

BEFORE THE HEARINGS COMMITTEE

IN THE MATTER

**of hearings on
submissions concerning
the proposed One Plan
notified by the
Manawatu-Wanganui
Regional Council**

**SECTION 42A REPORT OF ALEC MACKAY
ON BEHALF OF HORIZONS REGIONAL COUNCIL**

1. INTRODUCTION

My qualifications/experience

1. My full name is Alec Donald Mackay. I have a Doctor of Philosophy degree (PhD) in Soil Science from Massey University, Palmerston North, New Zealand. I hold a Bachelor of Agricultural Science Honours Degree from Massey University.
2. I have worked as a Post-Doctoral Scientist (1982-84) in the Agronomy Department of Purdue University, IN 47907, USA, Research Scientist, DSIR Grasslands, Palmerston North (1985-90), Research Scientist, Officer-in-charge, DSIR Ballantrae Hill Country Research Station (1990-92), Research Scientist; Officer in Charge, AgResearch Ballantrae Hill Country Research Station (1992-95), and as a Research Scientist and Programme Leader AgResearch Grasslands (1996-2007).
3. My current position is as an Eminent Scientist and Programme Leader in AgResearch in the Climate, Land and Environmental Group based on the Grasslands campus in Palmerston North. The current focus of my Land Use Research is on exploring the relationship between farm production and the environment, with a particular focus on the impacts of intensification of land use on those soil attributes (ie. physical integrity organic matter content) and functions governing the productive capacity and nutrient cycling in soil. The research extends to some wider land use issues, including an active involvement in the Sustainable Land Use Initiative with Horizons Regional Council, development of a natural capital-based approach to resource management, whole farm planning and environmental planning and reporting (www.projectgreen.co). I was a principal in the development of SUBS (Soils Underpinning Business Success) education package developed to assist land managers gain a few simple easily-learned skills for describing and mapping their own soils.
4. I am a Fellow of the New Zealand Society of Soil Science and the current President. I have published 80+ research publications, 100+ conference papers, 20+ significant client reports and over the last 15 years been involved in supervision of 18 post-graduate students.
5. I have provided expertise to Horizons Regional Council since its establishment, have been involved heavily in the development of the Sustainable Land Use Initiative (SLUI), have assisted in developing the case to Government for support for SLUI, and am retained by Horizons Regional Council on an ongoing basis to continue the development (eg. on-farm monitoring programme) and evolution (eg. refinements to the Whole Farm template) of SLUI.

6. I have read the Environment Court's practice note 'Expert Witnesses – Code of Conduct' and agree to comply with it.

My role in One Plan

7. I have provided expertise to Horizons Regional Council in the development of the Sustainable Land Use Initiative (SLUI) since its conception in September 2004, and in the development of the water quality component of the One Plan through several contracted research projects

My role in SLUI

8. I have provided expertise to Horizons Regional Council in the development of the SLUI since its conception, beginning with a presentation to the Community Leaders' meeting in September 2004; was a member of the working party, contributed to the development of the goals and objectives of the SLUI, member of the governance group, completed with a colleague a cost and feasibility study of SLUI, developed with a colleague six prototype whole farm plans and the Whole Farm plan template; initiated a number of research and development projects (eg. on-farm monitoring, linking on-farm actions to the catchment, links between SLUI and water quality), contributed to the case to Government; and am currently retained by Horizons Regional Council on an ongoing basis to continue the development (eg. on-farm monitoring programme) and evolution (eg. refinements to the Whole Farm template) of SLUI.

Scope of evidence

9. This report is to inform the committee of the following:
 - a) Background to the SLUI
 - b) The principles of land evaluation and planning
 - c) Development of the aims, objectives and underlying principles governing SLUI
 - d) Cost and feasibility of SLUI
 - e) Research, development and capabilities requirements for SLUI
 - f) Roll out of SLUI
 - g) Roll out of whole farm plans
 - h) Industry sector issues and solutions (capacity problem, relationships)
 - i) Cost benefit of SLUI

10. My evidence will cover the role I played as an expert in soils and land use evaluation and planning in the development of the Sustainable Land Use Initiative. My evidence does not extend to the implementation of SLUI beyond the development of the prototype whole farm plans, the whole farm template and proposed monitoring programme.

2. EXECUTIVE SUMMARY OF EVIDENCE

11. **Background to the SLUI.** I was asked to make a presentation to the Community Leaders' meeting in September 2004 on current knowledge and practices in sustainable land management, future challenges, and to make some suggestions on the actions that could be taken to ensure the Region was protected from a future storm event. Suggestions included the need for a sustainable development strategy, and the "heart" of that strategy a sustainable land management policy, delivery of the policy at the farm scale through whole farm planning, and the need for a new partnership between land owners and community.
12. **The principles of Land Evaluation and Planning.** Land evaluation is an internationally practiced discipline with its own theory and methodology. Whole farm planning represents the application of land evaluation to individual farm properties. It is a structured decision-support procedure for describing the characteristics and properties of a farm's land resources; identifying opportunities and limitations for production and environmental management; optional design and evaluation of improved systems of land use; and planning a course of action to effect any required land use changes.

Development of the aims, objectives and underlying principles governing the SLUI

13. As member of the working party I contributed to the development of the **aims of the SLUI:**
- Reduce the Region's reliance on government relief/recovery assistance in the future;
 - Protect hill country and lowland communities and assets from future storm events and the ongoing impacts of the 2004 storm event; and
 - Protect the soil asset upon which our rural economy is based.

More specifically

- To target 1,500 whole farm plans over 10 years with 50% of plans on the most 'at risk' biophysical non-sustainable sites and catchments.

The underlying principles chiefly

- Whole Farm Plans are targeted as the key vehicle to deliver future proofing assistance to the Region's land owners
- Whole farm plans requested in priority areas will be given the highest priority.

14. **Cost and feasibility of SLUI:** The SLUI financial budget was built around a number of overlapping phases, designed to explore the feasibility of the main activities of the Initiative, and was based on several key assumptions. These included government support, a three-way funding model, a limit to the resources land owners would have available each year to undertake a works programme, and the need for capability building. The roll out of the SLUI would be governed to a large degree by the availability of trained personal.

Funding: It was proposed that a 10-year programme be developed in consultation with government, with cost sharing to be agreed upon based on the benefits that accrue. A contribution in kind and cash for on-farm protection works from individual land users would be an integral part of the initiative. Linking the programme with other initiatives (eg. permanent carbon sinks) would provide additional resources for advancing the initiative and create the opportunity for achieving other environmental outcome.

Research, development and capabilities requirements for SLUI

15. A part of the report prepared for Horizons Regional Council on the costings and feasibility of the Sustainable Land Management Initiative in November 2005 included a list of research and development requirements and a brief commentary on the capability gaps and options for capability building.

a) Whole farm plan template development. A template to ensure consistency in the development and reporting of the whole farm plans. This will introduce several efficiencies.

b) Update of the Land Use Handbook. Update current advances in land management practices (soil conservation and stream bank management) and harmonise Regional land use recommendations by land class incorporating best information and consultation with community.

c) Evaluation package. To define outputs, expected benefits and key measures at the farm, catchment, district and Regional scales.

d) Establish the current status of farm planning in the Region. Five hundred plans have been completed in the Horizons Region under previous administration. Identify and GIS reference those containing useful resource information to complement the current initiative.

Progress has been made in all four of these research domains since 2005 and these are summarised in the body of this report.

Capability Building

16. There is a critical shortage of trained staff with the skills in resource mapping and in the development of environmental works programming and monitoring. Staff will need to be trained as part of the Initiative through a number of avenues including both structured courses at Massey University and direct mentoring within the Entity.

Roll out of SLUI

17. As part of the report prepared for Horizons Regional Council on the costings and feasibility of the Sustainable Land Management Initiative in November 2005, we recommended a 10-year programme of work with five phases:

Phase One. Research & Design

Phase Two. (a) Promotion, (b) Biophysical, (c) Economic Sustainability, (d) Education and Extension

Phase Three. Financial Support

Phase Four. Land Purchase & Swaps

Phase Five. Evaluation

The roll out of the whole farm plan component of the Initiative was governed to a large degree by the rate at which capacity in land evaluation and planning could be built, with the number of whole farm plans increasing from 65 in year 1 to a high of 200 in year 7.

