

# MAF Climate Change Technology Transfer Plan for Action 2010 – 2015

North Island (NI) Vegetable and Arable Sector Workshop  
12 February 2010  
Hamilton

## 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) welcomed attendees and briefed the plan for the day. "From a dairy background I am interested in soil conservation and sustainability." She has worked at AgResearch and Environment Waikato, and is passionate about helping farmers.

**Colin Jackson** (Foundation for Arable Research (FAR) Board) is a maize grower and the North Island representative for the arable industry. He grew 2500 acres of maize 3 years ago but, since then, the maize industry has had hard times. He has pulled right back to 1000 tonnes of grain (from 10,000 tonnes grain). "Business doesn't like uncertainty and, without the specifics, businesses make their own decisions."

**Trevor James** (AgResearch) has over 35 years research experience on weeds, herbicides, cropping, arable and pasture. His recent efforts have been in technology transfer up and down the country in a range of areas and thinks it's a good way to get information out. "I had a recent experience that may fit in with climate change. I visited a huge 7 hectare glasshouse complex where they monitor everything they do. They showed me a graph of sunlight hours, which peaked in 2005. It has been steadily declining since then and in 2009, sunlight hours were 20% less than 2005. That translates directly into 20% less crop. I thought it was fascinating and horrible at the same time, and the company is struggling."

**Hendrik Venter** (Bionera Ltd) has a degree in chemistry and a degree in agriculture/nutrient management. He is an in-house scientist with a passion for nutrient management and wants primary producers to be sustainable and get things done on an economical basis. He would like "farmers to be able to manage their nutrients more efficiently, as they need more knowledge and information available. With that fundamental information, the environment will take care of itself."

**Mike Parker** (FAR Board and a commercial vegetable grower for 25 years) works four days a week on maize research extension (FAR) and has a property where he grows maize and vegetables (corn and melons). "As a grower and having experienced weather systems for years, I wonder where exactly the sector is going. I think there needs to be focus on efficiency, because a change in climate may bring drier, wetter, colder, or warmer environments with a possibility of an increase in crops. Heavy downpours or droughts may occur more often." He thinks the sector needs to focus on better nutrient management and integrated pest management programmes for different scenarios (warmer weather may mean better life cycles of pests e.g. movement of grass species).

**Anis Rahman** (AgResearch) is a scientist at Ruakura and a leader of plant protection with a personal interest in weeds and pesticides. "I went to a lecture at the University of Waikato and the lecturer was a climate change sceptic. He said that it was the weather extremes that we had to cope with, for example droughts and floods and we needed to prepare the industries for them."

**Gabriele Kaufler** (Environment Waikato) is involved with sustainable agriculture. "It's important to bridge the gap because there is a lot of knowledge, data, and experience. However, more sustainable systems are needed because they are more resilient." She thinks the focus needs to be on the adoption of practices,

integration across sectors, working with other industries associated with AgResearch, creating new business opportunities and adding value in growers to invest in more resilient systems.

**Nick Dalgety** (MAF Senior Policy Analyst) has been based in Nelson for the last five years, actively involved in wine and pip fruit. In regards to climate change, "I have not been actively engaged in until 6-9 months ago, and am anxious about the issue. I feel reasonably comfortable working on the technology transfer issue, which is factual understanding about what's happening on the ground, its about ensuring land managers growers and farmers are given capabilities to deal with the realities."

## 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 Vegetable and Arable sector

Nick Dalgety commented that the CCTTSG is working in partnership with MAF on this project. Horticulture is well represented on the subgroup as are other sectors. When looking forward three to five years, the basic profitability associated with climate change is focussed on true possibilities. What comes up in the workshop will go back to the CCTTSG as both cross-sector and sector specific information. Clear engagement needs to take place within sector organisations.

