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SUSTAINABLE LAND USE AND BEHAVIOURAL CHANGE

How To Support And Develop New Practices for Farmers and Lifestylers

A Literature Review

Prepared for:

Robyn Skelton, Manager Land Resources (Western)

Bay of Plenty Regional Council

Prepared by: Cathy Heath, Heath Research Services

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PO Box 873, Napier 4100, New Zealand • Telephone: +64 6 843 3938 • Email: cathy@heath.co.nz • www.heath.co.nz

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Introduction

Behaviours are influenced by attitudes, social norms, self-identity, self efficacy and behavioural control, which are then influenced by factors such as a persons age, gender, communication skills, and the belief that they can control events which affect them. If action around sustainability and biodiversity needs to occur, then it is vital that human behavioural traits are identified, so that communications and tools for change can be targeted. Landowners and their attitudes, motivations and barriers to change in this interaction with the land must be understood first.

There is a need for local bodies to provide an expansive picture of how land sustainability and biodiversity affects the community, both locally and regionally. Councils are often perceived by farmers and land owners as piecemeal suppliers of help such financial assistance for small projects on farms such as fencing. To be truly effective, councils need to engage, inspire, and commit to providing long-term assistance and guidance about all aspects of managing land sustainably, and encouraging the renewal and protection of biodiversity.

This literature review is a sample of published information that provides guidance on the attitudes, behaviours and motivators of landowners towards sustainable land management and biodiversity. It also includes a wide range of practical tools and resources that can be used survey, educate, communicate and inspire landowners about pro-environmental behaviours.

It is not an exhaustive survey of what is available, but attempts to look at practical information that fits within the New Zealand environmental frame and psyche, focusing upon the farmer, lifestyle block owner, and the Maori values of kaitiakitanga (stewardship).

1. Executive Summary

1.1 Attitudes of Farmers and Landowners Towards Sustainable Land-Use and Biodiversity

- 1.1.1 - There is conflict in a farmers mind about using land as a resource productively versus thinking about the environment as a resource to be protected and preserved. (Oliver et al , 2009)
- 1.1.2 - Farmers have different levels of interest and attitudes, and research indicates that they can be broadly segmented by their age and existing land use practises. (Oliver et al , 2009
- 1.1.3 - Farmers are ageing as an occupational group. Traditionally, older people are less likely to take risks, especially if this will impact on generations to come. However, older, financially secure older farmers may feel that as they confront their own mortality, they want to leave their farm in a better place environmentally. Younger, educated family members may return back to the farm, wanting to put in place new ideas that they have studied or been involved in practically elsewhere. The key is to acknowledge the diversity in farming backgrounds and attitudes, achieve some degree of segmentation, and then inspire and educate with the appropriate tools and communication. (Barr, 2000, Durpoix, 2010, Fairweather et al, 2009)
- 1.1.4 - Attitudes by farmers towards protecting native forest on their farms are positively affected by the amount of time that they directly interact with nature, how their family discusses environmental issues, and their knowledge of ecology. (Durpoix, 2010, Jay, 2005)
- 1.1.5 - Collectively, farmers as a group may agree with another farmer's view on protecting native forest for example, but it doesn't necessarily follow that it will match what they think individually about the natural environment, or spur them to emulate others efforts. (Durpoix, 2010)
- 1.1.6 - Generally wealthier farmers were less conservation-minded, preferring to look at a farm primarily as a profit-generating enterprise. Older farms may also show the signs that economic demands on the farm have led to native forest biodiversity suffering. Small farms that were less profitable focused on developing a pleasant looking environment, as this could add value if they decided to sub-divide their farm into lifestyle blocks. Other unprofitable holdings were conservation-minded purely for the landowners' satisfaction. (Durpoix, 2010)
- 1.1.7 - Organic and conventional farmers don't significantly differ in their behaviour towards native fragments, but organic farmers were conscious of being seen (protection of image) to be sustainable in their farming practices, rather than just internal drivers such as attitude. They also have a wider view of their impact on nature, and don't consider it ends at the farm gate. This influence extends nationally and internationally. (Durpoix, 2010
- 1.1.8 - High end hobby (lifestyle block) farmers and quality farm operators are the most open to natural resource management practices, followed by low end hobby farmers and mainstream, but not well connected, segments. However, the 'Profit First' segment is not likely to be interested, as this group has very low levels of trust, environmental responsibility, satisfaction with previous programs participated in, high perceived capital and time constraints, and low levels of education. (Morrison et al., 2009)
- 1.1.9 - The type of farming undertaken is also a factor in whether a farmer will be willing to apply new environmental practices. Traditional stock and dairy farmers need more encouragement, whereas those trying new crops such as Gold kiwifruit or integrated sheep and beef farms are more likely to tolerate a risk to changing their farming practices - both financially and socially. Gold kiwifruit farmers in particular see their

type of farming as a ‘craft’ - not predetermined by how previous generations have farmed, as do organic farmers. (Rosin et al, 2009)

- 1.1.10 - Intergenerational vision of what the land should be like can be a powerful influence on new land behaviours. When parents voice a need to care for the land, this is heard by children, and translated into stronger pro-environment behaviours. (Gosling and Williams, 2010)
- 1.1.11 - Biodiversity practices and protection of the land is often done by landowners on a voluntary basis. (De Snoo et al, 2010)
- 1.1.12 - Using language such as ‘care’ and ‘stewardship’ of the land can have a powerful effect on social norms and perceptions of aesthetic quality in an environmental context. Stewardship is a blend of ego and social utility in the sense of the kudos that it can bring to a farmer. When people can appreciate and see evidence of care on a landscape, then this ‘halo effect’ can help advance stewardship amongst others by prompting curiosity or a sense of responsibility for ecosystem processes that are only partly understood. However, research shows that the link to actually changing land use practices by this approach can be tenuous. (Curtis et al, 1998, Earl et al, 2010, Nassauer, 2011)
- 1.1.13 - A ‘duty of care’ towards the land in terms of biodiversity is accepted by landowners, but when surveyed, famers are nervous about how the wider community might place conditions on how this is interpreted, and the impact of tools to enforce compliancy. Groups that are likely to view the introduction of a statutory duty of care most positively are likely to be those new to farming or to the district, or those who live elsewhere.(CSIRO, 2009, Earl, 2010)
- 1.1.14 - Maori have a cultural role in managing sustainable land development in New Zealand, and actively assert the preservation of land for future generations. This role is exemplified in teachings from their whakapapa, kaitiakitanga, tikanga, as well as from iwi and hapu beliefs. Treaty negotiations have also meant that Maori control significant natural resources in New Zealand, which are run as businesses. Maori acknowledge the need to monitor, preserve, and manage these resources in a sustainable manner.
- 1.1.15 - Maori involvement in formal sustainability programmes run by government agencies is low in New Zealand. This is primarily because of lack of resources, cross-cultural tensions, and not being able to access information or participate in larger sustainability programmes. (Jollands et al, 2007)

1.2 Motivations and Barriers Towards New Land Use Practices

- 1.2.1 - Farming is a profession that is marked by self-improvement on a cyclical basis, according to what jobs need to be done according to the calendar. Within this, there is a wide variety of methods employed on a farm, with new ideas and knowledge gained by reading, talking, watching and doing. This learning by adaption occurs because the farmer perceives that the value of the goals outweigh the cost and time by him or her. Innovation needs to be adoptable, and the success of this needs to be confirmed before communication and educational activities occur. (Burton et al, 2008, Pannell et al, 2006)
- 1.2.2 - Biodiversity damage is not immediately obvious; it can take years before any change in soil, water, vegetation or animal life is noticed, and action is required. Unfortunately, research shows that conservation practices haven’t helped overseas farmers’ stance towards attitudes, behaviour and understanding of biodiversity, or how to improve it. (Valentine et al, 2007)
- 1.2.3 - Sustainable land management or biodiversity programmes which identify personal benefits, provide measures of success and aid social standing, provide a degree of control over the outcomes, and self-identity for farmers will be the most successful. (Burton et al, 2008, CSIRO, 2009, Gosling, 2010, Valentine et al, 2007)

- 1.2.4 - Acknowledging barriers and deciding what isn't sustainable helps encourage discussion on what better alternatives there might be. (Pannell et al, 2006)
- 1.2.5 - If farmers are confident about their understanding of sustainability in farming, then that also supports beginning new conservation projects. (CSIRO, 2009, Pannell et al., 2006)
- 1.2.6 - Research shows that where there is a strong focus on economic production from the land, there is a reduced commitment to caring for the environment. Not surprisingly, organic farmers are the most likely to positively view different land management strategies which challenge conventional farming thinking, if the social or environmental benefits are measurable. (Durpoix, 2010)
- 1.2.7 - Aesthetics on the farm are important to farmers. Not only is a pleasant view nice visually, but also as a powerful social norm to others about how successfully they manage their farm. ((Burton et al, 2008, Nassauer, 2011)
- 1.2.8 - Overseas research shows that farmers are encouraged to practice environmentally-friendly behaviours when there are a mixture of legal, financial or behavioural incentives, rules and regulations and a change in how farmers view the way they farm. (Burton et al., 2008, Jay, 2005, Nassauer, 2011, Stanley et al, 2008, Valentine et al, 2007)
- 1.2.9 - A survey of farmers' attitudes to setting aside conservation areas on their farms in Australia showed that for over 20% of them, there are no limiting factors or barriers. Farmers vary widely in their capacity to change management practices. (Oliver at al., 2009)
- 1.2.10 - Barriers to farmers and landowners considering sustainable land use patterns include:
  - the age and educational level of the farmer or landowner
  - challenging farmers or landowners norms of "how to farm"
  - the loss of productive land, and associated decline in productivity level
  - the lack of 'trialability' or concern that new practices won't suit existing farming operations
  - not knowing how to monitor the effect of new land practices
  - regulatory barriers
  - changes being too expensive to implement, and worry about financial security once new land use patterns begin
  - concerns about a higher workload or use of labour to undertake projects
  - uncertainty regarding outcomes or benefits, and how this may affect generations to come
  - worrying about the effect of new land use practices on their neighbours
  - doubts about the long-term viability of the farming sector they are in
  - changing their lifestyle
  - a lack of clear guidelines or target levels to what needs to be achieved
  - skills, knowledge, access to technology and experience to implement changes (Ahnstrom, 2008, Barr, 2000, Cary, 2001, Pannell et al, 2006)
- 1.2.11 - Predictors of the uptake of sustainable land use patterns are:
  - an awareness of the problem
  - landowners feeling that they had a sense of control over what took place, which in turn motivated them to try new sustainable practices

- having a one-on-one farm planning session, performed by skilled staff about ICM, and receiving their own farm plan
- new practices that are affordable
- farmers or landowners making a public commitment to change or improve their practices
- those that have a financial benefit and or attract a financial incentive
- actions that improve the aesthetics of the land
- new land use practices which don't have a negative impact on the farm's productivity or profitability
- those that can be fitted around other farm management tasks
- farmers who understand and share an environmental focus, and can support and problem-solve with each other
- cost-saving benefits such as efficient and beneficial use of external inputs such as fertiliser. (Ahnstrom, 2008, Barr, 2000, Cary, 2001, CSIRO, 2009, De Snoo et al, 2010, Mills, 2010, Panneell et al, 2006 Valentine et al, 2007)

- 1.2.12 - The topography of the native forest is a crucial influencing factor in whether a patch of native forest should be protected. Flat area of native forests were more likely to be cared for as they are easier to manage than steep areas, and look aesthetically better. (Durpoix, 2010)
- 1.2.13 - Protecting livelihoods and jobs is often seen as more important than a better water environment, and people are only prepared to pay a low amount to improve the quality of water. (Marsh, 2010)
- 1.2.14 - Financial incentives to implement sustainable land practices or improve biodiversity must be flexible in the sense of providing a range projects that the incentive can be used for on their land. (Bridle et al, 2010, Wilkinson, 2007)
- 1.2.15 - The use of incentives are viewed differently by different segments. Those who are committed to biodiversity see them as a helpful way of assisting their ongoing projects, while the more pragmatically-minded view them as a practical aid to getting a job done. Commercial landowners see incentives as a 'push' to get them to finally decide on a course of action that they have been thinking about, or perhaps had not even considered. Lifestyle block owners need a higher level of support in terms of information and advice to enable them to maximise the potential of the incentive. (Gosling, 2010, Jay, 2005

1.3 Successful Tools for Sustainable Land Management and Biodiversity Measures

- 1.3.1 - When attempting to change land use behaviours, it's not just about what an individual landowner can do. New and innovative approaches in regards to systems, neighbours and whole-farm planning can really improve sustainability and biodiversity too. It's a matter of learning and adapting farm management tasks, as well as negotiating about how to move forward. (Pannell et al, 2006)
- 1.3.2 - Research presents many models of changing behaviours from Parminter's 'Theory of Reasoned Action', to the Adoption-Diffusion model, to ecological tools such as those following Maori kaitiakitanga stewardship ideals. All centre around understanding the human context, and what will drive behavioural change. These models segment by characteristics, which allow a targeted message to be sent. (Parminter, 2005, United States. Department of Agriculture, 2005, Harmondsworth, 2004)
- 1.3.3 - Benchmarking tools must be trusted by landowners. This means that the tool needs to be accessible, practical in the sense that the data obtained should be balanced by the effort taken to obtain the information, and that the results should be obvious and relevant to landowners. (De Snoo et al., 2010)

- 1.3.4 - Tools that help build communities and create opportunities to meet, discuss and bond about land use practices are the most successful. They build trust amongst the members, ensure that scientific information and ecological knowledge is developed, and help when negotiation and compromise needs to occur. (Fenermor, 2008)
- 1.3.5 - Community-based social marketing campaigns are the best way to inform and change behaviours relating to environmental practices. This is because they are practical and involve the community, building upon existing knowledge networks. (Birchall and Paterson, 2011, Dresser, 2008 and McKenzie-Mohr, 2000)
- 1.3.6 - It is critical from the beginning to ensure that landowners have access to information about sustainability and biodiversity and:
  - understand what their responsibilities and property rights are
  - are aware of social norms of practice, and the consequences of
  - have a technical understanding of what sustainability and biodiversity is, and how this is limited, and
  - agree on what the common objectives for success will be, and get feedback or receive benchmarking tools to measure progress. (Phillips, et al., 2010)
- 1.3.7 - The decision-making process of getting a landowner to change their land use practices is thought to involve eight cognitive stages:
  - anticipation of degradation
  - seeing degradation
  - seeking information
  - weighing the alternatives and risks
  - making a decision
  - undertaking a trial
  - making a change
  - reaffirming the decision. (Barr and Cary, 2000)
- 1.3.8 - Identifying farmers who have social cachet in the community and who are successfully employing sustainable land practices are examples to others about what can be achieved. For this to work, a high level of skill must be shown by the self-improver, a clear result or outcome must be apparent, and that these results must be visible and attractive (aesthetically) to others. (New Zealand Farm Environment ward Trust, 200?)
- 1.3.9 - Public commitments to change by landowners and competition between them to meet targets are also very persuasive tools to ensure commitment to new land practices. (De Snoo et al., 2010)
- 1.3.10 - Integrated Catchment Management (ICM) plans should:
  - be planned well in advance of introduction, and contain information that is sound
  - allow time for conjecture and discussion, so that collaboration and problem-solving can begin in the community
  - have a long-term commitment by the agency or council
  - have clear goals and indicators of success, but be affordable and flexible time-wise
  - be formulated around the community that they are directed to, and acknowledge the social and cultural dynamics within, as well as the current land practices

- be implemented by enthusiastic, knowledgable staff who can recognise and build relationships, and advocate for the community
- assist with compliance, and celebrate success
- include indicators of success, so that risk and success can be monitored. (Hungerford, 2009, Kilvington, et al., 2011, Phillips et al., 2010)

- 1.3.11 - Individual farm plans can be a great tool to establish what the environmental issues are on a farm, and then can provide a plan for action to remove or mitigate damage. Change can occur without regulation, giving landowners a degree of choice and flexibility on how they achieve success. (Blaschke and Ngapo, 2003 and Sheppard, 2008)
- 1.3.12 - Several indigenous groups are setting goals in environmental guardianship (kaitiakitanga). Maori indicators of ecological health have been established by:
  - establishing the relationship or association of by tangata whenua, iwi/hapu (site status)
  - evaluating the mahinga kai values (mahinga kai measure)
  - assessing stream health (stream health measure). (Harmsworth, 2004, Harmsworth et al., 2011, NIWA)

2. Attitudes Towards Sustainable Land Use and Biodiversity

2.1 New Zealand Research

2.1.1 Farmers' Attitudes and Behaviour Towards the Natural Environment

A New Zealand Case Study

Durpoix, Dorothee

A thesis presented in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Ecology at Massey University, Palmerston North, New Zealand

2010.

Link to PDF

Abstract:

...It was found that farmers with and without native forest responded to different models of attitude towards native forest. The attitudes of farmers without forest were more cognitively based than those of farmers with forest. **Farmers without forest tended to distinguish between native forest on and off the farm, while farmers with forest tended to hold more holistic environmental attitudes**. Farmers' environmental attitudes predicted their behaviour towards their native forest fragments to a similar extent to that usually found in the literature. **Direct experience with nature, interactions with one's family and objective and subjective knowledge were instrumental in predicting the environmental attitudes of all groups of farmers and the behaviour of farmers with native forest...**

...Wealthier farmers may behave in a less pro-environment way towards their land, but not necessarily because they do not care about the forest or environment. These results suggested that **wealthier farmers were more profit-oriented, which overrode favourable attitudes they may have towards the natural environment. Conversely, on farms that are less successful economically, respondents may focus on developing the aesthetic aspect of the farm, either to sell as lifestyle blocks or for personal benefit...**

...Farmers from different farm types no longer showed any differences in their attitudes. The sample of farmers with fragments [of forest] ≥ 1 ha was indeed mostly constituted of meat producers. **Although organic farmers still displayed stronger pro-environmental attitudes than conventional farmers, overall the two groups did not significantly differ in their behaviour towards native fragments. Nevertheless, a direct effect of organic farming on farmers' behaviour was positive, suggesting considerations other than internal (i.e. attitude) encourage organic farmers to look after their forest fragments. The sustainable image they may want to project may be part of the reason for such a direct relationship...**

...Ecological knowledge and confidence in one's knowledge played instrumental roles in predicting the environmental attitudes and behaviour of farmers with fragments ≥ 1 ha. **Famers with greater ecological knowledge showed more pro-environmental core beliefs towards the natural environment, while farmers with greater confidence in such knowledge showed stronger positive feelings towards native forest. Both relationships translated into stronger pro-environmental intentions and behaviours towards the forest...**

...respondents' interactions with with their family were one of the best predictors of farmers' attitudes and behaviour. **The more respondents talked about environmental issues with their immediate family and reported being influenced by these discussions, as well as the stronger environmental concern respondents reported of their parents, the stronger pro-environmental attitudes these respondents exhibited, attitudes which translated into pro-environmental behaviour...**

...In contrast, **farmers' self-report of being influenced by discussions with fellow farmers had a positive impact on their environmental attitudes that translated into pro-environmental behaviour. Yet being influenced by such discussions also directly an negatively impacted on respondents' behaviour. This result suggested that conflicting effects were at play among farmers regarding environmental issues. Farmers like minded on environmental issues can positively influence each other. Nevertheless, respondents may voice agreement with what other farmers say about environmental issues even if such agreement does not align with their attitudes towards the natural environment...**

...The way respondents perceived their regional council's strategy regarding conservation of New Zealand indigenous forests on private land as more strongly related to respondents behaviour towards their native fragments directly than indirectly through their attitudes. **This indicated that farmers may perceive their regional councils as an ad hoc provider of practical help (e.g. funding for fencing) rather than a provider of the big picture about environment issues. However, perceiving one's regional council's conservation strategy in a favourable light also tended to be associated with pro-environmental attitudes. This could indicate that regional councils succeeded to some extent in conveying a pro-environmental message to farmers - although there was still room for improvement...**

...**Contrary to expectation, farmers tended to engage in pro-environmental behaviour towards fragments on flat areas more than on steep areas. Furthermore, this was not dependent on farmers' desire to have native fragments in the first place: both groups of farmers with forest by choice and with forest by chance showed the same tendency. This can be explained, however, by the practicality of taking care of fragments on flat areas (e.g. fencing).** Also, it may reflect the ecological quality of the fragments. Fragments on steep areas may be smaller and with less coherent shape than those on flat areas. As a consequence, the farmer may be more inclined to protect healthy-looking fragments, and governmental agencies and/or environmental groups may also be willing to financially help the conservation of such fragments. It may also be due to the possibility that the sampled farms may have come from rather flat areas.

In addition the more native forest farmers had on their property (ratio of naive forest cover to farm size), the more respondents behaved in a pro-environmentally fashion towards the forest. The relationship remained after controlling for farmers who had wanted native forest on their farm. This result further suggested that the proximity of the native fragments encouraged pro-environmental behaviour...

Note: Page 312 of the thesis has a copy of the survey questions asked to farmers.

2.1.2 New Zealand Farmer Attitude and Opinion Survey 2008

Management Systems and Farming Sustainability

John Fairweather, Lesley Hunt, Chris Rosin, Henrik Moller and Solis Norton

Agriculture Research Group on Sustainability (ARGOS)

October 2009.

Link to PDF

Abstract:

The survey results presented in this report are part of ongoing research on New Zealand farmers and how they respond to changes and issues related to the sustainability of primary production. The survey assessed how farmers perceived three management systems (conventional, modified conventional or integrated management, and organic). Questions covered the precise identification of the management system the farmers used, their intentions to use different management systems, what they perceived as the outcomes from the use of each management system and the perceived barriers to using an alternative system. An additional objective was to assess how farmers were thinking about a range of issues important to the sustainability of agriculture, including farm plans, emissions trading, and water and irrigation. A questionnaire was posted to a random sample of full-time and part-time farmers. The response rate was only 16%, possibly due to the timing of the survey and the difficulty of the questions. Most of the questions used a seven point rating scale and the mean score and score distributions were examined. The data were analysed descriptively, supplemented with some statistical tests and detailed analyses.

Excerpt:

...Water

The questions on water and irrigation were designed to appraise farmers' views on current issues topical in recent times particularly in drier regions of New Zealand. Bear in mind that the sample of farmers is from all over New Zealand so the views expressed are a mix of those commenting about irrigation which does not directly involve them, along with a smaller group which includes farmers directly involved in irrigation is some way.