Roll out of whole farm plans

18. The protocol used to develop a SLUI Whole Farm Plan and secondly in ensuring an ongoing relationship between an Environmental Management Officer (EMO) of Horizons was designed as part of the SLUI. The use of independent contractors in the development of the WFP by Horizons Regional Council adds an additional dimension to the protocol.

Industry sector issues and solutions (capacity problem, relationships)

19. The SLUI has the potential to align with the primary industry sector's shift to environmental management systems. On a note of caution, there are concerns within the pastoral industry about adding to the cost of doing business. As part of the roll out of SLUI, Horizons has provided SLUI Whole Farm Plans to every hill country M&WNZ Monitor Farm in our Region. There are some challenges with engagement with the primary sector. These are also major

challenges for SLUI, namely the limited utility of national land resource inventories and the lack of human capability

Cost benefit of SLUI

20. The potential benefits at catchment, community and farm scale are covered in more detail within the report.

Cost to the country and region. Tax payers provided \$115 million as part of the Government's reprieve and recovery package. It is estimated that the 2004 storm event reduced the Region's GDP by \$141 million over the succeeding two years (Vision Manawatu 2006). An additional \$50 million of capital works have been added over the next 10 years to the Region's flood control Schemes in order to restore levels of service and extend flood protection. SLUI, over the medium to long term, in the Manawatu could reduce the mean sediment discharge from 3.8 to 2.4 million tonnes.

Community. Smith et al. (2007) investigated the social impact on farm families of the 2004 Manawatu floods and paid particular attention to issues of community resilience and response to this adverse event. The findings emphasise that increasing resilience requires recognition that farms remain both home and business and that any support provided must be cognisant of this fact. Equally, stress is placed on the need to actively work to support community vitality (or rebuilding), as the floods of 2004 revealed that in any adverse event self-reliance and mutual support are primary components of resilience.

Farm scale. Farm-by-farm assessment ensures mitigations and best management practices are tailored to the unique situations of individual farmers, their business, and the unique characteristics of their land and other resources. The 1-on-1 interaction between the farmer, resource surveyor, and farm business consultant is at the heart of the success of the development and implementation of the plan, and the resulting environmental and economic benefits.

Summary Report

21. This report provides a summary of the following aspect of the SLUI that I have been involved with as an expert in soils and land use evaluation and planning.
- a) Background to the SLUI
 - b) The principles of land evaluation and planning
 - c) Development of the aims, objectives and underlying principles governing SLUI
 - d) Cost and feasibility of SLUI
 - e) Research, development and capabilities requirements for SLUI

- f) Roll out of SLUI
- g) Roll out of whole farm plans
- h) Industry sector issues and solutions (capacity problem, relationships)
- i) Cost benefit of SLUI

3. SCIENCE PROJECTS THAT RELATE TO SLUI A HORIZONS PERSPECTIVE?

22. **Background to the SLUI.** I was asked to make a presentation to the Community Leaders' meeting in September 2004 on current knowledge and practices, future challenges and to make some suggestions on the actions that could be taken to ensure the Region was protected from a future storm event of the magnitude of February 2004. The suggestions included the need for a sustainable development strategy, at the "heart" of that strategy a sustainable land management policy, delivery of the policy at the farm scale through whole farm planning, and the need for a new partnership between land owners and community. A summary of the power point presentation is listed below. A number of the suggestions were picked up in the minutes of that meeting and used by the working party to scope up the SLUI.

23. Hill Country Land Management Workshop September 2004

1. Hill land

- Important part of the Region's economy and for the foreseeable future (increased value?)
- Provides a wide range of ecosystem services (water, habitat, carbon sink, play grounds, etc)
- Major environmental challenge (eg. loss of natural capital through erosion) and threat downstream (eg. sediment, flooding)

2. Sustainable land use

- As with previous storm events, erosion rates were higher on pasture-only landscapes (rock types, slope class, vegetation cover).
- Data agreement with previous analysis (Cyclone Bola in Gisborne 1998 and Manawatu-Wanganui storm in 1992).
- Hicks (1988) reported that slip erosion was reduced by 25% where willow and poplar were planted, but untended.
- Where conservation plantings were actively managed soil slipping was reduced by as much as 60-70%. Highlights the importance of a vegetation management plan.
- Effectiveness of conservation plantings following the February storm. Similar conclusion to Hicks, but soil conservation practices have evolved.
- Some land classes should not be in pasture, but in forestry.

- Needs to be communicated more forcefully
- Some land classes should not be in forestry
- Good data sets on what are sustainable land uses in the Region.
 - Require updating
 - Built into policy

3. Whole farm plans

- No data is available from the February 2004 storm event or from previous storm reports (eg. Bola) on the value of whole farm plans
 - Low levels of adoption by land owners
 - Viewed as an unnecessary expense to the business
 - Fear they will place constraints on land uses

Urgent need to obtain information - within a farm business context

Cost versus benefit of whole farm planning as a tool for reducing the exposure to extreme events.

- Hill country land in the Region
- Number of farm plans currently?
- Number that are active?
- Effectiveness of current active plans.
- Improvements?
- Lack of hard data and understanding of the short- and long-term benefits to the individual land owner and to the wider community of adoption of farm plans.
- The lack of land resource information (soils and Land Use Capability) at a scale of 1:5,000 to 1:15,000. Major impediment to several initiatives currently (Project Green, SLM groups).
- Lack of capacity in Regional Councils and Industry to provide the technical support to develop whole farm plans.

4. Looking forward

- If current intensification trends continue, the cost of future storm events to land owners will compound.
- Never been a greater need to build environmental management into the business planning.
- With global warming, the frequency and severity of extreme events are predicted to increase. (Greater environmental damage, increased cost of protection work.)
- This raises the "liability" to local and national government.
- Represents a major threat to the Government's Sustainable Development Strategy.

5. Current approach following a storm event

- Assistance to land owners suffering storm damage has come with few conditions in the past
- No questions asked on the appropriateness of reinstating existing infrastructure
- Continuation of existing land uses and practices
- Rationale is the flood relief package results in benefits beyond the farm to include the community
- This approach addresses the immediate consequences of the flood on economy, but does not address the ongoing risk

6. Need a new relationship

- Time is rapidly approaching where a more binding relationship between land owners and community is required to reduce the long-term risk of these events to individuals, community and to the country.

7. Binding relationship

- Both parties have responsibilities, make commitments
- Benefits of on-farm sustainable land management practices extend beyond the farm boundary to neighbours and downstream communities.
- Consequently the cost of planning, implementation and maintenance should be shared by the land owner and community.
- Not a new concept.

8. Elements of a binding relationship

- **Community** (central and local government) would assist **land owners** develop a whole farm plan.
- The **whole farm plan** becomes part of the farm's resource (ie. linked to the land title) that passes on sale to the next owner.
- **Future** central and regional government support following an extreme storm event would be limited to those farms with an "active" whole farm plan.
- **Land owners** would have a whole farm plan as part of an overall strategy to reduce business risk from an extreme event and as part of their commitment to community

9. Looking forward

- Linking future assistance following a storm event to sustainable land use practices requires land owners to consider more closely the need for whole farm planning, as part of an overall business strategy to reduce risk from extreme events.
- Banks and other financial institutions exposed to the industry would see an active plan as added insurance for their investment.

- The approach with time has the benefit of limiting the liability to government from the cost of storm damage and in time the overall level of storm damage to the New Zealand environment and economy.