Nick made the following comments in regards to the effects of climate change on the sector:

- The focus is on supporting better adaptation.
- Ensuring growers over the next five years are provided with reliable information for a fast changing climate with signature alterations and added resilience.
- There are new business opportunities that promote more efficient use of resources.
- GHG life cycle analysis work: what's the best way to track forward that information?

- Climate change is a real issue that businesses are trying to grapple with and develop products for. New Zealand (NZ) is perplexed with this issue but there is not a lot of common agreement internationally with a lot of angst still taking place.
- Nick provided some examples of how NZ environments could change. For example, the Wairarapa climate might increasingly be like that of Hawkes Bay. This is why biosecurity relating to pests and diseases is important.

### 3.3 Comments on the background session

- People are making assumptions that we want our “ladder to be leaning on the right wall”. We haven’t got any answers yet and there’s little in the way of technology and capability available at the moment. What definition of climate change is the subgroup working towards?
- All the tools aren’t available at present and might never be but that there are a lot of win-wins out there. The feedback from other workshops has highlighted: voluntary change, best interests of businesses to become more robust, using the technologies we have while science is developing more.
- There is quite a pool of capability and reasonable ground we can make. Whatever scenario there is in 10-20 years, there needs to be a resilient space, a transfer of knowledge and an up-skilling of those within the industry and tertiary facilities. There’s a range of initiatives that can be widened and boosted.
- Many people associate climate change with global warming but global cooling could occur as well. Any decisions made should be responsible and shouldn’t compromise businesses for the future. Growers need to be benefited.

## 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 by 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..

## 5 CCTT Plan for Action: Vegetable and Arable 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.

Nutrient 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>Nutrient management is one of the key primary sector issues that must be addressed.</p> <p>Because nutrients have a catchment-scale effect, all of the sectors are interdependent. Within the climate change programme, the objective is to reduce nitrous oxide emissions.</p> <p>Many of the management tools to reduce nitrous oxide are the same as those used to reduce nitrogen leaching and run off.</p>	<p>A. Provide information to 80% of land managers about nitrous oxide mitigation options and their costs and benefits by 2015.</p> <p>B. Align action plan targets with those developed by the Primary Sector Water Partnership, i.e.:</p> <ul style="list-style-type: none"> <li>i. 80% of nutrients applied to land nationally are managed through quality assured<sup>1</sup> nutrient budgets and nutrient management plans by 2013.</li> <li>ii. 1.7 million hectares<sup>2</sup> of intensively farmed land will have implemented nutrient management plans, in the context of their wider farm management planning, to achieve improved environmental outcomes and reduce on-farm operating costs by 2016.</li> </ul> <p>C. Ensure that nutrient management is integrated into the wider farm system through self management regimes. To gain the best use of resources, the initial focus of this approach will be on intensively farmed areas. Once achieved, the targets will ensure that not only are the majority of nutrients applied using nutrient management approaches, but also that land uses that contribute to approximately 2/3 of total nitrogen losses and 1/3 of total phosphorus losses are engaged in self management regimes to ensure best practice is achieved across the farm system.</p>	<p>4</p>	<p>A. No rating. B. 3. C. 0.</p>	<p>Trevor James Colin Jackson Hendrik Venter Mike Parker</p>

<sup>1</sup> The people undertaking and processes used will be subject to independent quality assurance

