SUSTAINABLE AGRICULTURE INITIATIVES IN NEW ZEALAND

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ABSTRACT

The promotion of sustainable land management practices by central and regional government and through local community group approaches in New Zealand is summarised in this paper. There are constraints to farm level adoption of new sustainable technologies and management practices in NZ pastoral agriculture. Sustainable systems by definition should be environmentally safe, economically viable and socially and culturally acceptable. The lack of farm profitability, the lack of co-ordination of technology transfer providing information for decision making and the withdrawal of rural services were identified as constraints to the uptake of "sustainable systems". For a period of 3-5 years a family owned farm received community and scientific input on how best to implement management and land use changes that will enhance sustainability. Both scientist and community group members raised their awareness of environmental, economic and social sustainability and the linkages between each aspect.

INTRODUCTION

New Zealand agriculture is largely based on pastoral or grassland systems that are extremely energy efficient and not highly modified. Farming activities have benefited New Zealand's natural resources. The nation's soils, for example, are far more productive than they were 50 years ago. There are, however, specific areas of agricultural land use that may not be sustainable over time. In some parts

of New Zealand land use has developed beyond the physical and climatic limitations of the resource. Weeds and pests in the semi-arid areas of the South Island High Country (Elliott and Anderson 1995), accelerated soil erosion on North Island hill country, drought on the east coast of both islands, and the impacts of dairy farming on aquatic ecosystems (Morriss 1996), have all been the focus of attention in recent years.

In the last decade, central and regional government policies have been attempting to encourage sustainable land management on privately owned farms through regulatory and facilitatory means, but generally without financial subsidies. Compounding the complexity of this task, in recent years farm incomes on sheep and beef farms have been at a 30-year low. While most New Zealand farmers have a strong stewardship ethic and want to carry out sustainable management of the resources within their control, financial pressures are in some cases preventing this from happening.

Despite this, real progress is being made. This paper will set the scene by describing New Zealand's recent experience in the sustainable land management policy context. It will then present an example of a project that has enabled the interactions of a farm's physical resources, financial pressures, and social factors to be addressed, while building on the sound scientific base that is required to achieve sustainable land management in practice.

NEW ZEALAND AGRICULTURE IN CONTEXT

Compared with the more intensive agriculture sectors of North Asian, European and North American countries New Zealand agriculture utilises more extensive systems, with substantially less reliance on fertilisers, pesticides and energy inputs. Livestock are grazed on pasture all year round, taking advantage of New Zealand's temperate climate and improved grassland.

Farming activities have benefited New Zealand's natural resources, particularly soils. Approximately 10 million hectares of improved pasture and crop land are now many times more productive than they were 50 years ago. This has been achieved with the application of science and technology, notably the correction of natural plant nutrient deficiencies, particularly phosphorus and sulphur and of

trace element deficiencies affecting plants (boron, molybdenum) and animals (copper, cobalt, selenium). The introduction of nitrogen fixing legumes and more productive grass species have restricted artificial fertiliser usage largely to that of phosphorus and sulphur.

With the development of agriculture, in the 30 year period from 1950 to 1984 livestock units doubled, livestock units per hectare more than doubled, livestock units per unit of farm labour trebled, but production per animal remained static. Research and development reinforced this trend and when commodity prices declined during the period of the 1970s and early 1980s, incomes were supported by a range of input subsidies and price supports which maintained the expansionary momentum, often beyond the natural sustainability of the land resource.

However, assistance measures were often applied in isolation from other policy areas, particularly environmental and resource conservation policies. Large areas of steep and marginal land were developed to pasture from native forest and bush. In many cases this was contrary to recognised soil conservation practices and impacted directly on water quality, by increasing concentrations of suspended sediments and dissolved nutrients.

In 1984, Government support to New Zealand agriculture was removed. Farm income levels are now entirely dependent on international prices and are therefore vulnerable to world market, as well as climatic, risks. The agricultural system is now reacting to market pressures. Changes have had some significant and beneficial environmental implications. The development of steep and marginal native forest and bush has largely ceased, and some is reverting back to bush. Livestock numbers have reduced substantially with a subsequent reduction in total grazing pressure, particularly on hill country.

SUSTAINABILITY ISSUES IN NEW ZEALAND

There has been growing concern in New Zealand in recent years over the degradation and loss of natural resources. There are specific areas of the country where sustainability is an issue.

