

MAF Climate Change Technology Transfer Plan for Action 2010 – 2015

South Island (SI) Arable and Vegetable Sector Workshop
18 December 2009
Ashburton

1 Status of this document

This document reflects the contribution of the workshop attendees and is not the confirmed opinion of MAF or any sector/industry organisation.

2 Introductions

Attendees were asked to provide two to three points about themselves that would help others understand the perspective they were bringing to the workshop.

Annie Perkins (Groundwork Associates, Professional facilitator) has done a lot of project work within the agricultural industry and is interested in organics.

Jeff Morton (Ballance Agri-Nutrients) is experienced in technology transfer for farmers relating to nutrients.

Nick Pyke (Chief Executive of Foundation for Arable Research and MAF CCTT Sub Group chair) was part of the research technology transfer group that started this process. Feels NZ's strength is currently in the research not the technology transfer hence his involvement in the CCTSG. Knows there are some passionate people out there getting the info to their industry. Realises there's a short amount of time to get the information out. Important to understand what's happening in other sectors.

Dave Grant (Farmer and is involved with Foundation for Arable Research (FAR)). Climate tech is part of what we do to become more sustainable. Grows a variety of groups, cereal based grass, reasonably standard cropping mix.

John Evans (Vegetable/seed crop farmer) has livestock in the system and is a sustainable farmer.

Katherine McCusker (MAF Senior Policy Analyst – Technology Transfer, Climate Change) was project advisor at MAF SFF before she took on this job. Looked at what needed to be done. All the actions equated to sustainable farming. "This process is about practical actions".

Craige Mackenzie (Cropping and dairy industry) was away last year on a Nuffield scholarship to study the carbon footprint, how to be more sustainable and have less impact on the environment. Advantages if we can modify what we do in relation to climate change.

Anton Nicholls (Independent farm management consultant) has a history of tech transfer and is interested in hearing the outcomes of today's discussions.

Robyn Dynes (AgResearch) worked in cropping farms but focus is now on pastoral sector. She is currently working on projects in the dairy, sheep and beef and deer sectors. Interested in how the system comes together; farm assistance programme. We need technology transfer.

Hamish McFarlane (Process grower) wasn't present for introductions.

Janine Lowe (Groundwork Associates, Marketing and communications assistant) Recent graduate from the University of Waikato and is interested in organics and sustainability.

3 Background

3.1 Overview of MAF CCTT Plan for Action

An introduction to the strategic framework and background to the plan was provided at each of the workshops by either Katherine McCusker or Annie Perkins. This summary reflects information provided across all workshops, in addition to the supplied background paper (see Appendix A), so that all sectors benefit from the same information.

3.1.1 Origins of the draft plan for action

The draft plan's themes and targets were developed at a high level by a research and technology transfer group. They were then worked through on a cross-sector basis through the Climate Change Technology Transfer Subgroup (CCTTSG). The plan is a living document and there will be continuing opportunity for feedback. Priorities will change as the plan is worked through with or by the sectors and/or as more information comes through from scientific or political sources, nationally and internationally.

3.1.2 Purpose of the plan and today's workshop

Through developing the plan to an implementation level, MAF wants to determine how to sensibly invest government funding to help farmers develop sustainable and resilient businesses.

MAF is particularly interested in:

- Setting meaningful targets which help business sustainability.
- Determining what practical information needs to be delivered to farmers and how;
- Determining how to best integrate government and industry action within and across sectors.

MAF will be using the information from this workshop series to take action from March 2010 onward and has funding available to support climate change technology transfer over the next five years. Some actions highlighted through this process may be supported from this fund; others from alternative sources, such as industry or industry/government partnerships. Others may evolve into Sustainable Farming Fund projects. MAF expects that initially action (and funding) will focus on raising general awareness and implementation of existing tools and technologies.

It is likely that different sectors will use the plan in different ways. As an example, the dairy sector has already set its targets. Other sectors aren't in that position. MAF is flexible about time and is interested in taking advice from the sectors about priorities.

3.2 Focus on Arable and Vegetable sector

Nick Pyke presented findings from two sector workshops held in March 2008 examining the impact of climate change on the sector. He made the following comments.

- Using the themes in the draft strategy helped the workshops to flow a whole lot better. We can talk about tillage systems or energy systems instead of mentioning climate change at any time through the discussion.
- Still a number of areas where the knowledge is limited: What is the climate going to do at a regional level? How soon do I have to think about changing?
- The detail around whether the temperature is going to rise one or two degrees isn't an issue. All the climate change scenarios predict temperature will increase by 2040, so we are going to have to do something.
- A lot of the technology transfer that is being talked about is good practice anyway, e.g calculator, water use.
- We need to look at how the ETS is going to affect vegetable/arable farmers. What pressure should they be putting on fertiliser companies? How are they going to encourage right behaviour on the farm? How are people going to benefit from it? What are the incentives? What should they be? Fuel savings are the only benefit you'll see with energy savings. The big question is about soil carbon. Is this something we should be pushing for good technology? Don't want to go too far with the [soil carbon] debate.

