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New Zealand Farmer Attitude and Opinion Survey 2008:

Management systems and farming sustainability

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Summary

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

Summary sketch of farmers
Most of 106 respondents were pastoral farmers (78 per cent) and nearly all used conventional management. Farms averaged 316 hectares in size, with average gross revenue of over $300,000, and low levels of debt. The mainly full-time farmers surveyed were 57 years old on average and had been farming for 33 years. Over half of all farmers had secondary school qualifications as the highest level of education completed, and most (87 per cent) were men.

Potential change in management systems
There were strong indications of likely change in the use of management systems among farmers in New Zealand. This position is supported by the following key findings:

- 69 per cent of farmers (most of whom were using conventional management) stated that they had an intention to use modified conventional management within the next ten years
- 42 per cent of farmers (most of whom are currently using conventional management) disagreed with the statement that using an alternative management system was something they would never do
- Trend data on intentions show an increased interest in alternative (non conventional) management systems in 2008.
- 16 per cent of farmers were thinking of changing their management system.

Given that the relative degree of use of available management systems is likely to change, what will be the direction of that change? Change is most likely to be towards modified conventional management:

- 69 per cent of farmers had an intention to use modified conventional management within the next ten years, as noted above
- Farmers assessed modified conventional management more positively than organic management in terms of outcomes
- Farmers saw fewer barriers to using modified conventional management compared to using organic management.

However, there was still interest in registered organic farming:

- Ten per cent of farmers had an intention to use registered organic management within the next ten years
- Of the 16 per cent of farmers thinking of changing their management system, one third would change to organic management.

Greater interest was expressed in changing to unregistered organic farming:

- 23 per cent of farmers had an intention to use unregistered organic management
- Of the 16 per cent of farmers thinking of changing their management system, one third would change to organic/biological farming or unregistered organic management.

Policy indications regarding change in management systems

The responses to the other questions showed that while the policy prospects may be difficult, there were groups of farmers who did not follow the mainstream and had a different perspective on each of the issues. The presence of this group opens up some policy space by providing at least some farmers with a more favourable stance regarding the issues.

To encourage farmers to change to modified conventional management it would be effective to emphasise and reinforce the positive characteristics attributed to it including: perceived capacity to enhance traceability, product quality, challenge, satisfaction, customers' demands, price premiums, market security and access, biodiversity and environmental health.

To encourage farmers to change to organic management it would be effective to emphasise and reinforce the positive characteristics attributed to it, including: challenge, market security, market access and improving the environment, and to rebut the attributes perceived negatively, including: quality product and personal satisfaction.

Written farm plans have some potential regarding change in management systems in that they are not dismissed by farmers as impractical. However, their main importance is seen for purposes other than environmental management.

Farmers were wary of emissions trading policies but there was a core of farmers who accepted responsibility and this group may provide some traction for future policies.

Chapter 1
Introduction: Objectives, Method and Design

1.1 Background to the Agriculture Research Group on Sustainability (ARGOS)

The main aim of the ARGOS research programme is to encourage the broader use of environmentally-enhanced primary production systems in New Zealand, in order to improve export performance and to meet enhanced environmental and quality standards. This will be achieved by evaluating the relative economic, environment and social performance of conventional, integrated management and organic management systems. These are examined as pathways to sustainability which will benefit New Zealand via improved export performance, greater innovation by both farmers and scientists and improved environmental performance.

The core of the ARGOS research design is a longitudinal panel study of New Zealand farms and orchards). Panels of 12 farms were selected to represent conventional, integrated and organic management for the sheep/beef sector, green and gold kiwifruit under the KiwiGreen integrated management system and organic green management for the kiwifruit sector, and conventional and organic management for the dairy sector. The research involves gathering data on these farms in order to assess the nature and effects of production from environmental, economic and social points of view. The design rests on testing the null hypothesis that there is no difference between the different management systems and in the derivative hypothesis that differences due to management systems are greater in the more intensive sectors. Farms in the panels were selected as generally typical of their sector in terms of obvious characteristics such as size, level of production etc. Farms from a range of geographies and with varying production intensities were selected to ensure broadly applicable results.