The Physical Factors

Physical degradation of the land resource is most evident in the indigenous grasslands of the South Island, 300,000 hectares or 2% of total South Island land area, and in areas of the East Cape of the North Island suffering severe soil erosion, affecting 285,000 hectares. The frequent and (historically)extensive provision of drought relief to farmers on the east coasts of both the North and South Islands gives an indication of the economic sustainability issues facing farms in those areas.

The protection of the environment from both imported and endemic pests and diseases is also a critical issue in sustaining agricultural production and trade. The introduction or outbreak of pests would pose significant risks. The need to control pesticides for environmental reasons needs to be balanced against the advantages of this protection. Nevertheless, New Zealand use of pesticides is low by world standards.

Changes in land use are taking place. Plantation forests (Pinus sp.) have been planted on generally poorer and hilly land after grassland farming has failed. Environmental protection is high in these areas once trees are well established. In addition, agro-forestry regimes are being integrated into farm systems both for environmental reasons and for product diversity. Protection planting on high erosion risk land is also taking place, both with exotic and native species.

The Economic and Financial Consequences

The financial viability of farm businesses is linked with considerations of physical resource use. Farms in New Zealand are vulnerable to both climatic and international market risks. Sustainable agriculture in New Zealand also means remaining competitive, and being able to operate profitably and sustain that profitability over time. New Zealand considers that high levels of taxpayer financial assistance are not sustainable as this distorts the signals and incentives to producers, processors and marketers and places an unsustainable burden on other parts of the economy providing the 'cost of support'.

This has been the premise on which farm subsidies, both on product prices and input costs, have been removed in New Zealand over the latter half of the 1980s. In this economic climate New Zealand farmers have not always had the resources

to respond to environmental pressures as well as they would like but there is recognition amongst most New Zealand farmers of the need to achieve sustainable land management practices.

Community Impacts

In the cases where land degradation occurs the effects extend beyond individual farm boundaries to the wider community. Community impacts have included:

(a) the flow on effects of declining and variable farm productivity and incomes placing additional pressure on the infrastructure of rural communities;

(b) erosion of headwaters and catchments, deposition of silt and sediment in water courses reducing the flood capacity and so increasing downstream flood risk and the associated flood management costs; and

(c) reduced water quality due to suspended sediments leading to increased treatment costs.

POLICY FRAMEWORK

The concept of sustainable management has been introduced in New Zealand through policy, legislation and science. Policy initiatives are addressing the need to integrate economic, social and environmental values and objectives. Agricultural research projects are now aimed largely at achieving the long-term sustainability of the farming ecosystem. It is recognised that both are required to achieve sustainable land management in practice.

Resource Management Act 1991 (RMA)

The key to the policy initiatives has been the Resource Management Act 1991. This legislation brings together all, or parts of, 75 statutes into a single Act. Probably the biggest law reform in New Zealand's history, this Act provides for fundamental changes to previous laws and includes:

- a single purpose to promote sustainable management in the use, development and protection of natural and physical resources;
- a duty on policy makers to assess costs and benefits and identify most efficient and effective means;

- planning that is not about deciding where particular activities go, rather, deciding what environmental effects should be controlled;
- a requirement for integrated management of pollution and wastes, and to ensure cleaner air and water; and
- an active responsibility on local government to ensure the Treaty of Waitangi[1] is taken into account in all decision-making.

The sustainable land management outcomes sought by the Government are:

- the maintenance of the potential of the nation's soil resources to achieve viable land use options for present and future generations;
- the adoption of management skills and application of appropriate technology to enable people and communities to provide for their social and economic well being;
- the adoption of land management practices that maintain or enhance the quality of waterways and ground water resources and to reduce levels of suspended sediments, nutrients, harmful micro-organisms and other contaminants;
- the avoidance, mitigation and remedying of the impacts of land related hazards including flooding, subsidence and erosion;
- the maintenance of catchments to provide high quality water resources for downstream users;
- the maintenance of cultural values associated with land and water, including the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, wahi tapu (sacred places) and other taonga (treasures); and
- the maintenance of aesthetic, ecological and conservation values related to land and water.