3.3 Questions following the background session

Q: What's the best way to do a life cycle analysis?

A: There are really no standardised techniques. At the moment you would want to pick up international life cycle analysis.

Q: Farmers collect all the debts for the input and get taxed on their outputs. Why doesn't it [the cost] go to the consumer at the other end or fertiliser companies?

A: This is not about prevention. It's about living with climate change. What needs to be happening on the farm?

4 The workshop process

4.1 Step 1: Assessment of relevance and usefulness of targets and themes

- The first two columns of each table in Section 5 were provided to the workshop. These had been developed through earlier MAF workshop processes (see Section 3.1.1 and Appendix A).
- The CCTTSG was aware that some themes and targets may be more relevant to some sectors than others. Defining areas of relevance/focus was the first stage of the workshop process.
- Attendees worked in small groups to assess the relevance of themes and usefulness and relevance of targets on a scale of **0 (not relevant/useful) to 5 (very relevant/useful)**
- The full list of themes presented was:
 - Capability and capacity
 - Efficient use of resources: water
 - Efficient use of resources: energy
 - Nutrient management
 - Greenhouse gases including methane
 - Resilience to extreme weather events
 - Soil management
 - Carbon sinks
 - Emissions trading scheme (ETS) impacts
 - Sustainable systems

This document only contains tables relating to those themes considered relevant to the sector by the workshop attendees.

4.2 Step 2: Gap analysis and definition of actions, timeframes and priorities

Each group was then asked:

- Whether there was anything missing from the supplied target, or whether they would suggest making any changes to it?
- How would they amend the target?
- What specific actions would be needed to reach the target, especially for this sector?
- When would action need to take place (1 to 2 years or 3 to 5 years)
- What was the priority for this target (0 = low to 5 = very high)? Some groups chose to prioritise actions rather than targets.

In amending or developing targets the groups were asked to aim for SMART targets, i.e. targets that were:

- Specific
- Measurable
- Achievable
- Realistic
- With a Timeframe

4.3 Step 3: Review and summary of key messages/issues

At the end of the day attendees were asked to reflect on key messages/issues raised during the workshop.

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5 CCTT Plan for Action: Arable and Vegetable Sector themes and targets

Groundwork has done its best to make these tables faithfully reflect the workshop experience. However to ensure suggested actions have been captured in the right place for subsequent analysis across sectors, some interpretative changes have been made during the editing process. Significant interpretative changes have been indicated by square brackets [] surrounding text. Some amended/new targets did not conform to the SMART model but Groundwork has not tried to correct this.

Capacity and capability	Targets	How relevant is this topic/theme to this sector? (0-5)	How useful and relevant are the targets? (0-5)	Who assessed this theme?
<p>Goals for climate change technology transfer are ambitious and will not be achieved with current capability. There is an urgent need for skills and experience to support land managers in moving toward more sustainable land use systems. These skills and experience are in short supply - they must be developed now. This requires a financial commitment to employ, educate and upskill the right people with the right skills.</p> <p>The technological solutions to management of climate change issues are limited in number and efficacy. It is critical that in a country the size of New Zealand all climate change technology transfer is aligned toward common goals. This includes primary sector and government funded programmes.</p>	<ul style="list-style-type: none"> A. Develop the required capability to achieve the sector-specific targets by 2015. B. Increase alignment of sector and public investment on extension to deliver the knowledge required to achieve the desired outcomes in climate change and sustainable land management. C. In partnership with the sectors, develop a programme to up-skill people so they can provide advice/support to advancing issues of adaptation and sustainability. D. Have the right people trained in the right areas at the right time. E. Have climate change integrated into tertiary and vocational land based courses by 2015. F. Provide opportunities for land managers to up-skill themselves on climate change and sustainability issues so they can increase their business resilience and profitability by 2015. G. Provide learning opportunities specifically for Iwi/Maori to increase awareness, encourage the uptake of new knowledge and foster Maori innovation in climate change and sustainable land management. 	5	5. All OK.	<p>Nick Pyke</p> <p>Jeff Morton</p> <p>Dave Grant</p>

Capacity and capability					
Is anything missing from the targets? Would you change anything in the targets?	How would you amend the targets?	Specific actions, especially for this sector, to reach the [amended] targets.	Action done (yrs)		Priority (0-5)
			1-2	5	
<p>No free advice - all is paid for therefore farmers need the best advice”</p> <p>Need more trained existing/respected consultants to deliver outcomes on government funded programmes → need training.</p> <p>Who is going to pay? Them? Passionate but impartial, trusted, who is going to train them?</p>	<p>Combine targets A-F into one target:</p> <p>A. Develop a programme in partnership with the sectors to up-skill all industry personnel and improve capability to implement required actions to deliver other themes by 2015.</p> <p>G. Maori target stays as is.</p>	i. Establish a monitor farm to demonstrate GHG accounting, adaptation and mitigation actions. Farmers to educate farmers.	√		5
		ii. Training courses for consultants and third party professionals to up-skill – paid to attend by?	√		5
		iii. Link with Lincoln and Massey Universities to develop courses with climate change content. ¹	√		5
		iv. Use existing extension methods as appropriate.	√		5

¹ Group recommended focusing only on these two centres as they are strongest in agriculture.