A report in 2005, based on a national survey of farmers, examined farmer attitudes and practices and assessed differences between sectors and between management systems (Fairweather et al., 2007a). It also demonstrated that the panels were reasonably representative of the sectors to which they belong (Fairweather et al., 2007b).

1.2 Research Aim and Objectives

The survey results presented in this report are part of ongoing research on New Zealand farmers and study of how they respond to changes and issues in primary production. The questions included in this research were derived from two main sources: first the need to explore and test results from ongoing ARGOS research and second, to respond to contemporary farming issues as articulated by farming stakeholders and as indicated in the literature. Important topics were gauging farmers' responses to a variety of environmental, economic, farm management and social indicators, and assessing farmers' opinions about different management systems. These topics were represented by a large number of questionnaire questions, so two surveys were conducted. The first survey and report (Fairweather et al., 2009) analysed responses to questions on indicators, social relationships, bird diversity and farm management, and perceived benefits from trees and shrubs. These results were analysed in terms of management systems and sectors. The focus on management system comparisons required that the survey included registered organic farmers. The focus on sector differences required that sufficient farmers in each sector were included. To meet these requirements, questionnaires were posted to random samples of

farmers in each sector. The second survey, covered by the present report, focused on opinions about the different management systems in use in New Zealand agricultural production. Here the interest was in how farmers in New Zealand perceived these management systems and therefore the questionnaires were posted to a random sample of farmers, excluding those who were registered organic farmers. By sending this questionnaire to a simple random sample of all farm types in New Zealand it is possible to make inferences about farmers' attitudes and opinions about management system and related issues to the farming population in general.

In this second survey, the questionnaire was designed to establish the extent to which choice of management system was reflected in farmers' attitudes and beliefs on a range of topics related to the use of management system. The survey assessed how farmers perceived three management systems (conventional, modified conventional or integrated management, and organic) including their level of commitment to them. The initial section of the questionnaire enabled a detailed demarcation of both official (as indicated by participation in any of a range of best practice schemes) and self-determined assignment to a management system. Questions covered the precise identification of the management systems the farmers used, their intentions to use different management systems, what they perceived as the outcomes from the use of each management system and the perceived barriers to using an alternative system. The data collected also facilitated a temporal comparison with similar questions on management system intentions from earlier surveys. In addition to recording the relative strength of commitment to management systems, a further objective involved recording farmers' views on emerging challenges to established practice. These challenges include: (1) governance of environmental practice, (2) demands for documentation of farm management plans, (3) societal pressures for mitigation of agricultural greenhouse gas emissions and (4) predicted shortfalls in available water supplies. It was expected that relative commitment to management systems that involved compliance with varying levels of restrictions on established practice would correlate with an individual's response to the challenges.

1.3 Sample design

A simple random sample of all farmers was purchased from AsureQuality (formerly AgriQuality). The sample size was 1,000 farms. AsureQuality records of farms in New Zealand have improved over time and now appear to be comprehensive, as indicated in Table 1 which shows AsureQuality data on farm types compared to other available sources.

Table 1: Numbers of farms by farm type for different data sources

Source	AsureQuality	Statistics NZ GST only	Statistics NZ GST only	Valuation NZ
	2007	2007	2002	2005
Horticulture	6,952	10,579	12,750	12,082
Dairy	12,188	17,377	14,000	25,975
Sheep/beef	44,240	28,291	34,130	56,931
Total	63,380	56,247	60,880	94,988

AsureQuality classify farms into types as shown in Table 2. Included in the random sample were pastoral, arable, dairy, horticulture and specialist livestock farms. The 'other' category was excluded, as were forestry and smallholdings. During pre-testing it became apparent that some of the pastoral farms around Christchurch were about five to ten hectares in size and with minimal production, valued at around $2,000 per year. AsureQuality classifies such smallholdings as pastoral farms. Since our objective was to survey full and part-time farmers only, we excluded smallholdings from the responses received. The list of background

questions was modified to include a question on type of farm to better facilitate the identification of full and part-time farmers.

