Chapter 6
Learning About the Social Elements of Adaptive Management in the South Island Tussock Grasslands of New Zealand

Will Allen and Chris Jacobson

Abstract Adaptive management initiatives are frequently used in multi-stakeholder situations. The more immediate barriers to success in these cases are proving to be organizational and social. We use a case study set in the South Island tussock grasslands of New Zealand to reflect on some of the social elements required to support ongoing collaborative monitoring and adaptive management. We begin by siting the case study within its wider policy context to show how this influences the choice and application of scientific inquiry. The next section concentrates particularly on the processes by which information and knowledge are shared across the different stakeholder groups involved. Finally, we expand on some specific lessons that emerge as important for sharing information and knowledge in adaptive management, including tools to support dialogue and improved tools for evaluation.

Introduction

Although adaptive management approaches have been advocated for environmental management for around 40 years (Holling, 1978; Walters & Hilborn, 1978), their success in practice has been less than spectacular. There is a growing appreciation that the more immediate barriers are organisational and social, rather than technical, given the multi-stakeholder nature of most environmental situations (McLain & Lee, 1996; Dovers & Mobbs, 1997; Gregory et al. 2006). These barriers include a tendency to discount non-scientific forms of knowledge, institutional cultures within research and policymaking 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; Pretty, 1998; Stankey et al., 2005; Feldman, 2008).

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Another problem we face as we try to develop the next generation of adaptive management programmes is that these initiatives are often multifaceted, unfolding over timescales that are longer than a single project or programme cycle. Unfortunately this characteristic means it is difficult to easily evaluate the success of the programmes. Adaptive management programmes generally include a number of learn–describe–predict–act cycles that should unfold over the 5–15 years of a policy cycle (Raadgever et al., 2008). In some cases, adaptive management programmes may only progress some of the way through these steps before the next policy or management issue overtakes them, and the original programme fades into obscurity. Alternatively, we find ourselves learning lessons from adaptive management programmes that are artificially squeezed into too short a time frame. In the latter, the language and steps inherent in adaptive management are often put in place, but the essence of reflective and scientifically robust discussion and adaptation is missed (Gregory et al., 2006).

We begin this chapter by outlining the social context of tussock grassland management in the South Island, New Zealand. Some sense of the major framings of high country issues over the past three decades are provided – in particular the ongoing emphasis on sustainability, along with an interest in monitoring during the 1990s and tenure review in more recent years. Activities that occurred between 1994 and 2000 were targeted to support adaptive management and increase understanding about the potential outcomes of alternative management strategies for this area of New Zealand. Using these experiences, we reflect on some of the social elements required to support an ongoing collaborative monitoring and adaptive management programme. We concentrate particularly on activities related to sharing information and knowledge across the different stakeholder groups involved. Finally we expand on some specific lessons that emerge as important for sharing information and knowledge in adaptive management.

Case Study Context

Policy Setting

Agriculture represents an important interface between people and their environment. The tussock grasslands of the South Island of New Zealand run up the eastern slopes of the Southern Alps, and are commonly referred to as the South Island "high country". These grasslands are renowned for producing high quality meat and wool for export. At the same time they represent a microcosm of the major resource management issues surrounding extensively grazed ecosystems worldwide. These lands have been used for extensive pastoral management since European settlement in the mid-1800s under leasehold tenure. As O'Connor (2003) points out, high country sheep runs (properties) remained as Crown pastoral leases for a variety of reasons, including climatic, topographic and politico-economic value. In the early

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1990s around 350 pastoral leases existed, covering about 2.4 million hectares of land (Walker et al., 2006).

Over the past three decades the high country has shared the worldwide trend of moving towards a more holistic, multi-use, multi-value view of such extensively grazed grasslands (Allen, 2001). Grazing by sheep has increasingly become a variable component, or even been abandoned in some areas. This change highlights the diverse management values that 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 Māori land rights, preservation of biodiversity and natural landscapes, sustainable management, tourism, and recreation.

As these values have gained recognition, high country resource use has been characterized by tensions between different interest groups (Allen, 1997).While changing the social worldview which underlies land use practices and management may appear a daunting task, Bawden (1991) reminds us that we should recognise that it is something that happens quite regularly in response to different societal concerns and aspirations. So marked are these changes in many rural areas in countries such as Australia and New Zealand that he suggests we can identify several different perspectives of rural land management since European settlement. These different perspectives are outlined in Fig 6.1 as they relate to the South Island high country since World War II. However, as Bawden (1991) 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 in resource management.

