to accommodate progressive site development, and make future material available by posting even single pages as they are completed.

A subsequent evaluation of its use by Department of Conservation staff was undertaken in April 2001 by a colleague, Chris Jacobson. This showed that the MIS is being used by staff to support their decision making. Staff stated that it is a valuable resource and that similar sites in other areas of interests should be initiated. A number of specific requests for improvement were made (), and these are being addressed during the 2001/02 year.

The lessons learnt in the development of the Tussock Grasslands MIS highlight the need for science agencies to take advantage of the Internet to support stakeholders in accessing and debating information pertaining to complex environmental issues. One major problem for environmental decision makers is that information held by different stakeholders (local, tradition and science) is rarely available on a collective basis (e.g. Chapter 4 p.59). In this regard the Internet provides us with a new and convenient system for managing complex information which allows people to create, annotate, link and share information from a number of disparate sources and media. Similarly, the linking abilities of the Internet enable scientists, and other information providers, to display any new piece of information in relation to how it addresses knowledge gaps in a wider context. This is important as solutions to emerging environmental issues are rarely provided through the development of discrete pieces of information and technologies. Rather, the act of developing new ways forward is more likely to be characterised by the need for debate and ongoing information distillation and synthesis among different stakeholder groups concerned with the linkages between different pieces of information, management systems and scales.

The need for this debate is often not appreciated by scientists who often see the use of the Internet as yet one more way of 'getting the right information out there' (p. 160). However, as the farmer group leaders involved with our Tb vector control case study indicated, 'their vision for the Internet MIS was as a focal point around which to build more opportunities for farmer/scientist discussion and learning' (p. 160). This is consistent with the steps outlined in the ISKM framework for engendering a collaborative approach to generating and managing information, through which different groups and individuals interact to learn together and broaden their perspectives of the world.

With the recent evaluation of the Tussock Grassland MIS (http://www.tussocks.net.nz/), we can see that this case study has involved the use of all the steps and feedback loops outlined in the latest version of ISKM (Figure 12.1). It has resulted in a demonstrable information system that is being used in practice, and is being improved with user feedback and new information. From a research point of view the case study has contributed to the development of a participatory approach to information management that emphasises a number of key steps applicable to developing the understanding, knowledge and action needed to address environmental issues constructively. Looking to the future, ISKM can provide a common framework that enables action researchers working in different case studies to develop process lessons relating to the various steps involved. This is important if we are to learn lessons across case studies (pp. 219–220). It also provides a guide to help science leaders looking to improve the responsiveness of their research programmes to end user needs, and the subsequent participatory management of that information through to its provision on the Internet.

Developing a supportive environment for wider learning

Even when science technologies (e.g. best practices, DSSs, models) have been developed with a high degree of awareness of stakeholder needs using processes such as ISKM, getting this information used to support management decision making at a wider level is still a major problem. Research teams can at best only work with a few representatives of stakeholder groups, providing limited opportunities for engendering social learning beyond this immediate level of engagement. This is particularly true in relation to many environmental management issues characterised by large geographic scales, many players, multiple perspectives on the situation and where science and other information is subject to diverse and contested interpretations.

In this regard, Internet-based material only provides the potential for different stakeholder groups to more readily access information. In the Tb vector control case study for example some group leaders and facilitators recognised that Internet-based material could provide a community resource which could be easily updated and shared with others - who may not have Internet access - through their involvement with groups (p. 160). The advantages of the technology are not in creating new 'virtual'

communities, but in strengthening already existing social networks (p. 186). This is illustrated in Figure 12.1 which points out that processes such as ISKM need to operate in a social environment that supports learning.

This diagram highlights that while information is key to learning and subsequent informed and collective action, such learning will only happen at a societal level if it is supported by social capital (trust among the different players involved, mechanisms to develop shared understanding, and strong horizontal and vertical networks between agencies and stakeholder groups). In turn, this implies a need to ensure that the different interest groups involved have adequate capacity to participate in such multi-stakeholder processes. Therefore agencies seeking to support improved stakeholder participation in R&D, both at operational and policy levels, need to support both process outcomes (creating the conditions for participation) and task outcomes (getting information flows in place on-the-ground).

Exploring how agencies can achieve this increased level of societal capacity for participation is then another important area for profitable action research study. Because science agencies and programmes do not generally have the resources or mandate to work at this scale, this will require action researchers to work with environmental agency staff as they seek to support regional and national management and change initiatives. In these situations action researchers need to negotiate a role for themselves as evaluation specialists assisting those involved in such multi-stakeholder processes to assess progress and guide ongoing programme improvement. Such evaluations will also serve to build capacity to support improved participatory processes, as well as developing lessons that can be used to shape future initiatives.

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APPENDIX I

An integrated approach for maximising local and scientific knowledge for land management decision-making in the New Zealand high country

Bosch, O.J.H., Allen, W.J. (Landcare Research), Williams, J.M. (Agriculture New Zealand) and Ensor, A.H. (Glenariffe Station) (Reference: *The Rangeland Journal* 1996, 18:1, 23-32)

Abstract: This paper describes the development of a process to facilitate the identification and introduction of sustainable land management practices in the high country of New Zealand. The process was designed to gather and structure community knowledge (both local and scientific) into a single, accessible decision support system (DSS). The development and provision of appropriate, and user-friendly monitoring tools is supported. An outline is given of how this integrated system can be used to integrate monitoring with adaptive management. Special reference is made to how this process is used as a large-scale ecological "experiment", to enhance continually the knowledge base available for land use decision-making in the South Island high country of New Zealand.

Introduction

Despite the importance of rangelands, their degradation can now be seen on every continent. Past approaches to manage the rangelands have generally failed to view the environment as a set of dynamic and inter-dependent systems. However, the problems facing the management of these agro-ecosystems are complex, inevitably involve multiple social perspectives, and should be viewed as moving targets. Ignoring this propensity to change, has frequently led to the implementation of programmes which focus on the immediate situation, and treat only the symptom of a perceived problem.

Resolving the problems facing the world's rangelands requires both land managers and policy-makers to make correct management decisions. In turn, wise decision-making is dependent on the quality and availability of relevant knowledge. Therefore, an important role for range scientists, now and in the future, is to provide communities with the best knowledge available to

help them manage their rangelands. As Provenza (1991) emphasises, range scientists must endeavour not only to understand the significant biological processes underlying rangeland production, but also to engage in research to apply that understanding to the development of new technologies and management applications.

This paper is set in the context of the grasslands of the South Island high country of New Zealand. The area encompasses the major issues facing grazed ecosystems worldwide. It is characterised by diversity, ranging from fertile pastures to fragile river valley flats, and from intermontane basins to mountain tops that reach above the treeline. For the last 150 years, the main human influence on the landscape has been pastoral farming. In recent times, however, other uses such as conservation, tourism and recreation, forestry and hydro-power developments have become prominent influences on land management decisions. This diversification, as Holmes (1994) notes, can be interpreted as a shift away from dominantly commodity values towards a mix of commodity and amenity values. The implication of this to farmers, is that they are now being required to share the use of the rangelands with a variety of other users. It is clear that change is needed, but it is an unfortunate feature of human behaviour that it often takes a crisis to trigger substantive action.

One such "crisis" centred around the rapid spread of an introduced forb (*Hieracium* spp.), which is increasing at the expense of both native biota and introduced forage species (Scott, 1984). This forb is most common on pastoral lands, and has a detrimental impact on farming enterprises through an associated decrease in productive capacity (Martin et al. 1994). Another "crisis" was the loss of the ability to manage the European rabbit (*Oryctalagus cunnicilus)* effectively. This loss was the product of a complex of ecological, institutional policy and financial factors, ultimately catalysed by New Zealand's major economic reforms (Williams, 1993). These factors, coupled with a series of years with low wool prices, caused the financial viability of many high country properties to become questionable (Martin et al. 1994).

The stresses on both landscape and people demonstrate that past institutional arrangements and research outputs did not lead to sustainable land uses. There were major shortcomings in the translation of research information into farmer knowledge applicable to management needs. In addition, there was a lack of integration between the sciences, and between scientific research and the social and economic context in which it must be applied. Most significant, there was

little recognition within the research community of the extent and value of land users' knowledge, potentially available to combine with more traditional scientific knowledge (De Walt 1994).