10. Actions looking forward (summary)

- Sustainable development strategy
 - § Not just soil conservation or catchment management
- At the “heart” of that strategy must be a sustainable land management policy.
 - § Priority areas, annual targets, etc
 - § Well-defined set of up-to-date recommended land uses and practices
 - § Currently weak and ineffective
- Delivered at the farm scale through whole farm planning
 - § Land evaluation (strengths and limitations) and planning
 - § Integrates economic and environmental management into the farm business
 - § Process must engage land owners to build the necessary understanding and to obtain ownership
- Partnership between community and landowners
 - § Benefits beyond the farm boundary
 - § New more binding relationship

24. The principles of land evaluation and planning. Land evaluation is an internationally practised discipline with its own theory and methodology. It conceptually encompasses methods used in other disciplines (eg. landscape ecology, resource conservation, environmental impact assessment), and is generally undertaken to provide new information; to assist, support or guide land users in decision-making; to predict the consequences of land use change; and to provide a more rational and objective basis for land use decision-making.

Whole farm planning represents the application of land evaluation to individual farm properties. It is a structured decision-support procedure for describing the characteristics and properties of a farm’s land resources; identifying opportunities and limitations for production and environmental management; optional design and evaluation of improved systems of land use; and planning a course of action to effect any required land use changes. Whole farm plans have been repeatedly advanced as effective methods of integrating economic and environmental objectives into the design of farming systems since the late 1930s. Such plans are represented through a variety of titles, but all share the common principles of land resource appraisal and the integration of environmental management while maintaining or enhancing farm production. Claimed strengths and advantages are considerable, backed by over sixty years of conceptual development, research, and example. Environmental farm

plans have a preferred and extensive historical use in soil and water conservation, and a more recent history of innovation and diversity in sustainable resource management. Manderson et al. (2007) provides a very good summary of their characteristics, diversity, and historical and current use in New Zealand, as part of a paper prepared for an OECD meeting on the utility of environmental whole farm management plans as agri-environmental indicators.

Development of the aims, objectives and underlying principles governing the SLUI

25. As member of the working party I contributed to the development of the goals, objectives and underlying principles governing the SLUI.

The Sustainable Land Use initiative aims to:

- Reduce the Region's reliance on government relief/recovery assistance in the future
- Protect hill country and lowland communities and assets from future storm events and the ongoing impacts of the 2004 storm event, and
- Protect the soil asset upon which our rural economy is based.

More specifically

- § To target 1,500 whole farm plans over 10 years with 50% of plans on the most 'at risk' biophysical non-sustainable sites and catchments.

Underlying principles included

- § Whole Farm Plans are targeted as the key vehicle to deliver future proofing assistance to the Region's land owners. Whole farm plans requested in priority areas will be given the highest priority.
- § The development of individual whole farm plans (WFPs) incorporating physical, farm management and business plans to achieve environmental and economic sustainable land use.
- § These plans include the professional services of land managers and farm management professionals to support land-owners to change their practices towards sustainable land use.
- § The key objectives of the process are to establish an environmental works programme to address threats to sustainable land use, to identify the land use changes with the greatest immediate benefit to community, and to assess the ability of the existing business to implement the programme of work.
- § For farms with <10% of the farm requiring a land use change and/or where there are no direct or immediate benefits to the community, the business analysis will not be completed.
- § It is proposed to provide a range of incentives to encourage farmers to adopt key practices in the early years of the plan.

- § These are likely to be restricted to the 50% of farms in the more critical areas, and for the works that produce the best immediate off-site benefits (ie. they are to fund external items).
- § Items that may be funded could include the development of the whole farm plan, retirement fencing, poles, structures etc.
- § Where there is a property that has insufficient quality land to give its owner a short-term viable future in pastoral farming, the initiative would (on a willing buyer willing seller basis) buy the property, swap sustainable pastoral land with adjoining neighbours and accumulate land suitable for conservation forestry and/or retirement with the aim of developing a joint venture forestry with a forestry company (where appropriate) and retiring other land into protection forestry. This concept was initially promoted in a farm partnership programme in 1990 but died with a change of government.

Note. The Governance group with guidance from the Technical group and Wise Heads group needs to develop further the criteria for prioritising and defining the incentives and any payment structure, in addition to the triggers required to initiate a discussion on land purchase.

Cost and feasibility of SLUI

26. A report was prepared for Horizons Regional Council on the costings and feasibility of the Sustainable Land Management Initiative in November 2005. The terms of reference for the report were:

- Examine the initial costings and the feasibility of delivery of the Sustainable Land Use Initiative developed by the technical committee established following the community workshop in September 2004.
- Calculate the annual cost of the initiative and list all assumptions.
- Explore the options for capacity building within the Initiative to address the technical gaps in Council and shortage of skilled professionals.
- Examine options for administration of the Initiative and its relationship with existing land management activities in Council.

The report covered each of these issues as follows:

27. **Financial Feasibility.** The financial budget was built around a number of overlapping phases, and was designed to explore the feasibility of the main activities (Table 1). The budgets needed to be considered in conjunction with several key assumptions. These included government support, a three-way funding model, a limit to the resources land

owners would have each year to undertake a works programme; and with the limited pool of trained and qualified land management officers nationally, some assumptions about the amount of time which is required for the SLUI to train its own land management officers by providing under-graduate and post-graduate training, and the necessary supervision in the field. The roll out of the SLUI is governed to a large degree by the availability of trained personnel.

Table 1. Revised financial budget for each phase of the Sustainable Land Use package.

| Year | Phase One Research & Design | Phase Two (a) Promotion | Phase Two (b) Biophysical | Phase Two (c) Economic Sustainability | Phase Two (d) Education & Extension | Phase Three Financial Support | Phase Four Land Purchase & Swaps | Phase Five Evaluation | TOTAL |
|--------------|-----------------------------------|-------------------------------|------------------------------|---------------------------------------------|-------------------------------------------|-------------------------------------|-------------------------------------------|--------------------------|---------------------|
| 0 | 350,000 | | | | | 325,000 | | 50,000 | 725,000 |
| 1 | 250,000 | 150,000 | 858,750 | 141,700 | 65,000 | 818,000 | | | 2,283,450 |
| 2 | 100,000 | 75,000 | 1,156,750 | 214,948 | 98,600 | 1,525,000 | | | 3,170,298 |
| 3 | | 75,000 | 1,370,750 | 308,252 | 141,400 | 1,999,000 | | | 3,894,402 |
| 4 | | 75,000 | 1,500,750 | 348,364 | 159,800 | 2,412,000 | | | 4,495,914 |
| 5 | | 75,000 | 1,556,000 | 395,016 | 181,200 | 2,701,000 | 10,000,000 | 100,000 | 15,008,216 |
| 6 | | 75,000 | 1,563,250 | 434,256 | 199,200 | 2,916,000 | 9,000,000 | | 14,187,706 |
| 7 | | 75,000 | 1,475,000 | 442,104 | 202,800 | 3,007,000 | 8,000,000 | | 13,201,904 |
| 8 | | 75,000 | 1,375,250 | 434,692 | 199,400 | 2,827,000 | 7,000,000 | | 11,911,342 |
| 9 | | 75,000 | 1,050,000 | 355,776 | 163,200 | 2,413,000 | 6,000,000 | | 10,056,976 |
| 10 | | | 765,000 | 261,600 | 120,000 | 4,429,000 | | 100,000 | 5,675,600 |
| TOTAL | \$700,000 | \$750,000 | \$12,671,500 | \$3,336,708 | \$1,530,600 | \$25,372,000 | \$40,000,000 | \$250,000 | \$84,610,808 |

Some thought was also given in that report to the possible options for administration of the Initiative, and its relationship with existing land management activities in Council, and to funding options.

Funding. It was proposed that a 10-year programme be developed in consultation with government, with cost sharing to be agreed upon based on the benefits that accrue. A contribution in kind and cash for on-farm protection works from individual land users would be an integral part of the Initiative. Linking the programme with other initiatives (eg. Permanent Carbon Sinks) would provide additional resources for advancing the Initiative and create the opportunity for achieving other environmental outcomes.

Research, development and capabilities requirements for SLUI

28. A part of the report prepared for Horizons Regional Council on the costings and feasibility of the Sustainable Land Management Initiative in November 2005 included a list of research and development requirements, and brief commentary on the need for capacity building.