The first worldview apparent in contemporary high country management was about *production*. Until the 1980s, those working in the high country were at least confident in the knowledge they were dealing with what everyone knew was a

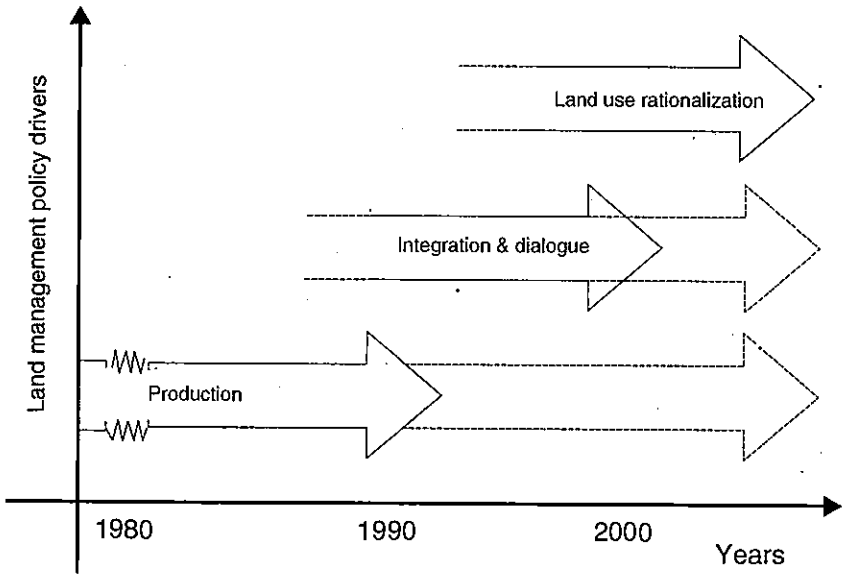

Fig. 6.1 Different worldviews that drive change in the high country

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largely extensive pastoral system (Allen, 1997). This manifested itself as a production system, with a science input oriented towards improving that production. The removal of agricultural sector subsidies by the New Zealand government in the mid-1980s encouraged farmers and policy-makers to rethink the viability of extensive pastoralism as the main land-use.

The second predominant worldview we draw attention to manifests itself in *integration and dialogue*, and stems from a growing interest in sustainability. In the 1990s a number of changes happened which encouraged an emphasis on sustainability issues. New Zealand redesigned its environmental legislation. The Resource Management Act (1991) replaced around 50 previous statutes. It was notable in being one of the earliest pieces of legislation to explicitly incorporate 'sustainable management' as the purpose placed at the heart of the regulatory frameworks for resource management (Harris, 1993).

Alongside this change was a national-policy-level focus on the high country, particularly the semi-arid regions, which raised questions around economic and ecological sustainability. 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). The Rabbit and Land Management Programme (RLMP) of 1986–1996 was established to address problems of the semi-arid high country regions, while landcare groups arose in the early 1990s to promote sustainable management of rural communities through environmental, economic and social reforms (Mark, 2004). The RLMP took advantage of this to support high country families to work in landcare groups. Each group took an approach most suited to their local environment, but more importantly one based on their interpretation of a range of information (Ricketts, 2001).

In more recent years, policy efforts have been focused on *land use rationalization*. As a result of tenure review processes, a return to Crown management has occurred for lands where significant inherent values (predominantly indigenous biodiversity) exist, while tenure on the remaining pastoral leasehold land has been freed up for economic use (McFarlane, 2008). While this conversation doesn't preclude consideration of multiple uses, it has tended to be more focused on positions than interests. However, this approach tends to support negotiations that are based around positional bargaining and support compromise around existing uses, rather than encourage joint exploration of new ways forward (Walkerden, 2006).

Developing an Adaptive Management Approach

The Semi-Arid Lands (SAL) research programme (MAF, 1996) was developed within the Rabbit and Land Management Programme. Most of the work was carried out between 1994 and 2000, and was designed to support the integration and dialogue worldview that was driving high country discussions of the time. The SAL research team comprised around five to seven scientists representing disciplines covering plant, landscape and wildlife ecology, and including social systems. Both authors

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have been involved in this research, and the lead author in this chapter was the primary social researcher in the SAL team.

Key to the SAL approach was recognition that the development of sustainable management (e.g. grazing) strategies requires an emphasis on experimental rather than descriptive ecology, and this required learning from large-scale management (experiments) by farmers, in addition to more detailed research experiments carried out by scientists. A report by the Parliamentary Commissioner for the Environment (1995) stated that ongoing monitoring by land managers was essential to increase the understanding of issues affecting tussock grasslands. The same report also stressed that decision makers and land managers needed to promote and adopt management approaches that were based on both research and monitoring. In 1994 the High Country Committee of Federated Farmers put together a farmer resource kit that detailed various monitoring methods farming families could use on their properties.

In response to these calls, one component of the SAL programme, the Hieracium Management Programme (HMP), emphasised an adaptive management process to more closely link research with management and policy. The wider benefits were seen as increased information sharing and dialogue among the different sector groups (e.g. farmers, scientists, policy managers) that collectively contributed to high country decision-making. More specifically, the Hieracium Management Programme (HMP) was initiated to encourage adaptive management as an approach to addressing an invasive weed, and improving understanding of the tussock grasslands in the high country. The programme had two main strands: the first brought together and integrated existing local and scientific knowledge, and the second involved development of a monitoring programme that could be used to learn from farmer experience.