Given the complexity of the systems under stress, it was evident to the community that a new approach was required to deal with the challenges of land-use sustainability. As outlined above, such an approach required a greater emphasis on linking research with management and policy, and on maximising the use of current knowledge in the community. This implied a participatory research initiative whereby land managers become directly involved as 'researchers' (Bosch et al. 1995b), through the process of monitoring and active adaptive management (Walters & Holling 1990). This is learning by doing. Finding out about complex and dynamic situations, followed by taking action to improve them, forms the basis for this learning process. Sustainability, accordingly becomes a measure of the relationship between the community as learners and their environments, rather than an externally designed goal to be achieved (Sriskandarajah et al. 1991).

This paper outlines the development of a community-based research initiative, which addresses these issues in the South Island high country. It emphasises the maximisation of knowledge (both scientific and local), and its usefulness in land management decision-making. A major component of such a participatory research approach involves the development of a comprehensive knowledge-based decision support system (DSS). This DSS provides a focal point through which land users can access both local and scientific knowledge systems to evaluate the implications of different management options and strategies. Two-way communication flows, which recognise that knowledge must be understood in context by all those involved, are supported as an integral part of the process. This acts to reduce conflict, encourage participation and provide a co-learning environment. It also provides a forum through which relevant research initiatives can be prioritised and designed. Collectively, these research processes help the identification and introduction of efficient and sustainable land management practices.

Capturing Existing Knowledge

Initial considerations

Years of experimentation with different management strategies to achieve different goals, have provided land managers with much knowledge about their local land use systems. Unfortunately, this knowledge is not available to the community on a collective basis. Similarly, much of the valuable knowledge that scientists have accumulated is fragmented, held in different databases and, consequently, not always readily available, even to other scientists or land managers.

The challenge is to bring local and scientific knowledge systems together into a single accessible and structured database. This would provide both land managers and scientists with more opportunities to inform and stimulate each other. If ready access could also be provided to appropriate monitoring tools, the lessons gained from the outcomes of management actions could be more accurately captured. At the same time, land managers and the wider community would gain direct access to a comprehensive decision support system (DSS) to help land-use decision making, without having to rely only on fragmented bases of knowledge and experience. Any framework to achieve these must be capable of:

- integrating existing local and scientific knowledge into an accessible and user-friendly DSS,
- incorporating tools to monitor and interpret the outcomes of management actions,
- continually capturing new information gained through research (scientists), and the adaptive management and monitoring process (land managers), and
- transforming new data and information into useful knowledge.

The development of such a comprehensive decision support system raises additional considerations. The traditional linear approach to DSS development requires that the complete specifications of the system are known before design and construction (Thierauf 1988). However, given that our knowledge of natural systems is, and will always be, incomplete, a more flexible prototyping approach is needed. This is especially useful when the technical improvement of DSS development is seen as a process that can be enhanced by continued feedback and learning.

Prototyping also encourages interaction between DSS developers and users. They continuously discover new requirements and refinements, which are then incorporated in succeeding versions of the DSS. In this way, the development process allows the user to gain experience with the system at an early stage, so increasing user confidence in subsequent working versions (Brittan 1980). Prototyping further lends itself to a modular approach. It produces a system which can be used at a much earlier stage than in the case of DSSs that are developed through more traditional linear approaches.

Sharing existing community knowledge

It is important to begin with local knowledge of management goals, problems and solutions. As already mentioned, land managers have collectively accumulated a vast amount of experience in local environments. They are also one of the largest potential end-user groups. Involving them from the outset ensures better access to their knowledge. In turn, sharing understanding and knowledge between scientists and land managers allows scientists to gain a better appreciation of the opportunities and problems facing land managers in the real world. This is more likely to lead to the development of a structured and comprehensive knowledge-base relevant to community needs (Blokker 1986). There is also likely to be greater commitment on the part of users to DSSs which they have had a hand in designing (Dearnley & Mayhew 1983).

An essential prerequisite to accessing existing knowledge, was the formation of a Steering Committee to ensure that land managers had equal participation in the research process. This committee comprised three farmers and three scientists. A farmer chaired the group, while the research activities were managed by one of the scientists. Many of the committee's initial activities focussed on developing a common understanding with the community of the participatory research initiative. A newsletter was produced and widely distributed, media coverage gained, seminars held, and field-day displays set up. These, and other processes that occurred during the development of the first working version of the comprehensive management-DSS, are outlined in figure A1.1.

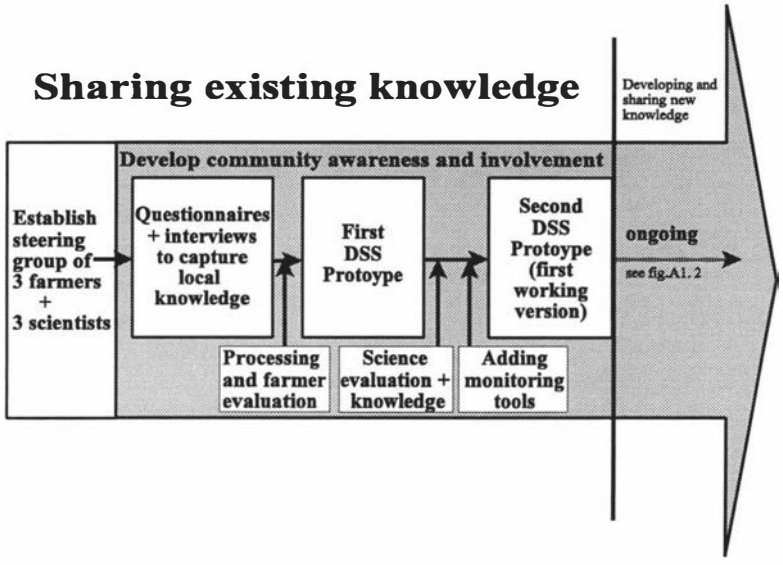

Figure A1.1 Combining existing local and scientific knowledge into a single decision support system.

The knowledge base held by local land managers was accessed through in-depth interviews and comprehensive mail surveys, which offered all high country farmers the opportunity to share their thoughts and observations. The results from this work, as well as from subsequent farmer workshops, were processed using LEVEL5 OBJECT software (Information Builders 1993). This resulted in the development of a first DSS prototype (Bosch et al. 1995b) which provides information as it relates to different system levels. Decisions impacting on sustainability often need to be made simultaneously at different decision-making hierarchies. These range from block/field goals (e.g. to improve vegetation condition for pastoral production, to protect and enhance an ecologically significant habitat), to enterprise/farm goals (e.g. to increase wool production, to improve lambing percentages), through to catchment/community goals (e.g. to reduce downstream siltation). The various strategies for achieving these goals are displayed in the DSS.

The science contribution

The strategies outlined by land managers in the first prototype were in many cases acknowledged to be inferential. In some cases strategies may successfully achieve individual farm goals, but may fail to take wider social and environmental impacts into account. Accordingly, existing scientific and expert knowledge was used to evaluate manager-defined strategies, both to assess

their potential for use in different situations, and to determine their possible impacts on the wider environment. Scientific knowledge systems can also be used to understand the biological processes underpinning rangeland dynamics better, and to provide a much greater array of options to land managers (De Walt 1994). The subsequent second prototype, accordingly, includes further scientifically-derived options, strategies and risks.

Placing knowledge in context

Given the complexity and different social perceptions of many agricultural and environmental situations, an essential component of the process focused on placing contributed information in context. As Ison (1993a) points out, sharing understanding of how different groups of people see the world and what they do in it, involves participation by all those who might be affected by the outcome (the stakeholders).

Ongoing community dialogue reduces conflict and clarifies issues by more clearly defining the context within which any piece of information is provided (Allen et al. 1995). Accordingly, contradictory management strategies are not displaced without the approval of those who practised them. This process encourages a learning environment which helps constructive and voluntary behavioural change. In a similar manner to the sharing of local knowledge, scientific knowledge is not used to displace that of land managers, but to complement local knowledge.

This ongoing community dialogue is best viewed as a mosaic of social interactions, operating at different points within a hierarchy of decision-making levels. Discussions of how best to achieve pastoral goals will primarily involve groups comprising farmers and scientists. Issues such as the management of different landscapes will involve a wider range of interest groups. In turn, as communication flows between different sectors of the community are expanded and improved, this should also reduce the level of conflict surrounding a number of high country land management issues.