Farmers appear to be well aware of issues in relations to irrigation developments. Some farmers saw that irrigation was needed to meet production goals. Further, they saw as likely to occur a number of consequences of increasing demand for irrigation water – such as depletion of aquifer and changes to the availability and quality of water in streams and rivers. **While there was an overall neutral response to irrigation not causing environmental problems, nearly one half of farmers disagreed with this claim. These results suggest that some farmers would be predisposed to management initiatives since they recognise that there are problems with increased demand. This is confirmed by responses to questions on managing water. Farmers agreed that they need to improve their management of water, including greater use of water storage systems. There was a mixed response to the role of payments for irrigation water to encourage better use but some farmers supported this strategy.**

These positive indications need to be tempered by acknowledging that the sample included farmers commenting on irrigation in general, and not something that they themselves would need to be involved in. This has two implications. **First, the general awareness of irrigation issues and acceptance of potential adverse effects and the need to improve management puts these farmers in a position similar to the general public or urban New Zealanders. This finding suggests that water and irrigation policy may not be inhibited by urban-rural tensions. Second, the views of farmers actually involved in irrigation**

may not be so positive, or at least even if they acknowledge the above issues they might not be able to respond to them so positively.

Sustainability of farming in New Zealand

..The high average age of New Zealand farmers raises a question about the sustainability of farming as a whole. **If we think of the overall demographic structure of the farm population with its high age, linked to the evidence of increasing age in recent years (Fairweather and Mulet-Marquis, 2009), there may come a point at which increased age inhibits both physical and innovative performance. This claim rests on the belief that older people are less innovative or likely to change. There are, however, some indications among the ARGOS farmers and orchardists that this may not be true. Many in the kiwifruit industry have taken up orcharding later in life as a path to retirement and at a time when they are more financially secure and arguably in a better position to innovate (see Hunt, 2009). Also, as sheep/beef and dairy farmers become older and also more financially secure they may be less taken up with an emphasis on production and more inclined to pay attention to environmental concerns, for example. ARGOS also provides some evidence that new entrants to farming may be more able to change farming systems used by former farmers on their properties, even if these former farmers were their fathers. Some sons in their thirties, returning to the family farm in ARGOS farms after experiences overseas, have become organic farmers...**

See survey questionnaire p. 49.

2.1.3 Overview of a Social Psychology Theory for Behavioural Change

Terry Parminter

Paper presented at Industry Development Practice Change Conference, Hamilton.

4 October 2005.

See Appendix One for full text of paper.

Abstract:

This paper reviews psychological determinants of human behaviour. Behaviour is shown to be most closely related to people's intentions and perceptions about their operating context. Intentions result from people's information, experiences and so beliefs about the consequences of performing a particular behaviour. beliefs can be related to their attitudes, responses to social norms, self identity, behavioural control and self-efficacy. Knowing which of these are the dominant influences of behaviour, can be used to guide different approaches to designing interventions, product specifications and marketing strategies.

2.1.4 Participation of Indigenous Groups in Sustainable Development Monitoring

Rational and Examples From New Zealand.

Nigel Jollands and Garth Harmsworth

Ecological Economics (2007), 62 (3/4), 716-726.

See Appendix One for full text of paper.

Abstract:

Over the past decade, many government policies have been aimed at the elusive concept of 'sustainable development'. Over the same period there has been a growing awareness of the need to evaluate the progress of these policies as well as the need to encourage broad community participation in that monitoring. **Unfortunately, it appears the participation of one important group, indigenous communities, in many sustainability programmes (including the selection and use of indicators in their monitoring and evaluation) is limited.**

This paper seeks to understand the role of sustainability monitoring and indigenous community participation in that monitoring within ecological economics and transdisciplinary research. We find that there is a strong need for sustainability indicators and a compelling rationale for indigenous community participation, both from ecological economic theory and from international and national policies. We also find that the present level of engagement of indigenous groups and communities in New Zealand in sustainability monitoring remains low, under-resourced, and uncoordinated. To improve the worldwide quality of sustainability indicators there is an urgent need to address this poor participation.

Excerpt:

...This indigenous level of engagement in sustainability monitoring in New Zealand remains low, under-resourced and uncoordinated...

...From the case studies in this paper we have highlighted a number of critical success factors for increasing indigenous community participation in government-led sustainability programmes:

- **Process is very important.** As with any community, indigenous communities need to be engaged at the beginning of the process. It is also important that the process is appropriate for the community involved.
- **Resourcing is essential**. Indigenous communities often do not have the resources necessary to participate in official, and often drawn out, processes. If the communities are to be involved, adequate resources need to be allocated at the outset.
- **Openness to different perspectives is essential**. Cross-cultural interaction will often lead to tensions as different world views collide. It is only a genuine openness to learning from each other that can take advantage of the lessons from the diversity of opinions for sustainable development.

We also find that the most enduring participation of Māori in indicator development is in those activities initiated by the indigenous groups themselves. However, these initiatives pose several challenges:

- **They are often inadequately resourced**
- **Groups often lack the capacity to engage in broader sustainability programmes ·**
- **They often lack coordination and an effective means of disseminating the approaches and lessons to other communities and groups..**.

2.1.5 Remnants of the Waikato: Native Forest Survival in a Production Landscape

Grace Mairi M. Jay

Department of Geography, Tourism and Environmental Planning, University of Waikato

New Zealand Geographer (2005) 61, 14–28.

Link to PDF

Abstract:

This paper addresses the issue of conservation of native biodiversity on privately owned farmland in New Zealand. Based on surveys of Waikato dairy farmers as exemplars of intensive agricultural practice, it examines factors that influence the survival of native forest on land with potential for commercial production. **Results suggest that a significant proportion of Waikato dairy farmers regard native forest favourably, although the proportion of farmers who actively conserve their forest is small. Factors that assist the persistence of native forest on dairy farms include personal characteristics of the farmer, past accidents of history which have left forest remnants in place, and physical characteristics of the farm such as topography.** While the conservation of native biodiversity within this intensively farmed landscape is strongly influenced by **political economy pressures that encourage production, non-utilitarian motives such as aesthetic enjoyment and family heritage can serve to counter the production ethic.**

Excerpts:

...A first conclusion is that the economic drivers of an industrial agriculture encourage the majority (perhaps as many as 80%) of dairy farmers to prioritize production to the neglect of environmental care and conservation of native biodiversity. Biophysical aspects such as topography, aspect, soil type and hydrology, can make it difficult or easy for farmers to remove native vegetation and thereby speed up or slow down the process of biodiversity loss. **But the evidence of Figure 8 which showed that older farms are proportionately least likely to support bush suggest that economic factors over time have led to erosion of native biodiversity, regardless of other factors...**

...Looking first at the factors that assist the survival of native forest regardless of the attitudes of the farmer, **topography of the remnant and of the farm appear to be the factors which influence bush survival most significantly although they by no means determine bush survival..**

...Considering the farmers from the perspective of biodiversity conservation, it is possible to distinguish at least three groups: committed conservationists, pragmatists and uncommitted conservationists, and opposers...

...**Policies for encouraging the protection of biodiversity on private land are likely to be most effective where they can assist the financial capacity of would-be committed conservationists (e.g. by subsidizing the cost of fencing) and by offering the pragmatists a practical and utilitarian reason for retiring and fencing off land with native vegetation from production...**

2.1.6 Social Differentiation and Choice of Management System

among ARGOS Farmers and Orchardists. Social Objective Synthesis Report 2.

Chris Rosin, Lesley Hunt, John Fairweather and Hugh Campbell.

University of Otago, Lincoln University and the AgriBusinessGroup

August 2009.

Link to PDF

Excerpt:

...The testing of the ARGOS null hypothesis in this report is restricted to comparisons within specific sectors of production: kiwifruit, sheep/beef and dairy. This analytic structure takes into account the observation that, as a result of the different production systems and social positioning, differences between sectors would overwhelm any potential difference between management system panels. It is also noteworthy that the structuring influence of production systems and industry relations within each sector has contributed to strong similarities in the social characteristics of the producers in each. As a result, the participating farmers and orchardists are socially very similar to their peers within each sector. It is, however, possible to identify distinctive characteristics or tendencies for each of the panels in each sector.

The organic panels, in particular, can be distinguished on the basis of their greater willingness to account for environmental and, to some extent, social concerns in their management strategies. In addition, they demonstrated less risk aversion in regard to socially accepted conceptions of appropriate management practice. **For their part, the Gold kiwifruit and Integrated sheep/beef panels showed a greater tolerance for financial risk and technological innovation. By comparison, both the Green kiwifruit and Conventional sheep/beef panels are likely to exhibit more conservative positions relative to risk and innovation.**

...By comparison, the achievement of **high production is commonly emphasised as a goal by the Gold (kiwifruit), Integrated (sheep/beef) and Conventional (dairy more so than sheep/beef) panels. The Gold and Integrated panels also indicated stronger belief in their ability to manipulate—or control—natural process to achieve productive ends (e.g., through the use of artificial shelter or chemical fertilisers)**...

...The concept of breadth of view that was developed in the assessment of the social data reiterates the distinct environmental positioning of the organic panels while also offering insight to differences between panels due to the extent of engagement with the social impacts of their management. The **organic producers more consistently indicated an awareness of and attention to the impact of their management on the environment at regional and global scales. In the kiwifruit and sheep/beef sectors, the organic panels exhibited a similarly greater social breadth of view, extending their recognized influence on society to national and global scales...**

...The ensuing examination of feedbacks also provided evidence of qualitative differences in the types of feedbacks to which panels would commonly refer. For example, the **organic panels consistently indicated that soil biota and biodiversity more generally were important feedbacks for assessing the success of their practice.** In addition, their causal maps included more connections per factor (on average). **The other panels referred to more limited aspects of biodiversity, such as the emphasis on birdlife among the Green kiwifruit orchardists. Tidiness (also an aspect of good farming for many of the non-oganic groups) was a commonly mentioned indicator that provided feedback to members of the Green (kiwifruit), and Conventional (sheep/beef and dairy) panels. ..**

..differentiates the **organic panels in each of the sectors involves their apparent willingness to assume a level of social risk associated with the adoption of a management orientation that is at odds with wider accepted tenets of non-organic practice...**

...the **organic panel does have slightly weaker ties to local communities, perhaps indicating their positioning slightly outside dominant local expectations about farming.** Furthermore, the **organic dairy farmers frequently noted the negative peer pressure they faced in needing to justify their decision to pursue certification—a telling confirmation of the power of productivist ideologies identified in the international literature (Bell 2004; Burton, et al. 2008).** The causality of such a configuration is, however, not apparent in this research...

...In the kiwifruit sector, differentiation on the basis of learning and expertise is more distinct—perhaps reflecting the distinctions in craft orientation among its practitioners. Thus, the Green panel distinguishes itself as orchardists who are more comfortable following the successful and established script of green kiwifruit production. As a result, they are challenged by references to dry matter as an alternative means of assessing their practice largely because it is not addressed within their current script. By comparison, the remaining kiwifruit panels demonstrate a greater propensity to expand their expertise through experimentation. For the Gold panel, this appears to result from the relative youth of their crop—the gold kiwifruit script is still in preliminary draft form and Gold orchardists appear to be more comfortable with this situation. Similarly, organic kiwifruit production remains an emerging skill and Organic orchardists demonstrate a capacity to allow best practice to develop as opposed to being pre-determined...

2.1.7 Systemic Interventions into Biodiversity Management

Based Upon Theory of Reasoned Action

T.G. Parminter and J.A. Wilson

AgResearch

2003?

See Appendix One for full text of paper.

Abstract:

...In the project, system diagrams and focus groups were used to describe each of the behaviour sets involved for farmers addressing the issues. The results of the focus group meetings provided the basis for quantitative surveys framed around the Theory of Reasoned Action...

2.1.8 Water Resource Management in New Zealand

Jobs or Algal Blooms?

Dan Marsh

Department of Economics University of Waikato dmarsh@waikato.ac.nz

Presented at the Conference of the New Zealand Association of Economists, Auckland.

2 July 2010.

Link to PDF

Abstract:

People's willingness to pay for water quality improvements in a typical dairy catchment in the Waikato region is estimated so enabling decision makers to consider both the costs and the benefits of different environmental policies. We describe the development of a choice modelling approach for assessing the value of water quality improvements and find that **respondents would be willing to pay for water that is safer for swimming and improvements in clarity and ecological health but are concerned about job loses even when they do not expect to be directly affected.**

Excerpt:

...Respondents said that they would be willing to pay for water that was safer for swimming and improvements in clarity and ecological health. **Median willingness to pay for slight improvements over the status quo was low ($26 per household per year) and zero if accompanied by job losses. Households had a higher willingness to pay for larger improvements with a median value of $126 per year to reduce the chance of algal blooms to 2% while improving clarity and ecological. However, respondents were concerned about job losses in dairying, even where they did not expect to be directly affected.** Future work will report on a survey of recreational users and people's willingness to pay for water quality improvements in the catchment streams, in order to build up a more comprehensive picture. This data will then be combined with research into the cost of achieving different levels of water quality improvements. Outputs from this research should allow decision makers to consider both the costs and the benefits of different levels of water quality improvements so allowing farmers and policy makers to identify the most cost effective options for achieving any given improvement in water quality...

2.2 International Research

2.2.1 Adoption and Diffusion of Conservation Technologies

People, Partnerships and Communities, USDA Natural Resources Conservation Service

June 2005.

Link to PDF

Overview:

This publication outlines and discusses the key elements of the Adoption-Diffusion(A-D) Model which social scientists use to describe, explain and predict human behaviour relative to the adoption and diffusion of agricultural technologies.

2.2.2 Connectedness to Nature, Place Attachment and Conservation Behaviour

Testing Connectedness Theory Among Farmers

Elizabeth Gosling and Kathryn J. H. Williams

J Environ Psych (2010) 30(3), 298-304.

Link to PDF

Abstract:

The aim of this study was to explore the relationship between pro-environmental behaviour and two forms of emotional association: attachment to place and connectedness to nature. This relationship is explored in the context of farmers' management of native vegetation on their properties. A postal survey was conducted to measure the extent to which farmers felt connected to nature and to their property. The survey also measured vegetation management behaviours and associated valued outcomes. A total of 141 farmers in northwest Victoria, Australia, completed the survey. **Results showed that vegetation protection behaviours increased with connectedness to nature (CNS), although CNS accounted for only a modest amount of the variation in behaviour. Place attachment was not related to management behaviours.** Further analysis suggested that the relationship between CNS and management behaviour was mediated by importance given to environmental benefits of vegetation management. **The findings lend weight to studies showing a relationship between CNS and more simple conservation behaviours (e.g. recycling). The findings are also consistent with frameworks suggesting that emotional association with nature leads to an expanded sense of self and greater valuing of non-human species, and so to pro-environment behaviour. This demonstrates the importance of using a range of instrumental and more affective strategies to promote conservation behaviours.**

2.2.3 Environmental Policy Implementation Challenged by Some Land Management Realities

John Cary

Connections - Farm, Food and Resource Issues

Volume 1 December 2001

Link to PDF

Excerpt:

...The NLWRA study found the following factors were useful as indicators of landowner capacity to change to sustainable management practices:

- **participation in occupation-related training**
- **level of farm income**
- **optimism about future farm income**
- **having a documented farm plan**
- **membership of Landcare**
- **age.**

In fact, most of these **variables are not particularly strong or reliable predictors**...

...These findings suggest strong limitations in the utility of community landcare alone to drive the adoption of sustainable land management practices. **Generally, financial incentive and financial capacity, skill capacity and appropriate useful technology are necessary concomitants for changes in resource management behaviour. Stewardship values and care about environmental ideals, on their own, are unlikely to bring about effective change in resource management behaviour...**

...For the most part, stewardship and landcare values have more significant indirect than direct effects on resource management behaviour...

...They provide a consensus for community action (and for the imposition of informal or formal social constraints) but they have a much weaker direct influence on individual action...

2.2.4 Farmers and Nature Conservation

What is Known About Attitudes, Context Factors and Actions Affecting Conservation?

Johan Ahnstrom, Jenny Hockert, Hanna L. Bergea, Charles A. Francis, Peter Skelton and Lars Hallgren

Renewable Agriculture and Food Systems (2008) 24(1); 38–47.

See Appendix One for full text of paper.

Abstract:

Farmers' attitudes towards viability of specific conservation practices or actions strongly impact their decisions on adoption and change. This review of 'attitude' information reveals a wide range of perceptions about what conservation means and what the impacts of adoption will mean in economic and environmental terms. Farmers operate in a tight financial situation, and in parts of the world they are highly dependent on government subsidies, and cannot afford to risk losing that support. Use of conservation practices is most effective when these are understood in the context of the individual farm, and decisions are rooted in land and resource stewardship and long-term concerns about health of the farm and the soil. **The attitudes of farmers entering agri-environmental schemes decide the quality of the result. A model is developed to show how attitudes of the farmer, the farming context and agri-environmental schemes interact and thus influence how the farming community affects nature and biodiversity. As new agri-environmental schemes are planned, agricultural development specialists need to recognize the complexity of farmer attitudes, the importance of location and individual farmer circumstances, and the multiple factors that influence decisions.** We provide these insights and the model to conservation biologists conducting research in farming areas, decision makers who develop future agri-environmental schemes, educators training tomorrow's extension officers and nature conservationists, and researchers dealing with nature conservation issues through a combination of scientific disciplines.

2.2.5 Human and Social Aspects of Capacity to Change to Sustainable Management Practices

Combined Report for the National Land and Water Resources Audit Theme 6 Projects 6.2.2 and 6.3.4

John Cary, Neil Barr, Heather Aslin, Trevor Webb and Shannon Kelson

Department of Natural Resources and Environment Victoria

June 2001.

Link to PDF

Executive Summary:

...An examination of the impacts of structural changes in agriculture on the capacity of landholders to improve the sustainability of land use provides the following observations on Australian agriculture:

- In many of the more densely settled or higher rainfall localities there is often a mix of commercial farming and hobby or lifestyle farming; commercial farming dominates the less densely settled and extensive farming areas.
- Australia has a large number of small farms that tend to be grazing properties concentrated close to the seaboard, in the hill country and surrounding major provincial centres.
- Increasing productivity through increasing scale is an option available to larger farms, but not available to smaller farms.
- Off-farm income is crucial to the continued farming future of families on many small farms.
- Families on mid-sized farms often experience the greatest pressure to adjust out of agriculture.
- Farm consolidation occurs during buoyant seasons.
- Major structural change in land management frequently occurs at the time of intergenerational transfer of farm ownership.
- In regions dominated by small farms the consolidation path to productivity increase is often blocked by high amenity-based land values.
- Changes in agricultural structure, if continued, will lead to some regions remaining clearly agricultural in their character and others moving towards emphasis on amenity agriculture where productivity does not determine land use decision making...

2.2.6 Influencing Improved Natural Resource Management on Farms

A Guide to Understanding Factors Influencing the Adoption of Sustainable Resource Practices

Neil Barr and John Cary

Bureau of Rural Sciences

2000.

Link to PDF

Excerpt:

...**The issue of inter-generational transfer or farm succession is a major contributing factor determining the adoption of new practices or investment**. This is typified by landholders who are older and deferring farm exit, who have an increased dependence on off- farm income and do not expect to transfer the farm to another generation...

...There is significant potential for goal conflict in environmental extension. **Family and financial security are generally the highest priority goals for Australian farm families, while increased sustainability often involves increased management complexity and financial risk...**

... On Australian farms, research has shown that **environmental innovations that have been profitable, or believed to be profitable, usually have been readily adopted**. Such innovations are usually referred to as having a relative, or financial, advantage...

... The other key factors regarding **adoption of a new NRM practice are: its complexity, trialability, compatibility, and the observability of outcomes. As well, the financial costs, the landholder's beliefs and opinions towards the new practice, the landholder's level of motivation and perception of the relevance of the practice and the landholder's attitudes to risk and change are also key factors...**

...**An understanding of the decision processes of landholders is necessary to influence change. Research has identified eight stages of decision making:**

1. Anticipation of degradation

2. Seeing degradation

3. Seeking information

4. Weighing the alternatives and risks

5. Making a decision

6. Undertaking a trial

7. Making a change

8. Reaffirming the decision.

2.2.7 Landscape Preferences, Ecological Quality and Biodiversity Protection

Kathryn Williams and John Cary

Environment and Behavior (2002). 34(2), 257-274.

See Appendix One for full text of paper.

Abstract:

The loss of biological diversity is a major environmental problem occurring on a global scale. Human-environment researchers have an important role in shaping policy and programs at a local, national and international level. This paper explores human preference for landscapes relative to ecological quality and assesses the relationship between these preferences and land management behavior. A survey of more than 1000 urban and rural residents of southeastern Australia examined preferences for 36 black and white photographs of native vegetation. There was more commonality than difference between urban and rural preference for different arrays of native vegetation. Preference for *Eucalyptus* species was higher than preference for non-*Eucalyptus* species. Preference ratings indicate minimal differences across landscapes with distinct variation in ecological quality. **The study suggests that preference for landscapes of relatively high ecological quality is associated with behavior that is protective of this resource**.

2.2.8 Social Acceptability of a Duty of Care for Biodiversity

Gillian Earl, Allan Curtis, Catherine Allan, Simon McDonald

Institute for Land, Water and Society Charles Sturt University

Australasian Journal of Environmental Management, Volume 17 Issue 1 (Mar 2010), 8-17.

Link to PDF

Abstract:

Biodiversity in Australia continues to decline despite substantial government efforts to promote conservation. A statutory duty of care for biodiversity could promote positive outcomes and complement existing regulatory and voluntary approaches. Interest in a duty of care has been persistent, but progress elusive. Two inter-related issues around the social acceptability of a statutory duty of care are impeding progress: (a) the absence of a practical framework to facilitate its implementation, and (b) concerns about the acceptability of a legal instrument to landholders. In this paper, we present research that, for the first time in Australia, addresses the social acceptability of a duty of care for biodiversity, drawing on data from surveys in two Victorian regions. **Our findings suggest that there is broad acceptance of 'duty of care' as an abstract concept, but diminished support for its detailed implications. Farmers, in particular, are concerned about the potential for wider community input, the prospect of a legally defined instrument, and the use of industry standards as a surrogate measure for compliance with a duty of care. These findings suggest that efforts to introduce a statutory duty of care need to engage farmers closely.**

Excerpt:

...No research into the social acceptability of a duty of care for biodiversity in Australia has been published before. The preliminary indications from this study are that rural landholders currently have significant concerns. While there is broad endorsement of the concept in principle, concerns arise in relation to more specific aspects of the concept and its implementation...

...While the results suggest some important impediments to the implementation of a statutory duty of care for biodiversity currently exist, they also present an opportunity for natural resource managers to engage in purposeful conversation with landholders so that underlying concerns landholders may harbour, can be articulated. **In particular, our findings suggest that management agencies considering introducing a statutory duty of care would be wise to involve farmer groups in its development at an early stage...**

...**Our findings show that the most supportive respondent groups (non-farmers, newer settlers in the district, newer property owners, non-residents) currently represent a small proportion of the survey population, and hence the actual rural population in the Corangamite and Wimmera regions.** Curtis et al. (2006, 2008a) predict that this demographic group will increase dramatically over the next 10-15 years, while the traditional rural population of farmers is predicted to decline. **The social acceptability of a duty of care for biodiversity may therefore increase over this period, as the makeup of the rural population changes, perhaps making the task of introducing this policy instrument easier for regional agencies...**

2.2.9 Some Legal and Social Expectations for a Farmer's Duty of Care

Mark L. Shepheard

Australian Centre for Agriculture and Law University of New England

CRC for Irrigation Futures, Irrigation Matters Series No. 02/10

February 2010.