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[1] the foundation document for New Zealand, the Treaty of Waitangi sets out the responsibilities and obligations of each partner. The Treaty established for the people of New Zealand the rights of government and those of self-management of the Maori people.

For the agricultural sector Government policy takes the view that sustainable agriculture must integrate environmental concerns with economic, social and cultural concerns. The definition adopted by the then Ministry of Agriculture and Fisheries (MAF 1993) is that sustainable agriculture is the use of practices and systems that maintain or enhance:

- the ability of people and communities to provide for their social and cultural wellbeing;
- the economic viability of agriculture;
- the natural resource base of agriculture;
- other ecosystems influenced by agricultural activities; and
- the quality and safety of food and fibre.

PROGRESS IN THE 1990'S

Implementation of the RMA is now well underway. Resource management issues of significance have been identified and policy objectives defined. Many Regional Policy Statements have been notified. A number of regional councils have proposed land, water and air plans, and district councils their District Plans.

However, its implementation has been heavily criticised by forestry and agricultural land users (Morriss and Workman, 1998). Farmers and foresters are concerned that councils are placing undue emphasis on regulation. In contrast to the view of the farming and forestry interests, a contrary view is that voluntary methods are not effective on their own, and that controls are needed for farming in high risk erosion areas.

It is even more important in these circumstances that promotion of sustainable agriculture and land management practices be based on a sound understanding of why farmers may or may not be motivated to implement sustainable management systems on their properties. This idea was well captured by James Wyllie as far back as 1953 when, in an early farm management text, he stated that (p. 4):

> *"whatever the conditions of the soil, climate, topography layout and so on may be, it is the farmer and his (or her) workers who determine whether*

the farming will be good, bad, or merely indifferent".

Furthermore, individual farmers who must make day to day management decisions are often having to do so without adequate information - in particular practical 'what to do' and 'how to do it'. This has created a number of practical consequences (following Walker and Morriss 1996):

- firstly, it has a tendency to reinforce a continuation of past and current practices (not all of which may be desirable);
- secondly, by not being able to define sustainability, the debate often turns to defining what is not sustainable (and not everything is); and
- thirdly, it limits the amount of learning possible by individuals and communities, and therefore the progress towards more sustainable practices.

All too often, valuable initiatives and information are not fully utilised simply because policies and data are not consistent with the learning needs of farmers and growers. There seems to be some reluctance to accept the situation and to redress the imbalance between **hard** and **soft** science among traditional scientists and policy advisors (Smith, 1996).

Experience in New Zealand over the last decade has shown that the participatory development and utilisation of best management practices is critical to industry progress. Recent examples of such processes in New Zealand include (naming a few):

- the development of an Agrichemical Users Code of Practice;
- industry development of the Fertiliser Users Code of Practice;
- development of Best Management Practices guidelines for the environmental management on dairy farms, and particularly effluent disposal, by a Dairy industry environment committee;
- development of environmental management systems and focus orchards in the kiwifruit and apple industries;

- development of a community based sustainable vegetable production system in the South Auckland area; and
- application of the Ontario Farm Plan system to Southland by the Southland Sustainable Land Management Group.

There are also now many New Zealand examples of initiatives, which recognise the importance of green consumerism, for example branding and quality assurance strategies in the wool, deer, dairy, apple and kiwifruit industries.

These developments have been supported by significant agricultural research effort, which is addressing factors concerned with achieving long-term sustainability of farming ecosystems. A national science strategy process has been developed which has attempted to guide research priorities toward this end (SCGSLMR 1995). Examples are programmes targeted at:

- further minimising chemical intervention and increasing the resistance of plants and animals to parasites and insect pests;
- the production of organic lamb, field crops, kiwifruit and pipfruit;
- biological control of weeds and insect pests;
- minimisation of pesticide residues; and
- reduced herbicide use and the ecological management of weeds.

New Zealand science has had a tradition of dividing scientific problems into discrete, manageable pieces, a process commonly referred to as reductionism. Many of our current agricultural and environmental problems can be traced to it. Equally characteristic is the belief in universal technologies - that technologies can be adopted and applied across the diversity of ecosystems in the same way (MacRae *et al*, 1989).

Historically science has been valued because of its objectivity, 'truth-finding' and knowledge development. More recent thinking emphasises that knowledge is also influenced by what we experience and the socio-economic, cultural, political, and emotional context in which we perceive them (Maslow, 1966; Davenport, 1982; Busch & Lacy, 1983; Miller 1985).