- a) Whole farm plan template development.** A template to ensure consistency in the development and reporting of the whole farm plans. This will introduce several efficiencies.
- b) Update of the Land Use Handbook.** Update current advances in land management practices (soil conservation and stream bank management) and harmonise Regional land use recommendations by land class incorporating best information and consultation with community (Year 1 to 3 of initiative).
- c) Evaluation package.** To define outputs, expected benefits and key measures at the farm, catchment, district and Regional scales.
- d) Establish the current status of farm planning in the Region.** Five hundred plans have been completed in the Horizons Region under previous administration. Identify and GIS reference those containing useful resource information complementing the current initiative.

29. **Each of these four research and development requirements has been advanced since 2005. These are briefly summarised below, as is a commentary on capability building.**

1. Research and development

- a) Whole farm plan template development.** *A template to ensure consistency in the development and reporting of the whole farm plans. This will introduce several efficiencies.*

Since 2005 the following research has been completed:

Prototype Whole farm plan. A contemporary Whole Farm Planning template was developed and tested by AgResearch, Horizons Regional Council, Landvision Ltd., and Sheppard Agriculture. Six farms representative of different Regional landscapes, levels of storm damage and ownership structures were selected, and the template was successively applied, tested and developed for each as part of the delivery of the Initiative to individual farms in 2005/06. Development focused not only on template design, but also the process of building relationships with farmers during the plan preparation itself. For SLUI, a whole farm plan represents a documented assessment and five-year plan of action to deal with on-farm risks and opportunities for sustainable resource management **and** sustained business growth. In a later section (**Roll out of whole farm plans**) the protocol to be used in the development and implementation phases of the WFP with land owners is described and discussed.

Whole Farm Planning template design. Horizons budgeted to complete 40 WFPs in 2006/07 and double that number in 2007/08. Before committing the already budgeted resources in 2006/07, Horizons asked for advice on the essential components in the whole farm plan (WFP), the minimum specification on the data sets used in the plans, and documentation of the protocol to be used in the development and implementation phases of the WFP with land owners. The advice was to inform both Regional Council staff and independent contractors. Horizons worked closely with AgResearch to prepare the template and the technical report to document best practice for preparation of WFPs. Input and comment was also sought from other Regional Councils on the environmental component of the plan and from farm consultants on the farm business analysis contained in the plan. Comment will also be made on the skill sets required by a land manager to complete the environmental component of the plan. A draft audit process was also suggested.

The whole farm plan template was developed from the experience gained in producing the six prototype whole farm plans in 2005/06. The draft template pulled the common elements from each of the six plans together into a document that was used in a round table discussion with land management staff from Horizons Regional Council led by Grant Cooper, Lachie Grant and Sarah Dudin from Landvision, and Greg Sheppard from Sheppard Agriculture. The elements in the prototype WFP included a (1) Review of the existing farm business using benchmarking, (2) Assessment of land, water, living heritage and farm production resources, (3) Identification of environmental issues and recommendation of tailored best practice, (4) Planning of an integrated long-term farm business plan and five-year environmental programme, and (5) Design of a follow-up procedure to clarify responsibilities, monitoring, maintenance and support.

In addition to discussing the content of the WPF, discussion also covered the following issues:

- The minimum specifications on the data sets used for developing the plans
- Documentation of the protocol to be used in the development and implementation phases of the WFP with land owners
- The roles and responsibilities of the players involved in developing a plan
- A check list to ensure the WFP contained the required data and included an assessment of farm resources and business, a set of plans, time-bound actions and a monitoring programme

- Limiting the business assessment in section 2.1 to an accounts analysis and benchmarking exercise, except in situations where the works programme is substantial and the economic implications are significant
- Inclusion of consents within the WFP
- The need for an audit and review process

A hard and electronic copy of the whole farm plan template was made available to Horizons Regional Council, along with an example of a completed WFP, (Ruth and Jim Rainey).

Inclusion of consents within the Whole Farm Plan

The opportunity exists to include current and future activities that require consent in the WFP. Activities currently requiring a consent include:

- Vegetation clearance (>2 ha)
- Tracking (2ha – 5m, 4km/yr)
- Culverts (>50, but <200ha)
- Dams (>2m or 10,000m³) – still requires engineer's report
- Nutrient plan (as proposed in the One Plan)

It is Horizons intention to integrate WFPs into the One Plan policy. Properties participating in the farm planning process will not need a consent for works approved by their Environmental Management Officer (EMO). At this stage this process has not been approved through the appropriate regulation changes, and consents are likely to be required for land clearance, new tracking, and excavation works, dams, creeks, diversions, etc. In these situations the local EMO will be able to give consent advice and will expedite any consents required under that particular plan.

b) Update of the Land Use Handbook. *Update current advances in land management practices (soil conservation and stream bank management) and harmonise regional land use recommendations by land class, incorporating best information and consultation with community (Year 1 to 3 of Initiative).*

The Land Use Capability (LUC) classification system has been used throughout New Zealand to assess the capacity of land to sustain production permanently. Principles of the system and examples of its use were last published in a LUC handbook in 1974. Since then, there has been a rethink about the classification of hill classes (V to VIII) and significant advances in land management research and practices. An update of the handbook was therefore an important tool to assist with achieving the objectives of SLUI. It requested AgResearch, as lead agency for a consortium of providers including Landcare Research and HortResearch, through Envirolink funding, to prepare a scoping

report to 1) identify gaps in current vs. recommended sustainable land use in HRC's Region, 2) identify changes required in the LUC classification, 3) canvass opinions from HRC and neighbouring regional councils on desired components of a new handbook, and 4) recommend an appropriate work programme. Interviews were conducted with lower North Island regional council land managers from March to May 2006. Key recommendations were that 1) a bound, hardcopy LUC handbook be produced, 2) hill country classes V to VIII be redefined, and areas of classes, subclasses and units be revised nationally at 1: 50 000 scale, 3) classes and subclasses be standardised nationally and LUC units standardised separately within the North and South Islands, and 4) included in the handbook would be details of the new definitions and relevant summary data, new photographs, new examples of applications of appropriate management for LUC units in examples, and sections on such issues as stock carrying capacity and tree site indices 2006 (Douglas et al. 2006).

Following the scoping report, Horizons Regional Council and Hawke's Bay Regional Council sought funding of the LUC handbook upgrade via the Envirolink tools funding mechanism. The structure of Envirolink tools is based on one or more regional council Champions working with a science team led by a scientist from a CRI. In the case of the LUC handbook upgrade project the project work is being carried out by a science team led by Dr Grant Douglas of AgResearch with input from Landcare Research and GNS science. The major issues that are being addressed in the **LUC Handbook revision include:**

- 1) Strengthening of definitions of LUC classes.
- 2) Revision of definition and interpretation of LUC Class 5 land, including option for erosion subclass (e) to be accommodated.
- 3) Description of process/method for standardising LUC unit correlations within regional authority boundaries.
- 4) Revision of erosion section, including definitions and assessment criteria eg. for erosion severity.
- 5) Provision of contemporary examples of application of LUC classification at various scales.
- 6) Description of relevance/importance of scale of assessment and implications for interpretation.
- 7) Provision of a contemporary glossary of terms, reference list and links to websites.
- 8) Description of how to prepare/derive LUC units more comprehensively than in 1970s handbook.

The revised handbook is long overdue, being last printed in the early 1970s. It will:

- revitalise existing capabilities within regional councils and elsewhere, and be a guide for the next generation of land management practitioners;
- provide practitioners with a contemporary 'one stop' overview of LUC classification, definitions, methods, and applications at a range of scales; and
- assist in ensuring greater consistency throughout New Zealand in interpretation of resources and LUC classification.

c) Establish Evaluation package *To define outputs, expected benefits and key measures at the farm, catchment, district and regional scales.*

Since 2005 the following research has been completed:

Agricultural Statistics for Horizons Region

Neild (2005) from Agriculture New Zealand prepared a report in response to a request by Horizons' Land Working Party on agricultural statistics for the Horizons Region for background to assist with the development of the strategy to protect and enhance the natural resources of the Region, and their contribution to the regional economy. The report highlighted the importance of the Horizons Region with 5.4% of all NZ dairy herds; 7.3% of NZ's cows in milk, approximately 15% of NZ sheep and beef farms with 16-17% of all sheep and cattle, 9% of deer numbers and a significant horticultural industry, particularly in vegetable crops for both domestic fresh and export process markets, with 21% of the national potato crop area, 43% of the national carrot crop area, 48% of the national parsnip area and 11% of the national cabbage area. The author points to the fact that future Intensification will depend upon favourable product prices and available technology, and given the loss of intensive sheep and cattle finishing country to dairying, dairy support, arable and horticulture and lifestyle use, many commentators expect hill country to be more intensively farmed to finish sheep and cattle and in doing so highlight the significance of the hill land to future economy of the Region.