Link to PDF

Executive Summary:

...This report identifies the competing interpretations for a duty of care in its use to define farmers' environmental protection responsibilities. A common law interpretation based on reasonable care is likely to be used by courts to interpret practical meaning for a poorly defined statutory duty of care for environmental protection. Such a minimal accountability interpretation is unlikely to meet the expectations of statutory duty advocates to legitimise a higher standard of virtuous performance and achieve environmentally benign farming systems...

3. Motivations and Barriers to New Land Use Practices

3.1 New Zealand

3.1.1 Applying Social Psychology Theory in Strategies for Industry Development

Terry Parminter

Paper presented at Industry Development Practice Change Conference, Hamilton.

4 October 2005.

See Appendix One for full text of paper.

Abstract:

Two examples of behaviour change strategies from the Victorian Department of Primary Industries and the Auckland Regional Council are used to highlight how belief based theories of human behaviour can be used for industry development, innovation and adaption.

3.1.2 Care and Stewardship: From Home to Planet

Joan I. Nassauer

Landscape and Urban Planning (2011), 100, 321-323.

Link to PDF

Abstract:

Care may be a way to engage people in planetary stewardship by connecting their responses to what they notice in everyday life with their effect on larger environmental systems. **Care is a deep, pervasive cultural norm that is imposed upon what is noticed and noticeable to others. At the same time, care often evokes an immediate aesthetic response. Both responses provoke behavior to change, maintain, and protect landscape appearance.** This essay examines whether the immediacy of the care response can be extended to effect stewardship at broader time and spatial scales. It describes how **landscape evidence of care has a halo effect in which an overall impression of the appearance of the landscape affects assumptions about the people who are responsible for providing care, as well as assumptions about resource characteristics.** Finally, it suggests that this **halo effect of care can contribute to design and planning strategies that benefit environmental health and ecosystem services at broader scales**.

Excerpt:

...The look of the landscape reflects on those who are responsible for it. **A place that looks neglected suggests that those who care for it are irresponsible or overwhelmed, and they probably are not desirable neighbors. Anticipating this normative response by others is a powerful motivation for conforming behavior. In addition, because an aesthetic response is immediate, it may be even more potent in affecting behavior.** Some-times the look of a well-cared-for landscape makes us feel good, and we may act to get or to share that good feeling, an aesthetic response...

...Where **evidence of care is recognized as good resource stewardship, the halo effect may help to advance further stewardship by prompting curiosity or a sense of responsibility for ecosystem processes that are only partly understood...**

3.1.3 Engaging Farmers in Sustainable Management

A Discussion Document

Gretchen Robinson

Taieri Trust, NZ Landcare Trust and Ministry for the Environment

2008.

See Appendix One for full text of paper.

Overview:

The Taieri Alliance for Information Exchange and River Improvement (TAIERI Trust) is a community based Integrated Catchment Management (ICM) project focusing on New Zealand"s third longest waterway, the Taieri River. The project is funded predominantly by a Ministry for the Environment Sustainable Management Fund Grant. The New Zealand Landcare Trust also has a large supportive role. The project began in 2001 and since this time has had strong involvement and support from a wide cross-section of stakeholders, including farmers. The Trust is currently chaired by Ian Bryant a local dairy farmer. The experiences of the TAIERI Trust and New Zealand Landcare Trust as well as current research and literature have been brought together in this discussion document with the aim of presenting some thoughts on engaging farmers in sustainable management approaches. The document aims to provide some insight into the history, constraints, and pressures farmers are operating under and some of the positive examples where farmers are becoming actively engaged in sustainable management.

3.1.4 Hatched: The Capacity for Sustainable Development

Edited by Bob Frame, Richard Gordon and Claire Mortimer.

Landcare Research New Zealand

2010.

Link to Sections of Book

Abstract:

Hatched is an eBook of research findings, stories and tools exploring five key areas of capacity needed to chart a new trajectory for our long-term success: Thinking and acting for long term success; Businesses as sustainability innovators; Individuals as citizen consumers; Facing up to wicked problems; The future as a set of choices. Hatched is written for practitioners in business, government and community.

3.1.5 Kia Pono Te Mahi Putaiao - Doing Science In The Right Spirit

Will Allen, Jamie M. Ataria, J. Marina Apgar, Garth Harmsworth, and Louis A. Tremblay

Journal of the Royal Society of New Zealand (2009). 39(4): 239–242.

Abstract:

Over the past two decades the challenges facing environmental and natural resource managers have become more complex. Natural resources are more contested and degraded, and as a result stakeholders are increasingly involved in their management. Single-issue management is often not proving effective. **Policymakers, industry sectors, indigenous groups, communities and scientists alike have to recognise the interlinked nature of many apparent resource use problems. Successful outcomes are increasingly dependent on the coordinated actions of decision makers operating at many different levels and scales. Consequently, many viewpoints and sources of information have to be shared among the different stakeholders involved, and integrated to find solutions that will guide the way forward**. **Multi-stakeholder research approaches that facilitate the wide involvement of people in problem solving and decision making with respect to issues and plans which impact on them are becoming widespread. Transdisciplinary research approaches such as sustainability science, post-normal science and complexity science all call for more inclusive inquiry where local and other knowledge systems collaborate with science in research.** The ownership of resulting knowledge production and ensuing management efforts are wider and can more adequately address issues of sustainability.

3.1.6 Principles and Processes for Effecting Change in Environmental Management

Ian Valentine, Evelyn Hurley, Janet Reid and Will Allen

Journal of Environmental Management (2007). 82(3):311-8.

Link to PDF

Abstract:

In New Zealand environmental management is essentially the responsibility of land managers. Management decisions affect both production/productivity and the environment. However, responsibility for ensuring positive environmental outcomes falls on both local (Regional) and Central Government, and both they and international agencies such as the OECD would wish to monitor and report on changes. In terms of policy, strong links have been established via Central and Regional Government to land managers. Consumers in the market place are also, increasingly, requiring responsibility for positive environmental outcomes of those who purchase and process primary products. Strong links for responsibility have been established between our international markets and processing businesses and there is a noticeable strengthening of the links from the processors to the land manager/producer.

In New Zealand a range of initiatives has been developed and implemented over recent times, whereby land managers are taking increasing responsibility for accounting for the environmental outcomes of their production activities. The range covers the spectrum from voluntary to compulsory (e.g. in order to meet market requirements) and from those initiated by customers to processor and/or producer initiatives. A selection of these initiatives will be described. Principles and processes associated with these initiatives will be discussed.

Excerpt:

...Motivation for effecting change in agricultural practice often hangs on the perceived balance of Private Good/Public Good to the land manager. Where the benefits are tangible, the steps of Awareness, Information Seeking, Evaluation, Implementation and Monitoring characterise and possibly constrain the rate of adoption. In contrast, environmental benefits are often remote in both time and space and the costs of environmental management practices cannot be offset against economic benefits...

...Sustainable agricultural practice extends into the catchment, landscape and community and represents an increase in complexity. **Awareness of environmental degradation is not immediately apparent on-farm and even more obtuse off-farm. Changes in soil, vegetation and water quality occur over decades and through seasonal noise...**

...**Regulatory instruments are not popular**, as the means of achieving the desired outcome is often perceived as unfair and even inappropriate. **However, these instruments are usually accepted as an underlying set of regulations to support other policy strategies to control the recalcitrant few...**

...Voluntary and economic incentives to effect behaviour change are seen as more democratic and consistent with the adult learning model of land managers' behaviour...

...Property-right incentives, where rights and responsibilities are shared between the land manager and some other agency, are seen as cost effective and un-intrusive. Property-right agreements negotiate what can and can't be done and lock this into a covenant. **Environment BOP (Bay of Plenty regional Council) offer a comprehensive farm plan that is effectively a partnership between the landowner and the regional council to protect indigenous biodiversity or address soil and water conservation issues...**

...**Solving problems associated with sustainable development is *not* just about changing the behaviour of individual landowners, but about seeking new ways of thinking about systems, neighbours and whole-farm planning. Consequently, sustainable development extension/practice is about engaging stakeholders (including landowners) in the process of learning and adaptive management and about negotiating how to move forward in a complex world, where we do not have all the information we would like.** This is important for issues such as pest management where the problem needs to be addressed both on farm, and across the region...

...It is important, therefore, that appropriate indicators be chosen. **When actions are simple, we may be able to measure compliance. As actions become more collaborative and co-ordinated then we have to also look to indicators of task and process.** Process looks at the supporting mechanisms that are in place to support eventual actions e.g. good governance mechanisms that include different stakeholders...

3.1.7 Shallow Lakes Restoration Workshop

Notes compiled by Monica Peters and Melinda Dresser

NZ Landcare Trust

1 December 2008.

Link to PDF

Overview:

Over the course of the morning, attendees were asked to note their visions and barriers for lake restoration.

3.2 International Research

3.2.1 Adoption of Conservation Buffers: Barriers and Strategies

USDA Natural Resources Conservation Service.

October 2002.

Link to PDF

Overview:

This document examines attitudes and behaviours of several producer groups relative to the adoption and diffusion of conservation buffers. It summarises general observations made by specialists and offers recommendations that field staff should consider when marketing conservation buffers. A technical transfer model in one state is described, four producer groups (all producers, livestock, low-income and minority, and American Indian) are examined, and barriers to the adoption of buffers and strategies that may address these barriers are listed for each group.

3.2.2 Benchmarking Biodiversity Performances of Farmers

G. R. De Snoo, A. M. Lokhorst, J. Van Dijk, H. Staats, and C.J.M. Musters

Aspects of Applied Biology (2010), 100, 311-317.

Link to PDF

Abstract:

Farmers are the key players when it comes to the enhancement of farmland biodiversity. In this study, a benchmark system that focuses on improving farmers' nature conservation was developed and tested among Dutch arable farmers in different social settings. **The results show that especially tailored information combined with public commitment making resulted in a stronger desire to engage in conservation, an increase in surface area of non-subsidized natural habitat, and an increase in time farmers spent on conservation. The feedback given to the farmers especially affected the non-subsidized conservation.** Benchmarking instruments using targeted information might be challenging tools for farmers.

Excerpt:

...In most cases **farmers are steered towards a more environmental friendly behaviour by law and financial incentives**. In the field of **biodiversity and landscape conservation this is mostly done on a voluntary basis...**

...However, from the study it can be concluded that especially the **combination of feedback and the making of public commitments was effective in eliciting behaviour change. Participants in this condition showed a stronger behavioural desire to engage in conservation, increased their surface area of non-subsidized natural habitat, and reported to spend more time on non-subsidized conservation.** These results are particularly impressive when it is taken into account that the commitment manipulation used in our study was not a very strong one as participants were only asked to attend one meeting during the course of the intervention...

...Another reason why we think our results to be promising is that research has shown that **farmers' attitudes and involvement concerning biodiversity are very resistant to change. In fact, it has been shown in some studies that conservation practices themselves do not influence farmers' attitudes, behaviour and understanding of biodiversity, or how to improve it** (Burton *et al*., 2008; Herzon and Mikk, 2007). Although our intervention was not successful in eliciting attitude change, it did prompt farmers to expand their surface area of non-subsidized (semi) natural habitat, and to devote more time to conservation...

...**It was our experience that the individual feedback in the form of a full colour report regarding their own farm was highly appreciated by the farmers. Farmers showed the most interest in scores related to the contribution to specific species groups and to the area of (semi)natural habitats. Also, feedback about how to improve conservation management on the farm was regarded valuable according to the farmers...**

...A demonstration version of the benchmark instrument for Dutch farmers in Dutch is available at the Internet (www.natuuropuwbedrijf.nl, in English: 'Nature on your Farm')...

3.2.3 Benefits of LEAF Membership

A Qualitative Study to Understand the Added Value that LEAF Brings to its Farmer Members

Jane Mills, Nick Lewis and Janet Dwyer

Countryside and Community Research Institute

November 2010.

Link to PDF

..."LEAF membership had enabled the farmers whom we interviewed to **save money in several ways - such as by improving energy efficiency and reducing their use of chemicals and fertilisers, without compromising output**. But the value of LEAF goes much further than the pure financial, with the **majority of farmers also highlighting the social benefits and increased confidence that membership brings. Farmers also reported increased awareness of the environment on their farms, which in turn had helped them to improve biodiversity, soil structure and water quality."...**

...LEAF farmer membership has developed farmer's knowledge of the environment as well as enhancing biodiversity, soil and water.

- For 86% of those interviewed, **LEAF farmer membership had increased their awareness and understanding of the farm environment. For some, the change was noted as 'transformational', affecting their whole attitude to farming**.

Although it was **generally a difficult task to link biodiversity directly to certain farming activities**, 49% of those surveyed could link biodiversity benefits directly with their LEAF farmer membership, for example:

- Increased bird populations on some farms were considered to be due to farm management and field operations following IFM principles, as opposed to any specific conservation activities carried out under agri-environment schemes.
- **Visible benefits to soil structure, water quality and water quantity** were identified as direct benefits from LEAF farmer membership...

... 3.3.2. Biodiversity benefits

It was often difficult for the interviewee to attribute the biodiversity benefits that they had observed on their farm directly to LEAF membership. Often these benefits were also tied up with agri-environmental schemes operating on the farm. Nevertheless, 49% felt that membership had brought biodiversity benefits.

- **One member said that an increased bird population recorded on his farm was due to farm management and field operations following IFM principles, as opposed to the specific conservation activities carried out under agri-environment schemes.**
- **A nursery, not participating in any agri-environment scheme, had undertaken tree and hedge planting as a result of LEAF membership, thereby providing increased habitat for wildlife.**
- **Other members had established field margins, beetle banks and wildflower areas, and erected bird boxes, as a direct result of LEAF membership**.

3.3.3. Benefits to the soil

Twenty percent of the interviewees were able to identify specific benefits to the soil from LEAF membership.

- **One member, who farms along a valley, started putting tramlines across the slope after undertaking the LEAF Audit, which had helped reduce soil erosion.**
- **Several other members felt that the soil structure had improved from the use of minimum tillage and incorporation of organic manure.**

3.3.4. Benefits to water quality and quantity

Forty percent of interviewees were able to attribute benefits to water quality and quantity specifically to LEAF membership.

- For one member producing fresh produce, the LEAF Audit **prompted them to look critically at their use of water for irrigation and resulted in the introduction of more efficient irrigation systems, which greatly reduced the volume of water used**.
- Two others had installed rainwater harvesting structures to save water.
- One member had switched to using header tanks, rather than direct mains, so that should a leak occur he will only lose a limited amount of water.

LEAF membership had also resulted in improvements in water quality, partly from increased awareness of the potential impacts of certain farm practices.

- For one, LEAF membership had made them much **more aware of when and how changes in water quality occur and so enabled adjustments to farming practices to reduce any negative impacts on water quality...**

3.2.4 Decisions Systems: Influencing Farming Families' Strategic Decisions

Dr Quentin Farmar-Bowers, Post Doctoral Research Fellow, Centre for Sustainable Regional Communities, Latrobe University Victoria, Australia

Small Enterprise Conference 2007, Building Sustainable Growth in SMEs

Manukau City, New Zealand 23 - 26 September 2007.

Link to PDF

Abstract:

An understanding of farmers' decision-systems would help government agencies appreciate how best they could encourage farmers make strategic decisions that would lead to better natural resource management (NRM), including the maintenance of native biodiversity on their farms. An appreciation of decision-systems in general would help farming families and their advisors improve their strategic decision making capabilities.

This paper outlines a decision-system theory we developed using the procedure for grounded theory from in-depth interviews with farming families. The theory helps explain farmers' perspectives on conserving biodiversity out of personal interest, compared with conserving biodiversity for business reasons.

The decision-system theory outlined in this paper has six parts. The first five parts concern decision-making from the farming family's perspective. Part one is a set of hierarchical stories that represented the life-long motivations (aspirations) of farming families. Part two is an understanding of how farm decision-makers create opportunities. Part three is a hierarchical set of decision-systems relevant to NRM. Part four is the concept of 'personal career path' that helped explain the impact of the decision-makers' family situation on strategic decisions. Part five is the concept of lenses that represent how farm decision-makers view opportunities. The sixth part of the theory concern the farming family's decision-making from the perspective of a policy developer. It reinterprets the first five parts of the theory to create a concept called 'boxes of influence' that categorise government policy and programs from the farmers' perspective.

The paper discusses how the concept of 'boxes of influence' can help agencies develop policy that encourage farmers to invest in natural resource management (NRM), such as the maintenance of native biodiversity on farms, out of personal interest compared with policies that provide a business incentive for conservation. The inference is that policies that facilitate the expression of farming families' intrinsic interest in the maintenance of biodiversity may be more effective in the longer term than polices that rely on a business incentive for conservation.

3.2.5 Encouraging Participation in Market Based Instruments and Incentive Programs

Mark Morrison, Jeanette Durante, Jenni Greig, and John Ward

Research project number CSU29 of the Social and Institutional Research Program of Land and Water Australia.

Land and Water Australia

2009.

Link to PDF

Overview:

This is the final report of the LWA funded research project CSU29.

The goal of this research project has been to understand how to improve the design and delivery of MBIs and incentive programs to increase the participation of landholders. Low levels of participation can reduce the ability of programs to achieve their desired outcomes, as well as reduce their efficiency. To understand how to increase landholder participation, answers to three main research questions have been sought, namely 1) what are the characteristics of MBIs and incentive programs that encourage participation, 2) who participates in MBIs and incentive programs and 3) how can MBIs and incentives be better communicated to increase participation?

A mixed methods research design was used to provide answers to these questions. This included a literature review (two working papers), 25 expert interviews (one working paper), eight focus groups (one working paper) in four regions of NSW and Queensland, and a quantitative survey of about 6000 landholders from two Catchment Management Authority (CMA) areas in NSW (Central West and Northern Rivers), two regional body areas in Queensland (Condamine Alliance and Mackay-Whitsundays) and one CMA area in South Australia (Mt Lofty Ranges).

See also Understanding Land Manager Constraints to the Adoption of Changed Practices or Technological Innovations: Literature Review

3.2.6 Exploring Farmers' Cultural Resistance to Voluntary Agri-Environmental Schemes

Rob. J.F. Burton, Carmen Kuczera and Gerald Schwarz

Sociologia Ruralis: Journal of European Society for Rural Sociology (2008). 48(1), 16-37.

Full Text

Abstract:

Studies throughout Europe have suggested that **voluntary agri-environmental programmes often engender very little change in attitudes towards productivist agriculture among conventional farming communities**. This study examines why this may be so, using case studies from Hessen, Germany and Aberdeenshire, Scotland. By constructing a conceptual framework based on Bourdieu's notions of capital we explore how farming activities are able to generate symbolic capital, and compare this with the symbolic value of conservation work. We find that voluntary agri-environmental work returns little symbolic capital to farmers as, by prescribing management practices and designating specific areas for agri-environmental work, such schemes fail to allow farmers to develop or demonstrate skilled role performance – thus inhibiting the development of embodied cultural capital. We conclude by **suggesting that entrepreneurial production-target based agri-environmental schemes may be ultimately more effective in changing long-term behaviour.**

Excerpt:

...In this article we propose that, for farmers, embodied cultural capital is constructed through the performance of everyday activities and is manifest primarily in the level of farming skill possessed by the farmer. **Becoming a 'good farmer' is a project of self-improvement involving practice (repeated on a seasonal basis) to improve the mechanical, motoric and managerial skills required to effectively manage farmland.** The habitus developed is thus a combination of activities that are determined by farm structure (for example, a hill farm will lead to a different habitus from that of an arable farm, the heritage of the farm family (that is, the transfer of skills between generations and the established cultural capital of the farming family) and, most importantly, the personal time investment of farmers themselves in the practices of farming (that is, the opportunities for skill expression, development and embodiment). **Transmitting embodied cultural capital thus becomes a matter of the developing 'identical categories of perception and appreciation' with other farmers, such that the embodied 'skills' can be recognised by others and rewarded with other forms of capital – for example, by generating social capital for the individual through enhanced status.**

We further contend that there are **three conditions required if a farming activity is able to display embodied cultural capital to other farmers. Firstly, the activity must require a skilled role performance capable of differentiating 'poor' and 'good' performances; that is, it must embody the level of cultural capital of the operator. Secondly, this skill must, in some way, be manifest in the outcome of the activity – that is, there must be outward signs that an efficacious action has been performed (for example, straight lines in the landscape may reflect motoric skills). Thirdly, these outward signs of skill must be visible or otherwise accessible to other members of the farming community. In the context of a mechanised productivist farming culture, it should thus be visible from the roadsides and be amenable to 'roadside farming'.**

...The question then is: how can AESs meet the goal of environmental protection and enhancement in Europe and, at the same time, allow farmers the autonomy to make their own decisions about conservation management? Simply removing the regulations and encouraging farmers to voluntarily become more

conservationist is unlikely to work. Although some studies have suggested that, as a result of broader social trends, younger farmers are more environmentally concerned, even for this generation economic profitability is likely to remain the bottom line for farming, and hard times may result in a reversal of any environmental gains. Another possibility; that of relying on a profitable farming industry to provide environmental benefits, also looks improbable. While it is true that farmers are more able to undertake conservation work when their farms are profitable, and some are certainly inclined to do so, it is hard to imagine that a profitable conventional farming industry would do anything but lead to increased investment in the agricultural side of the business (as observed by Richards et al. 2005).

One possible solution is to mimic symbolic capital production in conventional agriculture by setting species production targets (generally numbers and species of free-roaming birds or wildlife), building on existing small-scale schemes in a number of EU countries (Scottish Natural Heritage 2001) which aim to help integrate productive farming with the conservation of biodiversity and the countryside. By using this approach farmers would be able to see (and measure) the tangible changes resulting from their management practices and, importantly, they would be able to compare these figures with those of other farmers to measure self-improvement (reflecting management improvements).4 Enabling the comparison of results (like 'My farm maintains X of species Y. How many have you got?') with the prospect of economic reward for production would encourage farmers to learn more about each others' management practices and learn to value the skills required for managing biodiversity. Although the lack of visibility and understanding still remains an issue, by enabling comparison and attaching a value to higher levels of knowledge of 'good conservation practices' a production-based approach could harness the farming community itself as a means of developing and extending knowledge of good practice...

3.2.7 Farmers' Use of Sustainable Management Practices

ABARE report for the National Land and Water Resources Audit

Mark Oliver, Dale Ashton, Andrew Hodges and Daniel Mackinnon

Australian Bureau of Agricultural and Resource Economics (ABARE)

March 2009.