Efficient use of resources: water	Targets	How relevant is this topic/theme to this sector? (0-5)	How useful and relevant are the targets? (0-5)	Who assessed this theme?
<p>Water efficiency is a key issue for New Zealand in areas where water is considered to be constrained in availability for the primary sector.</p> <p>These are mostly traditional summer dry areas such as the east coast of both islands. Availability of water has also become an important issue in areas such as the Waikato.</p> <p>As rainfall becomes increasingly variable, and temperatures and evapotranspiration increase, water efficiency will need to improve just to maintain current levels of production. Improving water use efficiency benefits both the environment and the water user.</p>	A. Ensure land managers have the necessary incentives, information and technologies to improve the efficiency of water use.	5, relevant but not useful.	1. Not very useful the way it is written but it is very relevant to the general incentives.	Nick Pyke Jeff Morton Dave Grant
	B. Increase land managers' resilience to drought by providing information about efficient use of rainfall and irrigation, case studies and decision-support tools.		4	
	C. Support water efficiency measures such as greater strategic development and use of water storage.		5	
	D. Align relevant action plan targets with the target determined by the Primary Sector Water Partnership: i.e. 80 per cent of extracted water used by the sector will be under a self management approach to meet benchmarks ² of water efficiency by 2016.		3	

² Benchmarks set under the Primary Sector Water Partnership

Efficient use of resources: water					
Is anything missing from the targets? Would you change anything in the targets?	How would you amend the targets?	Specific actions, especially for this sector, to reach the [amended] targets. ³	Action done (yrs)		Priority (0-5)
			1-2	5	
A. Improve efficiency by how much by when? Incentives are where energy efficiency on water use efficiency (WUE) Need baseline which is scientifically robust. Average across all users. Needs a monitoring/management component e.g. number using proven moisture monitoring by 2015.	A1. 80% of irrigators using proven soil moisture monitoring by 2015. A2. All new irrigation equipment meets Irrigation NZ industry standards by 2011. A3. Existing equipment is operating as efficiently as possible within constraints of the equipment by 2015.	i. Financial incentives (from the govt) to the farmer who employs the services of a skilled professional.	√		5
		ii. Support standards currently being developed by Irrigation NZ.	√		3
		iii. Educate farmers on cost benefits of efficiency checks by 2012	√		3
		iv. Efficiency check to be a requirement of water consent by 2015.	√		3
B. Best utilise available water and understand crop/water requirements. Research and development provides specific water requirements for individual crops 'significant' species to all farmers by 2020.	B. Criteria for crop selection to match soil and available moisture are used by 50% of farmers by 2015.	i. Need more research and development for sine crops and packaging it so farmers can use it.	√		2 ⁴
		ii. Water use efficiency information is part of the crop package.	√		
C. Water storage on farm, Centre for Sustainable Water Management, targets on storage.	Agree with C as is.	No actions specified.			
D. Support this. This is something we have to up-skill farmers in. How are we going to get the message out?	Agree with D as is.	No actions specified.			

³ Group was asked whether their action plan targets aligned with Primary Sector Water Partnership (PWP) timelines and responded that they were quite different targets. Some PWP targets provided no scope for improvement (e.g. how do you improve efficiency by 20% if you are already at 90%).

⁴ Group gave this a low priority only because they thought action was happening in this area anyway [so did not require extra emphasis]

Efficient use of resources: energy	Targets	How relevant is this topic/theme to this sector? (0-5)	How useful and relevant are the targets? (0-5)	Who assessed this theme?
<p>There is an opportunity for New Zealand's land based businesses to reduce energy costs and related carbon emissions by adopting energy efficient practices and technologies (including on farm generation where appropriate). There is significant scope to make cost-effective efficiency improvements in irrigation, cultivation, harvesting, heating and cooling systems, transport, and processing of primary products when it occurs on-farm or in a vertically integrated operation (e.g. in a horticultural pack house or winery).</p> <p>To gain the best use of resources, the initial focus of this approach will be on energy intensive activities.</p>	A. Ensure land managers have the necessary information and technologies to improve the efficiency of energy use.	5, very important, more measurable and first step mitigation areas.	5. Necessary info, essential.	Anton Nicholls Craigie Mackenzie Robyn Dynes
	B. Continue to develop and disseminate information about energy innovation choices, including case studies, decision-support tools and cost benefit analysis.		5. Innovation: other things go with it; case studies very important, innovators need support from science and research.	
	C. Demonstrate leading edge energy efficiency and renewable energy.		5. Independent of commercial interests. Stated time frame.	