Erosion/sedimentation in the Manawatu catchment associated with scenarios of Whole Farm Plans

Schierlitz et al. (2006) used a simplified version of the *SedNet* model to predict the erosion and sedimentation regime of the Manawatu River associated with a range of different Whole Farm Plan scenarios. At present the mean sediment discharge of the Manawatu River is 3.8 million tonnes of sediment per year. If 500 Whole Farm Plans are implemented on a random selection of farms then the mean sediment discharge reduces to 3.5 million tonnes, an 8% reduction. In sharp contrast, if the 500 Whole Farm Plans (ie.

10% of farms) are implemented on the highest priority farms, then the mean sediment discharge reduces to 2.0 million tonnes of sediment per year, a 47% reduction on the present situation. Interestingly, if only half (250) of the Whole Farm Plans are implemented on the highest priority farms and the other 250 plans are implemented on a random selection of farms, then the mean sediment discharge reduces to 2.4 million tonnes, or 77% of that achieved by targeting all plans in priority areas.

Best practice phosphorus losses from agricultural land

Horizons Regional Council asked Landcare Research and SLURI – New Zealand’s multi-CRI Sustainable Land Use Research Initiative - to develop a method to determine the potential for water quality improvement in relation to phosphorus in waterways in the Upper Manawatu through the sustainable land-use initiative (SLUI), addressing erosion issues on farms and issues of sediment in rivers, and through the Farmer Applied Resource Management strategy (FARM strategy) to target reductions in nitrogen and phosphorus leakage from intensive land uses in priority catchments. Both initiatives are a part of Horizons’ recently notified One Plan. Parfitt et al. (2008) found most phosphorus comes down the rivers in particles of eroded sediment from steeper land during major floods – about 511 tonnes of phosphorus per year goes under the bridge at Hopelands. Ninety percent of the erosion occurs under pastures on steep land and 10% under forest. These phosphorus losses can be reduced from 511 to 193 tonnes by targeted planting of trees on targeted pastures.

Monitoring and reporting on whole farm planning

Monitoring the environmental benefit of the implementation of each WFP is critical for determining progress towards defined targets across each farm over time and achieving progress at the catchment scale. Current monitoring activities and future plans of four regional councils (Horizons, Greater Wellington, Hawke’s Bay, and Taranaki) were surveyed as part of the report for Horizons Regional Council by Douglas et al. (2008) on monitoring and reporting on WFP effectiveness. A simple model that links vegetation type/land use at the farm scale with sediment export off-farm has been developed. This provides for the first time a framework for quantitative assessment of effectiveness of conservation works, where previously monitoring and reporting was limited to counting the number of poles planted or kilometres of fencing completed. Before implementation the proposed monitoring programme needs to be field-tested for applicability across a range of farms and in catchments with different characteristics.

Evaluation of impacts of mitigations on economics, productivity and environmental outcomes at the farm scale

Wedderburn (2008) in a recent report for Horizons Regional Council, indicated there were several options (Input/ Output Tables and CLUES) for exploring the impacts of policy at the farm and catchment scale. These will be explored further in the coming year (2008/09).

- d) Establish the current status of farm planning in the Region.** *Fiver hundred plans have been completed in the Horizons Region under previous administration. Identify and GIS reference those containing useful resource information complementing the current initiative.*

This task was tackled in Master programme (Sian Cass) as part of the study towards a Masterate in Applied Science at Massey University. The project is summarised below.

Research Purpose

- Provide a classification for farm plans that have been developed in the Region which can be used for Horizons GIS database.
- Provide a framework that will assist Horizons to monitor changes that may occur as a result of the Whole Farm Plan programme and assist with its ongoing development.

Research Methodology

- Stage One Classification of Farm Plans.
Based on interviews with current and past staff of Horizons' farm plan programmes will be identified and classified.
The farm plan classification will be validated by reviewing a sample of existing farm plans.
- Stage Two Monitoring Framework
Based on findings of Stage One a decision will be made through consultation as to which farm plans will be selected for further investigation.
Interview farmers, council staff and other key informants to identify the outcomes and reasons for adoption and ongoing implementation of the farm plan programmes.

Research Outputs

- A farm plan classification was completed and reported on in 2007.

- Review literature on the adoption and implementation of whole farm plans and the factors that influence farmers' adoption and implementation of this type of technology. February 2008
- Research report for Horizons Regional Council summarising the key findings of the research and recommendations for how the regional council can monitor changes and ongoing development for the Whole Farm Plan programme. February 2008.
The farm plan classification will be used by Horizons to review existing plans.

Capability Building

30. There is a critical shortage of trained staff with the skills in resource mapping and in the development of environmental works programming and monitoring. This needs to be tackled as part of the SLUI. This is not a problem limited to Horizons, but a problem throughout regional councils and the wider pastoral industry. A paper prepared in March 2005 by the Land Managers' Group (LMG) expressed concerns about the recruitment, retention and remuneration of land management staff.

Capability building is being advanced through both structured courses at Massey University and direct mentoring within the Entity. Staff within Council responsible for implementation of the environmental works programme will need to have been through a training programme. Consultants involved in the business analysis and in development of the business plan will also need to have been through a training exercise.

The four main initiatives within Horizons include:

1. **LandVision.** Grant Cooper commissioned LandVision (Lachie Grant and Sarah Dudin) to produce a modular training programme that HRC could run internally to give land/soils staff all the basic information they need. The training programme is a mix of classroom, field and homework exercises with training provided by outside experts or in-house where appropriate and ongoing mentoring.
2. **Post graduate, Diploma or Honours course in Land Evaluation and Planning at Massey University.** This is linked directly to SLUI and comes with the pitch of "raising our capabilities in land management". It recognizes a lack of a single focus and a wide variety of graduates being employed within the land management field with a mix of expertise. The capability building is part of the sell to government around the SLUI project.

Two packages are offered:

1. Ruahine Scholarship for year one and two students

Where there are sufficient suitable applications, Horizons Regional Council will provide up to five Horizons Regional Council Land Use Scholarships (herewith referred to as 'scholarships') up to a maximum value of \$2000 each, for the duration of one year. Recipients of the year two scholarships will be offered paid holiday employment at Horizons Regional Council following the successful completion of their second year of study. Such employment would be based in Palmerston North and would run from November to February of the year the scholarship is awarded. All scholarship applicants must read these guidelines in their entirety before applying for the scholarship. By signing and submitting these guidelines along with their scholarship application, applicants are confirming that they have read and understood these guidelines.

Purpose of Scholarship: Horizons Regional Council provides the scholarships to encourage students entering their first and second years of study, and who are interested in a career in an environmental field, to undertake study in soil science and farm management as part of their undergraduate degree. Applicants are expected to have a solid interest in environmental management, soil science, and land use mapping. The scholarships are considered to be a good entry point for year three and post-graduate Horizons Regional Council Land Use Scholarships.

Tertiary Provider: Scholarships are available to students studying full-time at Massey University Palmerston North.

Criteria: Students applying for a scholarship must meet all of the following criteria:

- Enrolled full-time at Massey University Palmerston North, and
- Must be enrolled in, or have successfully completed:
 - For year one students:
189.151 Soil Properties and Processes.
 - For year two students:
189.151 Soil Properties and Processes, and a minimum of one from:
 - 189.251 Soil Fertility and Fertilisers, or
 - 189.252 Land Soil and Water, plus
 - both of 119.258 Agricultural Systems
 - 111.251 Farm and Horticultural Business Management or
 - 111.231 - Farm and Horticultural Systems Management

Applicants should note that the requirements for third year scholarship require that they are studying or have successfully completed -three or more of the above 200-level paper selections.