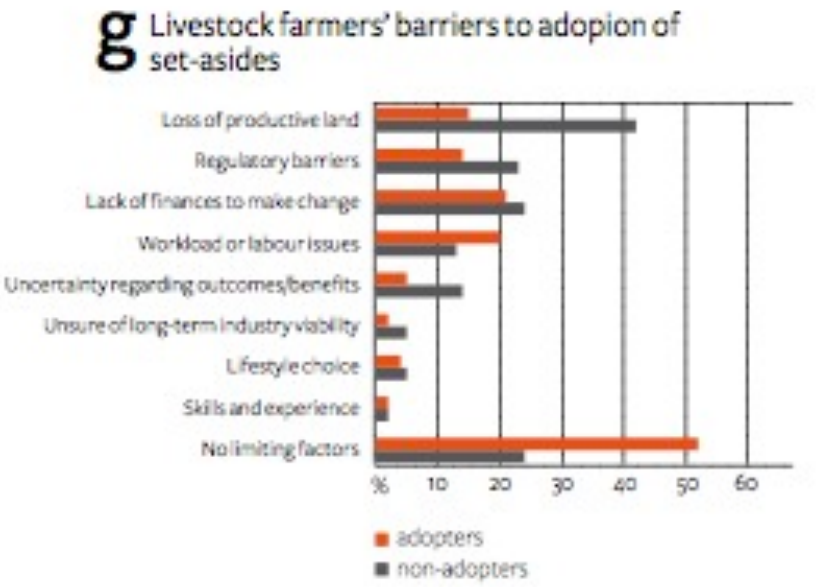
Link to PDF

Excerpt:

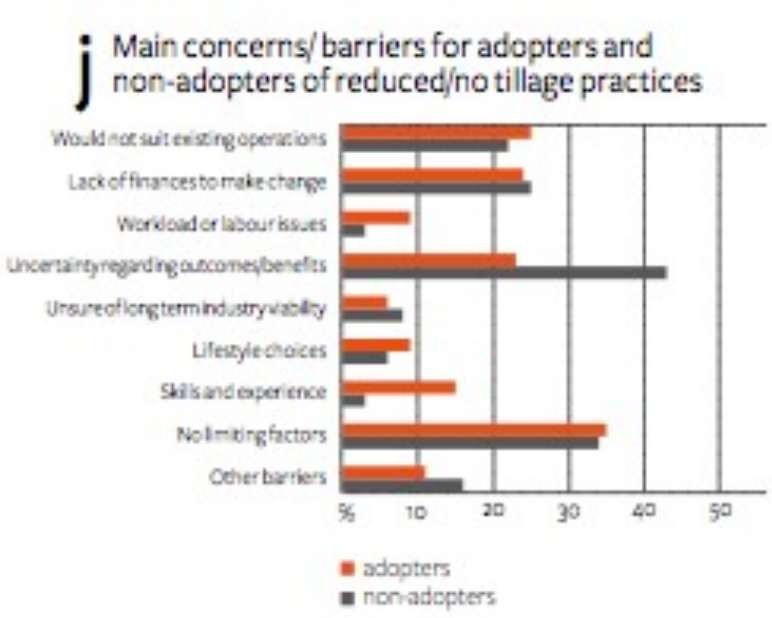
This report presents the results from a survey of Australian broadacre farmers' use of sustainable land management practices. The National Land and Water Resources Audit (NLWRA) commissioned ABARE to design and conduct a national survey to collect data on farmers' adoption of specified natural resource management and business management practices.

An understanding of land managers' willingness and capacity to adopt improved natural resource management (NRM) practices is important for policy and program-makers when developing and promoting NRM initiatives (NLWRA 2005; Nelson et al. 2006). **Critical to this understanding are the social and economic dimensions underpinning land managers' circumstances and decision-making.**

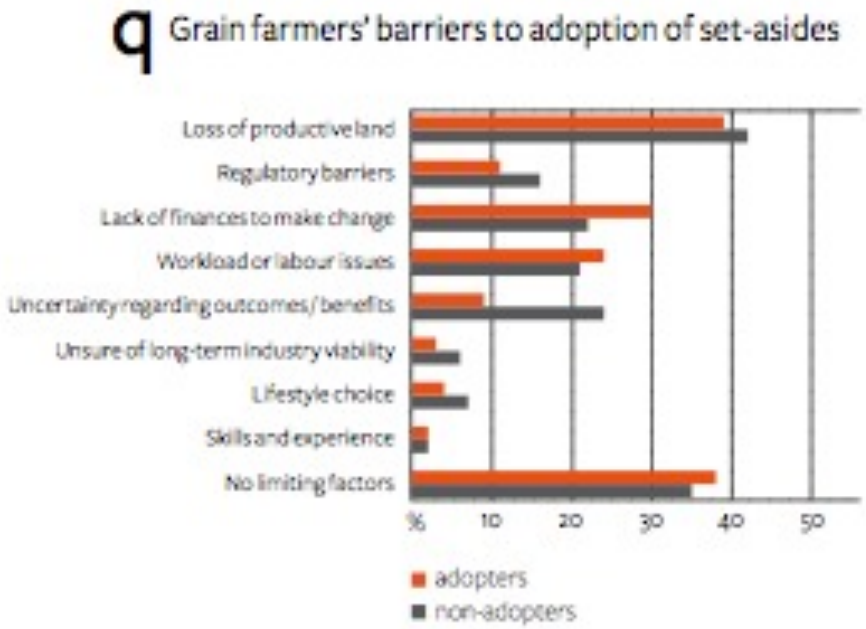
...Livestock farmers' barriers to adding conservation set-aside...



...Main concerns/barriers for adopters and non-adopters of reduced/no tillage practices



...Grain farmers' barriers to adding conservation set-asides



3.2.8 Food for Thought

Biodiversity Management on Farms - Links to Demand-Driven Value Chains

Kerry Bridle and Laurie Bonney

Social Alternatives, 2010, 29(3), 31-38.

Link to PDF

Abstract:

Traditionally agricultural production in western countries has been driven by commodity markets, where farmers are price-takers, dependent on market demands. Agricultural intensification combined with the globalisation of markets and declining terms of trade for many farmers have all impacted on farm land management decisions, which in turn had impacts on biodiversity. Globally the production of food and fibre has had detrimental impacts on the environment. Native vegetation clearance and the intensification of agricultural land management in Australia have adversely affected native biodiversity. The pressure on farmers to produce low-cost commodities has a biodiversity cost, one that is driven ultimately by internal and external factors, including consumer demands. This paper discusses the known and potential impacts of food and fibre production on biodiversity, and the consequences of consumer demand for quality, low cost produce.

Buying the environment - increasing stewardship payments for biodiversity

Consumers contribute to biodiversity on farms indirectly through taxation, a small proportion of which is spent on land stewardship payments. Such payments are common in both the EU and the US, and are increasing in Australia (Hajkowicz 2009). Australian models focus on components of the landscape (traditionally native vegetation) while the EU model focuses on landscapes and ecosystem services.

Very little attention has been given to farming landscape design in Australia, particularly the manipulation of paddock boundaries for biodiversity gains (e.g. IPM Nicolson 2008). In Australia a subset of ecosystem services deemed ‘duty of care’ is seen to be the responsibility of the land manager, covering issues such as the prevention of soil erosion, weeds and water quality. Recently, calls have been made for Australian policy to address multifunctional landscapes rather than focusing on the location and connectivity of native vegetation patches

The Caring for Our Country Initiative has begun to address broadscale environmental stewardship issues such as soil erosion (Commonwealth of Australia 2010). However, it is likely that biodiversity conservation agreements will remain focused on native ecosystems, particularly threatened species and communities.

Stewardship payments by government are likely to be the most successful mechanism in delivering change to farming practices in the near future. However a broad-based change in consumer behaviour is also required, using all components of the value chain to develop markets that recognise and reward sustainable agricultural practices.

3.2.9 Implementing a Relational Worldview: Watershed Torbay, Western Australia

Connecting Community and Place

Marie-Louise Duxbury

This thesis is presented for the degree of Doctor of Philosophy of Murdoch University

2007.

Link to PDF

Excerpt:

...In this final chapter I have attempted to show how the relational worldview has relevance beyond the individual Watershed Torbay project. While tension between the mechanistic worldview and the landcare ethic, commensurate with the relational worldview, continues in the policies and programs of government and business, regional natural resource management bodies do have opportunity to implement regional strategies aiming for sustainability. **Recognition of the tensions between approaches is the first critical step. Taking a deliberate worldview – and through this thesis the relational worldview is proffered – will assist regional bodies understand the conflicts in values that arise within a larger framework. It will need to be driven by local and regional community action, recognising that bureaucracies and politicians are rarely the initiators of change but are key partners to it...**

Note: See the Torbay catchment survey on page 357 of the thesis.

3.2.10 Landcare, Stewardship and Sustainable Agriculture in Australia

Allan Curtis and Terry De Lacy

Environmental Values (1998) 7, 59-78.

Link to PDF

Abstract:

There are over 2,500 "landcare" groups with 65,000 members operating across Australia. With considerable evidence of program impact, "landcare" is an important example of state-sponsored community participation in natural resource management. However, the authors **suggest excessive emphasis has been placed upon attitudinal change-the development of landholder stewardship, as the lever for effecting major changes in land management. Analysis of data from a landholder survey failed to establish predicted stewardship differences between "landcare" and "nonlandcare" respondents or between those who joined early/late, or participated more/less in group activities. And there was no relationship between stewardship and adoption for most of the sustainable agriculture practices surveyed. Further analysis clearly linked Landcare participation and concern about the environmental and economic impacts of land degradation. Whilst respondents were significantly more concerned about economic impacts, research findings were consistent with earlier work indicating that most land managers have a strong stewardship ethic.** The authors also suggest that concerns that Landcare is not addressing biodiversity conservation are largely unjustified and reflect urealistic expectations of these voluntary groups.

3.2.11 Partnerships and Understanding Towards Targeted Implementation (PUTTI)

CSIRO

2009.

PUTTI Final Report: Conditions Underpinning the Voluntary Adoption of Sustainable Land Management Practice

PUTTI : Landscapes and Livelihoods: Community Requirements for Sustainable Change

PUTTI: Attitudinal Modelling and Monitoring of Factors Influencing Land Management Practice in the Central West and Lachlan Catchments

PUTTI: Social Networks and Environmentally Sustainable Land Management

Identifying Factors Influencing Land Management Practice

Identifying Factors Influencing Land Management Practices in the Lachlan Catchment

Overview:

Partnerships and Understanding Towards Targeted Implementation (PUTTI) is a three-year flagship study which helped Catchment Management Authorities in the Central West region of NSW tailor their approaches to support the uptake of improved natural resource management techniques by landholders.

The study included behavioural modelling to understand the key factors influencing landholder decisions, and a series of workshops investigating the future of landscapes and livelihoods from the perspective of landholder groups.

The research, completed in late 2009, found that the more **in control landholders felt over events or outcomes, the more they were willing to try new approaches to environmentally sustainable practices related to soil, weeds, vegetation, stock, perennial, and native vegetation management.**

Landholders who felt in control were also more likely to be more innovative or take risks in their production techniques.

The outcomes from this project are being incorporated into the day-to-day management practices of Catchment Management Authorities.

Several Landcare groups are also using the insights offered by the workshops to identify and pursue their approaches to natural resource management.

3.2.12 Social Atlas for Sustainable Management

A Social and Economic Database for the National Land and Water Resources Audit

John Cary, Shannon Kelson and Heather Aslin

Bureau of Rural Sciences (BRS), Commonwealth Department of Agriculture, Fisheries and Forestry, Australia.

March 2001.

Link to PDF

Executive Summary:

...In this atlas, a set of possible indicators of ability to change identified by Fenton et al. (2000) in an earlier Audit report has been applied. Applying these indicators has involved identifying data sources for as many indicators as possible, and depicting relevant data in map form, accompanied by charts giving further details of the data underlying maps. In particular, the charts give information about the sizes of the Relative Standard Errors (RSEs) for ABARE data, which are derived from survey samples. The size of RSEs for the relevant data sets should be taken into account in interpreting the maps. Large RSEs suggest the need for caution in interpretation...

See also "Human and Social Aspects of Capacity to Change Sustainable Management Practices".

3.2.13 Social Issues in Asset-Based Management of Dryland Salinity

Case Studies of Commercial and Lifestyle Landholders in North Central Victoria and the South Coast of Western Australia

Roger Wilkinson

Department of Primary Industries, Victoria and CRC for Plant-Based Management of Dryland Salinity

August 2007.

Link to PDF

Excerpt:

...Not surprisingly, many of the landholders I interviewed responded favourably to discussion of incentives. After all, the offer of having someone else help you to pay for something is attractive. **For an incentive program to be effective it must be flexible. Incentives may be used to encourage landholders to try a new practice, to do something new over a larger area than they might have otherwise, or to roll out a management change faster than they might have. Pannell (2006) highlighted that the incentives generally offered by regional NRM bodies (small temporary payments) are most likely to be useful for accelerating activities that the landholder was going to do anyway**. Several of the interviewees made comments that this was indeed the effect of the offered incentives.

Commercial landholders often need a financial incentive to convince them to try something about which they may be wavering, or might not even have considered. The incentive acts as a little push, and once they have tried the practice it is hoped that they will continue with it on their own. For the incentive to have this effect, the practice must be seen by the landholder to be beneficial.

Lifestyle landholders have different needs. Those for whom land management is something new and perhaps even a bit scary need a combination of awareness raising, information provision, technical support, and sometimes a financial incentive. They almost need the project to be organised for them. An incentive alone is not enough. Other lifestyle landholders (and some commercial landholders) are keen to do the project anyway, and for them the role of incentives is to speed up their adoption. People know that incentives come with responsibility. Because landholders can't control their environment, they want to be rewarded for their behaviours, rather than their outcomes. **Not all landholders will respond to incentives. Several Lake Warden landholders felt that accepting incentive payments from government meant giving up full control of their properties. Only some of these landholders were anti-government: and several of them would have quite happily accepted extension advice but wanted to fund all the investments themselves...**

3.2.14 Understanding and Promoting Adoption of Conservation Practices by Rural Landholders

David J. Pannell, Graham R. Marshall , Neil Barr, Allan Curtis, Frank Vanclay and Roger Wilkinson

Australian Journal of Experimental Agriculture (2006). 46, 1407-1424.

Link to Website:

Abstract:

Research on adoption of rural innovations is reviewed and interpreted through a cross-disciplinary lens to provide practical guidance for research, extension and policy relating to conservation practices. Adoption of innovations by landholders is presented as a dynamic learning process. Adoption depends on a range of personal, social, cultural and economic factors, as well as on characteristics of the innovation itself. **Adoption occurs when the landholder perceives that the innovation in question will enhance the achievement of their personal goals. A range of goals is identifiable among landholders, including economic, social and environmental goals. Innovations are more likely to be adopted when they have a high 'relative advantage' (perceived superiority to the idea or practice that it supersedes), and when they are readily trialable (easy to test and learn about prior to adoption). Non-adoption or low adoption of a number of conservation practices is readily explicable in terms of their failure to provide a relative advantage (particularly in economic terms), and/or a range of difficulties that landholders may have in trialing them.**

Excerpt:

...The process of learning and experience to inform adoption decisions

Adoption is a learning process with 2 distinct aspects (Abadi Ghadim and Pannell 1999). One is the collection, integration and evaluation of new information to allow better decisions about the innovation. Early in the process, the landholder's uncertainty about the innovation is high, and the quality of decision making may be low. As the process continues, if it proceeds at all, uncertainty is reduced and better decisions can be made (Marra *et al.* 2003). **At least for relatively simple innovations, a landholder's probability of making a good decision – one that best advances their goals – increases over time with increasing knowledge of, and perhaps experience with, the practice. Viewed in this light, the adoption process is never completed, in the sense of eliminating all uncertainty. All options are continuously open to question and review as new information is obtained and/or circumstances change.**

The other aspect of learning is improvement in the landholder's skills in applying the innovation to their own situation (Tsur *et al.* 1990; Abadi Ghadim and Pannell 1999). **Most farming innovations require a certain level of knowledge and skill to apply them in practice and there can be a wealth of choices in the method of implementation (e.g. timing, sequencing, intensity, scale). Through learning-by-doing, as well as by reading, listening and watching, the necessary skills can be established and enhanced.**

This dynamic process has been broken down into stages or phases in a number of different (though similar) ways (e.g. Lindner *et al.* 1982; Pannell 1999; Barr and Cary 2000; Rogers 2003). One typical description of the sequence follows.

(i) ***Awareness of the problem or opportunity*:** In this context, 'awareness' means not just awareness that an innovation exists, but that it is potentially of practical relevance to the landholder. There has been relatively little research on the transition from ignorance to awareness. Gibbs *et al.* (1987) found that the time taken for different farmers in South Australia to become aware of the existence of new innovations varied markedly. For

many farmers it amounted to years despite the presence of extension activities designed specifically to raise awareness.

(ii) ***Non-trial evaluation***: Reaching stage (i), the point of awareness, is a trigger that prompts the landholder to begin noting and collecting information about the innovation in order to inform the decision about whether or not to go to the next step of trialing the innovation. Conducting a trial incurs costs of time, energy, finance and land that could be used productively for other purposes. To be willing to trial an innovation, the landholder's perceptions of it must be sufficiently positive to believe that there is a reasonable chance of adopting it in the long run.

(iii) ***Trial evaluation***: Trials contribute substantially to both the decision making and skill development aspects of the learning process. If small-scale trials are not possible or not enlightening for some reason, the chances of widespread adoption are greatly diminished. Landholders will be cautious about leaping to full-scale adoption due to the risk that the innovation will prove a full-scale failure. Untrialable practices may still be adopted (rotary milking platforms are one example), but generally only after substantial information-seeking, discussion, analysis and reflection.

(iv) ***Adoption*:** Depending on the trial results, use of the innovation may be scaled up. Typically, adoption is not an all-or-nothing decision – there is a grey area between small-scale trialing and the eventual scale of adoption (Duncan 1969). Adoption is often a continuous process, and may occur in a gradual or stepwise manner, sometimes ending in only partial adoption (Wilkinson 1989). Landholders often change and modify the practice or technology to adapt it to their own circumstances. Indeed, such adaptation is often an important outcome of the trialing process.

(v) ***Review and modification***. As noted earlier, in one sense, trialing is never completed, as landholders continue to evaluate the performances of all their practices. However, as the scale of use of an innovation increases, the balance of reasons for using the practice shifts from mainly evaluation to mainly beneficial use. Even after adoption peaks, there is a continuous process of review and modification.

(vi) ***Non-adoption or dis-adoption***: If external information or local trial results are not sufficiently encouraging (i.e. it appears that the landholder's goals will not be advanced by the innovation), the landholder will reject the innovation. If it is initially adopted but then, say, economic circumstances change or a superior replacement technology or practice becomes available, use of the original innovation may be scaled down and eventually discontinued.

The knowledge that is developed through this process is held by the landholder and is likely to be unique to them, to some extent. It will probably be based on a mixture of scientific information, personal experience, and cultural influences. Culture includes laws, social norms, ideologies and other human-devised factors that influence behaviour. The culture of landholders is the result of a rich history and it is dynamic, being continually modified by many factors...

...Implications for policy and for regional bodies

As noted in the introduction, some government officers express frustration at the lack of adoption by landholders of conservation practices and call for additional social research to better understand adoption. Sometimes it can be helpful to better understand the adoption of specific practices, but the influences on adoption in general have been studied intensely and we believe that they are sufficiently well understood. Rather than more research into adoption, the more pressing need is to apply what is already well established in the adoption literature.

As we have seen, one implication is that if a practice is not adopted in the long term, it is because landholders are not convinced that it advances their goals sufficiently to outweigh its costs. A

consequence of this is that we should avoid putting the main burden for promoting adoption onto communication, education and persuasion activities. This strategy is unfortunately common, but is destined to fail if the innovations being promoted are not sufficiently attractive to the target audience. The innovations need to be 'adoptable'. If they are not, then communication and education activities will simply confirm a landholder's decision not to adopt, as well as degrade the social standing of the field agents of the organisation. Extension providers should invest time and resources in attempting to ascertain whether an innovation is adoptable *before* proceeding with extension to promote its uptake.

For some environmental issues, the real challenge is to find or develop innovations that are not only good for the environment, but also **economically superior to the practices they are supposed to replace**. If such innovations cannot be identified or developed, there is no point in falling back onto communication. **Promoting inferior practices will only lead to frustration for all parties.**

Sometimes unattractive practices can be made sufficiently attractive by the provision of financial incentive payments (e.g. through economic policy instruments). However, it is important to be realistic about the potential of this approach. **In some cases, the level of payment required to achieve sufficient adoption would be more than can be justified by the resulting environmental benefits (e.g. Pannell 2001*a*). In some situations, the most sensible strategy is *not* to attempt to encourage uptake of existing technologies or systems. Rather, it may be more sensible to attempt to develop better practices (more effective and/or more adoptable), or it may be that research and policy needs to address the task of living with the problem.**

In conclusion, we set out to provide an integrated review of several disciplinary literatures on the adoption of conservation practices by rural landholders. We found that many of the findings and perspectives of our separate disciplines are consistent and readily translatable across disciplinary boundaries. We discussed these findings in three broad groupings: those relating to adoption as a process of learning, those relating to characteristics of potential adopters, and those relating to characteristics of the conservation practice. **In general, adoption of conservation practices is complex and multifaceted, but it is, nevertheless, reasonably well studied and understood. In light of the literature, the disappointing levels of adoption of conservation practices that are often observed are readily explicable in terms of characteristics of the learning process, the potential adopters or the conservation practices.** We have identified a number of important implications of the review for research, extension and policy...

3.2.15 Understanding Land Manager Constraints to the Adoption of Changed Practices

or Technological Innovations: Literature Review

Jeanette Stanley, Beth Clouston and Ray Baker

Working Paper No. 1 from the Project "Impediments to the Uptake of Market Based Instruments"

2008?

Link to PDF

Abstract:

The purpose of this working paper is to review the literature to identify what has been learnt about the social and economic factors that constrain land managers from participating in natural resource management activities or adopting changed practices and technological innovations.

The paper explores two distinct categories of constraints. The first category includes the characteristics of the innovation or practice itself that might influence participation including the methods of implementing the innovation. The second category explores the characteristics of the individuals or communities expected to implement the innovation or changed practice. The factors explored range from socio-demographic characteristics, attitudinal factors, knowledge constraints, the practice of succession, a land manager's financial 'health', and the stock of social capital residing at the community scale, and how each of these factors more or less influences adoption of changed practices at the land manager level.

The working paper is the first in a series of papers tackling the issue of land manager participation in market-based instrument (MBI) or other incentive programs. The assumption on which this paper is based is that the first step in designing any incentive program to facilitate change is developing an understanding of the factors that are constraining a land manager from adopting the desired behavioural or practice change independently of institutional interference. It is these constraints that can then be addressed with an incentive program.

The findings suggest that a mix of policy tools that are directly targeted at the social and economic factors that influence land manager behaviour, can begin to address those that act as constraints, promote those that act as positive drivers and ultimately increase the likelihood of land managers engaging with natural resource management or adopting changed practices.