Efficient use of resources: energy					
Is anything missing from the targets? Would you change anything in the targets?	How would you amend the targets?	Specific actions, especially for this sector, to reach the [amended] targets.	Action done (yrs)		Priority (0-5)
			1-2	5	
A. Land managers have necessary information and technologies in relevant learning packages to improve and for on-going improvement to efficient energy use.	A. Ensure land managers have the necessary information and technologies to improve the efficiency of energy use by 2011.	i. Baseline benchmarking by 2010.	√		5
		ii. Develop knowledge on how to package/transfer information to farmers.	√		5
		iii. Appropriate learning modules in three degree Agriculture courses.	√	√	5
		iv. E-learning as an on-going project. ⁵	√		5
		v. Educate the educators.	√		5
		vi. Develop learning packages, include energy budgets.	√		5
Tertiary training. Agriculture students – energy. On farm – benchmark targets: efficiency, baseline benchmarks, SMART, fuel/ha, \$/ha, kw/unit product, kwh/ha, mm/ha. By 2013 have benchmark data for all key crops. <ul style="list-style-type: none"> ▪ Measurement ▪ 50% farms with energy budget by 2015 ▪ 10% farms: 2011 ▪ A4 sheet 2015 ▪ Computer tools 2020 	B. Develop and disseminate information on new, novel and future options for energy/efficiency including case studies. DSS+BCA	i. Maintain on-going international networks by range of people from range of sectors to identify new and future opportunities.	√	√	4
		ii. Identify and complete full analysis case stories of systems which offer new, unique, relevant and economic for arable farmers and includes BCA.	√		4
		iii. Select and evaluate tools which meet land managers requirements for measure/manage energy on farm.		√	4

⁵ Different people logging on to a seminar type environment.

Efficient use of resources: energy					
Is anything missing from the targets? Would you change anything in the targets?	How would you amend the targets?	Specific actions, especially for this sector, to reach the [amended] targets.	Action done (yrs)		Priority (0-5)
			1-2	5	
<ul style="list-style-type: none"> ▪ Web based 2050 <p>Notes: On farm benchmark targets, this is where we're at, this is what we can reduce or improve. Have to start from a known point.</p>	C. Demonstrate leading edge energy efficiency.	i. Include renewable energy in evaluation.	√	√	5
		ii. Demonstration farms/sites which are independent, relevant and focused.	√	√	5
		iii. Energy budgets and full analysis.	√	√	5
		iv. Trial "bluesky" energy efficiency options ⁶ .	√	√	5

⁶ Group commented that this is important to keep people excited.

Nutrient management					
Is anything missing from the targets? Would you change anything in the targets?	How would you amend the targets?	Specific actions, especially for this sector, to reach the [amended] targets.	Action done (yrs)		Priority (0-5)
			1-2	5	
<ul style="list-style-type: none"> ▪ Provide information through a number of sources ▪ Processors, levy bodies etc ▪ District field days, farmer to farmer ▪ Integrate nitrous oxide into existing technology transfer on nutrient management. ▪ Develop an industry accepted nutrient management plan template suitable for all arable crops. ▪ Farmers aware of process for recognising mitigation products. ▪ Key message: It's about integrating into existing extension. Soil tests, crop maintenance, calculators on crops. 	A. Provide information to 80% of land managers on nitrous oxide mitigation options and their costs and benefits by 2011.	i. Consistent information through Foundation for Arable Research, Hort NZ, Meat NZ and Dairy NZ on nitrous oxide by end of 2010.	√		5
		ii. Integrate nitrous oxide and mitigating options into other extension on nutrient management by end of 2010.	√		3
		iii. Farmers aware of process for recognising mitigation products by 2011.	√		5
	B. 80 per cent of nutrients applied to land nationally are managed through quality assured ⁹ nutrient budgets 2015.	i. Develop an industry accepted nutrient management plan template suitable for all main arable crops: wheat, potatoes, peas and maize. (Simple not calculator/crop).	√		5
		ii. Develop an industry accepted nutrient management plan template suitable for all minority arable crops: e.g. vegetable seed. (Simple not calculator/crop).		√	5

⁹ The people undertaking and processes used will be subject to independent quality assurance.