2. Tararua Scholarships for year three, honours, and post-graduate diploma students

Where there are sufficient suitable applications, Horizons Regional Council will provide up to four Horizons Regional Council Land Use Scholarships (herewith referred to as 'scholarships') up to a maximum value of \$10,000 each, for the duration of one year, to third year and post-graduate/honours students. For scholarship recipients successfully completing year three and intending to progress to further study in the following academic year, paid holiday employment at Horizons Regional Council may be offered. Such employment would be based in Palmerston North and would run from November to February of the year the scholarship is awarded. Scholarship recipients successfully completing their third and/or final year of study may be offered permanent employment at Horizons Regional Council. All scholarship applicants must read these guidelines in their entirety before applying for the scholarship. By signing and submitting these guidelines along with their scholarship application, applicants are confirming that they have read and understood these guidelines.

Purpose of Scholarship: Horizons Regional Council provides the scholarships to encourage 300 level and post-graduate students to specialise in the field of soil science, land use mapping, and land management. Scholarships are also aimed at encouraging advanced, specialised study at the Honours level or higher.

Tertiary Provider: Scholarships are available to students studying full-time at Massey University Palmerston North.

Criteria: Students applying for the scholarship must meet all of the following criteria:

- Enrolled full-time at Massey University Palmerston North, and
- Must have successfully completed:
 - 189.151 Soil Properties and Processes, and
- Must be enrolled in, or have successfully completed:
 - 189.251 Soil Fertility and Fertilisers, or
 - 189.252 Land Soil and Water, and
 - 119.258 Agricultural Systems, and
- Must be enrolled in:
 - 189.362 Soil Fertility and the Environment, and
 - 189.363 Soil Resources and Sustainable Land Use, and
 - 111.351 Farm and Horticultural Management,
 - 119.357 Agricultural Production.
- Have successfully completed the above papers and be planning a related Honours project or course of post-graduate study.
- Successful completion is defined as being an average grade of B across the programme.

3. **Block courses** These are currently being championed by Garth Eyles, run in conjunction with Massey or other recognized training providers. These would be ideal for upskilling and updating more experienced staff. The OVERSEER® course is a good example. The training providers could use expertise available from within Regional Council or the private sector to provide specialist topics.
4. **Individual courses or papers through a training provider.** As an example two staff have enrolled in Alan Palmer's 3rd year Soil and Landuse mapping field trip at Limestone Downs. The advantage of using Massey University or other accredited teaching and training Institutes is that course work could be delivered to a standard and could be recognized as part of a qualification eg. Certified user of OVERSEER®, completed nutrient management course at Massey University.

Minimum set of qualifications in land evaluation and business

In separate discussions with the Horizons Regional Council the need was discussed to build the Whole Farm Planning capability of current and any new Environmental Management Officer's employed by Council, and the requirement for all of the independent farm contractors to have a minimum set of qualifications in Land Evaluation and/or Agri-business. Agribusiness consultants used by Horizons should be registered farm consultants and members of their professional body.

Roll out of SLUI

31. As part of the report prepared for Horizons Regional Council on the costings and feasibility of the Sustainable Land Use Initiative in November 2005, we recommended a 10-year programme of work with five phases.

Phase One. Research and Design

Phase Two. (a) Promotion, (b) Biophysical, (c) Economic Sustainability, (d) Education and Extension

Phase Three. Financial Support

Phase Four. Land Purchase and Swaps

Phase Five. Evaluation

The roll out of the Whole Farm Plan component of the Initiative was governed to a large degree by the rate at which capabilities in Land Evaluation and Planning could be built, with the number of whole farm plans increasing from 65 in year 1 to a high of 200 in year 7.

Roll out of whole farm plans

32. The following is a brief outline of the protocol used to develop a SLUI Whole Farm Plan, and secondly to ensure an ongoing relationship between an Environmental Management Officer (EMO) of Horizons and the landowner in the implementation of the works programme (Mackay 2007). The use of independent contractors in the development of the WFP by Horizons Regional Council adds an additional dimension to the protocol.

The first and ongoing point of contact for a landowner who has expressed an interest in a WFP for the property is the local EMO from Horizons. At all stages communication is critical. If the landowner has any issues or queries the first point of contact is the local EMO of Horizons.

Protocol

- Initial contact of landowner by Horizons Regional Council if considered in a high priority area, or through a landowner contacting Horizons.
- The local EMO will visit, assess needs (priority), may go out on the farm, give an information pack on the SLUI and a WFP (Appendix 3) and explain the steps in developing and implementing a WFP.
- Horizons prioritises the needs of one landowner against others in the catchment. Landowners would be notified of a start date.
- Once confirmed the EMO will ask for the following information from the landowner:
 - A map will be provided to the landowner to draw in the farm boundaries and paddocks.
 - The landowner's contact and property details will be collected. These will be forwarded to the independent contractors if employed.
 - The landowner will be asked to forward a copy of the audited accounts of the farm to the agribusiness contractor.
- At this stage a file will be created for the landowner.
- Close to the start date for developing a WFP a meeting will be arranged (if necessary) to introduce the landowner to the people who will carry out the on-farm mapping. At this time access issues, timing, opportunities for the landowner to participate in field work, etc, will be clarified.
- Farm mapping commences involving travelling over the property to assess land, based on rock type, soil, slope, vegetation and erosion, to produce a Land Resource Inventory. Information will also be collected on water resources, biodiversity and farm infrastructure.

- Farm mapping and the landowner's involvement Landowners will be encouraged to assist and be present for some of this work, if possible. (Mapping depending on the size and complexity of the property will take 2-3 people to 2-3 days.
- The land manager mapping the farm will also collect detailed information from the landowner on fertiliser use and application, soil test data, stock numbers and policy and farm management history. Some of this information will be forwarded to the agribusiness consultant to assist in the business analysis.
- The initial business analysis will establish if a full business case needs to be developed for the farm. The triggers are listed in the next section (5.3) of the report.
- The landowner will be closely involved in the development of the draft land and environment plan with the land manager and with the draft business plan with the agribusiness consultant.
- There could be a number of contacts and interactions of the WFP at this stage, depending upon how complex the property plan is. Meetings could involve the land owner, land management consultant (private contractor or EMO from Horizons), agribusiness consultant and Horizons staff in order to ensure good understanding by all parties and to negotiate a programme/plan that is acceptable to everyone. To ensure that on farms where the EMO from Horizons was not involved in developing the environmental plan, the hand-over for implementation is efficient and effective.
- Once an agreement has been reached the final plan information will be forwarded to Horizons to produce the final document. This will be returned to the landowner by the local EMO for sign-off. (At this stage a letter of intent will be signed explaining the commitments).
- The work programme set out for the first year in the WFP can begin. This is developed with the landowner by the local EMO and signed off by a senior Horizons staff member. The local EMO will also organise a meeting to discuss a programme to monitor progress and changes over time. This could include monitoring of soil, water and biodiversity.
- A visit to review progress will occur before developing the annual plan each year. The annual plan will include a summary of the information collected as part of the monitoring program in previous years.
- The local EMO from Horizons will be in regular contact with the landowner to ensure the programme is successful
- In the event of a change in ownership, storm event, major change in business direction, the local EMO will revisit the farm and review and update the work programme with the landowner.