Including a monitoring tool

If land managers are to be encouraged to become formally involved in the monitoring and adaptive management process, they also require access to user-friendly tools for monitoring. The

DSS framework provides for the inclusion of software to support land managers in assessing and interpreting the condition of their land.

As an example, the condition assessment module of the Integrated System for Plant Dynamics (Bosch et al. 1992) has been modified for direct inclusion in the DSS framework. Vegetation and soil change models have been developed for the different ecological regions of the high country (Bosch & Gauch 1991). These models are used as a basis for assessing and interpreting the condition of a particular site or area. Information is also provided on the existence of possible thresholds that are important for management decision-making (Bosch 1989b; Friedel 1991). Only a few species that are defined as good indicators of condition, are used for the assessments (Hurt et al. 1993). This is of particular importance in community-based monitoring programmes, where land managers themselves are involved in the assessments.

Ongoing Knowledge Maximisation

With the combination of existing knowledge, scientific and local, and currently available monitoring tools, the resultant prototype can be regarded as the first working version of the comprehensive DSS. For such an information-based system to facilitate sustainable land management in the long term, however, it needs to evolve in line with social and the environmental change. The strength of the process lies in the fact that it is ongoing, as illustrated in figure A1.2.

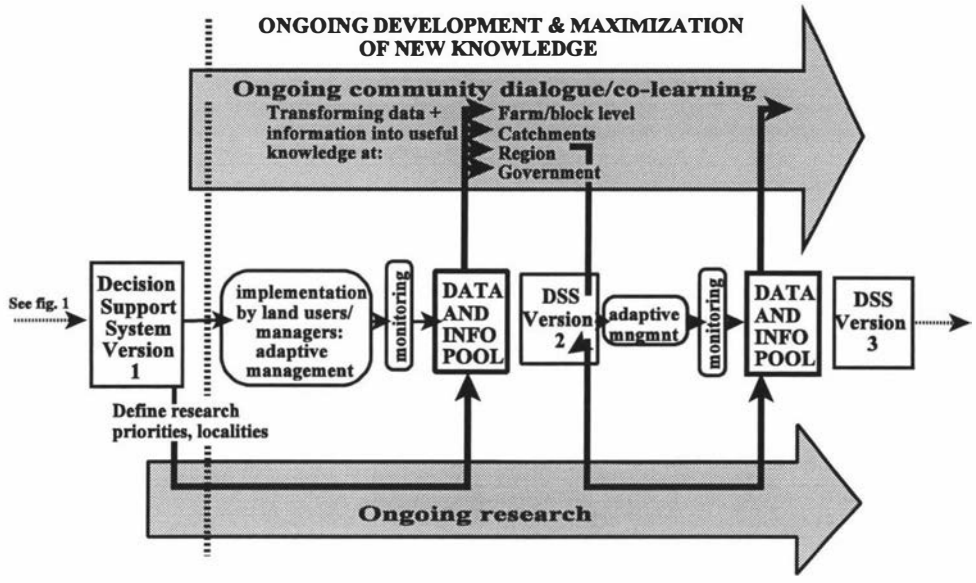

Figure A1.2 The ongoing process of knowledge maximisation to facilitate sustainable land management decision-making (Note: this should be seen as ISKM ver. 1.1).

An ongoing role for land managers

In normal practice, land managers manipulate ecosystems, primarily to achieve a management objective, rather than to find out how the system works. However, as MacNab (1983) observes, a management scheme is always an experiment. As land managers measure the outcomes of their actions, they continually gain new "experimental results". These provide new information whereby the knowledge base held in the DSS is re-evaluated and expanded in collaboration with scientists and other stakeholders (Fig. 2). In turn, the enhanced DSS provides a broader foundation to help individual land managers with future decision making.

To take one example, the development of sustainable grazing strategies requires an emphasis on experimental rather than descriptive ecology. Given the climatic and ecological variability of the South Island high country, it is logistically impractical for scientists to undertake a rigorous experimental approach to assess the effects of different management strategies (effect of spelling periods, rotational grazing, set-stocking, etc.) under different environmental conditions. The linked concepts of monitoring and adaptive management, however, make it possible for land managers to become involved in such a large-scale experimental approach (Walters & Holling

1990). Although the scale of such an 'experiment' would preclude a standard controlled experimental design, large numbers of participants would ensure some degree of replication.

Involvement in the participatory processes of monitoring and adaptive management in this way, means that individual land managers acquire greater technical expertise, using both local and scientific knowledge. At the same time, they also develop greater confidence in the scientific methods and the participatory approach, which ensures their continued and successful role in the process.

An ongoing role for science

At any given time the information base can play an important role in helping land managers and scientists jointly to determine new research priorities (Figure A1.2). Because it acts as a framework to display existing knowledge, the information base helps identify knowledge gaps, and prioritize new research initiatives. This is a continuing process, as evolving knowledge, technologies and value systems inevitably change our perceptions and provide new areas and issues for research (Stuth et al. 1991).

At the same time, new local knowledge will add to the range of strategies to be evaluated. Strategies and options will also continually change in response to social, economic and ecological pressures. This creates a role for ongoing research to determine the wider applicability and environmental implications of management options and strategies. This process is currently underway, and focuses on three main areas:

- Evaluating the financial implications when the management strategies outlined in the DSS, are applied to the wide range of land use enterprises across the high country.
- Determining the role of ecological factors and their interaction with management regimes, to evaluate the effects of different management options and strategies on patterns of vegetation and soil change.
- Evaluating the social and environmental implications of different land uses. This includes adding information to the DSS on resource suitability, and the possible impacts of different land uses, from the paddock level to the wider region.

Continual enhancement of the knowledge-base

The above processes leads to a continuous flow of new data and information from research (scientists) and monitoring (land managers) in the form of publications, research reports, monitoring data, and theses. This data and information is held in various different localities (universities, research centres, landcare groups, etc) and there is a need to make it accessible to all interest groups. This is being achieved by bringing summaries and data descriptions together into a centralised data and information pool (Figure A1.2).

The next important process is to transform this new data and information into useful knowledge at different levels, from the farm/paddock, to catchments, regions and policy makers in local and central government. This is done through ongoing community dialogue and co-learning processes (Figure A1.2). Relevant people and institutions are involved in a series of workshops, in which data and information are transformed into useful knowledge. This is then used to refine the DSS into a later version. Farmers and other users receive updated versions on computer disk, as well as through traditional dissemination mediums such as brochures and leaflets. The most up-to-date access is also available through a web site on the Internet.

Integrating an ongoing process into the community

As this paper has illustrated, *technical support* for the process is provided by scientists through the development of a comprehensive management DSS, which enables monitoring and management data to be catalogued and made accessible for management decision making. Involving land managers in the design and construction of the DSS was a necessary step, not only to assist our understanding of the system to be designed, but also to *mobilise* public awareness of the participatory research process, and the role it could play within the local community.

However, for the process to be adopted, and embedded in the community as an ongoing process, requires a number of other functions be undertaken simultaneously. Technical support and mobilisation (public awareness) are only two of the five elements that Roling (1988) regards as essential for programme success; functions of organisation, training and system management are

equally important. To these we can add the function of supporting community dialogue, which involves bringing together a number of different viewpoints within the community. Together, these functions are elements of a 'mix', which work in a synergic fashion (Roling 1988).

One of the difficulties of undertaking such a comprehensive programme, is that it involves such a large section of the community. The boundaries of the project cut across a range of different disciplines and political interests. There is a need to develop links, and to mediate between conflicting interests. This is essentially an issue of *systems management,* and ensures the success of the other four functions. In the example presented in this paper, the Steering Committee successfully undertook this role. To build the trust required, it was important that members of the committee be viewed as politically neutral.

The *training* of local people forms the basis of any participatory research programme. However, this should not be seen as solely the responsibility of extension workers and other employees of technical agencies. In many instances, it is best carried out by *community-based organisations* (Roling, 1988). A system in which land managers train land managers, gives them ownership of the research approach, and thus increased involvement and research uptake. In the South Island high country much of the training in DSS use at farm-level has been organised and carried out by farmer-initiated community bodies (Ensor & Aubrey 1994).