These concepts are now being incorporated into participatory research which requires the involvement of farmers and growers, and an interdisciplinary approach by the science team (Allen and Bosch, 1996). Participatory research is commonly described as an integrated activity that combines social investigation, educational work and action (Hall, 1981). This, in itself, creates tensions for scientists in today's competitive market. Interdisciplinary teamwork suggests some anonymity and much information sharing. Both can be inconsistent with publishing for career advancement, and with intellectual property considerations of contestable science.

THE WESTVIEW CASE

In 1995 a project was initiated to identify the sustainable land management issues and concerns facing meat producers, in order to develop a workable method for studying sustainable land management issues and developing solutions acceptable to the wider community (MacKay *et al*, 1998)

The project adopted a community-based approach on two farms, located in contrasting environments in the southern North Island. The Community Groups were diverse and included farmers and scientists and representatives from banks, policy agencies, and other interest groups including foresters, environmentalists and organic producers. The differing points of view were considered essential to identify the issues and concerns, and to develop acceptable solutions.

Project objectives

The project aimed to work with the community groups to encourage adoption of sustainable management systems on each property by:

- Defining each land use unit based on land resource inventory data.
- Establishing the potential productive capability and environmental constraints of each land unit to livestock farming.
- Testing techniques for practical and cost-effective measurement of environmental impacts of livestock farming.
- Comparing potential with current farm productivity and actual environmental impacts with acceptable environmental standards.

- Establishing input/output relationships for each land unit.
- Designing potential adjustments in current livestock enterprises to optimise the efficient and sustained use of farm resources.
- Exploring the effect of group processes on the attitudes and beliefs of community group members.

Approach

Westview Farm is a 963 ha (725 ha farmed) hill-country property in the Pohangina Valley, Manawatu. The balance includes a gorge, 41 ha of forestry, shelter plantings, and bush regeneration on the range country. There is also a 150 ha dairy farm associated with the overall farm operation, but this was not included in the project. It has relatively reliable summer rainfall, and farms sheep, beef and deer.

The approach with the Community Groups was interactive learning, rather than teaching/learning. The farmer members (about half the total) also brought a range of other experience to the Group as a result of their involvement in other organisations, such as district and regional councils and the Farm Forestry Association. Other members included technical specialists (e.g., scientists, consultants, regional council officers), agribusiness representatives (e.g., bankers, fertiliser company) and interest group representatives (e.g., Maruia Society, Fish and Game Council, Department of Conservation). The approach was to bring together a diverse range of views to facilitate the learning process, but to maintain a predominant farmer flavour.

The Community groups met four to five times a year over the three years of the project. Each meeting in the first two years involved a field activity to examine one or more Land Management Units (LMUs) followed by a meeting inside. The procedure for this part of the meeting involved alternating sub-group and full-group discussion, to maximise opportunity for input from all group members. A number of sub-groups were formed in the third year. In addition a number of "special" days were also held, including one to develop an erosion plan for Westview, a landscape values day at the other farm and a joint meeting of the two Community Groups to discuss and debate social sustainability.

Over the three years the project worked through the following tasks:

- Identifying the sustainable land management issues facing meat producers in each of the two environments.
- Constructing physical resource inventories for each property, by identifying land capability units, and aggregated these into land-management units (LMUs).
- Determining the current and potential production levels for each LMU, and the environmental outcomes resulting from those production levels.
- Identifying indicators that can be used to assess environmental health.
- Identifying alternative management systems and agreeing on an acceptable set of environmental outcomes for each LMU.
- Conducting physical and economic input/output analyses to determine profitability of each LMU under existing and alternative scenarios.
- Integrating changed LMU management policies into acceptable whole-farm management strategies, using decision-support models.
- Examining the effect of the project on group members' attitudes and beliefs on sustainable land use.

A monitoring programme was initiated on both properties in the second year to provide information on issues of concern to the group (e.g. water quality, wind and slope-induced erosion) and to gather information for input/output analyses.

The attitudes and beliefs of Community Group members were measured at the start, mid-point and end of the project. A "control" group of farmers was also sampled at the time of the third measurement of the Community Group members.