While there are MBIs and other instruments available to achieve these objectives, involvement in these programs remains low, so the environmental objectives are often not achieved. Understanding *why* participation remains low, and using this

Information to inform the design, and promotion of MBI or other incentive programs are the key objective of this research project. Hence, the second paper in the series explores the emerging literature to identify what has been learnt about how to design and implement MBIs and incentive programs to achieve maximum participation of farmers.

See also "Encouraging Participation in Market Based Instruments and Incentive Programs"

3.2.16 Will Farmers Trade Profits for Stewardship?

Heterogeneous Motivations for Farm Practice Selection

Hayley H. Chouinard, Tobias Paterson, Philip R. Wandschneider, and Adrienne M. Ohler

Land Economics (2008). 84(1), 66-82.

Link to PDF

Abstract:

We investigate the trade-off agricultural producers face between profits and stewardly activities when selecting farm practices. Instead of the profit-maximization framework, we model producer behavior in an expanded utility framework, built on production technology, and including two utility components: self and social interests. The framework introduces inherent heterogeneity and social/environmental motivations into farmer behavior. Based on this model, we hypothesize that there are farmers that are willing to forego some profit to engage in stewardly farm practices. With an empirical study, we provide evidence that some farmers are willing to make this sacrifice. Results are consistent with the multi-utility hypothesis.

Excerpt:

...Using this model we can identify two additional types of farmers. **One type of farmer maximizes ego-utility, where her utility derives from both farm financial returns and from positive personal (hedonic) environmental impacts. This farmer values environmental effects only to the extent that they provide direct personal benefits, such as recreational opportunities or a good view. We suggest another type of farmer exists who has at least two dimensions to her utility, an ego-utility dimension and a social or stewardly dimension. While our model might admit a pure steward, we have assumed that a pure-utility maximizing farmer does not exist; stewards are a blend of ego and social utility...**

4. Tools for Sustainable Land Management and Biodiversity Measures

4.1 New Zealand

4.1.1 100% Conjecture: Participative Games on Sustainable Futures for New Zealand

Landcare Research

October 2008.

Link to URL

Overview:

The marketing image of New Zealand used overseas, of 100% Pure NZ, implying *clean and green*, conceals a growing domestic debate about the nation's environmental and socio-economic sustainability.

What differing futures might we have in store, and which of these would you find more- or less-desirable directions for our country, over the next 50 years?

Manaaki Whenua - Landcare Research has been developing four contrasting future possibilities for NZ since 2004, to contribute to a future choices debate. None of these possibilities are predictions, or favourites, but each is plausible and has recognizable roots in today's experiences. As part of this continuing research, participative games (Classic Edition, Urban Edition, Biodiversity Edition) for groups, taking a few hours, have been developed. **They stimulate strategic-thinking on sustainability, and people's interest in future directions for New Zealand, and are available free.**

4.1.2 Adapting Farm Systems in the Starborough-Flaxbourne District to a Drier Future

Graeme Ogle

2008?

Link to PDF

Overview:

This project was fortunate to be able to study a farm system that has adapted to maintain business profitability and start the process of repairing hill slope erosion.

4.1.3 An Examination of the Use of a Human Behaviour Model for Natural Resource Policy Design

...and Implementation by Government (Central and Regional) Agencies

T. Parminter

A thesis submitted for the degree of Doctor of Philosophy in Management Systems at The University of Waikato .

2008.

Link to PDF

Abstract:

...This has been a quantitative study to develop and test models of human behaviour specific to the preservation of indigenous vegetation. Three data sets were compared from surveys of peoples' bush protection behaviour, the establishment of indigenous woodlots and the protection and planting of riparian areas with indigenous vegetation...

See survey questions p. 362.

4.1.4 Answers to Frequently Asked Questions on Riparian Management

John Quinn and Lucy McKergow

Prepared for Hawkes Bay Regional Council

NIWA Client Report: HAM2007-072

NIWA Project: ELF07272

June 2007.

Link to PDF

Overview:

A set of frequently asked questions (FAQs) about riparian management was developed by Hawkes Bay Regional Council staff to guide preparation of resources for a training workshop on targeted riparian management in Napier on 8-9 May 2007. The answers to these questions, developed by the course presenters in consultation with NIWA colleagues, provide a resource that is likely to be useful to land and water managers, policy makers, land owners and the public. The answers aim to briefly summarise the state of knowledge on key questions about riparian management identified by council staff.

4.1.5 Aorere Catchment Project

A Community Approach to Improving Catchment Wellbeing

NZ Landcare Trust

2009?

Link to PDF - Project summary and key milestones

Link to PDF - Aorere our river our future

Overview:

This Sustainable Farming Fund project, based in the Golden Bay area of the Tasman District, focuses on understanding water quality issues and their impact for wider catchment / farming sustainability. The work was originally sparked by aquaculture industry concerns following reduced harvest opportunities, linked to declining water quality.

The project has been running since July 2006 and considerable progress has been made. Reduced 'run off' from dairy farming activity has resulted in improved water quality which in turn has improved harvesting opportunities for the aquaculture industry.

A celebration took place in November 2008, in the form of a lunch, where guests enjoyed shellfish chowder and fine cheese.

The project has gone from strength to strength and has received considerable media attention, attracting the attention of Minister for the Environment Dr. Nick Smith.

On Friday 26th June 2009, Dr. Smith along with 70 guests from the local community, Fonterra, DairyNZ, Fish and Game, Tasman District Council, and Ministry of Agriculture and Forestry attended another celebration of the great work undertaken by the community - link to article>.

The celebrations include the publication of a booklet entitled 'Aorere Our River Our Future', available for download above.

The success of the project was reflected in the 'Deputy Director General of Ministry of Agriculture and Forestry's' announcement of a further $259,000 grant over 3 years.

4.1.6 Best Management Practices for Enhancing Water Quality in the Waikato

NZ Landcare Trust

Link to PDF

Overview:

'Best Management Practices for Enhancing Water Quality in the Waikato' has been designed to showcase some of the excellent work undertaken by Waikato farmers.

Eight Case Studies demonstrate how to farm profitably while reducing the adverse environmental effects often associated with modern farming. Thanks to their vision these farmers are already making a big difference. They have also made a great investment for the future, ensuring their children have the opportunity to farm sustainably in years to come.

The booklet also contains general information including an outline of Waikato's unique landscape, explores what is meant by the term sustainable land management and contains a handy BMP's checklist.

4.1.7 Best Practice Dairy Catchments Study

Summary Report to SFF

R. Monaghan, B. Wilcock, C. Smith, D. Houlbrooke, A. McGowan, J. Quinn, M. Bramley, C. Rutherford, and S. Cotton.

June 2009.

Link to PDF

Summary:

There is increasing concern, expressed both locally and nationally, about the negative effects that intensive farming can have on the environment. Whilst research shows that dairy cows are never the sole contributor to any issue, and there is wide acknowledgement of the key economic and social benefits of the industry, there is also recognition that certain landuse practices on dairy farms can result in degraded water quality. Five predominantly-dairy farming catchments are being monitored on behalf of the NZ dairy industry to benchmark soil and water resource status for a well-defined set of land management activities. Where improved water quality status in these catchments has been sought, BMPs have been recommended based upon (i) understanding the linkages between water quality and how farms are managed, (ii) their cost-effectiveness, and (iii) appreciating the importance of farm context when mitigation measures are being deliberated. **Research indicates that the adoption of targeted BMPs are likely to deliver significant improvements in the environmental performance of dairy farms within the catchments.** Farm Planning and extension initiatives centred on the 5 study catchments have contributed to some observed improvements in management practices and catchment water quality. This can be regarded as a significant success, given the on-going intensification of farming systems that has occurred over the life of the project.

4.1.8 Biodiversity on Farmland: Good Management Practices

A Report on Research on the Enhancement of Biodiversity on Farmland

Ministry for the Environment, Selwyn Sustainable Agriculture Society Inc, Watties, Agriculture New Zealand, Lincoln University, Foundation for Research Science and Technology and others.

2003.

Link to PDF

Introduction:

This booklet is produced for New Zealand farmers and other land owners to demonstrate how biodiversity can be enhanced to give multi-value benefits for production, conservation, recreation, historical, cultural, aesthetic and Maori needs. It is an outcome of the "Strategies to Enhance Biodiversity on Mixed Cropping Farms" project (1999 – 2003), funded by the Ministry for the Environment (MfE) Sustainable Management Fund. The project was run in conjunction with the Selwyn Sustainable Agriculture Society Inc. (SSAS) and key partners Lincoln University, Heinz Wattie's Ltd. and Agriculture New Zealand.

The aim of this project has been to create and put into practice farm biodiversity plans at two sites in New Zealand for research, demonstration and technology transfer. The first site is Kowhai Farm, Heinz Wattie's Organic Farm at Lincoln University in Canterbury and the second is a commercial farm near Gisborne in Tairawhiti. The project has demonstrated multi-value biodiversity with a strong emphasis on Functional Agricultural Biodiversity (FAB) by identifying those aspects of biodiversity which can be enhanced or added to a cropping system to improve "ecosystem services" (ES). **These services can be wide ranging in type and provide agricultural benefits below and above ground in crops, other production areas, fence-line margins and recreation areas. They include pollination, biological control of pests, diseases and weeds, mineralization of nutrients from decaying plant residues, shelter for livestock. They also include the capture of carbon from the air, which is relevant to the 'Kyoto Protocol' relating to the burning of fossil fuels and enhanced global carbon dioxide concentrations (see Box 1). The information in this booklet records the activities, outcomes and recommendations of the project in Tairawhiti and Canterbury.** This booklet also includes work on assessing and enhancing ES on farmland, funded by the Foundation for Research, Science and Technology (FRST) via programme LINX 0303: "Biodiversity, ecosystem services and sustainable agriculture".

4.1.9 Biodiversity Strategy for the Canterbury Region

Environment Canterbury

March 2008.

Link to PDF

Overview:

The Strategy applies to the entire Canterbury region, which stretches from the Clarence River/Waiau-toa catchment in the north to the Waitaki River catchment in the south, and from the Southern Alps and inland Kaikoura ranges in the west to the outer edge of the Coastal Marine Area (the '12 mile limit') in the east. It is a non-statutory document, intended to sit alongside existing statutory and other instruments relating to biodiversity, and it will contribute, at a regional level, towards achieving the goals of the New Zealand Biodiversity Strategy. It takes a long-term approach, but will be reviewed on a 5 yearly basis.

The purpose of the Strategy is to provide guidance and a common focus for policy and decision making, resource allocation, voluntary effort, and on-the-ground projects and initiatives relating to biodiversity management in the region. It aims to build on the good work already occurring, to raise awareness of biodiversity values, to facilitate the coordination of agency effort through synergies and partnerships, and to support and encourage the efforts of communities and individuals.

The Strategy establishes a common Vision and a number of Goals. It identifies the actions we need to take to achieve those goals together, identifies who has a role to play in those actions, and provides the framework for the development of specific action plans. It establishes a strategic approach built around the general concept of first protecting what remains, and secondly restoring what has been lost, and identifies priorities on this basis.

4.1.10 Collaboration and Modelling - Tools for Integration in the Motueka Catchment, New Zealand

Andrew Fenemor, Neil Deans, Tim Davie, Will Allen, John Dymond, Margaret Kilvington, Chris Philips, Les Basher, Paul Gillespie, Roger Young, Jim Sinner, Garth Harmsworth, Maggie Atkinson and Rob Smith

Water SA (Special HELP edition.) (2008), 34(4), 448 - 445.

Link to PDF

Abstract:

A conceptual model of integrated catchment management (ICM) is presented in which ICM is defined as a process to achieve both ecosystem resilience and community resilience. It requires not only biophysical knowledge developed by hydrologists and other environmental scientists, but an active partnership with catchment communities and stakeholders to break the 'paradigm lock' described by the UNESCO-HELP programme.

This paper reports observations from ICM research in the Motueka HELP demonstration basin in the upper South Island of New Zealand. The Motueka occupies 2 170 km_2 of land yet the river effects are felt on the seabed more than 50 km_2 offshore, so the true 'catchment' is larger. A hydrologically temperate mountainous catchment with horticultural, agricultural, plantation forestry and conservation land uses, the Motueka also hosts an internationally recognised brown trout fishery. Land and water management issues driving ICM research include water allocation conflicts between instream and irrigation water uses, impacts on water quality of runoff from intensifying land uses, catchment impacts on coastal productivity and aquaculture, and how to manage catchment processes in an integrated way that addresses cumulative effects of development.

Collaboration with catchment stakeholders can be viewed as having two primary purposes:

- **Building knowledge and commitment of resource users towards sustainable resource management (collaborative learning)**
- **Stakeholder involvement in resource management itself (governance).**

Examples are presented of a Collaborative Learning Group on Sediment learning of their differing perspectives on fine sediment impacts, and a Catchment Landcare Group working with scientists to improve water quality in their river. **Success factors for water user committees making decisions about water resource management include creating opportunities to communicate and build trust, share scientific knowledge on the issue, and willingness to compromise.** Functioning catchment groups have potential to take on delegated governance responsibility for meeting agreed water quality and other community goals. Finally a scenario modelling framework IDEAS (Integrated Dynamic Environmental Assessment System) is presented, in which environmental indicators such as nutrient fluxes are simulated alongside socio-economic indicators such as job numbers and catchment GDP for a range of land and marine use options.

4.1.11 Co-Operation, Capacity and Charisma

Enhancing the Hauraki Gulf Environment Through Non-Regulatory Approaches

Hauraki Gulf Forum

2010.

Link to PDF

The Hauraki Gulf Forum commissioned this report to better understand how non regulatory approaches can improve environmental outcomes in Tikapa Moana — Hauraki Gulf (the Gulf). While statutes and regulations relevant to the Gulf are generally well known, non regulatory activities making a positive difference to Gulf ecosystems and coastal regions internationally are a greyer area. **This report shines a light on this situation by describing coastal management and non regulatory activity in this context, identifying some non regulatory approaches that hold promise for the Gulf, outlining some of the non-regulatory activity occurring in the Gulf and Hauraki Gulf Forum (HGF) member views on this activity, presenting good practice when evaluating such approaches and overall key messages for HGF members and partners.**

4.1.12 Creative Platforms for Social Learning in ICM: the Watershed Talk Project

M. Kilvington, M. Atkinson and A. Fenemor

New Zealand Journal of Marine and Freshwater Research (2011). 45(3), 557-571.

See Appendix One for full text of paper.

Abstract:

Watershed Talk was an action research project within the Motueka-based integrated catchment management research programme. It explored processes of dialogue between catchment residents, scientists and resource managers, and examined how design of creative processes can shift people's understanding and develop their capacity to address the complex environ- mental issues that they face. The project was highly reflective, and examined the potential transformative power of constructive conversation and the means by which social learning platforms can affect the legacy of skills, knowledge and enthusiasm for action amongst participants. **Three important elements for the design of platforms for social learning were identified: (1) the value of using principles to guide process design; (2) the potential outcomes from using creative approaches to generate dialogue; and (3) the importance of integrating evaluation and reflection into platform design to both manage the platform and to help cement new learning amongst participants.** This paper outlines the fundamental aspects of the Watershed Talk platform design, its implementation, and conclusions drawn from evaluation of the experience.

4.1.13 Developing an Institutional Model for the Extension and Adoption of Environmental Best

Management Practices by Pastoral Farmers in New Zealand

Philip Journeaux

This report has been produced as part of the requirement for the executive Master of Business Administration, University of Waikato.

June 2009.

Link to PDF

Abstract:

The practice of extension of environmental Best Management Practices (BMPs) involves the integration of a range of complex issues. Currently the practice of this in New Zealand is somewhat piece-meal, ad-hoc, and not well coordinated amongst the organisations involved. There is also a strong rationale for Government involvement. This paper discusses these issues and proposes a way forward.

4.1.14 Enhancing Waterways for Native Freshwater Fish

Environment Canterbury

200?

Link to PDF

Excerpt:

...Actions you can take include:

- Preventing stock access to rivers and estuarine rush areas (eg fencing).
- Protecting and enhancing stream margin vegetation, especially sedges, rushes and native bush.
- Not introducing exotic fish, such as trout, if possible. Trout feed on native fish.
- Restoring and enhancing existing wetlands.
- Renovating or removing badly designed culverts, dams or weirs which prevent fish migration.
- Maintaining stream flows at levels which fish can survive and breed in.
- Being careful not to spread exotic waterweeds which can take over waterways and destroy fish habitat.
- Enhancing passageways to preferable fish habitats as this is as important as creating the habitats themselves.
- Considering the habitat needs of fish when clearing water weeds...

4.1.15 Establishing Native Plants in a Weedy Riparian Environment

S.J. Smaill, N. Ledgard , E.R. Langer, and D. Henley

New Zealand Journal of Marine and Freshwater Research (2011). 45(3), 357-367.

See Appendix One for full text of paper.

Abstract:

Riparian zones are important for influencing stream habitat and water quality. Efforts to populate these areas with native species are frequently hindered by fast-growing weed species. A trial was installed to examine riparian establishment alongside the Sherry River in the Motueka river catchment with seven native species and four weed-control treatments. After 2 years, herbicide use significantly improved seedling survival compared with the other weed-control treatments, but weed mats promoted greater seedling height and crown diameter growth. Seedling survival and growth varied significantly with species. **After comparisons of costs and practical issues, weed mats were concluded to provide the most suitable weed control. Cordyline australis had the highest survival rate, developed the most crown area and performed well in terms of height increment; Pittosporum tenuifolium and Plagianthus regius also performed well.** All three native species are recommended for use in further plantings at this and other similar locations.

4.1.16 Evaluation of the Integrated Catchment Management Pilot Project

Ruth Hungerford

Environment Waikato Technical Report 2009/17 Final Report

June 2009.

Link to PDF

Excerpt:

Managing the water quality of the region's waterways is an important aspect of the work of Environment Waikato. In 2006, Environment Waikato identified that agricultural practices were contributing to rising nutrient levels within the region's waterways, and particularly within the Waikato hydro lakes. In response, they launched a three year intensive policy implementation pilot process, the Integrated Catchment Management (ICM) pilot project, within two of the region's sub-catchments. The objective of the ICM pilot project was to investigate the potential effectiveness of ICM approaches in achieving sustainable improvements in water quality.

...Recommendations for future or similar projects

It **is recommended that:**

- **When planning an ICM project, projects should:**
  - **plan for lead-in time (estimate 12 months minimum); expect some initial suspicion and facilitate trust by providing credible information from reliable sources;**
  - **plan to consult and allow time for engagement and acceptance;**
  - **gather some information about the community (for example, what is important to them, what resources they have, what are their social dynamics) prior to entering the community;**
  - **consider a targeted approach (for example target farms by farming operation or land area or by those with direct access to waterways);**
- **When undertaking a ICM project, projects should:**
  - **be flexible and be able to adjust timeframes and expectations in response to developments on the ground;**
  - **ensure that on the ground staff are knowledgeable about the issues and their practical application, and are skilled at relationship building;**
  - **improve internal integration particularly in situations of compliance;**
  - **include formative and process evaluation activities to monitor progress and provide data to improve and manage risk**.

4.1.17 Facilitating Voluntary Action to Reduce Rural Land Use Impacts

in the Motueka River Catchment

A. Fenemor, R. Young, C. Phillips, R. Davies-Colley, B. Stuart, W. Allen, and T. James

See Appendix One for full text of paper.

Overview:

In New Zealand, a continuing decline in water quality and increasing competition for water have led to calls for a more collaborative approach to land and water management (Land and Water Forum 2010). Integrated catchment management is a process of working with stakeholders collaboratively to understand and address cumulative effects on the environment of all activities within a catchment. The challenge is to design ICM programmes which motivate landowners, in particular, to reduce land use impacts on water quality. This paper summarises observations from an action research project which worked with farmers in the Sherry catchment within the Motueka catchment ICM research programme.

Excerpt:

Motivating Landowner Action

So why would catchment landowners agree voluntarily to these measures? A survey of all Sherry landowners (Fenemor et al 2011) provided these insights:

- **Landowners, researchers and facilitators worked to find agreed solutions through a collaborative, non-threatening approach – trust was built among these groups**
- **Research (e.g. the cow crossing experiment) was framed in a way that addressed landowners questions, so they became more committed to the findings**
- **Actions were prioritised taking into account impact on water quality, but also affordability and allowing time for the farmer to stage implementation to fit other farming and financial priorities**
- **Some actions were found to have win-win outcomes – bridges allowed stock to cross the river even when in flood; voluntary action was seen to have public relations benefits for the group and to make regulation by the council less likely**
- **Having a focus on water quality created a reason for meetings, building both cohesion and peer pressure among the catchment community**
- **Events were held to celebrate progress and collectively support the actions being taken by individual landowners.**

When asked what single factor would most motivate landowners to continue implementing the actions in their Landowner Environmental Plans, the most consistent response was to have someone (e.g. from the NZ Landcare Trust) take an interest in and celebrate their progress. These observations provide guidance for ways to design effective engagement processes for integrated catchment management projects around New Zealand and abroad.

4.1.18 Farm Bridges: Design and Building Process

Environment Canterbury

200?

Link to PDF

Excerpt:

Why have bridges?

Crossing stock and vehicles through streams can contribute significant amounts of sediment and nutrient to the waterway. Crossings of waterways should therefore have culverts or bridges which are designed to prevent mud and animal waste getting into the water. Bridges generally have less impact than culverts on stream beds, stream banks and water flows.

4.1.19 Fresh Start for Fresh Water

Report of the Land and Water Forum.

Land and Water Forum

September 2010.

Link to PDF

Excerpt:

We propose the adoption of a standards framework for New Zealand which:

- Stems from a strategic view of water for New Zealand
- Defines national objectives for the environmental state of our water bodies and the overall timeframes within which to achieve them through National Policy Statements (NPS's) and National Environmental Standards (NES's) made under the Resource Management Act (RMA)
- Requires regions to give effect to this national framework at regional to catchment (or sub-catchment) level taking into account the spatial variation in biophysical characteristics of their water bodies and their current state
- Within that framework, requires regions to engage communities, including iwi, about the ways in which their water bodies are valued, and to work collaboratively with relevant land and water users and interested parties to set catchment-specific targets, standards and limits
- Maintains regional councils' control of the use of land for the purpose of the maintenance and enhancement of the quality of water in water bodies and the maintenance of the quantity of water in water bodies and coastal water.

This framework would address direct and diffuse discharges, both urban and rural, as well as flows.

4.1.20 Growing for Good

Intensive farming, sustainability and New Zealand's environment

Parliamentary Commissioner for the Environment Te Kaitiaki Taiao a Te Whare Päremata

October 2004.

Link to PDF

Overview:

...This report examines the environmental impacts and sustainability of more intensive farming in New Zealand. It has been written for a broad range of people and organisations. Although it explores many complex issues, readers are not expected to be experts in any particular area.

Key messages

A separate 12-page pamphlet summarises the main messages from this report. Key points and summaries are also included at the end of each chapter, except for Chapters 1 and 7 as these are relatively short.