Further refinement of the DSS by land managers takes place through focussed demand-driven projects, such as the 'large-scale grazing experiment' described above. These projects start from the need to meet a specific community objective, which may be financial, ecological, social, or some combination of these. In reality, to achieve this community objective requires members of the community to receive direct personal benefit in some way. This, in turn, ensures ongoing involvement, as the user sees the benefits of inputting into the knowledge pool.

Concluding Remarks

Involving the community in participatory research is essential if we are to resolve sustainable land management issues in a constantly changing environment. In turn, involving the community enhances our ability to learn from the experiences gained within enterprise and catchment-level

systems. Adaptive management approaches, such as those undertaken in the South Island high country, allow the use of local knowledge, and the adoption of a continuous enhancement process. At the same time, involvement in the participatory processes of monitoring and adaptive management allows individual land managers to acquire greater technical expertise, building on both collective local knowledge and an associated scientific awareness of their particular physical environment. By achieving specific objectives for the improvement of their resource position through a collective effort, land managers develop greater confidence, and that, in turn, ensures the successful continuation of the whole process.

Community-based research is likely to become increasingly used as a means to make better use of land manager knowledge. It is critical, in land management, that there is increased recognition that the land user has valuable knowledge, gained through experience from managing complex systems. As we move to the knowledge-intensive land user models, this is a major paradigm shift, and does not rest easily with many in the science community.

The effectiveness of co-research approaches and the continuous monitoring, feedback, improvement cycle that this process makes possible, are dependent on maintaining good science/community links. The location of research teams within communities, rather than remote city campuses, is important. Access to community groups is also a key. In New Zealand, it has been relatively easy to co-operate with the community because of the visibility of problems such as rabbits and *Hieracium* spp.. These problems, in turn, have encouraged the emergence of rural groups which represent an important ingredient in land user adoption of these approaches. Given the deteriorating state of the world's rangelands, however, we believe that other countries have similar problems, although not necessarily single factor ones, that could act as catalysts to introduce similar community-based and systems-oriented approaches.

Participatory research offers an educational experience, which serves to determine community needs, as well as motivate the community to develop a commitment to the solution of their own problems (Anyanwu 1988). Providing greater understanding of the system helps the community adapt to change, and can also help to determine what components are most affected by change, in order to target research priorities better (Stuth et al., 1991). In turn, this understanding allows the scientist to shift from a reactive to a proactive position. The approach outlined in this paper represents a process to facilitate the design of a more sustainable future, rather than to accept that

our future will be determined by the *status quo*. It therefore places new demands on individual land managers, the community and science.

Acknowledgements: The authors would like to acknowledge the support and funding that has been provided to this research programme by MAF Policy (NZ) and Manaaki Whenua - Landcare Research NZ. Research such as described here, is not possible without the support of the community, and we would like to record our appreciation for the efforts of all those in the high country farming community who have acted as our co-researchers.

APPENDIX II

Improving farmer motivation within Tb vector control[6]

Margaret Kilvington, Will Allen and Clare Kravchenko (Landcare Research).

This research aims to provide appropriate frameworks for AHB to better understand the different factors which influence: (i) the motivation of landowner's to undertake Tb vector control; and (ii) the success of Tb vector farmer groups. These frameworks can be used directly by the AHB to identify areas in which they can modify their support, and as a basis for focussing further research. It is part of work carried out during 98/99 under the AHB-funded project No. R1456 'Assisting the identification and uptake of effective Tb vector control strategies'. A three-part research approach was undertaken:

- A selection of North Canterbury LIP group convenors were interviewed. The convenors were asked to describe their Tb vector-control efforts throughout the year, to discuss their reasons for undertaking this control, and to detail issues and problems associated with it. They were also asked to comment on how the LIP groups were functioning and their involvement with them (See full report: Kilvington et al. 1999 Appendix 2.1). This information was then used as a basis to develop the subsequent analysis and discussion outlined in the following two points.

- Frameworks were developed to provide an understanding of: i) motivation factors; and ii) group dynamics relevant to Tb vector control. A commentary is provided to show how these are linked and how they can be affected by various policy approaches including the use of LIP groups.

- These frameworks were then used to help address issues about motivation and group activity raised by convenors during the interviews and a subsequent workshop.

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[6] The formatting in this report has been amended to fit that of this thesis. Some sections have been omitted to minimise duplication, and the report appendices have also been omitted.(Reference as: Landcare Research contract report.1999, LC9899/110).

It should be noted that this research does not include a comprehensive survey of 'what motivates farmers to undertake Tb vector control' in North Canterbury, or an analysis of the current status of LIP groups and their effectiveness in achieving Tb vector control.

Research context

Given the level of Tb incidence, and the difficulties of multi-species vector control in North Canterbury, there is a clear need to complement AHB national and regional control efforts with improved farmer efforts. Farmers need to appreciate the problem and be continually motivated to contribute effort to help eradicate Tb. To support this action, farmers need the most cost-effective and up-to-date information. This is an area which is constantly changing through new research and better operational procedures.

Farmers do not always assign vector control as high priority and differ widely in their perceptions of the risks of Tb (e.g., dry stock farmers vs breeding cow enterprises). In addition, due to the wide- ranging territorial characteristic of the vectors, there is a need for collective approaches to manage them.

North Canterbury farmers recognised the Tb problem, and took collective action during 1995 and 1996 when the Tb incidence was escalating due to the advent of ferrets as a Tb vector. Forty-five farmer groups were formed to focus on an integrated possum, ferret, and rabbit control programme. The reduction in Tb incidence from June '95 to June '97 , can be largely credited to on-farm effort by these farmer groups. However, since 1998 this rate of reduction has stalled and the Canterbury Regional Animal Health Committee (RAHC) expressed the view that this is related to a lack of motivation by farmers.

At meetings we have attended as part of this research this lack of motivation is commonly attributed to issues external to AHB's control, such as farm economics, drought, concerns about rabbits, and the release of the Rabbit haemorrhagic disease (RHD) virus. However, while external issues certainly have an impact, motivation is driven by a number of factors, many of which can be influenced by the AHB.

An evaluation workshop was held with the North Canterbury Tb Management Committee on the 15 May 1997. This provided researchers and committee members with a broad look at how different activities, and interactions between different parties, fit within the wider Tb-eradication programme (Allen & Bosch 1998). The results recognised the importance of current management and related research efforts into both disease and vector control. They also highlighted the need for the AHB to actively pursue a more effective collaborative learning environment for those utilising research findings in the practice of reducing the spread of Tb.

This collaborative learning environment requires a number of social needs to be addressed, including improved communication, learning, and information/technology transfer and exchange. These, in turn, will lead to changed behaviour 'on the ground' in the form of integrated farm management that includes active Tb vector control. As one farmer said at a recent meeting, "we need to get farmers to realise that they need to maintain their efforts into vector control, in the same way that they need to maintain their efforts into drenching the hoggets."

Participants in this evaluation noted that little is currently known about these social aspects of Tb control and little research is carried out on how to set targets, design action plans, and monitor achievements in these areas. In turn, because it is hard to specify the necessary actions and their resulting outputs in quantitative terms, it is difficult to write objectives and allocate money for them (e.g., extension). Newsletters, field days and late-night phone calls are essential activities, but because outputs are hard to quantify, they tend to be omitted from the formal operating plan, and consequently remain largely underfunded. Much voluntary effort is expended in these activities.

This report aims to provide AHB with frameworks for understanding motivation and group behaviour, enabling them to target their support to improve on-farm efforts in Tb vector control.

Understanding motivation

The question of what motivates people to undertake any action or behaviour is usually of most interest to us when there is some pressing desire to alter and influence that action. In the case of bovine Tb, agencies and farmers alike are interested in influencing rural property owners to take actions that will reduce the spread of Tb, including controlling stock movement and destroying

potential disease vectors. The challenge of motivation in pest control is twofold: to raise the level of motivation of rural property owners to undertake Tb vector control, (especially problematic amongst those whose stock, and hence livelihood, are not directly affected by Tb); and to maintain this motivation level when Tb is not an overtly visible problem.

The term 'motivation' is often used generically to cover a complex array of persuasive elements. In this section we describe the range of factors that can influence the intention of farmers to undertake Tb vector control. We also look at the influence of various policy options and the role of information and education.