Table 2: Numbers of farms in each of the AsureQuality farm type classifications

Farm Type	Code	Description	Number	Totals
Pastoral	GRA	Grazing other peoples stock	4,280	
	SHP	Sheep farming	8,286	
	DRY	Dairy dry stock	1,422	
	SNB	Mixed Sheep and Beef farming	11,878	
	BEF	Beef cattle farming	16,014	
	DEE	Deer farming	2360	44,240
Dairy	DAI	Dairy cattle farming	12,188	12,188
Horticulture	NUR	Plant Nurseries	387	
	FLO	Flowers	388	
	VIT	Viticulture, grape growing and wine	748	
	VEG	Vegetable growing	814	
	FRU	Fruit growing	4,615	6,952
			Subtotal	**63,380**
Arable	ARA	Arable cropping or seed production	1,567	1,567
Specialist	EMU	Emu bird farming	34	
Livestock	OST	Ostrich bird farming	42	
	ALA	Alpaca and/or Llama Breeding	144	
	PIG	Pig farming	272	
	GOA	Goat farming	275	
	POU	Poultry farming	463	1,230
			Subtotal	**2,797**
			Total	**66,177**
Other	HOR	Horse farming and breeding	1,583	
	API	Beekeeping and hives	46	
	DOG	Dogs	60	
	FIS	Fish, Marine fish farming, hatcheries	70	
	OAN	Other livestock	87	
	TOU	Tourism (i.e., camping ground, motel)	181	
	OPL	Other planted types	247	
	ZOO	Zoological gardens	13	
	NOF	Not farmed	560	
	UNS	Unspecified	584	
	NEW	New Record - Unconfirmed Farm Type	952	
	OTH	Other enterprises	1,119	
	NAT	Native Bush	1,123	
Forestry	FOR	Forestry	3,737	
Smallholders	LIF	Lifestyle block	28,109	

1.4 Questionnaire development and survey procedure

Most of the questions asked respondents to put a number in a box while a few questions asked for a tick in the box. A variety of scales were used but the most frequent ones were level of importance and level of agreement. The other scales were tailored to the particular question, for example, asking if a development was likely or unlikely. The seven-point scales ranged from one to seven, with four as the mid point on the scale. We interpreted this mid point as the neutral point between each end of the scale. In working with the seven-point scale it is useful at times to summarise the results and to take the highest three position (5, 6

and 7) as indicating some level of agreement or importance, and to take the lowest three positions (1, 2 and 3) as indicating some level of disagreement of unimportance.

Questions were asked in a consistent, clear, and concise fashion. The questions were framed to present both extremes of the scale. For example, in asking about level of agreement, the question was worded: How much do you agree or disagree with the topic. Further, in questions with a range of options to rate on a scale, the options were ordered carefully to avoid presenting any pattern in the options, and, where possible, the options were couched in positive and negative terms in order to avoid any consistent patterns of agreement or disagreement. The questionnaire is included in Appendix 1.

Pre-testing occurred early in the questionnaire development process by asking AERU researchers with farm connections and members of their family to comment on it. This resulted in major revisions to the way questions were asked. At the final stage of questionnaire development a more formal process engaged the assistance of nine reviewers (two farm couples and five individual farmers) who reported on questions or words that were difficult to understand. This review resulted in comparatively minor changes. One important change was to the wording for integrated management. Few farmers understood this concept so it was reworded as 'modified conventional' farming, a term that made more sense to our pre-test farmers. Care was taken to provide definitions of these terms in the questionnaire

Before mailing questionnaires, the random sample list was checked to remove any farmers involved in pre-testing and any known registered organic farmers. One registered organic farm was found in the original sample provided. A total of 995 questionnaires were posted out. The policy of excluding the views of organic farmers was required since they were included in the parallel survey of sectors.