<sup>2</sup> Land with dairy, arable and horticultural operations

<b>Nutrient Management</b>					
<b>Is anything missing from the targets? Would you change anything in the targets?</b>	<b>How would you amend the targets?</b>	<b>Specific actions, especially for this sector, to reach the [amended] targets.</b>	<b>Action done (yrs)</b>		<b>Priority (0-5)</b>
			<b>1-2</b>	<b>5</b>	
<p>A: Change focus to target big growers according to 80/20 rule (e.g. 80% of food produced by 20% of farmers.</p> <p>B: Bring date forward to 2013?</p>	<p>A. Provide good information to land managers with 80% of the land on understanding and managing the nitrogen cycle within their farming system and [associated] costs and benefits by 2015.</p>	i. Compile this information into information/training packages.	√		4
		ii. Establish who to target – need to know their names.	√		4
		iii. [Seek] funding to support, drive and organise meetings, workshops and training.	√ (funding immediate)		4
		iv. Publicise the incentives.	√		4
		v. Establish key demonstration areas that successfully implement the nutrient management plan with no loss of profitability e.g. maintain production and reduce losses.		√	4
	<p>B. 80% of nutrients applied to land nationally are managed through quality assured nutrient budget and nutrient management plans to achieve improved environmental outcomes and increasing profitability by 2016.</p>	i. Government services need to provide nutrient budgeting for optimised/profitable yield.	√		5
		ii. Overseer need to be integrated with other nutrient programmes.		√	5
		iii. N2 Gap program should be utilised more.	√		5
	<p>C. Delete this target: too long, confusing and in conflict with target B. Those that have nutrient management plans in place will be using best management practices by 2016.</p>	i. Have it written into the farm management plan. The best management practices would have to be written by independent experts.	√		3

Greenhouse gases (GHGs) 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 GHGs come from, how to estimate them for their farms, how to mitigate them to reduce cost and new benchmarks.</p> <p>GHG 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 GHG 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"> <li>▪ Deals with the quality and type of feed</li> <li>▪ Modifies the composition of the bugs that produce methane in the rumen</li> <li>▪ Modifies farm systems</li> </ul> <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. Getting away from that dichotomy between farming and forestry. Oliver octopus – multiple objective modelling. Using the model to put options in front of people to give more outputs while meeting other objectives.</p>	<ul style="list-style-type: none"> <li>A. Ensure the common language of GHGs is understood and widely used by land managers by 2015.</li> <li>B. Provide information to 80% of land managers on GHGs, where they come from and how to estimate them for their business by 2015.</li> <li>C. Establish benchmarks for GHGs for different farming systems by 2015.</li> <li>D. Demonstrate GHG scenarios and options on focus, research and monitor farms and other properties providing industry leadership by 2012.</li> </ul>			<p>Trevor James Colin Jackson Hendrik Venter Mike Parker</p>

Greenhouse gases (GHGs) 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	
<p>Concerns:</p> <ul style="list-style-type: none"> <li>▪ Appears to focus purely on animals.</li> <li>▪ Cultivation of the soil.</li> <li>▪ Need to look at minimum, number, and strip tillage.</li> <li>▪ Repeat cultivation releases – organic carbon into the air/atmosphere.</li> <li>▪ Can't tell growers not to cultivate, can tell them in some situation there are great alternatives.</li> </ul>	A. [No change] Ensure the common language of GHGs is understood and widely used by land managers by 2015.	[No actions outlined]			
	B. [No change] Provide information to 80% of land managers on GHGs, where they come from and how to estimate them for their business by 2015.	i. [Ensure information covers release of organic carbon into the atmosphere as a result of cultivation]			
	C. [No change] Establish benchmarks for GHGs for different farming systems by 2015.	[No actions outlined]			
	D. [No change] Demonstrate GHG scenarios and options on focus, research and monitor farms and other properties providing industry leadership by 2012.	i. [Demonstrate available options to reduce tillage].			
		ii. [Demonstrate cultivation alternatives to cater for high risk scenarios.]			
		iii. Explore the disproportionate release of CO <sub>2</sub> from organic growing systems.			