The first strand included activities around accessing existing farmer and science information through the use of interviews and questionnaires, synthesising this information, and then holding workshops (or community dialogue processes) that would more actively involve farmers and researchers in developing the structure and content of a first-version decision support system that made use of this information. This activity relates to the information sharing component of adaptive managemnet described in Chapter 2 of this volume. The second strand ran concurrently and focused on development of a farmer-friendly monitoring system for use in the tussock grasslands. A project linking researchers and farmers in the development of condition assessment models for measuring (monitoring) and interpreting vegetation change was developed (Bosch et al., 1996a, b; Gibson & Bosch, 1996). With the outputs of these two strands – 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, had been achieved. Instead, the search for ways to support such a programme continues today. Exploration of the social and institutional issues involved in the SAL/HMP project has provided ample grounds upon which to reflect on the practice of adaptive management. Rather than guiding readers through a traditional case study that describes the adaptive management process at each step, this case study focuses on the roles of information sharing, engagement and dialogue in supporting adaptive management.

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Integrated Systems for Knowledge Management (ISKM)

The Integrated Systems for Knowledge Management framework (ISKM) (Bosch et al., 1996c, 2003; Allen et al., 1998a, 2001) was used in this case study. ISKM (Fig 6.2) focuses 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 address problem situations in a constructive way.

The ISKM framework is designed around the steps of adaptive management. Two phases are involved: the first supports finding out about a situation and the second aims to take action to improve the situation. Activities associated with the first phase involve establishing a climate for change with the different parties involved, setting goals and objectives (including joint problem framing), searching for information, developing a shared understanding and creating action plans to address the issue at hand. Monitoring plans also need to be developed to monitor progress and help check that the action plans remain on-track. The final activity in this first phase of ISKM involves the development of a management information system that captures decision-making information for the benefit of the wider community of stakeholders. Computer technology is often relevant at this stage as it offers a way of

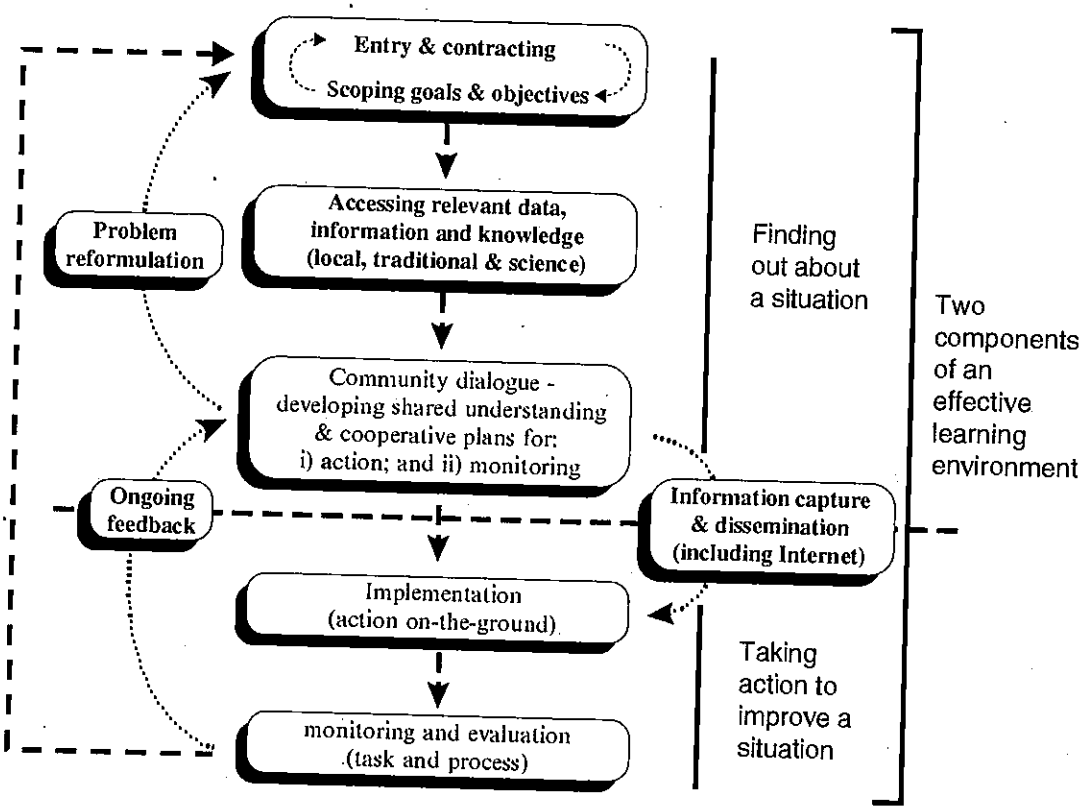

Fig. 6.2 ISKM – a participatory research framework to facilitate the identification and introduction of more sustainable resource management practices. The two phases interact to create an effective learning environment (Allen, 2001)

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organising information in ways that make it easily accessible to a range of audiences. The second phase of ISKM stresses the need to develop feedback loops to maximise the benefits from monitoring and evaluation and develop a collaborative-learning/ self-improving environment.

The skills required for managing the process involved in ISKM will naturally vary according to the specifics of the initiative. For instance, 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 characterized by existing conflict. In the latter, the need for effective facilitation and expert mediation of conflicts is greater.