Greenhouse gases including methane	Targets	How relevant is this topic/theme to this sector? (0-5)	How useful and relevant are the targets? (0-5)	Who assessed this theme?
<p>The CCTT Plan for Action requires land managers and those advising them to understand a new area – that of greenhouse gases (GHGs). This includes new terminology, where the greenhouse gases come from, how to estimate them for their farms, how to mitigate them to reduce cost and new benchmarks.</p> <p>Greenhouse gas emissions for agriculture can only be measured experimentally while emissions at farm, regional or national scale are estimated.</p> <p>Ruminants produce methane as part of their normal digestive process. As a greenhouse gas methane is 21 times more potent than carbon dioxide when you compare their heat-absorbing abilities over a hundred years.</p> <p>Technologies and practices to reduce emissions are likely to come out of research that:</p> <ul style="list-style-type: none"> ▪ Deals with the quality and type of feed ▪ Modifies the composition of the bugs that produce methane in the rumen ▪ Modifies farm systems <p>We currently do not have the technologies available to extend to farmers to significantly reduce methane production. Initially the action plan will look at increasing farmers understanding of how increasing feed efficiency will decrease methane per unit of product and improve profitability.</p>	<p>A. Ensure the common language of GHGs is understood and widely used by land managers by 2015.</p>	<p>4, less livestock issues.</p>	<p>5 (useful). Relevant by 2012 and widely used by 2015.</p>	<p>Robyn Dynes Craigie Mackenzie Anton Nicholls</p>
	<p>B. Provide information to 80% of land managers on greenhouse gases, where they come from and how to estimate them for their business by 2015.</p>		<p>5 (useful). Relevant by 20% farmers by 2013 and 80% by 2015.</p>	
	<p>C. Establish benchmarks for greenhouse gases for different farming systems by 2015.</p>		<p>5 (useful).</p>	
	<p>D. Demonstrate GHG scenarios and options on focus, research and monitor farms and other properties providing industry leadership by 2012.</p>		<p>5 (useful). Need to have a mixed crop and 100% arable.</p>	

Greenhouse gases including methane					
Is anything missing from the targets? Would you change anything in the targets?	How would you amend the targets?	Specific actions, especially for this sector, to reach the [amended] targets.	Action done (yrs)		Priority (0-5)
			1-2	5	
A. Fine as is.	A. Ensure the common language of GHGs is understood and widely used by land managers by 2015.	i. Develop glossary of words/terms for farmers and industry.	√		5
		ii. Supporting glossary and background for Agribusiness.	√		5
B. Needs a staggered target	B. Provide information to 80% of land managers on GHGs by 2012. 20% of farmers using tools to estimate GHG by 2013 and 80% by 2015.	i. Background information on GHGs; What? Origins? What emitting from arable? Global warming potential?	√		5
C. Fine as is.	C. Establish benchmarks for different farming systems by 2015.	i. By 2013 have benchmark data for 80% of arable crops.	√		4
		ii. By 2015 have systems platform for GHG.		√	4
D. Fine as is.	D. Demonstrate GHG scenarios and options on focus farms to provide industry leadership by 2015.	i. Demonstrate GHG scenarios on at least three arable/vegetable focus farms (selected for existing high quality data)		√	4
Add new target E. Have tools and knowledge for farmers to develop and implement individual GHG efficiency plan for a resilient farming system by 2015 with targeted reduction of at least 10% in intensity of GHG/unit of product. <ul style="list-style-type: none"> ▪ End of 2012 1st understand common language ▪ End of 2012 2nd industry benchmarks ▪ End of 2013 3rd individual farm use ▪ End of 2014 4th plan GHG efficiency on your farm 	E. (New) Have tools and knowledge for farmers to develop and implement individualised GHG efficiency plans by 2015.	i. Resilient farming system by 2015.		√	4
		ii. Targeted reduction at least 10% in intensity of GHG/unit product by 2015.		√	4

Resilience to extreme weather events	Targets	How relevant is this topic/theme to this sector? (0-5)	How useful and relevant are the targets? (0-5)	Who assessed this theme?
<p>Adaptation to climate change is likely to benefit from experience gained in reaction to extreme climate events, specifically by implementing proactive climate change risk management plans.</p> <p>Climate change in New Zealand will increase the frequency of extreme weather events, challenging the resilience of many of our land based businesses.</p>	<ul style="list-style-type: none"> A. Provide tools, knowledge and skills so land managers can make well informed timely decisions. B. Provide tools so that land managers can increase farm profitability and their resilience to the impacts of a changing climate. C. Identify a suite of practices, technologies and tools to adapt to a changing climate and manage risk from extreme weather events by 2013. D. Provide demonstrations of why increased resilience is needed and the benefits of increased resilience to the farming operation. E. Increase investment analysis skills and tools to future proof major on-farm investments. 	5		<p>Katherine McCusker</p> <p>Hamish McFarlane</p> <p>John Evans</p>

Resilience to extreme weather events					
Is anything missing from the targets? Would you change anything in the targets?	How would you amend the targets?	Specific actions, especially for this sector, to reach the [amended] targets.	Action done (yrs)		Priority (0-5)
			1-2	5	
	A. Provide a network of learning and support for arable farmers by 2015.	i. Provide financial, investment and risk management short courses to farmers and those that advise them by 2012.	√		4
		ii. Re-evaluate financial ratios to manage volatility and extend to farmers.	√		5
		iii. Expand mentoring schemes, train mentors (SFF project).	√		3
		iv. Build on Australian work/models and adapt for NZ.	√		4
		v. Promote diversity of income, risk and harvest/sowing time (late crops/early crops), water efficiency.	√		5
	B. Provide farmers with cultivars suitable for a changing climate (on-going).	i. Foundation for Arable Research and industry to add tolerance to drought and insect pressure to cultivar evaluations.	Start 2010		5
Add new target F.	F. To have affordable crop insurance available for extreme weather events by 2014 e.g. rain/hail/snow.	i. An arable working party to approach govt/private insurance consortium by 2011.	√		5
		ii. Feedback and support from arable industry measured by 2011.	√		5
		iii. United wheat grower scheme approached for support by 2011.	√		5