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 GHG 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>		2	<p>Anis Rahman Gabriele Klauffler Nick Dalgety</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	
<p>This theme should be up the upfront, overarching theme.</p> <p>Target needs to focus on developing two-way communication between land managers and providers. "Stop force feeding the land managers and start feedback and interaction with them."</p> <p>Create "hunger" to interact on the information between land managers and providers. There needs to be proactive approaches, and it needs to come from other farmers and growers where support can be given.</p> <p>One needs the interaction and willingness to listen to where the land managers are at. We need to define the wants and needs.</p> <p>There needs to be a change in the system to identify the gaps/needs with the land managers e.g. Doug Avery and his 7 year drought – finally turned his farm into a sustainable system.</p>	<p>A. [Amended] Create meaningful interactions about developing or defining between land managers and providers e.g. policy makers, scientists and others.</p>	i. [Create a mechanism ("a group of listeners") to enable feedback on land managers' wants and needs to be brought back into [the policy and research] process.]	Ongoing		4-5
		ii. [Explore system changes] to identify the gaps/needs with land managers.	Ongoing		4-5
		iii. [Farmers and growers to proactively support each other to interact on information with providers.]	Ongoing		4-5
		iv. [Foster understanding that] real change arises from the land managers and it needs to be an integrated effort with a holistic view.	Ongoing		4-5
	<p>B. [New] Enhance/establish focus farms as a platform for interaction.</p>	i. [Develop strategy for getting the best out of focus farm experiences]	√	√	5
		<ul style="list-style-type: none"> <li>▪ Applying different thinking.</li> <li>▪ Focussing on interaction.</li> <li>▪ Stocktake on best practices/focus farms. What are you doing? Why is it working well?</li> </ul>			
		<p>ii. Sourcing increases the number of people to help in that area.</p>		√	5
	<p>C. [New] Provide guidance/support to help land managers make changes and take workshop information to the next step.</p>	i. It's all about funding. Changes are made from creating cash from other areas – a system change.	√	√	5
		ii. Sourcing increases the number of people to help in that area.		√	5
		iii. Up skill advisory capability.		√	5

<b>Sustainable systems</b>					
<b>Is anything missing from the targets? Would you change anything in the targets?</b>	<b>How would you amend the targets?</b>	<b>Specific actions, especially for this sector, to reach the [amended] targets.</b>	<b>Action done (yrs)</b>		<b>Priority (0-5)</b>
			<b>1-2</b>	<b>5</b>	
	D. [New] Look for cross-sector opportunities (e.g. arable, maize, dairy) to compare sustainable systems and find win-wins.	i. Create a forum across sectors to share ideas, maybe including more workshops to encourage interactions.	√		4
		ii. Look for solutions outside sectors (e.g. carbon depletion in arable – maybe look for in dairy; apply carbon sink lessons from forestry) or within one farm (diversity).		√	4

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<b>Biodiversity</b>	<b>Targets</b>	<b>How relevant is this topic/theme to this sector? (0-5)</b>	<b>How useful and relevant are the targets? (0-5)</b>	<b>Who assessed this theme?</b>
[New theme proposed by this group which considered it overlooked and strongly related to systems.]		4-5	n/a	Anis Rahman Gabriele Klauffler Nick Dalgety

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<b>Biodiversity</b>					
<b>Is anything missing from the targets? Would you change anything in the targets?</b>	<b>How would you amend the targets?</b>	<b>Specific actions, especially for this sector, to reach the [amended] targets.</b>	<b>Action done (yrs)</b>		<b>Priority (0-5)</b>
			<b>1-2</b>	<b>5</b>	
<ul style="list-style-type: none"> <li>▪ It's ingrained in agricultural systems. Both European and NZ plants are contributing to dairy systems.</li> <li>▪ It's related to the cash capability of the land manager.</li> <li>▪ Biodiversity needs to be improved by having more sustainable systems, more knowledge on the soil carbon and integrated pest systems.</li> <li>▪ It's not about creating increased biodiversity within native systems; it's about modifying the current system. It's about what NZ systems have to offer European systems e.g. Lincoln University study by Steve Rayton.</li> <li>▪ The Waikato has a monoculture dairy system. There is biodiversity along the fence lines, and we need to identify the local/indigenous plants that used to be there.</li> <li>▪ Land owner practices.</li> </ul>	<p>A. Utilise developments across sectors and overseas so New Zealand benefits.</p>	<p>i. Evaluate case studies within NZ and overseas that made advances and make the evaluation accessible to farmers.</p>	Ongoing		5
		<p>ii. Encourage uptake of orchard systems vegetation management practices on arable farms – less use of herbicides, pesticides and more soil management.</p>	Ongoing		5
	<p>B. Improve biodiversity systems/knowledge. Utilise margins within and between monoculture systems as an opportunity to improve biodiversity.</p>	<p>i. Encourage an expanded definition of biodiversity. Include weeds.</p>	Ongoing		5
		<p>ii. [Identify plants (NZ and introduced) that climate change may 'convert' into a risk or which may add value without risk.]</p>	Ongoing		5
		<p>iii. Identify the local/indigenous plants that used to be along fencelines.</p>	Ongoing		5
		<p>iv. Improve biodiversity by encouraging more sustainable systems, increasing knowledge on soil carbon and promoting integrated pest systems.</p>	Ongoing		5