1. Introduction

The first chapter identifies the purpose of this report, what it does (and does not) cover and the methods that we used to research and write it.

2. Farming systems and sustainability

The second chapter sets the scene by explaining important concepts. It defines terms such as 'natural capital' and discusses why more intensive farming can be a cause for concern. It also identifies some key principles that have guided the thinking in this report.

3. Current trends

This chapter looks at some recent farming trends within New Zealand. Although the trends vary across each farming sector, it highlights that farming is generally becoming more intensive and that the environment is being damaged in many intensive farming areas.

4. Drivers and incentives

What is driving the development of more intensive farming in New Zealand? This chapter examines what is shaping farming in this country, focusing on the economic factors that tend to have the most influence.

5. Risks and challenges

This chapter examines some of the major risks that the environment and the farming sector face if current trends persist. In particular, it looks at the consequences of using more and more synthetic fertilisers and irrigation on fresh water in New Zealand.

6. Emerging trends

There is currently a lot of activity taking place to address the environmental impacts of farming in New Zealand. This chapter examines some existing approaches to 'redesign' farming and considers the scale of the challenges ahead.

7. Moving forward

Although many initiatives are already underway, more fundamental changes are needed to maintain and improve the quality of the environment and to avoid many risks to farming. The final chapter suggests some first steps towards change and provides recommendations for action...

4.1.21 Growing Natural Capital to Develop Resilient Dryland Farm Landscapes

Starborough Flaxbourne Landscapes: an Overview

Paul Millen

2008.

Link to PDF

Excerpt:

...The development of resilient farm landscapes

Farmers in the Starborough Flaxbourne district of South Marlborough are developing resilient farm landscapes, based on the sustainable use of their farms' natural resources (the climate, soil and water) to grow natural capital (plants and animals) adapted to the challenging dryland environment.

A resilient farm landscape can recover from seasonal climatic and biological challenges, while continuing to provide for the financial and social needs of the farm family and surrounding community.

The Starborough Flaxbourne Soil Conservation Group (SFSCG) project was initiated by a group of farmers who recognised that current farming practices were not sustainable. They were losing natural capital through drought and erosion, leading to financial losses. Also, they were conscious that their eroding hills were highly visible from State Highway One, creating a poor perception of farmers in the district.

New farm management systems developed by the SFSCG in conjunction with the farming community, are a response to these challenges. The farming families involved should be commended for recognising the need to adapt and their efforts to change.

Farm management options that have resulted from this project are relevant not only to the natural dryland environment of South Marlborough, but to similar areas throughout New Zealand. Likely adverse effects of climate change are an added impetus for building resilience into farming landscapes...

4.1.22 Guide to Managing Waterways on Canterbury Farms

Environment Canterbury
2009

Link to PDF

Overview:

How to use these guidelines

This overview book provides general information about how to manage waterways to improve stream health, at the same time as enhancing the farming operation.

While all waterways are important, these guidelines focus on the management of smaller streams, drains and wetlands. They do not address mountain streams, where agriculture has relatively little impact, or large braided rivers, where riparian management has little influence on the instream environment.

Because different types of waterways need to be managed differently we have developed companion guidelines for three small waterway types that are common throughout Canterbury:

- lowland plains' streams and drains
- hill country streams
- inland basins' streams.

These companion guidelines have been designed to fit into the pocket in the back of this book.

This overview book describes the issues common to all stream types, the role of the riparian margin and the various management options.

The companion guidelines provide more specific information on the best management options for each stream type. These guidelines should be used with this overview book.

4.1.23 Improving the Management of Freshwater Resources

Issues and Opportunities

A Report Prepared for Ministry of Environment

Hill Young Cooper Ltd, 2006.

Link to PDF

Excerpt:

...The project is a component of MfE's Sustainable Development Water Programme of Action, which was established in July 2003 as one of four priority work areas under the Sustainable Programme of Action. Following consultation with a range of stakeholders, six broad goals were confirmed for the project:

- Achieve greater strategic planning for water at national and regional levels;
- Provide clearer direction and guidance from central government
- Ensure greater consistency in the way increasing demands on water resources are managed across the country;
- Develop a better framework for deciding between conflicting demands for water;
- Enable increased effectiveness of Maori participation in water management; and
- Provide for more effective management of the impacts of diffuse or unintended discharges on water quality...

4.1.24 Integrated Catchment Management: A Review of Literature and Practice

Clare Feeney, Dr Will Allen, Annette Lees and Maree Drury

Environmental Communications Ltd

June 2010.

Link to PDF (Main report)

Overview:

The report makes an assessment of how well Integrated Catchment Management (ICM) is working in New Zealand for managing freshwater quality. It identifies opportunities for improving ICM, ranging from increased funding and better information, through to central government leading integration by example.

4.1.25 Integrated Catchment Management: Interweaving Social Process and Science Knowledge

A. Fenemor, C. Phillips, W.Allen, R.G. Young, G. Harmsworth, B.Bowden, L. Basher, P.A. Gillespie, M. Kilvington, R. Davies-Colley, J. Dymond, A. Cole, G. Lauder, T. Davie, R. Smith, S. Markham, N. Deans, B. Stuart, M. Atkinson, and A. Collins

New Zealand Journal of Marine and Freshwater Research (2011). 45(3), 313-331.

See Appendix One for full text of paper.

Abstract:

This paper provides an overview of the Motueka integrated catchment management (ICM) research programme. This research was based on the thesis that achieving ecosystem resilience at a catchment scale requires active measures to develop community resilience. We define a generic adaptive planning and action process, with associated knowledge management and stakeholder involvement processes, and illustrate those processes with observations from five research themes: (1) water allocation; (2) land use effects on water; (3) land and freshwater impacts on the coast; (4) integrative tools and processes for managing cumulative effects; and (5) building human capital and facilitating community action. Our research clearly illustrates the benefits for effective decision-making of carrying out catchment scale science and management within collaborative processes which patiently develop trusting relationships. **We conclude that coastal catchments should be managed as a holistic continuum from ridge tops to the sea and that some processes like floods or loss of community resilience have decadal consequences, which support the need for long-term monitoring and investment.**

4.1.26 Integrated Catchment Management Research

Lessons for Interdisciplinary Science from the Motueka Catchment, New Zealand

Chris Phillips, Will Allen, Andrew Fenemor, Breck Bowden and Roger Young

Marine and Freshwater Research (2010), 61, 749-763.

See Appendix One for full text of paper.

Abstract:

Integrative research projects are becoming more common and inherently face challenges that single-discipline or multi-disciplinary projects seldom do. It is difficult to learn what makes a successful integrative research project as many of these challenges and solutions often go unreported. Using the New Zealand Integrated Catchment Management (ICM) for the Motueka River research program, we reflect on the demands confronting research programs attempting to operate in an integrative interdisciplinary manner. **We highlight seven key lessons that may help others learn of the benefits and difficulties that confront scientists and stakeholders involved in undertaking similar research. These are (1) clarify the goal and work with key people; (2) manage expectations; (3) agree on integrative concepts and face the challenge of epistemology; (4) leadership; (5) communication in an atmosphere of mutual trust and respect; (6) acknowledge that different modes of learning mean that a wide range of knowledge products are needed; and (7) measure and celebrate success.** The recognition that many environmental problems can only be solved through the creation of new knowledge and through social processes that engage the research and management domains has been a major benefit of the research program.

4.1.27 Integrated Kaipara Harbour Management Group

Link to Website

Link to PDF (Brochure)

Excerpt:

...This site is the web presence of the Integrated Kaipara Harbour Management Group (IKHMG) - an initiative developed by Te Uri o Hau and its stakeholders to assist in managing the Kaipara Harbour.

The Kaipara is one of those sacred taonga and Katiaki are responsible for protecting it for the benefit of all people. **Their vision is focused on 'the realisation of rights as Te Uri o Hau' and Nga Kaitiaki Tai Ao o Kaipara and 'a natural environment that is rich in diversity and life-supporting capacity'.**

Nga Kaitiaki Tai Ao o Kaipara see their role as providing the leadership to coordinate the various resource management agencies and stakeholders in a united vision for the management of the Kaipara Harbour catchments and of the harbour itself. This would assist them in meeting their responsibilities under the Te Uri o Hau Settlement Act and is consistent with a number of Memoranda of Understanding and Protocols established between Te Uri o Hau Settlement Trust and key stakeholders.

4.1.28 Kaitiaki Tools

NIWA

URL Link

Overview:

Kaitiaki Tools is a store of knowledge for people who manage natural resources. It contains information about the environmental impacts of different kinds of land use and industries, and how these will affect water quality and mahinga kai. It also helps people apply this information to the resource consent process.

4.1.29 Landcare: A Practical Guide

NZ Landcare Trust

Excerpt:

Farmers and landowners are passionate about their land and want to ensure that it continues to be healthy and productive in the future. The growth in farm based technology has enabled productivity to increase to previously unimaginable levels and the pressure for further intensification continues. The challenge is to maintain profitable production levels without undermining the capacity of the land to recover and regenerate. This idea is at the core of landcare and a driving force behind ‘Landcare: A Practical Guide’.

4.1.30 Leading Change

New Zealand Farm Environment Award Trust

2006?

Link to PDF

Excerpt:

Taking a lead, working towards whole farm sustainability on your own property and encouraging other farmers to do the same on theirs, is a more positive approach than waiting for regulation to force your hand. This tip sheet is designed to help farmers working with other farmers to change attitudes and practices. Content reflects the experience and opinions of farmers from around New Zealand who are top environmental performers...

...Taking the lead to address bad practice: working through the issues

It can be difficult to come up with 'rules of thumb' for good practice. Sometimes when discussing the issues it is easier to identify or agree on poor practice first and use this as a stepping stone into discussion about positive, sustainable alternatives. Use the table of farmer-generated issues below as a catalyst. What are the alternatives to these practices?

4.1.31 Linkages Between Cultural and Scientific Indicators of River and Stream Health

G.R. Harmsworth, R.G. Young, D. Walker, J.E. Clapcott and T James

New Zealand Journal of Marine and Freshwater Research (2011). 45(3),423-436.

See Appendix One for full text of paper.

Abstract:

Scientific monitoring of river health is well established and has a significant role to play in environmental assessment by communities, managers and policy makers. Cultural indicators help to articulate cultural values, assess the state of the environment from a cultural perspective and assist with establishing a role for Māori in environmental monitoring. We reviewed the philosophies behind cultural and scientific monitoring of river health and compared the results from the two approaches at 25 sites in the Motueka and Riwaka catchments. Both scientific and cultural indicators suggested a decrease in river health in relation to increased land-use pressure. There were also correlations between the results from the two approaches suggesting cultural indicators could be used in a similar manner as scientific indicators to set environmental benchmarks. U**sing scientific approaches alongside culturally based monitoring provides a wealth of knowledge to understand better what we mean by river health. The two approaches can be regarded as complementary and reflect two different knowledge systems and perspectives.**

4.1.32 Lowland Plains Streams and Drains

A Companion Guide to “Managing Waterways on Canterbury Farms”

Environment Canterbury

2005.

Link to PDF

Excerpt:

The key approaches to managing waterways in the lowland plains:

- 1st priority: Keep stock out of streams
- 2nd priority: Leave a grass buffer and avoid cultivating right to the stream edge
- 3rd priority: Plant margins to provide shade
- 4th priority: Good management of drains

4.1.33 Learning from Leaders (LFL) Project

New Zealand Farm Environment Award Trust (NZFEA)

2006.

Link to website to access PDFs below

Overview:

...Encouraged by the success of the New Zealand Farm Environment Awards (NZFEA) Trust's sustainable farming publications, several organisations teamed up with NZFEA Trust to support learning from sustainable farming leaders across New Zealand . The project was supported by MAF's Sustainable Farming Fund and project partners included the Ballance Farm Environment Awards (BFEA), Federated Farmers of New Zealand, New Zealand Contractors' Federation, Queen Elizabeth II National Trust and the Rural and Associated Contractors Federation of New Zealand. The LfL Project provided opportunities to learn about practical and applied sustainable farm business management options, primarily from farmers who are developing and using them. A feature of the project was the participatory learning approach, designed and facilitated by Annie Perkins and Helen Ritchie at Groundwork Associates...

Topic	Key Practices for Sustainability	Tools for Farmers	Field Day Follow Up reports	
Whole Farm Sustainability	Leading Change [PDF 96K] Also see the other tip sheets listed below	See any or all of the documents listed below in this column	Whole Farm Sustainability [PDF 1.2M]	All reports 1-9
Nutrient Management	Managing Nutrients [PDF 101K]	Nutrient Management, Soils and Pastures [PDF 64K]	Getting Smart With Nutrients - a guide to nutrient management [PDF 687K] and worksheet [PDF 362K]	1, 2, 5, 6, 7, 8, 9
Soils and Pasture	Managing Soil Health [PDF 133K]	Crops, Pasture Species and Rotation [PDF 60K]	Growing Greener Grass – a guide to sustainable pasture management [PDF 639K] and worksheet [PDF 157K]	5, 7 ,9
Natural Features, Shade & Shelter	Natural Features [PDF 98K]	Natural Features and Plantings [PDF 62K]	Managing Natural Features on Farms [PDF 454K] and worksheet [PDF 656K]	1, 3, 5, 6, 7, 8, 9
Waterways and Water Quality	Managing Waterways [PDF 123K]	Waterways [PDF 61K]	Winning Margins – Managing Waterways on Farms [PDF 1.3M] and worksheet [PDF 503K]	1, 6, 8

Water Efficiency and Irrigation	Managing Water Use [PDF 94K]	Irrigation/water efficiency [PDF 61K]		2, 5, 7, 9
Tracks and Races		Tracks and Races [PDF 60K]	Low Impact Tracks and Races [PDF 456K] and worksheet [PDF 373K]	1, 6, 8
Planning and Financial Management		Financial and Planning [PDF 64K]		1, 2, 5, 7, 8, 9
People on Farms		People (including succession and ownership) [PDF 66K]		1, 3, 5, 7, 8, 9
Miscellaneous		Energy, Chemical use, Waste Management, Stock Management and Health [PDF 64K]		1, 3, 5, 6, 7, 8, 9

4.1.34 Mahurangi Action Plan

A Strategic Plan for the Catchment 2010-2030

September 2010.

Link to PDF

Overview:

The Mahurangi Action Plan (MAP) has been underway since 2004. MAP was introduced as a proactive response by the Auckland Regional Council (ARC) and the Rodney District Council (RDC) to reduce sediment entering the Mahurangi waterways, primarily through working with private landowners on best practice land management (e.g. fencing and riparian planting along waterways) as well as educational programmes.

4.1.35 Managing Land for the Future

A Sustainable Land Management and Biodiversity Enhancement Guide For Landowners in the Kaimai Mamaku Catchments

Karen Denyer, Kate Akers and James Barnett

NZ Landcare Trust

2011.

Link to PDF

Overview:

This guide has been developed to help landowners and catchment care groups apply best management practices to sustainably manage their land and enhance biodiversity in the catchments of the Kaimai Mamaku Range. It was produced to assist the Kaimai Catchments Project.

The guide has information about:

- best management practices (BMPs) to leave the land in a better state
- incentives and opportunities for landowners
- where to get advice and information
- funding options
- upcoming research
- families and communities who are applying BMPs in the Kaimai Mamaku catchments.

4.1.36 Managing Waterways on Farms

A Guide to Sustainable Water and Riparian Management in Rural New Zealand.

Ministry for the Environment

2001.

Link to PDF

Overview:

This publication is aimed at those who provide advice to farmers about how they manage their land, and to those farmers who wish to enhance their properties and reduce the impacts of their farming operations. We hope it will be used by field officers, consultants, farmers, landcare group members, and hapu and whanau who have practical involvement “on the ground”. **This publication seeks to provide some background information about the sources, causes and processes involved with the deterioration of streams in farmed catchments and the consequences of that deterioration. Readers can thus better understand the problems and, as a consequence, be better equipped to manage the problems.**

4.1.37 Maori Sustainable Development in the 21st Century

The Importance of Maori Values, Strategic Planning and Information Systems

Harmsworth, G.R.; Barclay Kerr, K.; and Reedy, T.

He Puna Korero: Journal of Maori and Pacific Development (2001). 3(2), 40-68.

See Appendix One for full text of paper.

Abstract:

The term 'sustainable development' has been widely used since the latter part of the 20th century. The concept implies economic and social development, economic growth, and environmental responsibility in order to sustain improved standards of living based on economic growth, to achieve some form of social equity, and to manage the environment sustainably. **Sustainable development should generally be at a rate that allows future generations to meet their needs without causing degradation of the natural environment, and should avoid economic or social decay.** The concept has been debated and criticised by many as being ambiguous, untenable, and difficult to achieve, and frequently labelled part of global capitalism. But the concept provides a challenge to all of us, on how to balance economic, social, and cultural goals, while at the same time safeguarding and responsibly managing the environment for future generations. **Attempts by indigenous peoples internationally to achieve sustainable development have been based on holistic approaches and frameworks that seek to balance economic, social, cultural and environmental objectives, and these provide effective models for viable sustainable development approaches.** Māori Sustainable Development in Aotearoa-New Zealand is a term often used to describe a pathway to Māori autonomy, self-determination, the building of human and social capacity, as part of a strategic direction to capitalise on opportunities in the 21st century. This paper outlines research undertaken between 1998-2002 and funded by the Foundation for Research, Science, and Technology (FRST) in the programme "Māori Sustainable Development in Te Puku o Te Ika", contract UOWX0005, simply referred to as the MSD programme. **It focuses on the importance of determining Māori values, a vision, strategic planning and development of information systems as a holistic framework and process method to achieve Māori sustainable development**.

4.1.38 New Profitable Farming Systems for the Lake Taupo Catchment

Puketapu Group

Prepared by Bruce Thorrold, Dexcel, Hamilton and Keith Betteridge, AgResearch, Palmerston North

December 2006.

Link to PDF

Excerpts:

...In May 2000, Environment Waikato announced their intention to introduce a variation to the Waikato Regional Plan aimed at protecting the water quality of Lake Taupo. Research and monitoring indicated that increasing nitrogen (N) losses from pastoral and urban land to the lake were one component of water quality that was being adversely affected by human activity. Trends in land use apparent then (and now) indicated that there was a clear risk of further increases in N loss to the lake as farmers continued to increase production, forest owners investigated conversion of forests to pasture and sub-division for residential purposes continued without reticulated sewerage...

In response to the agreed need for new farm management options, AgResearch worked with farmers to establish the objectives of a local research project. Resulting from this work, Puketapu Group was funded by the Ministry of Agriculture and Forestry Sustainable Farming Fund (SFF) to investigate new options for farmers in the Lake Taupo catchment. In addition to funding from Puketapu Group and SFF, the project was supported in cash and kind by; Taupo Lake Care, FertResearch, Dairy InSight, Environment Waikato, Meat and Wool NZ, Wrightsons Seeds and Genetic Technologies.

...Drawing on the overall results, this study indicates that

- The efficiency of forestry and cut forage systems in terms of yield and profit per kg N leached suggests that they require further analysis to overcome issues around yield and feasibility.
- The potential impact of DCD products similarly suggests that research into better predictions of responses and optimising their use especially on Sheep and Beef farms is warranted.

Improving stock performance emerges as the most profitable route for farmers in the short-term as they seek to improve profitability without increasing N leaching.

4.1.39 New Zealand Biodiversity Strategy

Department of Conservation, Ministry of Fisheries, Ministry for the Environment Ministry of Agriculture and Forestry

2000.

Link to PDF

Introduction:

...New Zealand first pledged to play its part in halting the decline in global biodiversity at the Rio Earth Conference in 1992. There, we affirmed that biodiversity is vital to sustain life, and offers us a unique basis for our culture and sense of national identity. The New Zealand Biodiversity Strategy now charts the way forward.

The Strategy establishes national goals to "turn the tide" on the decline of our biodiversity, and to maintain and restore a full range of our remaining natural habitats and ecosystems and viable populations of all native species. The Strategy sets out a comprehensive range of actions, that we need to initiate or improve progress on, to achieve these goals...

Executive Summary:

The New Zealand Biodiversity Strategy has been prepared in response to the state of decline of New Zealand's indigenous biodiversity — described in the State of New Zealand's Environment report as our "most pervasive environmental issue". It also reflects New Zealand's commitment, through ratification of the international Convention on Biological Diversity, to help stem the loss of biodiversity worldwide.

The purpose of the Strategy is to establish a strategic framework for action, to conserve and sustainably use and manage New Zealand's biodiversity. The primary focus is on New Zealand's indigenous biodiversity. However, because of the value and economic importance of much of our introduced biodiversity, the conservation of the genetic resources of our important introduced species is also addressed.

Part One — A Strategy for New Zealand's Biodiversity

New Zealand's high level of endemic biodiversity makes a unique contribution to global biodiversity and places on us an obligation to ensure its continued existence. Our indigenous biodiversity — our native species, their genetic diversity, and the habitats and ecosystems that support them — is of huge value to New Zealand and its citizens; to our economy, our quality of life, and our sense of identity as a nation.

However, since humans first settled in New Zealand, our biodiversity has been in decline — through species' extinction, loss and disruption of natural areas and ecosystems, and the effects of an increasing number and variety of introduced plant and animal pests. This trend of decline has continued throughout the 20th century, slowed only in part by more active conservation and natural resource management over the last three decades. Without increased and more targeted management efforts, driven by clear biodiversity goals, the decline in biodiversity will continue, with irreversible consequences.

Increasingly, New Zealand's international reputation and trade opportunities will depend on our performance in maintaining a quality natural environment, of which biodiversity is a key element.

Part Two — A Vision, Goals and Principles for Managing New Zealand's Biodiversity

The Strategy's vision describes a future in which all New Zealanders contribute to sustaining the full range of indigenous biodiversity and share in its benefits, and in which the genetic resources of our important introduced species are secure.

Four goals are established for conserving and sustainably managing New Zealand's biodiversity:

Goal One: Community and individual action, responsibility and benefits

Enhance community and individual understanding about biodiversity, and inform, motivate and support widespread and coordinated community action to conserve and sustainably use biodiversity; and

Enable communities and individuals to equitably share responsibility for, and benefits from, conserving and sustainably using New Zealand's biodiversity, including the benefits from the use of indigenous genetic resources.

Goal Two: Treaty of Waitangi

Actively protect iwi and hapu interests in indigenous biodiversity, and build and strengthen partnerships between government agencies and iwi and hapu in conserving and sustainably using indigenous biodiversity.

Goal Three: Halt the decline in New Zealand's indigenous biodiversity

Maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified ecosystems in production and urban environments; and do what else is necessary to

Maintain and restore viable populations of all indigenous species and subspecies across their natural range and maintain their genetic diversity.

Goal Four: Genetic resources of introduced species

Maintain the genetic resources of introduced species that are important for economic, biological and cultural reasons by conserving their genetic diversity.