At the outset of the project the desired outcomes included an improved understanding by Community Group members of issues involved in sustainable pastoral farming, the importance of recognising and considering the wider view, and the development of a workable and productive method for studying sustainable land management that could be used by other Community Groups.

Sustainable land management issues

The project has shown that "sustainability" is considerably more than just stopping point source effluent discharge and soil erosion. This is reflected in the list of concerns raised and discussed by the Community Groups over the course of the project. This included water availability and quality (both surface and ground), economic viability/performance of pastoral systems at current production levels, land use competition, soil fertility depletion, soil structural decline through stock treading and soil loss through wind erosion, social change and rural decline, pests (rabbit and opossum/tuberculosis) and weeds (thistle), chemical use, landscape management and value (wildlife, aesthetics), animal welfare, shelter, market access, rural infrastructure and product quality perceptions.

The groups also identified positive attributes, including the lack of physical problems, the scope, scale and balance of the property, future economic prospects with additional development, tourism potential due to the unspoilt nature and character of the property, and the local community.

The list of concerns raised and discussed by the Community Group at Westview included many issues in common with the other farm but, in addition, some different concerns and different priorities, highlighting the interaction between individual farms, the farm's characteristics and people in defining sustainable land management issues. The most significant issues at Westview were water quality and the effects of this on eutrophication, erosion, pugging, and the impact of tuberculosis on sustainability.

With both farms only 30 minutes drive from a major centre, the issue of alternative land use was considered. The Community Groups had very mixed views about the impact on rural communities and economies of people moving to a rural setting for "lifestyle" reasons.

The project has developed a workable approach to study sustainable land management that can be readily incorporated into existing monitor or farm discussion group structures.

There is no need to study the subject as a separate activity. The essential components in the approach developed included:

- A community of interest.
- An interactive learning environment.
- Ready access to information and expertise.
- Resource information at a paddock scale.
- A systematic approach to the identification of issues.
- Establishment of the current and potential productivity of the farm.
- Establishing an acceptable and measurable set of environmental outcomes.
- A monitoring programme to provide base data and provide additional information to increase understanding on key issues.
- The use of systems models to allow meaningful comparison of the physical and financial performance of the alternatives.

One of the major findings of the study was that many of our current land management practices were found to be sustainable where appropriate and when correctly implemented.

The financial analysis of the alternative farming systems demonstrated that by optimising the use of the farms resources and minimising environmental effects it is possible to design production systems that are more sustainable in both economic *and* environmental terms.

Group members overwhelmingly considered they had gained a wider perspective from their Community Group membership. The wider perspective was sometimes challenging, sometimes affirming, but almost always positive. Exposure to other points of view was widely seen as beneficial. It has shown that the participatory approach can be a very powerful tool in gaining an appreciation of others' viewpoints.

CONCLUSION

The New Zealand withdrawal of agricultural supports in 1984 has led to several direct environmental benefits, including reduced marginal land development,

associated protection from soil erosion, reduced application of fertilisers and pesticides and associated pressures on the environment.

Fluctuations in farm incomes can affect the environment, for example in relation to investment in soil conservation measures, short term management practices aimed at maintaining financial viability, and level of flexibility for farmers to apply risk management strategies in advance of adverse climatic events such as floods and droughts.

New Zealand has established a framework within which the future orientation of sustainable agriculture and land management policies can be focused. Integrated, comprehensive, multi-disciplinary approaches are needed at all levels, from the farm through to national policy.

One such comprehensive programme at the farm level has been implemented over the last 3 years on Westview. It sought to identify the sustainable land management issues and concerns facing meat producers, in order to develop a workable method for studying sustainable land management issues and developing solutions acceptable to the wider community (MacKay *et al*, 1998)

It has achieved the knowledge that many of our current land management practices were found to be sustainable where appropriate and when correctly implemented. It also concluded that the participatory approach is a very powerful tool in gaining an appreciation of others' viewpoints.

The lessons learnt are that the successful incorporation of sustainable resource management into farming practice requires land managers to work through three steps:

- Managers' awareness needs to be raised.
- They need good resource information, education and assistance with adoption.
- They need to be provided with the tools to monitor effects.

Tools for achieving this need to be developed and promoted as the next stage to follow on from the Sustainable Land Management Project. Best management practices will move farmers rapidly towards sustainability because the bottom line is affected.

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