ISKM Phase 1: Finding Out About the Situation

Entry and Contracting

This first phase of ISKM includes making sure the right people are involved and establishing the ground rules for working together. However, while open access to a collaborative effort is important symbolically, making sure that key stakeholder representatives are involved is critical (Wondolleck & Yaffee, 2000). This is because some people are more suited to, and interested in, participating in a collaborative inquiry than others. As Bunning (1995) points out, the reality of that because of current global pressures (e.g. production squeeze, downsizing, reduction in organisational levels, 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 be developed. 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 (Allen, 2001) (see also Chapter 18, Fazey and Schultz, this volume).

It is important to cultivate relationships that make it easy for people to talk about their needs, share information, and work together. Previous experience is one of the most important influences on attitudes to collaboration. People may be extremely reluctant to enter into a further 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. Equally, as people begin to work together successfully in new systems, so trust manifests itself as an emergent property of the new way of working. Rules for working together should not be imposed from outside, but should be developed in conjunction with the people involved, as described in the box on trust in Chapter 4 of this volume.

The SAL/HMP began its adaptive management initiative in the tussock grasslands by convening a steering committee including scientists and farmers.

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Much of the initial contact with farmers was done through the farmers on the committee, who effectively provided the researchers with personal introductions. Conversely, when the funding by the Ministry of Agriculture finished and subsequent funding from the Ministry of Environment redirected the focus towards conservation issues (with a new title, the Tussocks Grasslands programme) the research team became acutely aware that existing relationships built with the farming and local government communities would have to be extended. This necessitated finding the time to develop new relationships with agencies such as the Department of Conservation (DOC) who have responsibility for managing public conservation lands within the high country. Ensuring that enough time is given to developing the right relationships was one of the most important lessons from this exercise.

Accessing Information

Changing land management systems requires the many parties involved to change the way they work with the land and with each other. It is important to acknowledge the validity of different worldviews and concentrate on showing how individuals with different worldviews can work together. Information often remains fragmented because we do not have the mechanisms to collect it. However, as Allen and Kilvington (2005) point out, strong emotions associated with information can also 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 situations over which they have no future control. Other stakeholders may have similar fears that their information might be used inappropriately, or against them, if released publicly. Consequently, the exchange of information between different levels and groups in society is often inadequate.

Years of experimentation with different sheep stocking rates and other management regimes have provided individual high country managers with much knowledge about local land-use and environmental systems. Unfortunately, this knowledge resides in the heads' of farmers, and is seldom available to the wider community on a collective basis. Similarly, much of the valuable knowledge accumulated by scientists was fragmented, held in different databases and, consequently, was not readily available, even to other scientists. The need to develop protocols that safeguard information use, and protect against its misuse emerged as a way to address these concerns. Farmer interviews were undertaken with clear expectations on both sides on how the information would be used, and safeguarded. How farmer derived monitoring information might be used was also a topic for discussion. Table 6.1 provides an example of a protocol that was developed by a Landcare group to agree on how they would use their monitoring information.

Concerns similar to those of farmers were raised regarding the use of information from research sites on private land. In one case during the programme, access to sites in one farm cluster was denied, largely because farmers were unsure about what use would be made of the subsequent research findings. However, because

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Table 6.1 Draft protocol for monitoring information sharing (Allen et al., 2001)

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.

the project process was prepared to address this conflict, with appropriate skills for conflict resolution, the situation was able to be resolved (Allen & Kilvington, 2005). A subsequent conflict management exercise resulted in the establishment of information management protocols that enabled the research to proceed. These protocols protected the rights of landowners to be advised of research results prior to their release to third parties, and provided for discussions of the implications of research results for different stakeholders involved, before publication.

Community Dialogue

Enormous gains can be made by promoting an understanding of what different stakeholders and other groups, such as local land managers or indigenous people, have to offer to the resolution of complex environmental problems (Bosch et al., 2003). 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 this case study tended to work separately with government conservation management staff and local farming families (who collectively manage all the tussock grasslands), or solely with one or other group, largely to avoid having to deal with possible conflict (Allen, 1997). Given that 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.

Information may have different meanings and hence values in different situations. Making sense of information has two principal components. First, all stakeholders must agree and clearly understand the intended use of the information. This may, for example, be to resolve a particular environmental problem or to attain a particular resource management goal. Second, the context within which the information was originally collected is a key to its strengths and weaknesses. Addressing this requires clarifying issues such as why the information was collected and by whom; its source (e.g.

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practical experience, observations, science research etc.); whether the information relates to a specific situation or site and whether it can be extrapolated to other situations. Skilled facilitation is needed to ensure that all participants and stakeholders share a common understanding of these components of new information.

For the tussock grasslands Allen and Bosch (1996) point out that scientists concentrated on determining the effects of grazing on *Hieracium* (describing and accounting for some phenomenon). In contrast, farmers asked more focused questions such as the effects of different grazing regimes (rotational grazing vs set stocking, different grazing intensities and frequencies), and were concerned with applying the answers to their own context. Similarly conservators often place a high priority on protecting individual species – such as a rare lizard. On the other hand, farmers are unlikely to identify the same species if asked to list conservation issues in order of importance (Allen & Bosch, 1996). As part of this programme, a number of workshops were held that brought together different people and groups that provided their information, knowledge and experience gained in the tussock grasslands. The collective discussions that ensued helped groups make sense of others' contributed information, and enabled it to be understood in the context in which it was generated. Ensuring that information is understood "in context" is a main reason that scientists and others are often reluctant to share their data until they are confident these have been understood and interpreted.