Soil management	Targets	How relevant is this topic/theme to this sector? (0-5)	How useful and relevant are the targets? (0-5)	Who assessed this theme?
<p>Soils underpin our land based systems. Soils physically anchor plants, support livestock, provide a source of water and nutrients and regulate emissions to air and water. They are supported by an extensive biological system that aerates the soil and cycles nutrients and organic matter.</p> <p>When soils are water logged, compacted, lack aeration, or contain too much nitrogen they are more likely to lose nitrogen to the atmosphere as nitrous oxide. Soils are both a source and store of carbon. Most soil carbon is locked up. However unless we alter our management practices, more of this carbon may be released into the atmosphere, as temperatures and mineralisation rates increase.</p> <p>By increasing the amount of carbon locked in the soil, land managers can benefit from:</p> <ul style="list-style-type: none"> ▪ Increased water holding capacity and infiltration rates ▪ Improved soil structure, less erosion and more ability to cope with compaction ▪ Improved nutrient cycling and cation exchange rates <p>With increased frequency of drought, high rainfall events and high wind the risk of soil loss increases in the arable, outdoor vegetable and pastoral sectors increases. Greater uptake by land managers of current best management practices would increase the resilience to extreme weather events and reduce soil loss. Forestry experiences major issues with soil/sediment loss during and immediately after harvest.</p>	<p>A. Implement changes in soil management to build more resilient rural businesses.</p> <p>B. Increase the uptake by land managers of Code of Practices and best management practices.</p> <p>Work on this theme links to a number of other programmes including the Forestry and Horticultural Code of Practices, Hill Country Erosion and Regional Council work.</p>	5	3	<p>Nick Pyke</p> <p>Jeff Morton</p> <p>Dave Grant</p>

Soil management					
Is anything missing from the targets? Would you change anything in the targets?	How would you amend the targets?	Specific actions, especially for this sector, to reach the [amended] targets.	Action done (yrs)		Priority (0-5)
			1-2	5	
A. Good info on existing soil quality in relation to soil type by 2011. 700+. Available as a benchmark produced in a systematic manner. Comment: Soil is a stable component in the farm system and the opportunity to increase soil carbon is minimal.	A. Quantify current soil quality based on Land Management Information project data by 2010.	i. Report on data in understandable English	√		5
B. Increased use of best management practices.	B. Increased use of “best management practices” to maintain soil quality by 50% of farmers by 2015.	i. Define best management practices from current research activities, farmer practices and future research.	√		4
		ii. Deliver information to farmers.	√		4
New target.	C. Quantify potential effects of climate change on soil management and carbon within regions by 2025.	No actions specified.	√		2

Carbon sinks	Targets	How relevant is this topic/theme to this sector? (0-5)	How useful and relevant are the targets? (0-5)	Who assessed this theme?
<p>There are increasing opportunities for forest owners and farmers with areas in trees to receive an income from carbon trading. Carbon forestry presents both opportunities and risks. Carbon stock forests have a different objective to commercial forests and may need to be managed differently</p> <p>There are market opportunities for businesses that undertake carbon foot printing, life cycle analysis.</p>	<p>A. Provide appropriate tools and information to support the uptake of business opportunities of carbon foot printing and life cycle analysis by 2011. These will be demonstrated to potential users (from technology transfer strategy)</p> <p>B. Provide an integrated programme to foresters and farm foresters on the impacts of a changing climate on forestry; the opportunities and management of risks of carbon farming.</p>	<p>2-5, very relevant but don't know how to handle it – could be neutral. If Biochar works that would increase relevance to 5.</p>		<p>Robyn Dynes Craigie Mackenzie Anton Nicholls</p>

Carbon sinks					
Is anything missing from the targets? Would you change anything in the targets?	How would you amend the targets?	Specific actions, especially for this sector, to reach the [amended] targets.	Action done (yrs)		Priority (0-5)
			1-2	5	
<p>A. Information and knowledge on soil carbon, carbon cycles by 2012 and tools developed for farmers use to predict impact of farm management decisions on total soil carbon by 2018.</p> <p>B. Information and knowledge on impact of climate change on soil organic matter/carbon within regions.</p>	<p>Refer to soils</p>				

Emissions trading scheme (ETS) impacts	Targets	How relevant is this topic/theme to this sector? (0-5)	How useful and relevant are the targets? (0-5)	Who assessed this theme?
<p>The ETS is the price-based mechanism for greenhouse gases and is a key part of overall climate change policy. It involves all significant greenhouse gases and all sectors.</p>	<p>A. All foresters and farm foresters able to make informed decisions on ETS by? (date dependant on legislation).</p> <p>B. Give all land managers the opportunity to be aware of ETS, understand their obligations and make informed decisions by ? (date dependant on legislation).</p>	<p>5, relevant for the wrong reason.</p>	<p>5 relevant, 3 useful.</p>	<p>Nick Pyke Jeff Morton Dave Grant</p>