Motivating factors

The motivation of individuals to change their behaviour is affected by numerous factors, of which not all are immediately evident and only some are subject to direct and deliberate influence (Ajzen & Fishbein 1980).

Ajzen & Fishbein's theory suggests that people's intentions to undertake some action (such as Tb vector control) are a good indicator of their likely behaviour (leaving aside interference from unpredictable events, such as severe weather, physical accident et.c). Intentions to undertake various actions are in turn influenced by two principal types of factors: (i) subjective norms, i.e., what the individual perceives to be the social pressures promoting a behaviour, and (ii) personal attitudes towards that behaviour. The balance between the two streams of influence will vary according to the individual concerned and the action.

Figure A2.1 uses the results of the convenor interviews to outline some of these interacting factors which influence farmers to take-up and remain involved in Tb vector control initiatives.

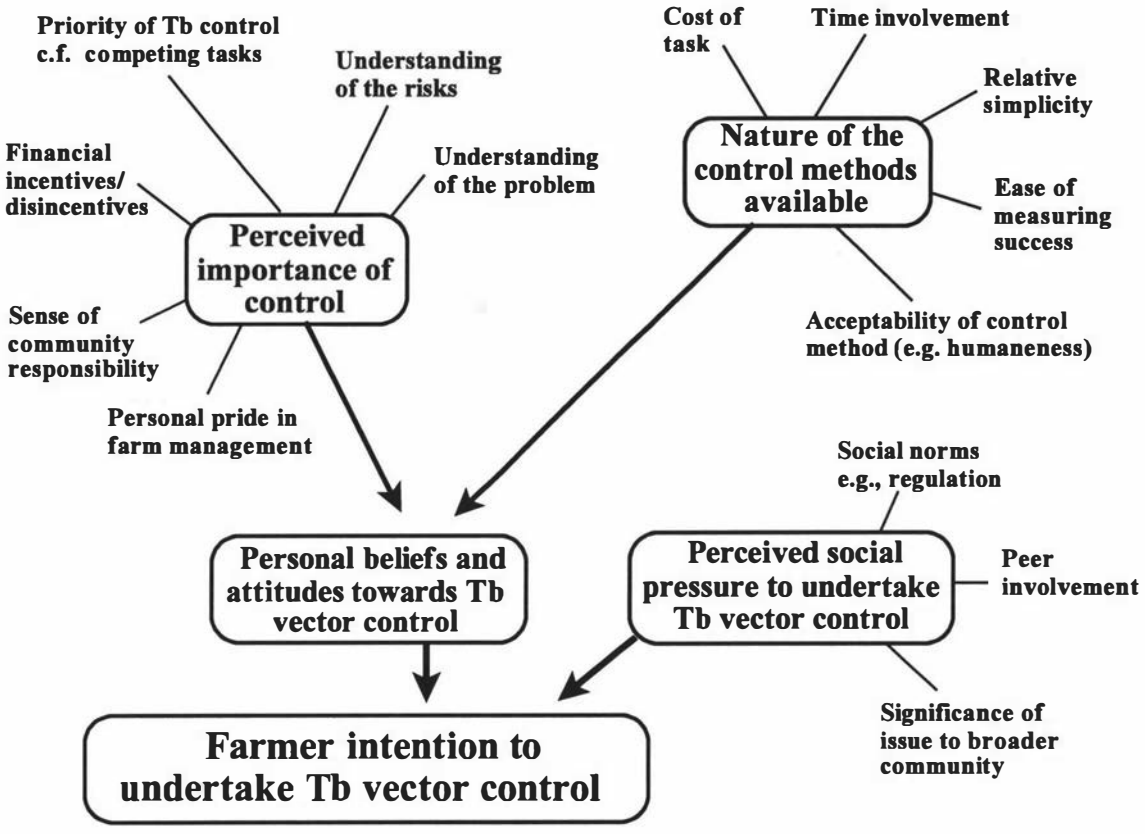

Figure A2.1 Factors affecting vector control motivation

Motivation influences: Personal attitudes and beliefs

An individual landowner's attitude towards the **importance of Tb vector control** and the **methods of Tb vector control available** to them will influence their intention to undertake Tb vector control on their property. Factors affecting these personal attitudes and beliefs are outlined in Table A2.1.

Table A2.1 Personal attitudes and beliefs affecting motivation

Perceived importance of Tb vector control

How much importance a landowner places on control is influenced by:

- financial incentives/disincentives (such as bounties, or the cost of having stock on movement control);
- understanding of the problem
- perception of the risk to them
- sense of community responsibility
- personal pride in farm management;
- relative priority of Tb control against competing tasks.

Perceptions about Tb vector control methods

Qualities of the control methods likely to be important to landowners are:

- cost
- time involvement
- relative simplicity
- ease of measuring success
- acceptability of the method in terms of humane killing.

Policy approaches that affect the degree of financial incentive/disincentive may persuade landowners of the importance of Tb control, but to differing degrees (depending on the landowner's financial position and their core business activity). Technology/information transfer approaches can enhance landowner's understanding of the problem and perception of the risks, as well as promote integration of pest control into standard practice for what is generally considered 'good farm management'. This integration into standard farming practice acts to counter competition from other pressing issues (such as drought and decline in product prices), which is currently a commonly cited reason for the decline in landowner investment in pest control (rightly or wrongly!). Similarly technology/information transfer techniques can do much to affect perceptions about control methods. The information transfer must be a two-way exchange (co-learning) between technology developers and those using the control methods, to ensure future development of technology addresses landowner needs and concerns.

Motivation influences: Social pressure

Factors affecting the degree of social pressure landowners experience in regard to Tb vector control are outlined in Table A2.2.

Table A2.2 Perceived social pressure to undertake Tb vector control

A landowner's intention to undertake some form of Tb vector control will be influenced by:

- what they perceive to be the extent of peer involvement and the attitudes of those close to them (family and friends);
- the support of social norms (i.e, good practice standards or regulation);
- the extent to which any landowner perceives this issue is significant to the broader community.

Information management and learning play a crucial role in helping to motivate people to undertake Tb vector control, through triggering these social pressure factors. Education can expand awareness of the social significance of the Tb issue as well as promote the understanding of regulatory policy mechanisms and consequently increase the likelihood of their being adhered to. Groups, such as those set up under the Local Initiative Programme, are a possible vehicle for education initiatives as well as a mechanism for increasing the perceived pressure to collaborate with neighbours and friends.

Policy and motivation

There is considerable evidence from the psychological literature that, all else being equal, a policy instrument is more likely to produce both compliance and a positive attitude change if it is perceived as non-coercive (e.g. Kelman 1983). Thus, voluntary instruments such as compliance with recommended best-practice targets, are likely to be preferred by resource users over direct regulation because they are flexible, give individuals greater freedom and the opportunity to experiment with lesser known approaches to solve their problems. However, the extent to which voluntary approaches can be relied on as a principal tool, or whether these need to be combined with other policy options, and what those options should be, must be evaluated on a case-by-case basis.

Voluntary approaches are likely to work best, and have the greatest dependability, when there is a substantial coincidence between public interests and the private (especially commercial) interests of individuals. However, even in cases where public and private interests substantially coincide, voluntary approaches can only work if individuals (and the wider community in which they operate) fully appreciate the nature of the problem involved, and their own self-interest in the matter. This, in turn, requires that such voluntary approaches are supported by appropriate motivational, information, and educational efforts (Young et al. 1996). As shown in figure A2.2 these support-approaches can reinforce the effectiveness of other policy instruments.

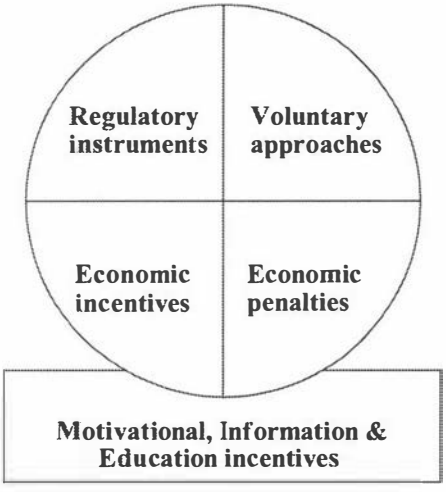

Figure A2.2 Major types of policy instruments that can be considered to support behaviour change relevant to bovine Tb vector control. (Adapted from Young et al. 1996).