<b>Market Impacts and Access</b>	<b>Targets</b>	<b>How relevant is this topic/theme to this sector? (0-5)</b>	<b>How useful and relevant are the targets? (0-5)</b>	<b>Who assessed this theme?</b>
[New theme proposed by this group which considered it important as it determines revenue.]		5. Where the revenue is generated.	n/a	Anis Rahman Gabriele Klauffler Nick Dalgety

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<b>Market Impacts and Access</b>					
<b>Is anything missing from the targets? Would you change anything in the targets?</b>	<b>How would you amend the targets?</b>	<b>Specific actions, especially for this sector, to reach the [amended] targets.</b>	<b>Action done (yrs)</b>		<b>Priority (0-5)</b>
			<b>1-2</b>	<b>5</b>	
<ul style="list-style-type: none"> <li>▪ There will be barriers introduced if there is no adequate progress.</li> <li>▪ Need to be serious about climate change mitigation properties.</li> <li>▪ Need to be aware of the market and its premium.</li> <li>▪ Need a holistic sustainable system with a growing population.</li> <li>▪ Capitalise on other topics.</li> <li>▪ Explore this topic to the similar depth as other themes.</li> </ul>	A. Target new markets e.g. Asian (expanding to Korea and Japan) which have more attractive emission potential.	i. Educate markets (quality assurance) about climate change credentials – this is a key area to sell into.	√	√	3-4
		ii. Do an assessment of NZ and international markets [to determine markets with more attractive emission potential]. Need to be aware of the market, its premium, and what's being produced or safe guarded.	√	√	3-4
	B. Get clarity around the climate change international market fed to land managers here (change and practice). <ul style="list-style-type: none"> <li>▪ Develop cross-sector learning so advanced sectors can support those in infancy. Relay climate change market signals back to land managers.</li> </ul>	i. Explore market impact/access initiatives in other industries. ii. Continue to look at added improvements. iii. Ensure there is a feedback loop to modify the system so it can adjust to what the market does. iv. Develop clear, easy to change systems – acknowledge changes take time and financial investment.	√	√	5
	C. Incorporate advances in climate change technology transfer initiatives into a broad quality accredited system for the purpose of improved premium market access.	i. Carefully evaluate the benefits of attaching systems to sectors – initiate actions.	√	√	4

<b>Biosecurity</b>	<b>Targets</b>	<b>How relevant is this topic/theme to this sector? (0-5)</b>	<b>How useful and relevant are the targets? (0-5)</b>	<b>Who assessed this theme?</b>
[New theme proposed by this group] Change to pests, diseases and weeds.		5. Insects and weeds can reduce crops to nothing.	n/a	Trevor James Colin Jackson Hendrik Venter Mike Parker