Information Capture and Dissemination

Using collaborative approaches provides all those directly involved with an environment in which information is synthesized through a participatory process (Allen & Bosch, 1996). At the workshops, participants clarified management questions, sorted information on the basis of its applicability to addressing these, and identified the starting points for stakeholder-specific information needs. Essentially, this provided a way of understanding information relevant to the entire high country and the management of multiple, sometimes competing values. It was then possible to develop a management information system (MIS) that served to integrate collected information and organize it in a way that matched the questions asked by land managers, so that it could benefit others who have not had the opportunity to be directly involved in the ISKM process. The resulting Internet-based Tussock Grasslands Management Information System – TGMIS (2000) provided background ecological knowledge and best practice guidelines for managing different vegetation states. It was designed as an open-ended system that could be continually updated as new information became available through research and monitoring (Bosch et al., 1999). It drew on farmer, conservation manager and science knowledge that had been discussed at forums with representatives of these different groups.

Underlying the need to develop the MIS system is the need to look beyond a presenting symptom (in this case an exotic weed) to presenting information about the management of the wider system in which it is embedded (Bosch et al., 2003). Farmers do not manage for *Hieracium* alone, but are primarily concerned with managing

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for increased stock production or available forage supply, without degrading the system. Accordingly, the TGMIS provides information not only on *Hieracium*, but also on a whole range of inter-related management issues such as conservation, grazing management, burning and water quality. It brings information from many different sources together into one place for easy access by land managers, policy-makers, researchers and other interest groups. Importantly, dissenting opinions are not dismissed, but are included with a descriptor of the variety of existing perspectives and, where appropriate, acknowledgement that they are a minority opinion.

ISKM Phase 2: Taking Action to Improve the Situation

Development of the MIS provided a link between the two phases of ISKM: finding out about a situation and taking action to improve it. The ability to access the MIS was one way of supporting the ability of land managers to take action to improve the management of their grasslands. Support for ongoing farmer-based monitoring was also 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 (Gibson & Bosch, 1996). This information was 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. REDIS was also made available through the Tussock Grassland Management Information System TGMIS (2000).

Funding for the SAL/HMP project finished in late 2000. The TGMIS was subsequently evaluated in 2001 and 2002. Copies of these reports are available online (Jacobson, 2001, 2002). At that stage, indications were that the website was being used by Department of Conservation staff, and to a lesser extent by local government agency staff. Although participants noted that much of the background information was not new to those with a history of involvement in the high country, they valued MIS' potential to provide research summaries, including summaries of new research. Farming participants noted that the website would be of particular use when changing a management regime, when diversifying practices, applying for resource consents (to undertake different land uses on pastoral lease land), or when unusual observations were made. Publicly available website statistics have been maintained for the front page of the website since its launch in September 2000. Since that date more than 36,000 visits have been made to this page of the website. The site receives substantially more visits from New Zealand Internet-users, than it receives from any other country. On average, the MIS has been visited more than 260 times each month over the past eight years. The highest monthly number of visits was 672 in November 2004, more than three years after the site launch.

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Broader Lessons on Sharing Information and Tracking Progress

This case study has highlighted some aspects of collaboration in adaptive management that are not commonly discussed. Two lessons were particularly evident: (1) the need to use good facilitation tools and processes to help people share information, and (2) the need to move from the term 'monitoring' to 'evaluation'.

Models and Pictures for Information Sharing

Information gathering and sharing is not just a matter of asking people what they know and then passing the information on. Frameworks, pictures and representations are powerful aids to help people unlock and discuss the information and experience they have with others (Heemskerk et al., 2003). This process is best described as a form of participatory modelling (Heemskerk et al., 2003; Lynam et al., 2007). By using modelling processes, we begin to expand the use and richness of the word 'model' in the adaptive management literature beyond that of quantitative systems modelling (e.g. Walters, 1986) or even that of Bayesian predictive modelling (e.g. Johnson & Williams, 1999) to one of helping people sort out and represent different forms of knowledge.

Importance of Pictures

The idea of bringing people together to develop a common understanding of issues and what an appropriate set of responses might be sounds easy enough. In practice, one of the main challenges turned out to be the development of a common language. To illustrate this with a simple, but crucial, example, it became apparent at the workshops previously described that everyone had their own idea of what different 'states' of tussock grassland were. Some people regarded short tussock grassland as being up to the top of their work-boots, while others regarded it as being more akin to the height of gumboots. Finally, a successful – but unplanned – solution was developed when one of the ecologists sketched out the diagram shown in Fig. 6.3.