Thirteen principles are identified to guide the conservation and sustainable management of New Zealand's biodiversity and the implementation of this Strategy.

Part Three — Action Plans for New Zealand's Biodiversity

A comprehensive framework for action directed towards the Strategy goals is outlined in ten "themes": biodiversity on land; freshwater biodiversity; coastal and marine biodiversity; conservation and use of genetic resources; biosecurity and biodiversity; governance; Maori and biodiversity; community participation and awareness; information, knowledge and capacity; and New Zealand's international responsibilities.

For each theme, a desired outcome describes what needs to be achieved to realise the goals for the Strategy. Key biodiversity issues are summarised, highlighting the gap between the current state and management, and the desired outcome. Detailed action plans for each theme, setting out objectives and actions, are designed to target gaps and achieve the desired goals.

Part Four — Strategic Priorities and Implementation

Priority actions identified in Part Three are grouped under the Strategy goals. These actions have been selected as priorities because they should best position us in the short term (the first five years of implementation) to achieve our biodiversity goals in the long term.

A mechanism for coordinating implementation of the Strategy at a central government level is outlined. Successful implementation will require a coordinated effort across central and local government, working in partnership with iwi and hapu, and with the community, the private sector and landowners.

4.1.40 Okaro Catchment Lake Restoration Group

Farm and Catchment Accountability - What are we Achieving?

Megan Birchall and John Paterson

Okaro Catchment Lake Restoration Group

2011.

Link to PDF

Abstract:

Lake Okaro is one of the twelve Rotorua Lakes that is monitored by the Bay of Plenty Regional council, and one of the five lake catchments where land owners have been regulated with a nutrient loss cap applying to both nitrogen-loss and phosphorous-loss levels from land use activities (Rule 11). Lake Okaro is thirty one hectares in size and has a 367 hectare catchment, 90% of which is farmland. It is the most polluted lake in the Rotorua Lakes district with a current Trophic Level Index (TLI) of 5.1, recently improved from 5.5 in 2009, and has a target TLI of 5.0

In 2009 all six landowners within the Okaro Catchment formed the Okaro Catchment Lake Restoration Group (OCLRG) to try and reduce the impact of their farming operations. The group is supported with funding from the Sustainable Farming Fund (SFF). The land owners are taking a proactive approach to increasing Lake Okaro's water quality by investigating their environmental performance, primarily by utilising Overseer® and are considering the use of Environmental Management Systems (EMS) to demonstrate improvement and environmental accountability.

A private consultant was employed to run each of the properties through Overseer® to calculate the nutrient losses for the 2008-2009 and 2009-2010 seasons and compare these to their benchmarked levels (the average nutrient loss that occurred during 2001-2004). Within the Okaro catchment, nitrogen-loss has increased 3%, and phosphorus-loss has decreased 34%, compared to the benchmarked years. The group aims to further reduce these levels, so a whole catchment nutrient plan has been developed outlining further steps the land owners will take. Collective performance will continue to be assessed using Overseer®.

The origins of this project are **unique in that the entire farming community has now agreed that their primary goal is to work in collaboration with each other, the wider community and the Regional Council to improve the water quality in Lake Okaro. This is a concerted attempt to 'take ownership' with a demonstrable Environment Management System (EMS) and to have a directive role in the long-term measures that will be needed to restore Lake Okaro.**

4.1.41 Primary Sector Water Partnership Leadership Document

Summary of the Plan of Action Draft for Consultation

2008.

Link to PDF

Overview:

The Primary Sector Water Partnership is a group of major primary sector organisations who are committed to ensuring the sustainable use of freshwater resources in the primary sector.

This is a collective action plan that builds on the individual environmental management programmes of the various partners.

Our goals are:

- Maintain and/or enhance water quality from primary production land, with demonstrable and accelerated progress on the resolution of water quality issues from agricultural land within five years
- Demonstrable improvements in water use efficiency by the primary sector within five years.

Our approach aims to achieve sustainability goals and to maintain dynamism and flexibility in the primary sector by:

- Developing Sustainable Water Management Strategies for each partner.
- Engaging land managers in environmental outcomes and self management of their impacts, with an initial focus on identified priority catchments.
- Working in partnership with central and regional government.

4.1.42 Psychology of Sustainability: What Planners Can Learn From Attitude Research

Alice Jones

Journal of Planning Education and Research. (1996). 16(1), 56-65.

See Appendix One for full text of paper.

Excerpt:

The centuries old concept of finding balance between human and natural systems has emerged most recently under the rubric of sustainability or sustainable development. Although definitions of sustainability differ, at the heart of the notion is the idea that human social and economic systems should operate within the limits of the natural systems upon which they depend.

4.1.43 Realistic Solutions to Real Farm Problems

Aorere Management Team

NZ Landcare Trust

2011

Link to PDF

Overview:

Written by the Aorere Management Team 'Realistic Solutions to Real Farm Problems' was designed by the local dairying community and highlights the key water quality messages specific to areas of high rainfall such as the Aorere Catchment:

- Stock out of waterways
- When soils are wet store it! (ensure adequate effluent storage)
- It's gotta sink in! (use low rate effluent application to land)

The best management practices guide takes the form of a fold out poster that is robust enough to survive the rigors of the dairy shed wall!

4.1.44 Rediscovering the “Green and Gold” in Starborough/Flaxbourne

Report prepared by Katie Nimmo, NZ Landcare Trust

With editing by Graeme Broad, Don Ross and Philip Coburn

For the Starborough/Flaxbourne Soil Conservation Group as part of a Sustainable Farming Fund funded project #05/132

October 2006.

Link to PDF - Report

Link to PDF - “Growing Natural Capital to Develop Resilient Dryland Farm Landscapes”

Excerpt:

Over the last ten years Starborough Flaxbourne farmers have been faced with the challenge to increase productivity and profitability in the face of a long-term drought. Economic drivers affecting farmers include, changes in commodity prices, rising on- farm costs, and increasing land prices. Some farmers who have survived on the strength of high commodity prices in the recent past will struggle to run a profitable farm if commodity prices continue to drop.

National or district-level drivers influencing the project farmers include, improved performance from farms in other districts such as Canterbury, changes in local pastoral agricultural and processing infrastructure and seed and fertiliser agencies failing to cater for farmers coping with drought. Compared to responses to flood events, government policy concerning the long-term, insidious effects of drought on agricultural communities is inadequate.

Farmer capacity to improve the productivity and profitability of their farms is constrained by the size of their farms, topography, and levels of debt. This in turn will have a flow-on effect on farmer capacity to address soil erosion on their properties or change their business to more sustainable dry land farming practices. The scale or size of farms in the district was a consistent theme across all of the interviews. Farmers perceive a number of properties in the district are too small to be profitable, and that the pastoral farms that will survive into the future will need to be larger. However, increasing farm size is especially difficult because of rising land prices.

The project community has changed as pastoral farms have been converted into vineyards, or subdivided and converted into ‘lifestyle’ blocks. These new land owners or managers may bring to the district considerable financial resources and business acumen that may not be available to the pastoral farming community. The community as a whole has the potential to benefit from these changes if there is a willingness to develop positive working relationships and networks across these different kinds of landowners

4.1.45 Restoration Indicator Toolkit

Indicators for Monitoring Ecological Success of Stream Restoration

By Stephanie Parkyn, Freshwater Consultant Kevin Collier, Environment Waikato/University of Waikato Joanne Clapcott, Cawthron Institute Bruno David, Environment Waikato Rob Davies-Colley, National Institute of Water and Atmospheric Research Limited (NIWA) Fleur Matheson, NIWA John Quinn, NIWA William Shaw, Wildland Consultants Limited Richard Storey, NIWA.

NIWA

2010.

Link to PDF

Overview:

Purpose of the Indicator Toolkit

The purpose of this toolkit is to recommend and describe a range of indicators for monitoring improvement in stream restoration projects. We provide guidance on appropriate indicators depending on the goals of your restoration project and when to expect improvements.

Who is the Toolkit for?

The Toolkit has been developed primarily for the needs of regional councils with access to laboratories and technical equipment, but it should also be useful for community groups and resource users that are undertaking stream restoration without specialist equipment. It is based around the concept of identifying the important goals of the restoration and choosing appropriate indicators to measure the success of those goals. Some of the indicators require specialist equipment or technical training. However, there are several indicators for each type of goal, and when selecting from the Toolkit, a community group may simply avoid specialist indicators and choose others that match their goals and can be measured more easily. Alternatively, it may be possible for a community group to work with the regional council or research scientists in monitoring a restoration site.

Defining restoration success

Clear and measurable goals need to be established for your restoration project to design appropriate monitoring and evaluate whether the restoration has been successful. It is not the purpose of the Toolkit to dictate these goals, but the assumption is made that most restoration projects generally aim to return some or all of the following towards a more natural (pre-human) condition: biodiversity, physical habitat character, ecological processes, and water quality. **Many projects do not begin with a clear statement of their goals and this hampers their ability to determine success** (Hassett et al. 2007, Rumps et al. 2007).

4.1.46 Restoring Shellfish Beds to Harbours and Estuaries: A Guide for Community Groups

Version1, National Institute of Water and Atmospheric Research (NIWA).

2010?

Link to PDF

About the guide

Welcome to the Restoring shellfish beds to harbours and estuaries guide. **This guide is to assist community groups who are keen to undertake a shellfish restoration project. It is designed for groups who have some harbour and estuarine shellfish monitoring experience, and who have also identified restoration as a priority.**

The guide is based on knowledge and information gained from years of working in New Zealand's harbours and estuaries and, more recently, from a project in collaboration with Northland Regional Council, the Whangārei Harbour Kaitiaki Roopu (as guardians of the harbour) and the National Institute of Water and Atmospheric Research Ltd (NIWA). The project ran over five years and aimed to establish the best method for reseeding cockles in Whangārei Harbour.

Seven key steps (refer Shellfish Restoration Project Flow chart) are used as a framework to structure the guide. The guide can also link to more detailed information contained in other community monitoring guidelines, such as the Ngā Waihotanga Iho – (translation: what is left behind, lift up) Estuary Monitoring Toolkit for Iwi.(NWI).

The drivers for restoration projects will differ between groups depending on the vision, values, goals, and the issues faced. Steps and instructions given within, can be adapted to suit your own knowledge, vision, and circumstances. Please remember that a 'one size fits all' framework may not be suitable for all shellfish restoration projects.

4.1.47 Restoring the Balance: Biodiversity Self-Help Kit

2004?

Link to PDF

Overview:

...This kit was developed for the Northland Biodiversity Enhancement Group. The group (N-BEG) has representatives from agencies in Northland that have a role in promoting the protection of the region's biodiversity, particularly on private land. Convened by NZ Landcare Trust, other agencies represented on N-BEG are the Northland Regional Council, Queen Elizabeth II National Trust, Bank of New Zealand Kiwi Recovery Trust, NZ Fish and Game, Department of Conservation, Farm Forestry Association, Kaipara District Council and Far North District Council...

...**This resource kit aims to help you -**

- **Identify the existing biodiversity values of your land and protect what you've already got**
- **Find out about pest control, planting trees, habitat protection (both physical and legal) and access to outside funding**
- **Find and record essential information that is often requested when seeking funds**
- **Set up an action plan.**

From this you will have the information to start making informed decisions about protecting and enhancing what lives around you.

You can also use the kit as a personal diary about the comings and goings of native animals in the changing landscape around you, a personal story about your own environment...

4.1.48 Review of New Zealand Environmental Farm Plans

Prepared by Paul Blaschke and Norm Ngapo

Ministry for the Environment

May 2003.

Link to PDF

Foreword:

Farm planning is basically a mechanism for identifying and documenting actions and timeframes to achieve desired outcomes, these can range from purely financial and production objectives to a wide range of environmental outcomes.

Farm plans have, since the 1940's, assisted New Zealand farmers and the councils in catchment management. Soil conservation programmes dominated early environmental farm plans. However, since the early 1990's, these farm plans have expanded to address a range of farm improvements in addition to soil conservation (e.g. water quality, waste, biodiversity, animal welfare, riparian zones, etc).

The Ministry for the Environment is encouraging self-regulation as a means to reduce agricultural impacts on land and water. The Ministry sees effective industry self-regulation as achieving more positive environmental outcomes than sole reliance on a rule based regime imposed by regulatory agencies. Farm plans and their ability to reflect and document agreement between parties on the work programme and resources required to implement a plan are useful adjunct to self-regulation.

This report consolidates all of the different farm plans currently in use in New Zealand into one document. The report sets out the components of the range of farm plans, how they are used by regional councils and industry and discusses their relative merits and effectiveness in environmental management on farms

By identifying and documenting critical factors/elements and successful methods of farm plans, the Ministry can encourage better environmental farm plans or perhaps the development of a farm plan template.

Finally we wish to acknowledge the assistance of regional councils and the dairy industry for providing the information on existing farm plans without which this report could not have been prepared. We hope that this report in turn provides regional councils, farmers and in dustry with useful information for the development of new farm plans or when reviewing the effectiveness of their existing farm plans.

Excerpt:

...Current New Zealand regional council use of farm planning

1.There is fairly widespread use of environmental farm planning mechanisms in New Zealand regional councils.

2. Unitary authorities and some poorly-resourced regional councils do not currently use environmental farm planning.

3. The current use and content of environmental farm plans is tied quite strongly to its historical soil conservation basis, with an emphasis on soil conservation and land capability.

4. Some promising innovations have emerged in the last few years, after a phase of uncertainty in the early 1990s regional council establishment, restructuring and the withdrawal of government support. There are many different forms of farm planning currently being undertaken in New Zealand. Not all of them are suitable for the dairy sector.

5. Environmental farm plans are seen as an effective method of documenting environmental issues and management approaches to environmental issues on a property basis in a simple but integrated and effective way. They are also an effective method of achieving environmental outcomes using a non-regulatory process.

6. Some regional councils are recognising the potential of aggregating individual environmental farm plans for environmental management on a catchment basis, as occurred widely in the past. They can be an ideal mechanism for implementing catchment schemes.

7. Generally, successful environmental farm planning needs to be integrated with financial planning and production management to demonstrate bottom-line advantages to farmers.

4.1.49 Riparian Management Classification Reference Manual

John M. Quinn

Prepared for Environment Canterbury

NIWA Client Report: HAM2009-072

NIWA Project: ENC09202

June 2009.

Link to PDF

Overview:

This manual is part of a project that aims to facilitate application of the RMC in Canterbury. It aims to support on-ground interpretation of the classification and development of a step-by-step process for rating, prioritising, and monitoring riparian management within a catchment. This manual is intended as a training and office reference document. A briefer companion manual (Quinn 2009b) is intended for field use.

This initial phase of the project involved a 2-day workshop with staff of Environment Canterbury in December 2008 to provide an introduction to the RMC method and gain staff input on information needs by applying riparian function assessment to the Cam River catchment. Findings for the Cam River are summarised in Quinn (2009a).

4.1.50 Riparian Management: How Well Are We Doing?

Stephanie Parkyn and Rob Davies-Colley

NIWA

Water and Atmosphere (2003). 11(4), 15-17.

Link to PDF

Overview:

Stream riparian management projects are being undertaken across New Zealand in an attempt to reverse some of the impacts of land use on waterways. In pastoral farming, riparian management usually means fencing out livestock and planting trees along stream margins to create buffer zones. Expectations are that riparian planting schemes will help deal with problems including channel instability, degraded aquatic habitat, and water pollution from diffuse inputs, as well as improve aquatic and terrestrial biodiversity.

Can these small strips of land within a much larger agricultural landscape really solve all of these problems, and if so how long does it take?

4.1.51 Riparian Zones: A Guide to the Protection of Canterbury's Streams and Wetlands

Environment Canterbury Regional Council

200?

Link to PDF

Booklet on how to develop a riparian zone.

4.1.52 Role of Biodiversity in Maori Advancement

A Research Framework

Garth Harmsworth

He Pukenga Korero: A Journal of Maori Studies (2004). 8(1), 9-16.

See Appendix One for full text of paper.

Abstract:

Explores the unique role of Maõri in sustaining indigenous biodiversity in NZ, both in terms of kaitiakitanga and in achieving national biodiversity goals through the provision of another cultural perspective and another knowledge system that will help plans for the future. Summarises traditional concepts and perspectives and present Maõri involvement in biodiversity projects. Proposes a research framework to show that role biodiversity could have for Maõri advancement and to underpin a bicultural approach for achieving national biodiversity outcomes.

4.1.53 Sediment Model Development: Workshop and Survey Summary

Sandy Elliott, Mal Green, Jochen Schmidt, Anne-Gaelle Ausseil, Les Basher, Alison Collins, and John Dymond.

NIWA Client Report HAM2006-147

October 2006.

Link to PDF

Overview:

This document provides a follow-up to a series of workshops on erosion modelling held in May-June 2006. **The workshops worked towards agreement on the types and features of models that can be used by North Island regional councils to help manage on-site erosion and sediment impacts in streams, lakes and coastal areas.** This will in turn guide future model development by NIWA, Landcare Research, and Regional Council partners.

4.1.54 Setting the Standard for Nutrient Management Plans

Doug C. Edmeades, Melissa Robson, and A. Dewes

24th Annual FLRC Workshop held at Massey University on the 8th, 9th and 10th February 2011.

Link to PDF

Overview:

...Nutrient Management Plans (NMP) are a relatively new concept in New Zealand and, for reasons discussed in this paper, are likely to become mandatory for many, at the individual farm level, within the next 5-10 years. This prospect should be vigorously embraced and encouraged by all those involved, especially farmers, because it is now known that NMPs not only reduce the environmental footprint but also can have significant economic benefits (Edmeades 2008)...

...**The tentative efforts to date to develop NMPs have been ad hoc and hence the purpose of this paper is to outline an approach to nutrient management planning and attempt to define the minimum requirements of a NMP in terms of the technical and non-technical attributes which a NMP should embrace..**.

4.1.55 Sherry River Native Plant Establishment

“Best Bet” Guidelines

Nick Ledgard and David Henley

Scion, Christchurch

200?

Link to PDF

Overview:

This Sustainable Farming Fund project aims to improve water quality within the Sherry River catchment, a 7800 hectare sub-catchment in the upper reaches of the Motueka River near Nelson. Research had confirmed the problems caused by farm practices, specifically dairy herd crossings. The area is made up of forestry in the upper end of the valley with a mix of dairy, sheep, beef and lifestyle landowners in the lower catchment. The valley is a micro example of the larger Motueka Catchment land use and a major contributor of *E. coli* and nutrients to the Motueka River. The project feeds into the broader Integrated Catchment Management (ICM) Project which is a six-year whole catchment ‘mountain top to the coast’ study of the Motueka River and its tributaries.

4.1.56 Social Marketing and Behaviour Change

Addressing Land/Water Issues Through Partnerships in Rotorua

Melinda Dresser, New Zealand Landcare Trust

Working with Landowners Towards Sustainable Land Management

Sustainable Management Fund, Project Number: 2238

April 2008.

Link to PDF

Excerpt:

...Community-based social marketing is an attractive alternative to information intensive campaigns. In contrast to conventional approaches, **community-based social marketing has been shown to be very effective at bringing about behaviour change. Its effectiveness is due to its pragmatic approach**...

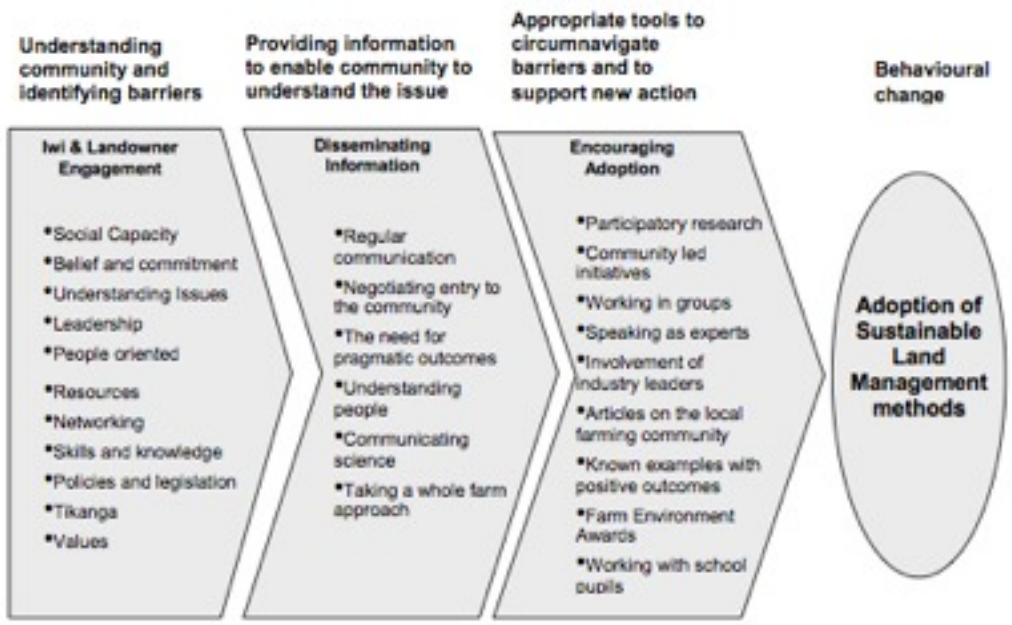
...By using the Social Marketing approach for disseminating information and encouraging landowners to **adopt best management practices (BMPs) and on-farm nutrient mitigation options there will be potentially a better uptake of the new practices than if the less effective one-way strategies are used**...

...Using Social Marketing theories to **disseminate information and encourage the adoption of BMPs is complex and relies heavily on understanding why people behave as they do, and to identify what might support more sustainable behaviour.** In order to do this it is vital that the researcher uses **participatory methods of research and take their lead from what the farmers already understand about the issue.** Edgar et al. (2005) describes knowledge sharing issues which should be considered in order to be able to disseminate information effectively.

In the AgResearch survey (Roth and Botha, 2007) data collected from farmers in the Rotorua catchment included both current nutrient mitigation technologies already adopted and perceived barriers for the different technologies. These data could be used as a basis for an in depth social marketing strategy in the future especially if the information gained is then combined with the tried and tested ways which generate a positive approach from farmers when encouraging the adoption of BMPs as described by G. Robertson (2005).

For **social marketing to be effective there must also be a focus on the whole community, therefore the researcher must take into account the ethnic diversity of the Rotorua area and ensure that they have an understanding of the Maori worldview if they are to engage with iwi successfully**...

...The diagram below provides a summary of the three main stages needed for a social marketing strategy to be effective i.e. to lead to the adoption of sustainable land management techniques...



A Strategy for disseminating information to farmers

In order for landowners to gain a better knowledge of what nutrient mitigation options are available for them to adopt there needs to be a robust way of disseminating information. According to Edgar, Nimmo and Ross (2005) the following points are knowledge sharing issues which need to be considered in order to be able to disseminate information effectively:

1.1 **Regular communication**

There needs to be regular communication between researchers and community in order to build trust and understanding. Regular face to face meetings are important.