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Emissions trading scheme (ETS) impacts					
Is anything missing from the targets? Would you change anything in the targets?	How would you amend the targets?	Specific actions, especially for this sector, to reach the [amended] targets.	Action done (yrs)		Priority (0-5)
			1-2	5	
<p>Targets</p> <p>1. Quantify start point and energy use and fuel use on arable/vegetable farms so know ETS commitment by end of 2011.</p> <p>2. Look at what can be changed etc to reduce ETS costs by 2012 and deliver to farmers.</p> <p>3. Deliver methodology with robust models for ETS accounting to farmers by 2013.</p> <p>4. Overseer with a robust GHG component for arable/vegetable by 2012 (linked to 3 above).</p> <ul style="list-style-type: none"> ▪ Discussions occurred with processors re: point of obligation to ensure ETS provides rewards for “good” practice. ▪ All extension providers giving the same message. ▪ Target good information on current energy and fuel use. 	A. Provide all land managers with info on requirements of ETS so they can make informal decisions by 2015.	i. Analyse ETS, determine which sections are relevant to arable/vegetable farms and deliver outcome to farmers.	√		5
	C. Quantify energy, fertiliser and fuel use on arable and vegetable farms to determine baseline ETS commitment by end 2011.	i. Survey farms to determine current uses and relate it to existing information.	√		5
	D. Deliver methodologies using robust models for GHG accounting for ETS by 2013.	i. Overseer has a GHG component for arable/vegetable farms by 2012.	√		5

Sustainable systems	Targets	How relevant is this topic/theme to this sector? (0-5)	How useful and relevant are the targets? (0-5)	Who assessed this theme?
<p>Farming systems have changed enormously over the last 50 years and will continue to do so in the future. The average New Zealand land based business has increased in size, complexity and has to meet increased demands from markets and regulation.</p> <p>To adapt to a changing climate and/or to reduce greenhouse gas emissions our land managers will need to further up-skill their management skills.</p> <p>To do this they will need good information on system options including integrating different land use options, changes in stock/crop policies, management systems and financial returns. This includes the interaction between soil, plants and animals in a system that is economically, environmentally and socially sustainable.</p>	<p>A. Provide appropriate tools and information to land managers so they can make informed decisions at a property or catchment level.</p>	5	3	<p>Katherine McCusker Hamish John Evans</p>

Sustainable systems					
Is anything missing from the targets? Would you change anything in the targets?	How would you amend the targets?	Specific actions, especially for this sector, to reach the [amended] targets.	Action done (yrs)		Priority (0-5)
			1-2	5	
<ul style="list-style-type: none"> ▪ Need timeframe. ▪ Real targets e.g. tool to do this by 2013. ▪ Best practice for farm system (whole farm) ▪ Need more science to do this – 5-10 yrs out. Need data and ground truth. ▪ Commercialise new technologies from overseas. Need to calibrate and adapt for N2. ▪ Need to go hand in hand with market development. ▪ Need better understanding of how components and management affect the whole system - understand marginal returns. ▪ Benchmarks across the whole system, e.g. water, soil, energy, chemical. ▪ Develop then get market drivers and uptake. ▪ Gold mark system if BMP – N2 Green Certification ▪ Build on N2 gap as a module of this for vegetable sector. ▪ Certification: Elite gold card; Silver card for majority ▪ Sustainable system overarches everything. The system is built up in the detail of the components. 	<p>A. Establish a whole farm certification system, using benchmarks from the other topics (water, soil, nutrients) with different levels (gold and silver) operating and linked to market by 2015.</p>	i. Develop benchmark using a consistent module approach to each topic.	Year 1		5
		ii. Get cross sector buy-in.	Year 1		5
		iii. Develop marketing plan/links or partnership.	Years 2-3		5
		iv. Trial system with 50 farmers.	Year 3		5
		v. Provide appropriate tools and information to farmers and industry.	Year 3		5
		vi. Have 10% of farms on system by 2013 and 75% by 2015.		√	5

6 Feedback session

6.1 Feedback on workshop process

- Give each group two topics.
- Positive, best workshop. Didn't waste a lot time in the day reporting back. Checked in at the beginning to make sure people were on track.
- The targets that are coming out are good.
- Different facilitator with a different system.
- Need to shelve it for a week or two and come back to it.
- Make the North Island arable and vegetable sector work through it the same way as the South Island.
- Initially some confusion between targets and actions. SMART model was helpful.
- What's the target, when do you need it? The relative importance and time you need to do your business.
- Need to account for different "sizes" and think how big issues are for that sector: e.g. energy is a big issue for arable. The GHG more theoretical, open ended, some were more practical.
- Less focus on the timeframe more on the priority. Using the 1 to 5 scale was useful to find out when to deliver – i.e. now or in 5 years.
- Need clear actions that can be aligned to the targets, without being outrageous.