Jointly developing models helps participants clarify the system boundaries, formulate questions, and reveal assumptions of the different people involved. The most difficult communication gaps to bridge are those between science disciplines. Similarly, it can be extraordinarily difficult to get managers to set out the underlying knowledge behind their practices. Many of these practices are highly contextual, and it is necessary to find ways to help them express this. During the workshops described earlier, a decision tree approach was used to unlock and structure existing knowledge (Bosch et al., 1999). An example illustrating a completed version of

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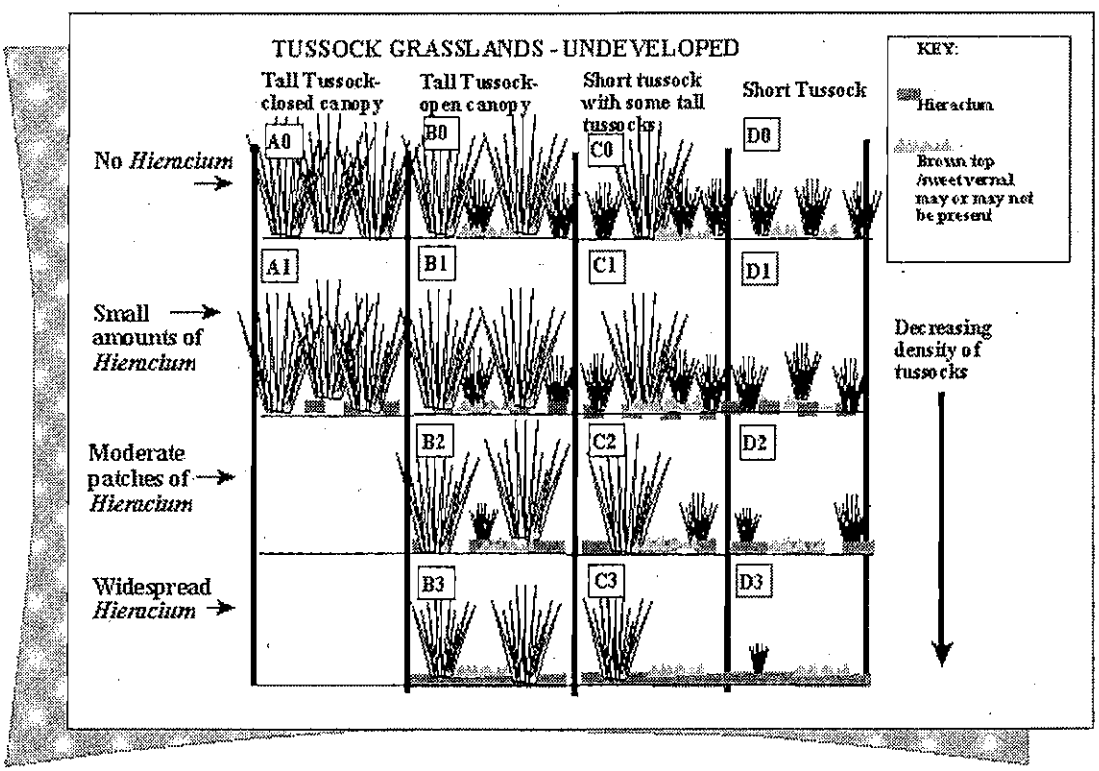

Fig. 6.3 Pictorial representation of tussock states developed in the tussock grassland management workshops (Allen, 2001)

such a decision tree is given in Fig 6.4. This example also illustrates the holistic way in which the programme sought to deal with the exotic weed *Hieracium* spp. That is, farmers do not manage for the weed 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.

The session began by defining the management goals and targets. 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 participants supply them. 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, could you use this option or strategy under all circumstances and conditions?". 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) are able to see their inputs in the design and content of the final information system. 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., 2003).

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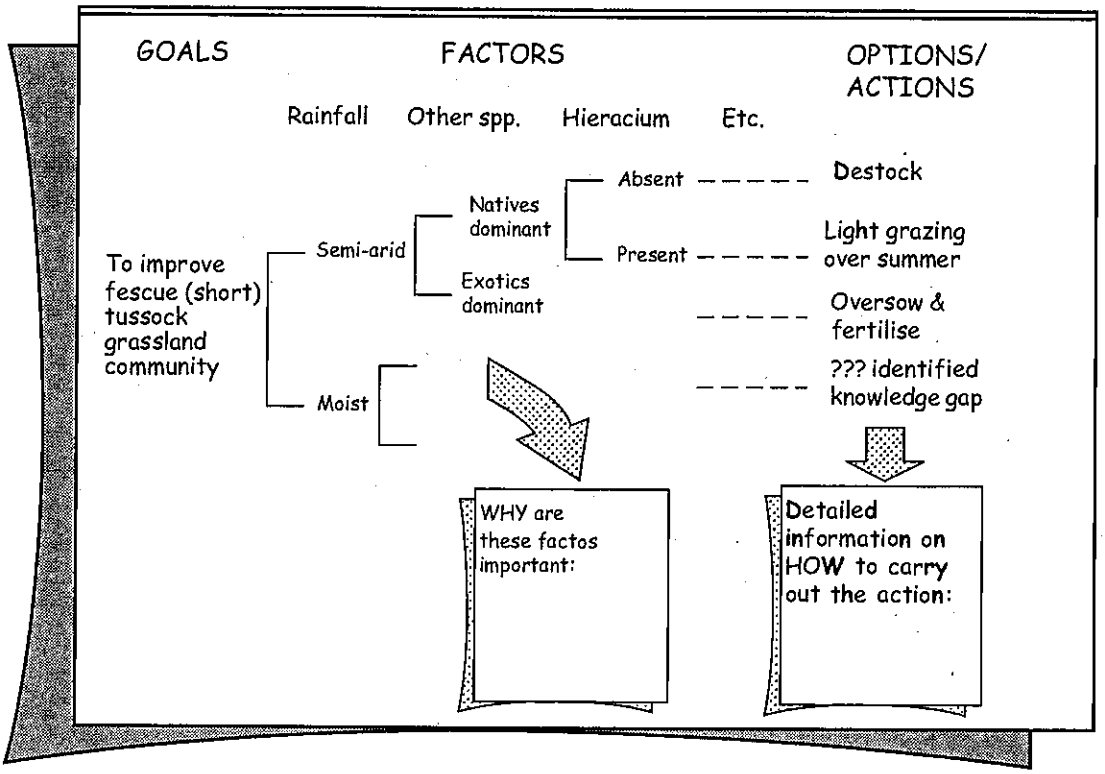