1.2 **Negotiating entry to the community**

Researchers should not assume that they will have automatic entry into a community or catchment just because they think their research is important. Entry should be negotiated with key individuals and usually involves a process of education and learning for all stakeholders involved.

1.3 **The need for pragmatic outcomes**

Researchers who insist that their approach to a problem or the proposed management tool is the correct and only approach will loose farmer support very quickly. If they focus solely on investigating the high level theory which underpins a research project at the expense of producing good advice and practical solutions, they will also loose community support. Most land managers prefer to see pragmatic outcomes from most research projects.

1.4 **Understanding people**

Researchers who have good personal networks and contacts within local communities, local government and different industry sectors can be very effective when trouble- shooting problems or managing relationships. Scientists who have an astute understanding of the personalities involved in a project, and how local communities operate are also especially effective.

1.5 **Communicating science**

Not all good research scientists are effective at communicating their ideas, goals or research findings to 'lay people'. If this is the case, it is important to integrate into the research process 'translators' who can explain the

principles which underlie the research and the management tools to stakeholders using appropriate concepts and teaching styles.

A third party can play a vital role working between and with scientists and communities. Facilitators help to integrate the different kinds of knowledge held by different stakeholders and support those stakeholders to work together to implement a successful research programme.

1.6 **Taking a 'whole farm' approach**

Research and proposed new management tools need to take into account a 'whole farm' approach. Farmers need to know:

- The economic costs and benefits of using the management tool or taking part in the research
- Implications for changes to daily farming practices – (e.g. how it might impact on a farmer's work load)

In line with the social marketing theory, Edgar et al. (2005) point out that there must be some recognition within the farming community that a problem exists in the first place. In essence **researchers need to be able to convince end users that there is a land management issue such as excessive nutrient loss at their location that needs to be addressed. It may be appropriate at this early stage to undertake a public meeting or organise a workshop in the area so that the issue can first be debated by affected parties.**

Ultimately the local community needs to learn about the local land management issue and come to some l**evel of consensus that a problem exists before they can reasonably consider ways that they can contribute to managing the problem.**

Before the community accepts there is a problem, the problem needs to be put into the local context to illustrate the immediacy of the issue to local communities. Once the community recognises there is a local problem, it is at that point that discussion can occur on ways to address the problem. It is **important that the community feel their local knowledge can be considered alongside other more scientific or technical knowledge.**

4.1.57 Stream Health Monitoring and Assessment Kit

NIWA

URL Link

How healthy is your stream? SHMAK - the New Zealand Stream Health Monitoring and Assessment Kit - has been designed to help you find out.

This kit enables non-scientists to collect consistent, scientifically valid information from small rural streams and to use that information to make assessments of stream health.

4.1.58 Ten Years of Grassroots Action

Ministry of Agriculture and Forestry

October 2010.

Link to PDF

Overview:

The Ministry of Agriculture and Forestry's Sustainable Farming Fund (SFF) was set up in 2000 to fund projects that contribute to the economic, environmental and social wellbeing of New Zealand's land-based primary industries. Ten years on, the SFF has invested close to $100 million in nearly 700 farmer, grower and forester-led projects. This funding has been matched in cash and in-kind by industry, community groups and individuals.

This report looks back over the past ten years and illustrates just some of the projects funded over that time. The SFF will continue to support a wide range of projects based on innovation and leadership within the primary sector.

4.1.59 Three Frameworks to Understand and Manage Social Processes for Integrated

Catchment Management

Margaret Kilvington, Will Allen and Andrew Fenemor

New Zealand Journal of Marine and Freshwater Research (2011). 45(3), 541-555.

See Appendix One for full text of paper.

Abstract:

Integrated catchment management (ICM) initiatives involve many complex social interactions. Project leaders and participants face challenges in managing multiple demands for engagement, communication and integration of different knowledge across agencies, sectors, research disciplines and communities. **Social frameworks can be practical management tools that help project leaders and participants: (1) make sense of the social and management context of a project; (2) design strategies to meet social process needs such as communication and engagement; and (3) evaluate the effectiveness of the project with a view to improving it. This paper examines the role of social frameworks in supporting ICM research in the Motueka catchment over 10 years.** It reviews use of the ISKM (Integrated Systems for Knowledge Management) framework for sharing information between different stakeholder groups and the Orders of Outcomes framework for evaluating outcomes over long periods. In particular, it introduces the Social Spaces framework as a new tool for visualising diverse communication and collaboration needs across a project. We conclude with suggestions on using frameworks in conjunction with participatory evaluation to build capacity and strengthen relationships among project participants.

4.1.60 Tiffany Bush Care Group

2009

Link to PPT

Overview:

- Redoubt Ridge Bush and Stream Care Group
- Active since 2002
- 33 landowners
- 10 hectares in total
- 3 kms of streams
- Private land
- 5000 sq metres
- Semi-rural
- 3 mins to Manukau City Centre
- Practitioners of retrofit LIUDD

4.1.61 Upper Taieri Project

Redefining Upper Taieri Water Allocation and Management for Whole of Community Good

NZ Landcare Trust

200?

Link to PDF

Overview:

Led by the community for the community, The Upper Taieri project is working towards a community self-management approach for water resources. The project has strong farming leadership in partnership with the wider community. Deriving solutions as a community makes sense!

4.1.62 Waitao Stream

Landcare

Link to PDF

Overview:

A neighbourhood project to restore the banks of the Waitao Stream has had the additional benefit of restoring community spirit. That's the inspiring story of the journey taken by the Waitao-Kaiate Environmental Group and their work to clean up the Waitao Stream and maintain the natural beauty of the Kaiate Falls.

It was the threat of a landfill site at the top of their valley that first brought the Waitao Road residents together. United by their common goals of keeping heavy trucks off their quiet rural road and protecting their stream from contaminants, neighbours in the middle and upper catchment joined forces. They eventually succeeded in stopping the dump and as an added bonus, they got to know each other over countless cups of tea!

Local hapu, with their marae at the bottom of the catchment, had been working to enhance the lower reaches of the stream, with assistance from NZ Landcare Trust and NIWA. They shared their knowledge with their upstream neighbours through workshops and in 2008 the groups joined forces to form the 'Waitao-Kaiate Environmental Group'. This reinvigorated community went on to take up the challenge of improving overall water quality within the stream.

The founders wanted a corridor of bush along a pristine stream – a place for birds to live and kids to play.

The Environmental Group quickly developed a 10 year strategic plan and a structure of six sub-committees that dealt with specific aspects of the work. Creating a formal group helped with access to council funds and advice.

Members of the planting group began with their own properties, before using their experience to support other keen landowners with riparian fencing and planting. They tend to plant out larger plants (1 m tall or so) to compete with the grass and gorse. It saves time spent on weeding!

As the river has been improving, so have the neighbourhood relations. Resident Lyndel McGowan remembers the strong community spirit in the valley she grew up in. When she returned years later with her husband and daughter, everyone seemed to be leading their busy lives separately. The stream restoration project has changed all that. Now a core group of dedicated families have fortnightly working bees, chatting and enjoying each other's company while planting or potting up seedlings, and always making sure there is tea and muffins and time to relax once the tools have been put back in the shed.

4.1.63 Weedbusters National Strategy 2009-2014

Link to PDF

Overview:

This document provides the strategic direction for the Weedbusters programme in New Zealand from 2009-2014. This National Strategy forms the platform on which to build regional action plans, and follows on from the first successful Weedbusters National Strategy 2003- 2008.

The Weedbusters National Strategy 2009-2014 has several purposes. Central to the Strategy is the coordination of New Zealand's weeds education and awareness programmes. This coordination is achieved through the regional Weedbusters coordinators, encouraging synergies between organisations, agencies and regions and wider community to enable consistent and clear messages to be communicated. Essential to the Weedbusters work is the evaluation and improvement of weeds education and awareness.

It is hoped that these strategic directions will be reinforced through annual regional action plans to drive the work. These short-term plans will allow for the specific targeting of groups and issues within the strategic framework, according to regional and local priorities and resources available.

4.1.64 We're From the Council - and Here to Help

Vivienne McLean

New Zealand Tree Grower (2009). 30(1), 17-20.

See Appendix One for full text of paper.

Excerpt:

For Wanganui farmers Dougal and Di McIntosh, joint ventures have proved the key to survival through tough times, maintaining their forestry plantings and generating cash flow for farm development. Now a new type of partnership with Horizons Regional Council is taking their hill country sheep and beef farm to an even higher level of sustainable land management - and they are still planting.

See also "Whole Farm Planning: Horizons and Hill Country"

4.1.65 Wetland Restoration: A Handbook for New Zealand Freshwater Systems

Landcare Research

Link to URL

Overview:

Wetland Restoration: A Handbook for New Zealand Freshwater Systems brings together expertise from specialists and groups actively engaged in restoring wetlands throughout the country. **The handbook builds on regionally based restoration guides and provides a detailed, comprehensive ecosystem approach toward understanding, protecting and enhancing our remaining wetlands. It is targeted at those who plan to, and those who already are making a difference to improving wetlands, and is written in a way that can easily be understood and importantly, acted on.**

4.1.66 Whaingaroa Catchment Management Project

A Multi-stakeholder Approach to Sustainable Catchment Management. Report on the Approach

Margaret Kilvington, Landcare Research
Sustainable Management Fund Project N0. 2073
Landcare Research Contract Report: LC9899/021

Prepared for: Environment Waikato

September 1998

Link to Word.doc

Excerpt:

The Whaingaroa Catchment Management Project has been a new and brave approach to address issues of improving community involvement in environmental management on a catchment scale. The project has had some successes, primarily in the participatory nature of the process, the raising of awareness and interest in environmental management in the catchment, and securing the involvement of skilled and committed community members.

This project trialled the application of the process utilised in the Atlantic Coastal Action Programme. Participants in this evaluation have identified some areas where future application in other areas could be improved by:

- **Adequate time should be allowed for initial project set up, to address the needs of future participants to be consulted and to have input into identifying the process used.**
- **Selecting the site on the basis of antecedents such as : a recognised crisis or pressure for change, a shared vision, championship of a strong leader and adequate incentives and willingness for community participation, and considering the issues of natural geography and local identification with the area.**
- **Ensuring long term agency commitment to the project and to addressing necessary changes to their own organisational process to improve community participation in resource management through ensuring there is common and wide understanding and agreement on the project aims and objectives.**
- **Agency representatives could be less hands-off than prescribed in the ACAP process and take on a more active role in advocating for the group within their agencies and involving the group in catchment policy and planning.**
- **Ensuring capability to undertake fundamental research is built into the project to address questions regarding the key issues of catchment health, identified by the community.**
- **Ensuring flexibility is built into the process to allow participants to build the necessary skills, awareness, and confidence (and not compromised by ties to project funding).**
- **Useful collaboration with mana whenua could be addressed by adjusting the level-playing-field approach, acknowledging the independent relationship of iwi and local government and working to strengthen this.**

4.1.67 What has Changed Stream Management Practices in the Waitao Sub-Catchment?

Paula Blackett, Michael Mackay and Catherine de Monchy

Prepared for Robyn Skelton, Manager Land Resources Western Bay of Plenty Regional Council

August 2011.

Contact Robyn Skelton for a copy of this report, or search Western Bay Regional Council's website for a copy.

Introduction:

This report follows the effect of the Waitao-Kaiate Environment Group and Te Awa O Waitao Restoration project on environmental awareness and knowledge, stream management practices and social capital of Waitao Catchment residents from 2004 to 2011. Previous research within the Waitao Catchment in 2004 and 2007 (Blackett & Wilson 2008) has already looked at 1) the efforts of the Te Awa O Waitao Restoration Project Joint Steering committee, 2) the formation and activities of the Waitao-Kaiate Environment Group, and 3) a joint submission in opposition to a proposed landfill site in an old pumice quarry. It was suggested that these activities had resulted in;

1. An increased awareness of the role of poor stream management practices in water quality degradation.
2. An increased knowledge of the impacts of land and stream management practices.
3. A general acceptance of riparian planting as a mitigation measure to reduce impacts of land use and land management practices and a willingness to take action around planting waterways.
4. Increased social capital as a result of increased interaction between local residents.

A further series of interviews and face to face surveys in 2011 (reported in the current document) allows for further clarification on the impact of restoration activities in the catchment and the identification of factors which have contributed to stream restoration activities. The research also provides some key lessons which may be relevant to other local restoration projects (and voluntary action movements, more generally) within the Bay of Plenty Region. Before reviewing the outcomes of this study it is important to note that the effects described are restricted to those participants with properties in the Waitao Valley. Changes in awareness and perception do not appear to extend to residents of Rocky Cutting or Kaitemako Roads.

4.1.68 Whole Farm Planning: Horizons and Hill Country

Greg Sheppard

Primary Industry Management (2008). 11(2), 32-35.

See Appendix One for full text of paper.

Abstract:

The Horizons Regional Council Whole Farm Plan focuses primarily on the land resource and business management. However, for many farmers involved in the process, the plan they receive at the completion provides them with information about their whole business, information that previously was not available.

Key sections in the plan include:

- **An inventory of core resources as a factual description of what is there such as soils, subdivision, vegetation, land and water resource.**
- **Resource evaluations to identify magnitudes of environmental risk, capabilities of sustained production, production yield gaps and opportunities fro improved farm performance.**
- **Review of the existing farm business using benchmarking and an analysis of options for achieving personal ands business aspirations.**
- **Recommendation of best practice solutions to enhance farm sustainability tailored to the individual farm in question.**
- **Integrated long-term business and resource management plans that outline the what, when, where and how much of achieving agreed change.**

4.2 International Research

4.2.1 Australia: Social Capital and Natural Resource Management

The Australian Landcare Movement

Trevor J. Webb and John Cary

In: Agriculture and Rural Development Discussion Paper 11 Extension Reform for Rural Development

Volume 4. Revitalization Within Public Sector Services. Case Studies of International Initiatives

William Rivera and Gary Alex (editors). The International Bank for Reconstruction and Development / The World Bank. 2004.

Link to PDF

Overview:

Landcare is a unique approach to rural and regional development based upon a partnership between the community and the state in the context of natural resource management. Landcare has been successful in mobilizing local communities, in particular landholders, to work collaboratively in the treatment and prevention of land and water degradation on agricultural lands. This participatory approach, encouraging community self-reliance with limited but strategic government support, has become the dominant approach to rural and regional development in Australia. Landcare has been very successful in motivating and mobilizing landholders to treat land degradation as a serious issue with the existence of over 4,500 community landcare groups. More than one in three farms in Australia is represented in a community landcare group. One of the contributors to the success of landcare is its community-based, bottom-up approach to an issue that is of direct tangible concern to rural and regional communities. Landcare uses and enhances social capital existing within these rural and regional communities to effect positive environmental change. This paper presents a brief case study of landcare and its relationship to social capital in achieving community-defined goals.

Excerpt:

...Landcare is successful, in part, due to its ability to capitalize on existing social capital, and to further build the elements of social capital, within rural and regional communities. The degree of integration within communities is evidenced by high levels of farmer participation in community landcare groups, the growth in community groups, and the broad-based support for community landcare. Importantly, community landcare groups provide a forum for learning for their members...

4.2.2 Barriers and Strategies for Small-Scale Producers

People, Partnerships and Communities, USDA Natural Resources Conservation Service

June 2000.

See Appendix One for full text of paper.

Abstract:

This fact sheet provides a list of barriers and strategies that, although not exhaustive, provide social science based information to assist you as you work with limited resource groups.

4.2.3 Community Landcare

A Key Player in Building Social-Ecological Resilience Networks?

Ruth Beilin and Nicole Reichelt

Victorian Government Department of Sustainability and Environment, Melbourne. June 2010.

Link to PDF

Introduction:

...The main assumption of these social developments is that community Landcare faces a new wave of social challenges that may require the cultivation of a suite of strategic responses in communications and program delivery to ensure its operation in community space remains relevant and viable. Changes in the social landscape are ongoing and vary spatially, temporally and culturally. Therefore social change per se is not novel, but how we (as individuals, communities, society) respond to change is constantly evolving. The question underpinning this literature review is: how might Victorian community Landcare be affected by and respond to diversifying socio-demographics, further development of corporate farming and shifting natural resource management (NRM) policy directives?...

4.2.4 Frameworks and Indicators for Assessing Progress

in Integrated Coastal Management Initiatives

Stephen B. Olsen

Ocean and Coastal Management (2003). 46, 347-361.

See Appendix One for full text of paper.

Abstract:

The fundamental purpose of all integrated coastal management (ICM) initiatives is to maintain, restore or improve specified qualities of coastal ecosystems and their associated human societies. A defining feature of ICM is that it addresses needs for both development and conservation in geographically specific places—be they a single community, an estuary or the coast of an entire nation. The times required to achieve these fundamental goals at significant spatial scales far exceed those of the usual 4–6-year project, the dominant ICM modality in developing nations. **This paper offers two simple, but elastic frameworks for assessing progress over the extended time periods involved. The first is the four Orders of Outcomes that group together the sequences of institutional, behavioral and social environmental changes that can lead to more sustainable forms of coastal development. The second framework is a version of the more familiar ICM policy cycle. These conceptually simple frameworks are making it possible to unbundle and organize into consistent formats the usually implicit assumptions that underpin project and program designs and then group activities and outcomes along a critical path that leads—or is presumed to lead—to the desired outcomes. Each step in the ICM policy cycle and each Order of Outcomes suggest the indicators by which progress and learning can be assessed. The application of these frameworks to a diversity of ICM initiatives is proving useful in assessing progress across portfolios of ICM initiatives, extracting good practices and teasing out how different governance contexts effect the forces that shape the evolution of ICM initiatives.**

4.2.5 Hawkesbury-Nepean River Recovery Program (Smart Farms Project)

Industry and Investment, New South Wales Government

Link to PPT

Overview:

The Hawkesbury Nepean River system is under significant stress. Water extraction, catchment development, and contaminated runoff have resulted in excessive weed growth, algal blooms and elevated levels of pollutants.

The Australian Government, through its Water for the Future Program, has funded a Hawkesbury Nepean River Recovery Package to improve the health of the River. The Package aims to increase environmental flows and reduce nutrients entering the River system.

The Package includes various components that will be co-ordinated by state and local government agencies. Industry and Investment NSW (formerly NSW Department of Primary Industries) is working with the Hawkesbury Nepean Catchment Management Authority to implement the NutrientSmart Farms and WaterSmart Farms project components from 2009 - 2011. Both projects are working with landholders in the Hawkesbury Nepean catchment below the major water supply dams. Due to the many synergies between the two projects they are being delivered together, and are known collectively as the Smart Farms projects.

4.2.6 Promoting Sustainable Behaviour

An Introduction to Community-Based Social Marketing

Doug McKenzie-Mohr

Journal of Social Issues (2000), 56(3), 543-554.

Link to PDF

Abstract:

Most programs to foster sustainable behavior continue to be based upon models of behavior change that psychological research has found to be limited. Although psychology has much to contribute to the design of effective programs to foster sustainable behavior, little attention has been paid to ensuring that psychological knowledge is accessible to those who design environmental programs. **This article presents a process, community-based social marketing, that attempts to make psychological knowledge relevant and accessible to these individuals. Further, it provides two case studies in which program planners have utilized this approach to deliver their initiatives. Finally, it reflects on the obstacles that exist to incorporating psychological expertise into programs to promote sustainable behavior**.

4.2.7 Using Market Segmentation to Improve Targeting

of Natural Resource Management Expenditures

Mark Morrison, Jeanette Durante, and Jenni Greig

Australian and New Zealand Marketing Academy Conference (ANZMAC)

2009.

Link to PDF

Abstract:

Standard marketing tools have rarely been used in natural resource management (NRM) yet marketing provides a rich set of information to improve targeting of expenditures. Market segmentation allows identification of landholder segments which are "investment ready" and programs that they would be most willing to participate in. It also allows identification of segments that are not investment ready, and what might be done to encourage participation. We report the results of a large scale segmentation exercise involving a quantitative survey of 6000 landholders. We find three mainstream and two lifestyle segments which differ substantially in their propensity to be involved in NRM programs.

Excerpts:

...The three mainstream farmer segments have been labelled *Quality Operators*, *Mainstream but not well connected,* and *Profit First.* Broadly, these three groups can be classified as comprising landholders with high, medium and low socio-demographic status, although the data are more nuanced than this. Across the three groups we see decreasing levels of business orientation, information seeking behaviour, innovativeness, time and capital constraints, with the **highest levels amongst the *Quality Operators*** and the **lowest amongst the *Profit First* segment. The *Profit First* group is also distinguished by its very low levels of trust, environmental responsibility, satisfaction with previous programs participated in, high perceived capital and time constraints, and low levels of education.** The *Mainstream but not well connected* segment is unlike the other two segments in several respects. **Connectedness** was lowest amongst the segment, possibly because this group had 40% people living on their property less than 10 years and because they have a high proportion of people from a professional background. In addition, this group was **highest in terms of trust and environmental responsibility, and lowest in terms of economic motivation. This group is the most interested of the three in increasing its area of native vegetation.**

...The **two hobby farmer segments** can also be differentiated in terms of socio-demographics with the lower sociodemographic group being much larger segment. **Both groups have relatively low levels of business orientation and information seeking behaviour, however both have high levels of trust of those delivering NRM programs, and the latter are well connected in their communities, which is important for achieving word of mouth. Both groups have high levels of environmental responsibility and wish to substantially increase the area of native vegetation on their properties**.

...Of particular interest for this research is understanding which groups are likely to be investment ready. The awareness of and past participation of each of these groups in a range of NRM programs was therefore assessed. As shown in summary form in Table 2, both **awareness and participation was highest amongst the quality operators, with almost one in two *Quality Operators* participating in at least one NRM program**. It was **second highest amongst the *Mainstream but not well connected* segment, with about one in four landholders participating in at least one program**. Awareness and participation is much lower amongst the remaining segments. **Participation is however much higher amongst the *higher-end hobby farmers* than the *smaller hobby farmers*.**

...Interest in future participation paralleled past participation, with the ***Quality Operators*** **and** ***Mainstream but not well connected*** **having the greatest interest in each of the programs considered**.

5. Useful Websites

The websites below contain a plethora of additional resources and information related to this literature review.

NAME	DETAIL
New Zealand Websites	
Agriculture Research Group on Sustainability (ARGOS)	http://www.argos.org.nz/index.shtml
Waikato Biodiversity Forum	http://www.waikatobiodiversity.org.nz/
Sustainable Land Use Research Initiative (SLURI)	http://www.sluri.org.nz/
Land and Water Forum	http://www.landandwater.org.nz/
New Zealand Farm Environment Award Trust	http://www.nzfeatrust.org.nz/content/1/default.aspx
Australian Websites	
Caring for our Country	http://www.nrm.gov.au/
Landcare	http://www.landcareonline.com.au/
United Kingdom Websites	
Campaign for the Farmed Environment	http://www.cfeonline.org.uk/
Linking Environment and Farming (LEAF)	http://www.leafuk.org/leaf/home.eb

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