Motivation, information, and education are located at the base of the policy mix because of the major contribution they can make in reinforcing and making more effective each of the other mechanisms. If people are persuaded that Tb vector control is worthwhile, they are more likely to respond positively to a range of instruments: voluntary, regulatory, and economic. As Young et al. (1996) point out, prospects for changing behaviour will always be greater 'if direct regulatory approaches are overlain with a web of mechanisms that create a financially attractive and voluntary atmosphere that encourages cooperation and the sharing of information.'

Information, education, and motivation

The ability to make and influence decisions that directly affect an individual is a major factor in motivation. Involvement in decision making encourages people to buy into outcomes and work to see them implemented. Good decision making, at all levels, is dependent on sound information, hence the management of information is an important component in motivating people to undertake certain 'desirable' actions.

In Part I of this project, the ISKM (Integrated Systems for Knowledge Management) approach was introduced as an information management framework to develop best practice guidelines for effective Tb vector control strategies (Bosch & Allen 1998). It is based on a process of adaptive management or 'learning by doing', and aims to create closer links between science, policy making, and management. The use of ISKM, and similar processes, provides all involved with a learning environment in which 'useful knowledge' is developed through the participation and contribution of a number of stakeholders (researchers, farmers, policy makers etc). However, only representatives of the different interest groups can participate at any one time. Therefore there is a need to capture this knowledge to benefit those who have not been directly involved. This can be done through a range of media such as minutes of meetings, journal papers, memorandums, reports, the news media, telephone, facsimile and (last but certainly not least) face to face conversations. In other cases, especially in relation to more complex problems, computer based decision support programs can provide a decision-tree type format to guide people through the problem-solving exercise.

The Internet is emerging as a new complex management information system (MIS), which allows people to create, annotate, link together, and share information from a variety of sources and media. A number of researchers are also pointing to the potential of such systems to promote collaborative learning and problem solving (e.g., Carrascal et al. 1995; Allen et al. unpublished data).

An Internet-based MIS has been developed through this programme to provide best practice for ferret control. In this case the direct users of such an Internet-based system are not necessarily the farmers of North Canterbury. Clearly, not all farmers have access to computing and Internet

facilities. However, in North Canterbury the majority of farmers belong to groups organised around the issue of pest management. These groups are serviced by facilitators and group leaders, and provide an effective cooperative environment for learning. Facilitators and group leaders are seen as the interface between the Internet information system and farmers. In

addition, the Internet site has the potential to form a powerful and immediate link between farmer group facilitators, group leaders, researchers, and other relevant agency staff.

Managing groups effectively

Farmer involvement in local vector control groups provides a significant opportunity to influence landowners' perceptions of the importance of the Tb problem, and their understanding of the control methods available to them. It can also influence the degree of social pressure experienced by landowners to undertake control on their properties. A number of Local Initiative Programme (LIP) and voluntary groups have already been established through the efforts of the AHB. These groups provide a vehicle for improved information sharing, collaborative learning, and influencing behaviour change.

The idea of working through groups to achieve these aims is not new. Most of us, if we wish to learn a new skill or broaden our perspectives on an issue, will seek out some collaborative learning environment such as a club or training programme. Similarly, talking an issue through is a natural process for many people. We gain new insights as we express our own views and we subsequently modify our views as other people provide us with new ways of looking at the issue at hand. Groups can also foster a collective sense of responsibility; we generally try to fit in with groups we are involved in.

Groups that function well do not happen by accident. It takes patience, persistence, and resources. It also requires skill in managing group dynamics to keep the group moving in a positive direction. It cannot be expected that groups will function successfully all the time. Awareness of what is happening to a group and access to the skills necessary to address this are crucial to the long-term viability of groups and their success in achieving their goals.

While successful groups are those that have been individually tailored to each situation, there are some common elements that make these groups work (a number of guides for those interested in reading more are listed in Kilvington et al. 1999. Appendix 12.1). As a starting point for reviewing the effectiveness of groups in North Canterbury, a brief summary of key issues and points distilled from other successful groups is provided here.

Defining goals and objectives

Groups are started for a number of reasons, and by many different players, in the wider community. Often they may be initiated by a community member to fulfil an identified local need. Often too, they will be initiated by an agency, especially where the issue is one that has wide geographic interest. It is important that the proponent of a project involving groups (e.g., AHB) should have a clear objective in mind when approaching a group for assistance. In this section we discuss what takes place once the group is established and has agreed to take on the task to meet the proponent's objective.

The objective from the proponent's perspective is the plan or policy. Once the plan or policy has been well demonstrated and the community group has agreed to participate in the process, it is the turn of the local group to work out how they can best achieve it. Often, where these groups are helping to meet an agency objective, support will be provided for this. Important steps are to develop: (i) their vision (or goal) of what they might achieve; (ii) some objectives that help attain the vision and provide benchmarks for success, and ; (iii) strategies (or actions) to meet the objectives. Groups have a tendency to ignore the vision and the objectives and jump into defining actions they want to see happen. Often these actions reflect the special interest they represent. Without the vision and objectives there is no way to measure progress, however well intentioned the actions.

Agencies must also be aware that their definition of group success may be the achievement of a single objective (e.g., to control Tb-vectors). However, for local people their time involvement in this may need to be balanced against a range of competing needs. In particular, it is important for agencies to be aware that in setting up these groups, and in gaining the involvement of key community leaders, they are tapping the same "largely voluntary" community resource that

supports other community groups (e.g., landcare, sport, education, health). There is a need to accommodate this, and in some cases flexibility will be required to enable the same group to undertake different functions.

How groups work

Despite an obvious difference between many groups (a consequence of the variation in participants and the dynamics between them) there are several stages of group development that appear to be common to all. These stages are consistently described by a number of writers in this field, albeit using a variety of terminology (e.g., Hunter et al. 1992; Donaldson & Kilvington 1996). They are the developmental stages of 'getting started' and 'getting to work' through to 'maturity' and 'ending', where the group has reached a point of fulfilment and completion of its objectives. This development process is often referred to as **forming**, **storming**, **norming/performing** and **dorming**.

Active facilitation is often necessary throughout these developmental stages. This is to draw from a clear purpose from the group, to support the group in identifying actionable first steps and to maintain motivation in continued effort. Without effective facilitation and support it is not uncommon for groups to flounder midway, losing the initial enthusiasm which prompted the group to form. Complacency or loss of purpose can then prevent members from getting on with tasks at hand or assessing the effectiveness of what has already been undertaken. Table A2.3 illustrates the main ways of identifying groups in each of these stages and the corresponding facilitation needs.

Table A2.3 Different stages of group development

Forming stage ▸ lots of questioning about the purpose of the group and what tasks are to be performed ▸ looking for leadership.	**Facilitating forming** ▸ patient explanation of the purpose of the group ▸ identifying and agreeing group goals, and objectives ▸ setting up the process - e.g., how decisions will be made and who will make them ▸ establishing leadership in the group.
Note - if this stage is not done thoroughly it is likely to have to be revisited as the group loses sense of direction.	
Storming stage ▸ disagreement over goals or objectives ▸ conflict between group members ▸ absence and withdrawal by group members ▸ frustration over lack of achievement of goals etc.	**Facilitating storming** ▸ reiterating the purpose – reminding members of the goals ▸ checking on achievements so far – celebrating them, however small ▸ checking on tasks – reassigning them if necessary and reviewing resource needs to carry them out ▸ carrying out conflict resolution - using professional facilitation ▸ possibly rotating the leadership to encourage involvement by other group members.
Note - this stage is a common sticking point for many groups.	
Norming/performing stage ▸ group attendance is high and enthusiastic ▸ tasks are being performed regularly ▸ optimism about achievements.	**Facilitating norming/performing** Maintaining momentum by: ▸ ensuring resource needs are met ▸ achievements are noted ▸ failures are learnt from.
Dorming or ending stage ▸ the group purpose has been achieved ▸ or, circumstances have changed and the group no longer continues.	**Facilitating ending** ▸ may require a redefinition of goals if the group wants to continue together ▸ or, acknowledgement of achievements in order to leave participants with a positive experience of group work.