Fig. 6.4 Example of a decision tree being developed during a workshop, indicating the points at which "why" and "how" questions could unlock information in a structured way (Allen, 2001)

Looking for Measures of Success

All too often we think of agricultural and natural resource management projects and programmes as being vehicles for the provision of a particular on-the-ground outcome. However, what became very clear in this case study was that there are many stakeholders, all with different perspectives, involved in an endeavour that is unfolding over time. Accordingly we found that we needed to develop new evaluation approaches that recognized this.

Multistakeholder situations like the high country challenge the common perception of what a "programme" is. A multistakeholder perspective clearly recognizes that each group of participants has its own viewpoint on an issue, and its own reasons for becoming involved in a project. As Schwedersky and Karkoschka (1994) point out, it is traditional to observe programmes within an operational cycle. 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, as was the case in the RLMP, which involved farmers, conservation managers, local government and other central agency staff, scientists and other interest groups.

While researchers and policymakers tend to concentrate on the environmental outcomes sought, it is easy to forget that much of the challenge of implementing integrated management within these wider situations lies in promoting change in the

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behaviour of the different user-groups, departments and even wider communities. Collaborative multistakeholder situations inevitably involve integration of multiple perspectives on the most significant values inherent in a landscape (e.g. production, conservation) and require a more holistic view of the problem as an interconnected system. Other changes may still occur (e.g. building capacity of communities) that are equally important if not the original intent of management programmes.

To evaluate programmes we need to go beyond judging success by primary outcome measurement, and look to evaluation frameworks that raise awareness of processes that contribute to them. Evaluation frameworks also need to help us evaluate over an appropriate timescale. One such approach for grouping the outcomes of an integrated governance initiative is known as the Orders of Outcomes model (Olsen, 2003). It highlights the importance of changes in state (such as better environmental or social outcomes), but recognizes that for each change in state, there are correlated changes in the behaviour of key human actors. Importantly, the model helps plan activities in sequence so they build on each other over time (Fig. 6.5).

First-order outcomes are the organisational conditions that must be present when we begin any programme to bring about a change such as those proposed by cross-theme policy frameworks. Together these form the "enabling conditions" that are required if policy frameworks are to be implemented successfully. *Second-order* outcomes are evidence of the successful implementation of a behaviour-change programme. They mark changes in the behaviour of individuals and organizational groups, and include evidence such as new forms of collaborative action among stakeholder groups, investments in infrastructure, and the behavioural changes of actors in response to policy, regulations, and by voluntary actions. *Third-order* outcomes are the socio-economic, structural, and environmental results that define the ultimate success or failure of the programme. These must be defined in unambiguous terms early on in any management process, although this is often not an easy task. Such terms