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Biosecurity						
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"> <li>▪ Climate change will alter the distribution, frequency, and density of damaging weeds, pests, and diseases.</li> <li>▪ Our beneficials (biological control agents) may also be affected by climate change e.g. Irish wasp (works in the South Island but not the North Island).</li> <li>▪ We need to recognise that some changes will be directly related to the climate and therefore might be predicted, while other will be due to land use changes e.g. that area might have the climate for that pest but isn't present until a change in the land use.</li> <li>▪ Changes in pest and disease distribution can also result in geographical redistribution of cropping areas.</li> <li>▪ Existing pests and diseases we have – how will they react to warming/cooling of the climate?</li> </ul>	<p>A. Identify changing distributions/frequency/density of damaging pests, weeds, diseases resulting from climate change and/or changes in land use.</p>	i. Alert and inform land managers to biosecurity threats and risk potential.		√	2	
		ii. Forecast changes and raise awareness in high risk areas before invasion.	√		2	
		iii. Educate at the border so potential invasions can be picked up early and stopped.			2	
		<p>B. Establish an early warning system for new incursions to minimise spread from farm to farm, district to district or island to island.</p>	i. Implement identification and reporting systems so new incursions are picked up early.	√		1
			ii. Establish incentives to notify new incursions without impediments and with no fault or cost.	√		1
			iii. Investigate compensation where there could be a disincentive to notify new incursions (e.g. Johnson grass – loss of income to grower).	√		1
		<p>C. Maintain efficiency of control measures in an environment of change.</p>	i. [Enable] Land managers noticing a loss of [pest control] efficiency to report this to scientists to maintain access to effective control options.	√		3
			ii. Update integrated pest management practices regularly.	√		3

## 6 Key take home messages

At the end of the workshop, attendees were asked to consider what actions crossed themes and what key messages had emerged from the day.

### Supporting dissemination of information/education

- A lot of information is available but how do we broadcast it? From where/whom?
- Business and farmer relationship should be a partnership, not one telling/schooling the other. Genuine interaction and intrinsic motivation.
- Best experts are the ones on the ground.
- Integrated “demonstration” facilities must be activated or enhanced as soon as possible so land managers can see opportunities/benefits of major climate change technology transfer initiatives, assess them and then act.
- Reinstate permanent extension services to serve the wider farming community.
- Prerequisite of adoption is that the farm systems context is addressed in these approaches. This requires active engagement with land managers one on one and genuinely both ways.
- Need commitment to put more people on the ground that can work one on one with land owners and develop solution with them tailored to the farm systems.
- Link research outcomes to extension.
- Central and local government partnerships required.

### Focus for biggest gains

- Potential for making large gains [by focusing on] only a few managers either because of the size of their operation or the fact that they are poor managers.
- Increasing knowledge of the largest land users could make nutrient management considerably more effective.

### Market issues

- Retailer education required. Retailer demand has led to farmers reducing diversity and specialising in one or two crops. This reduces farm business resilience and may increase the risks associated with climate change. Rotating a crop system makes it more sustainable. MAF/govt needs to see how markets can integrate with this approach.
- Confirm major signals coming from overseas markets on climate change – support sector’s evaluation of best responses by land managers.
- How to turn climate change/NZ approach to climate change into a competitive advantage and generate wealth?

### Drivers for adoption

- “What’s the difference between climate change and the Y2K dilemma. I was prepared with 20L of water, batteries, torches, etc. When climate change is over, I should be left with some genuine benefits that have been implemented and advances for farming. That’s the outcome: irrespective of the driver; we can make farming in NZ more profitable and efficient.”
- What is the benefit to the farmer?

### Research and its funding

- Information must be robust and proven/science based.
- Farmers need confidence that science is independent and not biased by industry agendas.
- It is every government’s responsibility to provide funds for research and also extension, e.g. Ruakura.
- There is benefit in scale e.g. Zespri initiates a lot of research and development. In other sectors, research is done within private entities, in a focused form and for themselves.
- More research data on nutrients or GHG release from cropping systems with differing systems.

## Appendix A

# 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 managers<sup>3</sup> 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.

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<sup>3</sup> 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, and 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 Cactus'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 e.g. Land Environment Plans and risk management plans
- DVDs, interactive games, case studies and fact sheets

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