Notes:

1. At any stage, up until the sign-off of the plan, the land owner can pull out of the WFP process. Once signed off there is an expectation that the agreed programme will be undertaken, accepting that circumstances can change for both the Regional Council and the land owner, so it can be difficult to plan specific activities and support for extended durations. It is therefore critically important to review progress and plan operational activities on an annual basis. This is accommodated by having a detailed strategic plan and a concise operational plan. The relationship between the landowner and the local EMO is critical to the ongoing progress of SLM.
2. The WFP could be in three forms when delivered to Horizons. Final and active, final and inactive and draft plan. The draft plan are those plans with significant work and/or attracting significant community support. These may require additional visits and require the involvement of senior staff within Horizons.
3. The resource information collected as part of the process of developing the WFP will be in the public domain. This includes the LRI (soil types vegetation cover, rock type, slope, erosion severity) and all the data that could be derived from the LRI (eg. LUC, erosion risk maps, etc). These data and any other biophysical data collected at the farm scale (eg. information from the monitoring program) will be used for reporting at the district and regional scale. The identity of individual properties will not be provided.
4. All the business information (infrastructure, livestock, production information, financial data, business plans) remains the ownership of the land owner. This information will not be available under any circumstances to the public.
5. Shared responsibilities. Ratepayers have ultimately funded the preparation of the WFP as an investment for the good of the local and regional community. While implementation is entirely voluntary, there is a moral expectation that agreed recommendations and actions will be undertaken by the landowner. However, it is recognised that farming situations and circumstances can change markedly during a year, and that sometimes there are just too many other concerns and jobs that need doing. It may not always be possible or practical for every farmer to adhere to the recommended actions of this plan. Horizons Regional Council has a responsibility to the landowner and the regional community (ie. ratepayers). Our role is to help with implementation, monitoring and annual renewal of the plan monitoring, and renewal is to help keep the plan on track and is critically important to ensure that ratepayers' money is being invested effectively and efficiently. Like most aspects of farming, environmental management requires a commitment to long term maintenance. Shelterbelts, erosion-control plantings, and riparian plantings all require a degree of periodic maintenance. Poplars falling over or willows choking streams are examples of what can happen if environmental works are not

- managed. Similarly, farming situations change and new environmental challenges can arise (eg. nitrogen leaching was barely even acknowledged 20 years ago). We therefore suggest a long term partnership with Horizons where this Whole Farm Plan is continued well beyond its explicit duration of five years. Responsibilities regarding the business side of this plan are a little different. Responsibility for designing an operational plan, and for implementing the business strategy, is completely in the hands of the landholder. We suggest that the landowner work closely with their business development consultant. Business strategies should be revisited and evaluated at least annually.
6. Support from Horizons. The eligibility for support from Horizons for a landowner, which may take on the form of financial grants (if eligible), the provision of some materials (eg. poplar poles), labour and technical support, is set out in the programme of work for the land management group in Horizons in 2006/07.

Business Assessment

33. On properties where the works programme is limited to a small part of the farm and the implications to the farming operation and financial position of the landowners are small the business analysis will be limited to a Level One Business Assessment as outlined in Section 2.1 of the Whole Farm Plan Template.

1. Level One Business Assessment

- Standard APM Accounts Analysis and benchmark of financial performance with farms of a similar type and environment
- Standard Farm Management Business Review summarising:
 - Existing farm operating policies and performance levels
 - Personal and business goals of the farm owners
 - Strategies to realise goals taking account of the land management and works programme recommended.

2. Level Two Business Assessment

A more comprehensive business assessment will occur when one, or a combination of key indicators are triggered, either as a result of the land management plan or the APM Accounts Analysis. Trigger points include:

- Low farm profitability as assessed by the Earnings Before Interest and tax calculation (<6% of total capital value of the business)
- Economic Farm Surplus (EFS) of less than \$150/ha
- Low Gross Farm Income/ha (less than \$600/ha)
- The generation of a cash loss from farming
- Interest and rent costs greater than 25% of Gross Farm Income (GFI)

- Farm Working Expenses (FWE) greater than 60% of GFI
- Term borrowings of more than \$150/stock unit
- Times Interest Covered of less than 1.3
- Recommended area for removal from pastoral use greater than 15% of the effective area
- Amount of community infrastructure at risk
- Less than 1.3kg/su of phosphate fertilizer applied annually

The additional analysis will include:

- A more detailed strategic business plan for the farm owner.
- Complete further physical and financial analysis of the business to identify with greater specifics the opportunities the owner needs to capture to ensure the respective needs of the property owner and Horizons Regional Council are met.
- Provide additional financial cost benefit analysis (where necessary) of a range of options for the owner to consider for long term business viability.
- Support the owners adopt and implement new policies as required.

34. Minimum specifications for the data sets

1. GIS data base layers

- LRI (Scale 1:5,000-15,000)
- Landuse (pastoral, exotic forestry, indigenous forestry, woody pasture, gorse, spaced trees)
- Riparian zones, dams, streams, major culverts
- Catchments
- Tracking
- Farm Plan boundary and proposed works

2. Annual input data

- Annual works activities. Replaces proposed works activity
- Data from monitoring eg. soils, water, vegetation, etc
- Variation to the proposed works programme

3. Audit and review

A draft audit and review process was developed for evaluating the quality, consistency and effectiveness of delivery of the 40 plans at the end of 2006/07 and in future years.

Elements of an audit and review process would include:

1. A desktop check of a random sample (5% or a minimum of 10 plans) of the completed plans against the WFP template.
2. A field check of a random sample (1% or a minimum of 3 WFP's) of completed plans in differing geographic districts against the WFP template.
3. A field assessment and review of a random sample (1% or a minimum of 3 WFP's) of completed plans in differing geographic districts by experts. This would be followed by a debrief with EMO's of Horizons and the independent contractors on any potential improvements or changes to procedures.
4. Assessment of the works programme (eg. plantings, fencing, release, pruning, etc) implimented by independent contractors and landowners on a random selection of farms in differing geographic districts.
5. A review of the effectiveness of a random selection of WFP after 5 years (1% or a minimum of 3 WFP's) in differing geographic districts by experts, followed by a debrief with EMO's of Horizons and the independent contractors on any potential improvements or changes to procedures.

In initial years of the SLUI the focus of the audit and review process will be limited to elements 1-3, but in time more emphasis should be given to elements 4 and 5.

Industry sector issues and solutions (capacity problem, relationships)

35. **The SLUI has the potential to align with the primary industry sectors shift to environmental management systems.** The use of environmental management systems and allied approaches to on-farm environmental management is increasing in the primary sector in New Zealand. They have been promoted as a tool for simultaneously meeting market and community demands for environmental assurances in the agricultural, horticultural and forestry sectors. Most New Zealand primary sector EMS-type arrangements have been developed by individual sectors, and are not ISO 14001 accredited. Most are reasonably prescriptive in terms of the environmental issues that should be included, the implementation process, and the management options that are acceptable (Parminter et al. 2004). A sheep and beef industry initiative back in 2001 (www.projectgreen.co.nz), continued in 2005 as NZFarmSure (www.nzfarmsure.co.nz) provides an on-farm quality assurance package that for the first time includes environmental management. That initiative was driven by significant players in the industry at that time in response to both international and domestic pressures, with the goal of placing farmers in a position where they could proactively respond to questions or challenges. The land and environment plan in the NZFarmSure software package aligns very closely with the structure of the whole farm planning approach in SLUI.

A note of caution, there are concerns within the pastoral industry that unless the market is prepared to pay more for an on-farm QA scheme that includes environmental management outcomes, there is a danger the market will expect all farms to have an on-farm QA, adding to the cost of doing business.

Meat & Wool New Zealand (M&W NZ) have commissioned AgResearch to produce a Land and Environment Planning Tool Kit (LEP Tool Kit) that will be made available to all 14,500 Sheep and Beef farmers to assist in the assessment of the farm's land and environmental issues and development of a plan outlining how those issues will be managed. The proposed framework for the LEP Tool Kit would align with the structure of the whole farm planning approach. As part of the roll out of SLUI, Horizons has provided SLUI Whole Farm Plans to every hill country M&W NZ Monitor Farm in our Region. The number currently stands at nine. Horizons also has an environmental management officer assigned to each monitor farm as part of the community group. Officers are also active in the field days held on the monitor farms

36. **There are some challenges with engagement with the primary sector.** These are also a major challenge for SLUI. Namely the **limited utility of national land resource inventories and the lack of human capacity.** The limited utility of our land resource inventories (NZLRI) at the farm scale is a major barrier to advancing environmental management on-farm. The lack of specialists in the primary with skills in land evaluation and planning are major impediments to advancing not only the discussion on the merit of land and environmental planning within the industry not also implementation. These issues recognised and understood. There are some initiatives underway at the present time to address these two issues, but neither will be solved quickly or easily

37. **Cost benefit of SLUI**

1. **Catchment**

Cost to the country and region. Tax payers provided \$115 million as part of the Government's reprieve and recovery package. It is estimated that the 2004 storm event reduced the Region's GDP by \$141 million over the succeeding two years (Vision Manawatu 2006). What the analysis does not consider is the loss of natural capital or the "drag" on future growth and investments by the primary sector and on the economy. For example, the cost of reinstating existing infra structures will consume discretionary income and divert investment capital for years to come. On average, land owners in hill land only allocate \$10-15,000 p.a. to repairs and maintenance. If 5% of the farms internal

fences are damaged this will consume discretionary income for the next 5-10 years. This will impact on the annual productivity gains by the primary sector, which has improved at a cumulative rate of 4% p.a. since 1985 (Johnson and Forbes, 2000).