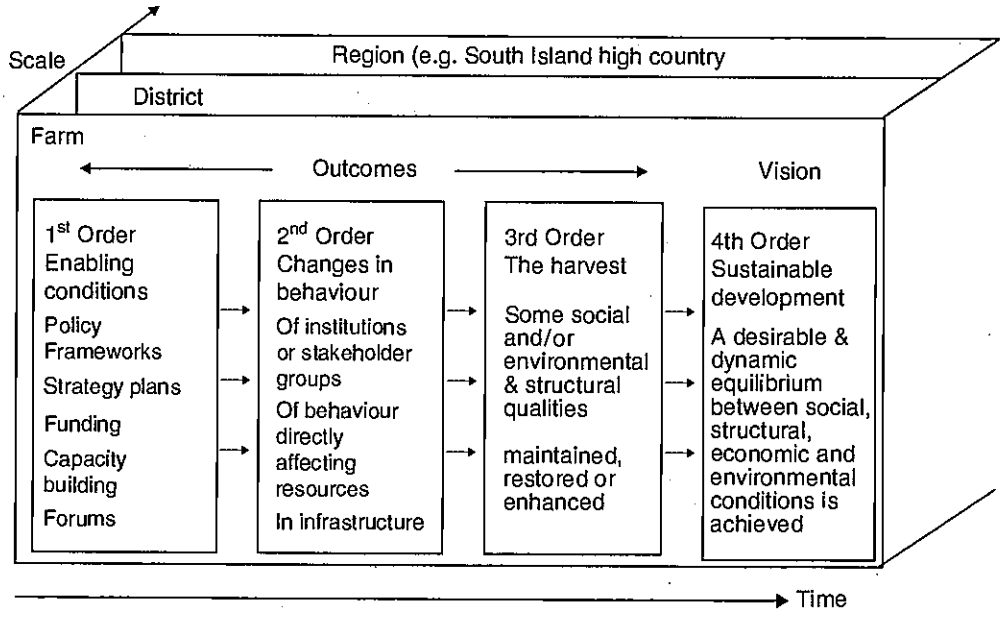

Fig. 6.5 Orders of outcome model approach to monitoring and evaluation (Adapted from Olsen, 2003)

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could be, for example with reference to biodiversity issues, in the form of goals that specify the percentage of area we require in a specific tussock state. This long-term goal of sustainable high country development is recognized in the model as one of the *fourth-order* outcomes. Rather than being seen as an externally designed goal to be achieved, sustainability is better viewed as a desirable and dynamic relationship between environmental, social, and economic aspects.

In adaptive management, a focus on monitoring and analysis of that data results in a focus on the ecological processes, and judgements about "success" are often based on whether the results were used as a basis for management adaptation. While the "orders of change" approach to evaluation was not applied in the high country, it might have provided a more comprehensive way of evaluating a range of outcomes of the programme if it had been. In the high country, the SAL/HMP programme was only just beginning to develop the relationships and partnerships to address land management change in a constructive manner before the overarching policy environment changed dramatically with the instigation of tenure review. Today the perceived need to manage for multiple land use goals on single properties that characterised the integration and dialogue era (Fig. 6.1), has been sidelined as efforts to rationalize land-use through tenure review take centre stage.

However, a focus only on third-order land-use change misses the many other achievements that the SAL/HMP programme supported both within the high country, and in other areas. The most significant of the programme's high country successes revolve around capacity building and information sharing, and represent a mix of first- and second-order outcomes. For example the program clearly supported improvements in relationships between conservation managers and farming interests resulting from conflict management exercises (Allen et al., 1998b). In the same exercise new ground was broken by the community inviting a scientist to play a mediating role in supporting better communication and relationships. The Tussock Grasslands Management Information System represents one of the first Internet-based systems to link local and science knowledge (Allen et al., 2001a).

Outside of the high country, the programme can also point to other areas where the Integrated System for Knowledge Management (ISKM) approach has been used to support community-based learning initiatives. These areas include pest management in New Zealand (Allen et al., 2001b), learning about issues related to oil and gas in British Columbia, Canada (Booth et al., 2004), and understanding the links between land use practices and livelihoods around Lake Victoria in Africa (Albinus et al., 2008). The ISKM approach has also been used as an evaluation framework to look at an environmental health surveillance system in California (Abinader, 2004).

Concluding Comments

The goal this programme was addressing (i.e. changing land use patterns in recognition of the need for sustainable development) was quite substantial, even though the programme time period was substantially short. Changing perspectives on land use

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were evident over the course of the project. For example, diversifying land uses are apparent in the information requests received during an evaluation of the MIS. While the website originally included ecological management information (e.g. effects or fire, grazing and fertilizer on biodiversity), information on tourism impacts, viticulture and statutory processes, regarded as changes in land management practice, were sought (Jacobson, 2001). In this case study we can clearly point to the development of conditions that enable behaviour change. Many of these serve to build capacity, and so leave the wider communities and agency partners with more skills and relationships that can be used to take the process on across a range of fronts.

Collaborative adaptive 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. It is always important to consider the timing for bringing groups together and, as mentioned previously, it may be more culturally appropriate and progressive to work separately with some groups at the commencement of a project, with a view to building collaboration or participation as the project evolves. Overall 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.

What is important is that skilled facilitation is used in adaptive management processes such as that described here. As Reed (2008) points out, highly skilled facilitation is particularly important for natural resource management given the high likelihood of dealing with conflict. To take up these challenges, interdisciplinary science approaches need to include personnel with complementary skills in the management of participation and conflict, and the integration of biophysical and social aspects of collaborative learning.

In combination, the lessons drawn from this case study have highlighted that in cases such as the high country where the management goal is long-term, adaptive management won't "solve" a problem. Funding for programmes such as that presented in this case study should be seen as part of policy directives that represent a changing interaction between society and the resources required to support it. In this sense, the programme contributed to raising awareness about sustainability, and highlighted two key issues needed for it to succeed: that informational integration and capacity of managers and scientists to work together are essential. Perhaps, most importantly, programmes such as those described here leave capacities that can and are used by communities and policy makers as building blocks to support the greater success of future adaptive management initiatives.

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