Successful groups

Groups that are functioning well share a number of identifiable characteristics: confidence in leadership, a sense of cooperation, and good communication are three significant areas for effective group functioning. When a group has a strong sense of cooperation its members recognise the importance of the central issue for the group and the necessity to work with others to achieve their desired objectives. This desire for cooperation prompts members to play their part and build the trust and confidence that will ensure the collaboration of others. Good communication is a pillar for building this sense of co-operation. This communication may range from something as simple as ensuring that participants are aware of and present at meetings, to promoting the successful exchange of valuable technical information between the participants. Good communication also ensures participants are able to express views and concerns, and are less likely to withdraw from the group from a sense of not being able to contribute or influence the direction of the work.

Effective groups pay attention to both the task ('what the group has to do' e.g., reduce ferret numbers) and the process (i.e., how the group functions and maintains relationships). Groups often neglect their process issues, commonly in order to concentrate on their task. However, both task and process will suffer if they are split from each other.

Because task and process are linked, it is important to measure progress of both. For example, groups will not only need to monitor how many ferrets are killed but also people's views on group involvement, field day attendance, etc. It is important to notice the changes that have occurred and reinforce them. Groups can become frustrated if they are only comparing their current achievements to an ultimate goal rather than recognising them as important steps along the way.

Also, too many groups depend upon the good work, energy, and commitment of one or more individuals and/or on the presence of dedicated projects. If the individual(s) are transferred or stop contributing, or if the project ceases to function, the process may be blocked or simply fail. The process should be institutionalised as much as possible, making it as independent of individuals and outside inputs.

Group supporting roles

Supporting groups involves a number of roles. Key among these is leadership that ensures the group achieves its goals, remains cohesive, and enables every participant to contribute to the best of their ability. Providing resource back-up such as expert advice, general secretarial and/or administration support is another key role.

Leadership

The purpose of group leadership is building and maintaining the group, and achieving its' objectives. Leadership in groups can be a fluid concept. At various times in group development different styles and types of leadership may be more appropriate than others. However leadership is defined, there are characteristics common to effective leaders (Table A2.4).

Table A2.4 Important aspects of leadership

- a sense of responsibility for the group in all its facets (human, financial, task accomplishment)
- being a risk taker and accepting the risks to maintain strong direction within the group
- being able to communicate clearly the goals and objectives
- using a leadership style appropriate to the situation, and which encourages support and cooperation from the members
- performing to a high personal standard as an example to promote high standards within the group.

Good leadership leads to a good group dynamic, where members demonstrate a strong sense of purpose, and tasks are carried out enthusiastically. There is high rate of attendance at meetings, and members are willing to take on increasing levels of responsibility and more complex tasks.

Leadership roles

Chairing meetings: is a common leadership role within groups. The chair generally has responsibility for:

- laying out the rules and procedures of the meeting (which, incidentally, should have been developed at the outset in discussion with all the members)
- ensuring that people speak in turn
- keeping order during the meetings
- striking subcommittees and ensuring that administrative duties are attended to
- and may hold a deciding vote.

A good chair pays close attention to detail, and ensures that the agenda are realistic and meaningful to the group as a whole (Donaldson & Kilvington 1996).

Facilitation: is an important aspect of leadership, which may be performed by a professional outside the group or a group member. Facilitation is more than simply ensuring that meetings or workshops run smoothly, agenda are adhered to, time lines respected, individuals get equal opportunity to speak, and a decent summary of the proceedings is produced. Important roles for a facilitator include:

- ensuring that everyone participates to the best of their ability,
- being aware of, and be willing to rectify, potential conflict areas, personality issues, or process breakdown,
- understanding group processes and being able to move the group through difficult stages,
- seeking consensus and recognising closure when it is reached.

This type of leadership role requires excellent people skills, an intuitive feel for potential conflict whether personality or issue driven, sensitivity to the concerns of others and the ability to help with these without appearing biassed and judgmental (Donaldson & Kilvington 1996).

Resourcing groups: Groups dealing with issues with a technical or expert component require information that may be provided by a resource leader, internal or external to the group(such as government scientists or private sector consultants). This person/s will generally provide advice

and information when asked and clarification on specific questions relevant to the work at that time. When technical advice is not readily available within the group, another component of leadership is networking with external experts and advisors to bring in needed skills and information. This is part of the administration component of leadership, which may also include contacting group members, co-ordinating newsletters, and organising events.

Distinguishing roles: It is often tempting to combine the above roles in a single person but this should not be done without some consideration of the potential for conflict and the complexity of the mix of skills required. For instance it is not always possible for a group member to be sufficiently withdrawn from the core of the group to act as an effective facilitator, particularly in stages of conflict or uncertainty over group direction. Similarly, the time demands of a resource person, or the differing skill requirements of that person (such as the necessity for them to bring expert technical knowledge to the group) may preclude them having the energy or ability to act well as a chair or facilitator.

Issues and discussion: Addressing LIP convenor concerns

During the interviews and workshops a number of convenors and farmers discussed the current management of LIP groups. Many convenors became involved with the LIP groups firstly because they were concerned about preventing Tb outbreaks on their properties, but also because they saw the necessity for a district-wide approach to controlling Tb-vectors, particularly ferrets due to their wide territorial range. However, they raised issues about group management, motivation, and their own role as convenors, and the way these influenced group effectiveness. These issues are outlined below (in italics) and discussed in terms of the frameworks for understanding motivation and group dynamics that are set out earlier in the report.

How successful are LIP groups?

Convenors often gave the impression that their groups appeared to have not accomplished much in the fight against Tb. They (the convenors) expressed concern that they were still dealing with administrative details regarding roles, responsibilities, and payment for various materials and services, rather than winning the battle against Tb vectors.

Clearly, some groups have been more successful than others in controlling Tb vectors. However, focussing on this alone, as a measure of success, ignores the fact that groups do not all start off from the same place. Currently, there are few established ways for LIP groups to measure their success in the short term, as the focus appears to be on the long-term goal of managing, or even eradicating ferrets. The groups have made a lot of progress along the way, and appropriate participatory monitoring and evaluation (PM&E) methods need to be found to measure this (involving a mixture of monitoring the success of the group process, and achievement of tasks). A challenge here is to make monitoring and evaluation a valuable learning experience for groups, while also meeting the accountability requirements of the AHB. Groups need to be helped to recognise their successes, as success, in turn, brings about renewed commitment and motivation.

As part of this need to provide more feedback to increase motivation, convenors expressed a desire to raise the profile of the Tb problem within the district, but were concerned that over-publicising of issues could damage their image and hence the market value of their products. Convenors also asked about methods for transferring information to farmers about the status of bovine Tb in New Zealand at a local and national level.

Group facilitation: issues and concerns

What are areas of leadership responsibility? *A number of group convenors expressed a lack of confidence in the effectiveness of their facilitator in managing group processes. Convenors and LIP farmer group members cited a downturn in group participation and motivation following John Oliver's departure and the accompanying change in structure and function of the group facilitation role.*

Part of this issue is the confusion over terminology (what does 'facilitator' or 'convenor' mean?), and, in particular, what is expected of an AHB facilitator as opposed to a LIP group convenor[7]. These concerns relate to the issue of group leadership described above in 7.4.

[7] Note: during the course of this project these roles have been redefined by the AHB LIP coordinator, using, in part, the framework developed in this report for group dynamics.

Is my involvement as convenor worthwhile? *Some convenors expressed concern that their role as convenor can occupy valuable farm time with little recognition in return.*

The information gathered from the interviews and from meetings with LIP group members suggests convenors are getting too little administrative support. It also suggests a mismatch of skills in the current facilitating arrangements, which neglect fundamental roles of motivating the group and the broader community. Although the availability of technology and the ability to interpret that technology for the farming public is an important aspect of supporting LIPs, the people-management aspect of running effective groups appears to present some of the greatest difficulties for the group convenors. Just as groups need to have their achievements noted, so to do group convenors.

What skills do convenors need? *A number of different questions were raised in relation to this. On the one hand some convenors were calling for more training in how to run meetings, how to delegate tasks within groups, how to motivate groups, etc. Other convenors were confident in their ability, but passed strong judgement on those farmers who appear unwilling to contribute to Tb vector control or participate in the LIP group, dismissing those who are not actively participating, which suggests they have limited ability to recruit less willing members of their community.*

Convenors need to be supported with appropriate people skills. This is equally true for those convenors who are asking for more skills to be able to more successfully involve group members, and those who dismiss local community members who do not participate. Training would help but convenors also need ongoing support from facilitators[1].