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Appendix A

MAF Climate Change Technology Transfer Plan for Action 2010 – 2015

What is the purpose of this action plan?

New Zealand depends greatly on our climate and land resources, or 'natural capital.' The primary sectors generate wealth and also contribute greatly to social and cultural values. To sustain New Zealand's economic prosperity and quality of life, the sectors recognise the need to adapt to climate change and mitigate greenhouse gases.

The expected impacts of climate change and associated climate warming and increased incidence of extreme weather events will expose many sectors of the economy (particularly the rural sectors) to increased risk and new opportunities. New Zealand farming and forestry practices will need to change to adapt to climate change. The right information will need to be packaged and delivered in the right way at the right time to help implement changes effectively at a national, regional, catchment, community and individual farm level.

To this end MAF has proposed a Climate Change Technology Transfer Plan for Action to provide land managers¹⁰ with sufficient information, technologies and systems to enable and encourage the adoption of land management practices that help to:

- reduce total greenhouse gas emissions, improve the efficiency of resource use and minimise the liabilities;
- adapt to a changing climate; and
- take advantage of new business opportunities relating to climate change.

The defined purpose of the action plan is:

To promote more resilient land based businesses by supporting and co-ordinating sector and government initiatives and providing up to date, relevant information on climate change to land managers and their advisers.

Its goals are to:

- Ensure New Zealand land managers and their advisers have the necessary information and technologies to adapt to, manage or mitigate the impacts of climate change at both the farm and regional/community level.
- Achieve demonstrable improvements in understanding and implementation of available technologies that address climate change and sustainability issues by the primary sector.
- Ensure that land based businesses can make informed decisions for their businesses that improve their financial viability and sustainability.
- Identify the drivers of change to increase uptake and ensure investment is well targeted.

¹⁰ Throughout this document the term land managers have been used as a generic term that includes farmers, foresters, growers and agri-business advisors and Maori.

How will the action plan achieve this purpose?

The primary sectors have seen the need to work collectively to achieve their climate change adaptation goals. This document outlines the sector's overarching action plan to address the impacts of climate change in the future. The action plan already builds on the specific initiatives of the various sub-sectors and will continue to look for opportunities to leverage existing activity as more specific actions and targets are developed.

The approach aims to achieve by:

- Undertaking a stock take of information and technology transfer activities funded by government on topics that relate to climate change.
- Reviewing extension activities being undertaken by sectors and other groups.
- Remaining aware of science projects and programmes that will deliver outcomes of value to farmers.
- Identifying the key needs of farmers and land managers.
- Developing information and technology plans to deliver these outcomes to farmers.
- Working in partnership with central and regional government.
- Providing active engagement with land managers so they can make better informed decisions.

What activities will be within the action plan's scope?

The action plan will cover all **land based** industries: dairy, sheep, beef, deer, arable, horticulture, forestry, farm forestry, pigs, poultry.

Activities of organisations that directly influence land owners (land based industry organisations, rural professionals & advisors, supply companies and processors and those that provide training for the rural sectors) are also within scope.

Greenhouse gas emissions and activities that are under direct control of land managers will be included in the plan's scope.

Excluded from scope are emissions and activities that are beyond the farm gate including processing of primary products, except when processing occurs on farm or is a vertically integrated operation (e.g. a horticultural pack house or winery).

How is the action plan being developed?

To help develop the action plan, MAF established a Climate Change Technology Transfer Sub-Group (CCTTSG) which represents the following sectors/organisations:

- Arable (Foundation for Arable Research)
- Dairy (Dairy NZ)
- Federated Farmers
- Forestry
- Fertiliser (Fertiliser Manufacturers Research Association)
- Horticulture (HortNZ) and NZ Winegrowers
- Sheep and Beef (Meat and Wool NZ)
- Iwi/Maori
- Local Government New Zealand
- Ministry of Agriculture and Forestry MAF

Other horticultural sectors and the Pork and Poultry Industries are not specifically represented on the CCTTSG but are still contributing to the development of this action plan.

The CCTTSG reports to MAF's Research, Innovation & Technology Transfer Working Group (RITTWG) which is part of a wider climate change programme.

In March 2008, a CCTSG workshop started a process which determined a number of common (cross-sector) themes and targets for the action plan. The next stage is for the various primary industry sectors to examine

these themes and determine sector-specific actions, targets and priorities. This will be done through a series of workshops and meetings between now and February 2010.

As sector/partner strategies are developed and the action plan gains momentum, the targets will be refreshed and updated. Sector specific actions and targets will be defined on a short-term (1 to 2 year) and long-term (5 year) basis. From the CCTTSG's perspective, priorities for short-term action are likely to be:

- Integrating climate change issues into existing extension and training programmes
- adapting existing tools to respond to climate change management options
- monitor, focus, demonstration farms and forests
- workshops, conferences, field days
- web based information and tools
- sector publications
- rural media
- individual farm plans eg Land Environment Plans and risk management plans
- DVDs, interactive games,
- case studies and fact sheets

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