An additional \$50 million of capital works have been added over the next 10 years to the Region's flood control schemes in order to restore levels of service and extend flood protection. SLUI, over the medium to long term, will reduce aggradation and slow the need for continual upgrades, especially after major storm events. By reducing sediment aggradation in lowland rivers, long term flood protection costs will be significantly lessened. Whole Farm Plans can reduce sediment discharge by up to 60%, which significantly lessens both turbidity and sediment aggradation. Based on Schierlitz et al. (2006) analysis using a simplified version of the *SedNet* model to predict the erosion and sedimentation regime of the Manawatu River associated with a range of different Whole Farm Plan scenarios. If 250 of the Whole Farm Plans are implemented on the highest priority farms and the other 250 plans on a first come first served basis, the mean sediment discharge would be reduced to 2.4 million tonnes, or 77% of that achieved by targeting all plans in priority areas. Parfitt et al. (2008) found most phosphorus comes down the Upper Manawatu River in particles of eroded sediment from steeper land during major floods – about 511 tonnes of phosphorus per year goes under the bridge at Hopelands. Ninety percent of the erosion occurs under pastures on steep land and 10% under forest. These phosphorus losses can be reduced from 511 to 193 tonnes by targeted planting of trees on targeted pastures.

2. Community

Smith et al. (2007) investigated the social impact on farm families of the 2004 Manawatu floods and played particular attention to issues of community resilience and response to this adverse event. The research findings highlight how the 'hollowing-out' of rural New Zealand has increased its vulnerability through the disintegration of many traditional community structures. At the same time, increasing farm size, increased fragmentation of farm blocks, a decrease in the number of full-time residential farm workers and an increasing reliance on electronic communications has resulted in a new technological dependency. This results in a decrease in capacity to respond to adverse events and an increased sense of isolation and vulnerability when telecommunication links fail. The report emphasises that increasing resilience requires recognition that farms remain both home and business and that any support provided must be cognisant of this fact. Equally, stress is placed on the need to actively work to support community vitality (or rebuilding) as the

floods of 2004 revealed that in any adverse event self-reliance and mutual support are primary components of resilience.

The floods of 2004 have prompted many households to take better precautions to minimise the impact of future adverse events and there is some acceptance that production systems (or land use) may have to change. However there is as yet little evidence that this transformation has occurred. Equally, there is no evidence that farmers who had taken appropriate preventative measures have been disillusioned by the floods, although there is some scepticism as to the compensation many less proactive farmers received.

Farm scale

38. Farm-by-farm assessment ensures mitigations and best management practices are tailored to the unique situations of individual farmers, their business, and the unique characteristics of their land and other resources. The one-on-one interaction between the farmer, resource surveyor, and farm business consultant is at the heart of the success of the development and implementation of the plan and the resulting benefits.

The environmental and economic benefits at the farm scale are significant and include:

- With land often the single largest capital investment made by a farmer, a WFP can ensure that land purchase (eg. increase the utility of existing land), development (eg. targeting of additional fertiliser inputs) and land management decisions (eg. livestock policy) are fully informed.
- Much of the spatial character and pattern of land is hidden from casual observation (eg. soils), so it may take several years of cumulative experience to gain a level of understanding comparable to that obtainable through a WFP, and experience may not suffice for identifying the full scope of land potential beyond existing use.
- A land evaluation and planning approach can shortcut experiences; provide a depth of understanding greater than that afforded by experience alone; and highlight new possibilities for farm improvement and management that may have otherwise gone unnoticed.

These on-farm environmental and economic benefits are also felt by the wider community, in improved environment and increased economy, beyond that of the targeted works programmes on accelerated soil erosion supported by community.

Note. As part of the report prepared for Horizons Regional Council on the costings and feasibility of the Sustainable Land Management Initiative in November 2005, the

recommendation was made for annual reporting against agreed outputs and a formal evaluation and review of the programme at Year 4-5 and Year 10 to ensure the programme delivered more sustainable land use practices, especially in critical catchments. Measures will include:

- Number of plans created and number in 'critical' catchments.
- Number of plans operational.
- Change in land use attitudes and beliefs by landowners.
- Progress in key indicators and measures (developed as part of Phase One – evaluation package).

Dr Alec Mackay

29 May 2008

References

Douglas, G., Harnsworth, G., and Mclvor, I. (2006). Updating the Land Use Capability Handbook – A Scoping Report. Horizons Regional Council. AgResearch Client report prepared for Horizons Regional Council. June 2006.

Douglas, G., Manderson, A., Lynn, I., Harnsworth, G., and Page, M. (2008). Updating the Land Use capability survey handbook Envirolink tools contract AGRX604. AgResearch report (April 2008).

Douglas, G., Dymond, J., Mclvor, I. (2008). Monitoring and reporting of whole farm plans as a tool for affecting land use change. Horizons Regional Council Envirolink Medium Advice Grant (February 2008).

Johnson, R.W.M., Forbes, R.N. (2000). Recent productivity trends in New Zealand primary sectors - Agriculture and Forestry Sector, Report No. 2000/20, MAF, Wellington, New Zealand.

Mackay, A., and Neild, J., (2005). Horizons Regional Council Sustainable Land Use Initiative Costings and Feasibility. AgResearch Client report prepared for Horizons Regional Council. (November 2005).

Mackay, A., (2007). Specifications of whole farm plans as a tool for affecting land use change to reduce risk to extreme climatic events. Horizons Regional Council. Envirolink_Medium advice grant 243-HZLC25).

Manderson, A.K., Mackay, A.D, Palmer, A.P. (2007). Environmental whole farm management plans. Their character, diversity, and use as Agri-environmental indicators in New Zealand. J. Environmental. Management. 82 319-331

Neild, J. (2005). Agricultural Statistics for Horizons Region. Prepared for Horizons Land Use Working Party Prepared by Agriculture New Zealand Ltd. (January 2005)

Parfitt, R.L., Dymond, J., Mackay, A., Gillingham, A., Houlbrooke, D., McDowell, R., Clothier, B., Roygard, J., Clark, M. (2008). Sources of phosphorus in the Manawatu River, and implications for the One Plan. A report by SLURI for Horizons Regional Council (January 2008).

Parminter, I., Mackay, A., Wharfe, I., and Frazer, A. (2004). Environmental Management Systems –A market driven tool for achieving clean green outcomes? Primary Industry Management Journal Volume 9. Number 2 9-12.

Schierlitz, C., Dymond, J., Shepherd, J. (2006). Erosion/sedimentation in the Manawatu catchment associated with scenarios of Whole Farm Plans. Report prepared for Horizons Regional Council (September 2006).

Smith, W., Mackay, A., Bankoff, G.. (2007). Resilience and Farm Family Response in the Aftermath of the 2004 Manawatu Floods. Contract Report For The Ministry of Agriculture and Forestry. (January 2007).

Vision Manawatu. Economic Impact Analysis of the Major Manawatu-Wanganui Flooding February 2004. (September 2006).

Vision Manawatu. Economic Impact Analysis of the Major Manawatu-Wanganui Flooding February 2004. (September 2006).

Wedderburn, L. (2008). Evaluation of impacts of mitigations on economics, productivity and environmental outcomes at the farm scale. Report prepared for Horizon Regional Council. (May 2008) 29 pp.