How can we involve people more fully? *Convenors appeared to feel the responsibility to motivate their LIP group members – a task for which individuals consider themselves varyingly prepared. Common questions raised included: how can we motivate people to attend workshops? and what are some ways of making sure neighbours are doing some work towards pest control?*

Motivation is affected by numerous factors, not all of which are immediately evident and only some of which are subject to direct and deliberate influence (see above section). However,

groups can be run in a way that will tap into a number of opportunities for influencing motivation to undertake Tb vector control, including increasing peer pressure through involvement of neighbours, establishing and rewarding good farming practice that includes pest management, and sharing information about easy and effective techniques.

Motivation is also affected by participation in activities and involvement in decision making. Involving people in monitoring and evaluation of the project they are working on provides an opportunity for individuals, groups, and organisations to learn more about their environment and to recognise the effects of their efforts. It also increases their motivation for continued involvement. Reasons for this are:

- people feel more committed to a project when their opinions about it are asked and valued,
- people like to know what the results of their efforts have been,
- people generally like to know how to do things better,
- and, if people are in a position to judge and evaluate their own work, they feel more comfortable about it than if only outsiders judge it.

How can we involve people who don't have a direct financial interest? *How can members of the community who have nothing to gain from Tb vector control (sheep farmers, lifestylers, etc.) be convinced to join efforts of the LIP groups?*

Involvement with LIP groups may not be the only policy instrument needed to encourage Tb vector control in non-directly-affected parties. Voluntary approaches are likely to work best, and have the greatest dependability, when there is a substantial coincidence between public interests and the private (especially commercial) interests of individuals.

However, as identified earlier, factors such as the importance of maintaining good farming practice , the perceived significance of the Tb issue to the broader community, and the influence of peers, have the potential to affect the motivation of landowners to undertake Tb vector control. There is substantial goodwill in the community to work towards common goals. Different sectors of landowners (e.g., lifestyle block owners, sheep farmers) will have different

information needs and perceptions of the Tb problem. These need to be researched further in order to target the most effective approaches to draw the support of all sectors of the community.

Improving opportunities for information transfer

A number of concerns about information transfer and overall coordination were also raised by the convenors, such as: is it possible to have a central resource person who has contact and information for the entire North Canterbury region with regard to Tb vector control and LIP groups?

What was identified here was that when one person (John Oliver) had a coordinating role for North Canterbury as a whole, people felt that they knew what was going on. This extension role provided an ideal mechanism for getting the lessons learnt in any one group, out to the rest. With the change to having a number of individual facilitators for the region, this function has largely disappeared.

(Another question related to) where can farmers/convenors/facilitators find out information about innovative field days, guest speakers, newsletters etc?

Convenors of different groups all have the same needs and it would help if the answers to these questions could be accessed from one point (e.g., the Internet[8]). This saves different people having to go through the same searching routine each time. Having one facilitator would also help.

[8] See Chapter 9, including Allen et al. (2000), for more information on this aspect of the study.

Conclusions and recommendations

Conclusions

'Increasing motivation' is often considered to be a single objective, and lack of motivation to undertake a task such as Tb vector control is commonly attributed to single and discrete causes (such as drought, or falling product prices). However, motivation is made up of numerous factors, not all of which are immediately evident and only some of which are subject to direct and deliberate influence. Two principal types of factors contribute to motivation: (i) subjective norms i.e., what the individual perceives to be the social pressures promoting a certain behaviour and; (ii) personal attitudes towards that behaviour.

A combination of regulations, incentives and disincentives, and voluntary approaches can influence motivation factors in varying ways. Voluntary approaches (such as the LIP groups) are attractive policy options for reasons of flexibility and acceptance by the target group. To influence behaviour, voluntary initiatives need to be supported by learning-based, technology transfer.

Farmer involvement in local vector control groups provides a significant opportunity to influence landowners' perceptions of the importance of the Tb problem, and their understanding of the control methods available to them. It can also influence the degree of social pressure experienced by landowners to undertake control on their properties. A number of Local Initiative Programme (LIP) and voluntary groups have already been established through the efforts of AHB. These groups provide a vehicle for improved information sharing, collaborative learning, and influencing behaviour change.

Groups that function well do not happen by accident. It takes patience, persistence, and resources. It also requires skill in managing group dynamics to keep the group moving in a positive direction. Groups will not function successfully all the time. Awareness of what is happening to a group, understanding a group's needs for resources and leadership, and access to the skills necessary to address this, are crucial to the long-term viability of groups, and their success in achieving their goals. Successful groups are those that have confidence in leadership, a sense of cooperation, good communication, and put effort into maintaining a good process as

well as achieving set tasks. Encouraging members of groups to participate in monitoring the progress of the group and evaluating achievements strengthens motivation as well as increases understanding.

Management of information is also an important ingredient of motivation. The Internet offers an opportunity to reduce the duplication of effort that occurs when many players are seeking the same new knowledge, and forms a powerful and immediate link between farmer group facilitators, group leaders, researchers, and other relevant agency staff.

Recommendations

- There are multiple factors that can affect landowner motivation to undertake Tb vector control. A range of policy approaches that address a mix of factors will have a greater likelihood of successfully influencing motivation. LIP groups can be used creatively to influence a number of these factors.
- Managing the various developmental stages of groups, their leadership, and information needs requires support and active facilitation by those with good 'people' skills. Although much of the work by groups is voluntary, effectively managing and supporting these groups is an area that requires resourcing.
- Monitoring and evaluation of the LIP should take into account process aspects (such as group development, and core aspects of successful groups) as well as task achievement (such as the number of Tb vectors killed).

Scope of the work and further research

This work does not include a comprehensive survey of 'what motivates farmers to undertake Tb vector control' in North Canterbury, and has not conducted an analysis of the current status of LIP groups and their effectiveness in achieving Tb vector control. This research has provided two frameworks:

(i) factors affecting motivation of landowner's to undertake Tb vector control.

Further research would use this framework to understand more about the factors affecting landowners and their motivation to undertake Tb vector control, including their current understanding of the Tb problem, beliefs about control methods, and beliefs about the role of vector control in standard farming practice. In particular, with the change in land-use patterns in the southern part of North Canterbury, and the corresponding increase in small, lifestyle blocks, it will be important to ascertain the different levels of understanding, information needs, and expectations amongst these new landowners.

(ii) factors affecting the success of LIP groups.

Further research would use this framework to monitor and evaluate the LIP groups, in particular to ascertain the effectiveness of process issues as well as achievement of tasks.

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APPENDIX III

Glossary

The terms used in this thesis are explained in context as they arise. However, because of the importance of the following terms to this study, a more concise definition is provided here along with a reference to their main use and description in the thesis.

Collaborative learning

Collaborative learning (CL) is a problem solving approach where each learner functions as part of a community of practitioners helping to address real-world situations. It suggests a way of dealing with people which respects and highlights the abilities and contributions of all those involved. The underlying premise of collaborative learning is based upon consensus building through cooperation by a group of people working together, in contrast to competition in which some individuals best others (see also pp. 169–171).

Best management practices

Best Management Practices (BMPs) provide guidelines that are intended to provide common sense and cost effective suggestions for achieving a basic level of environmental protection. These recommendations need to be compiled with the benefit of stakeholder involvement using science and local knowledge. It remains the responsibility of individual managers to satisfy themselves that these guidelines should be acted upon in their specific situations. In some situations there may be legislation or some other form of protection afforded to the environment in addition to, or instead of, these BMPs. Any such legislation will take precedence over these recommendations (see also p. 174)

Adaptive management

Adaptive management is based on principles of collaborative learning. It involves the rigorous combination of management, research, and monitoring so that credible information is gained and management activities can be modified by experience. It acknowledges institutional barriers to change and designs means to overcome them (see also pp.26–27).

Useful knowledge

The community dialogue step in ISKM is designed to produce useful knowledge. This highlights that the outcome of collaborative learning is knowledge that has been put into a meaningful context by those involved (see also pp. 83–84).