The questionnaires were posted from 25-27 August 2008. A covering letter was included along with a freepost return envelope. Also included was a brochure directing participants to a website where farmers could calculate carbon credits. On Tuesday 7 October a reminder post card was posted to all farmers who had not responded at that point in time. The net effect of this was to stimulate responses from an additional three per cent of farmers.

1.5 Response rates and sample representativeness

The response rate from the farmers was 16 per cent. This is lower than the 32 per cent response rate obtained in 2005[1]. A probably contributing cause of this was the timing of the questionnaire mail out. Late August is a very busy time for all farmers and horticulturalists. It is likely that the increased workload of farmers at that time meant that, even if they were favourably disposed to filling out the questionnaire, they would not have had time to do so. While the questionnaire could have been posted earlier, we delayed posting because the weather conditions in late winter were particularly bad. For a number of weeks a large proportion of farmers in both islands experienced extremes of weather, including serious flooding and its attendant damage to farm infrastructure, particularly fences. The weather was sufficiently bad that there was considerable coverage on national television prime-time news. Sending out a questionnaire when farmers were reacting to severe damage would have been insensitive and may have increased the probability of the questionnaire being ignored

Another factor likely to have contributed to the low response rate was the questionnaire structure. Each completed questionnaire was checked before data entry and this provided a sense of how the questionnaire was perceived by the farmers. It was apparent that the second set of questions on farming systems was difficult for them to understand and respond to despite our efforts in simplifying the questions. A small number of farmers wrote on the

[1] A lower than expected response rate also occurred for the sector surveys.

question saying that they did not understand what was wanted. Others were not able to complete the question in the way it was intended. For example, question B1 asked for an assessment of each of the three management systems and in many cases only one or two were assessed. Of the 106 cases in the dataset, there were around 60 who completed this question in full. Question B2 asked for a response regarding the two management systems that the farmer did not use and sometimes only one column was used. Further, there was inconsistency between what some farmers indicated in question A1 where they identified the management system they used and what columns they used in question B2. (This problem was exacerbated by differences in response to questions A1 and A2 where for the former some indicated that they were conventional farmers while for the latter they indicated that they were modified conventional management farmers.) Another factor in explaining the low response rate may have been the cover page of the questionnaire which included definitions of each management system and this may have created the impression that the questionnaire was complicated. Overall then, the questionnaire asked some questions which were demanding and it is apparent that many farmers found them difficult. It is very likely that some farmers abandoned partly completed questionnaires and therefore did not send them back. The questionnaire used in the other surveys on sectors and management system was simpler in format, asked about management systems in a more direct manner, and went on to questions that were relatively straightforward – all factors contributing to the better, but still lower than expected, response rate of 22 per cent on average across the sectors.

The low response rate means that while the original sample was large, the respondent sample was comparatively small. This difference was exacerbated by inadequacies in the samples provided. Many questionnaires were returned as ‘gone no address’ or ‘incomplete address’. In addition, there were people who received the questionnaire but the questionnaire was not applicable because they were no longer farming. In some cases, the farmer had died and his widow returned the uncompleted questionnaire. The total number of cases where the questionnaire was returned uncompleted was 144 making for an effective sample size of 855. The 134 responses received from the total of 855 gives a response rate of 16 per cent. Further adjustments were made to the respondent sample by removing smallholdings, and this reduced the sample to 106 cases.

The low response rate raises a question about the composition of the respondent sample. The assumption of random sampling is that the sample will represent its population. If the sample is sound then good representation occurs when all people in the sample respond to the questionnaire. For the respondent sample to adequately represent the population it must have the same characteristics as the whole sample. This means that the respondent sample and the non-respondent sample must have the same characteristics. Non-response bias occurs if the characteristics of the non-respondent sample differ from the respondent sample on the measures of interest. Low response rates in themselves do not necessarily mean that a non-response bias has occurred.

A number of considerations apply to the issue of non-response bias and these show that there are some conditions which have to be met before it can occur. First, what we are looking for in any assessment of non-response bias is a systematic pattern among the non responders in the way they would have answered a question or questions. Such differences must form a pattern to indicate non-respondent bias, otherwise the effect of any bias is mitigated and the variety of opinions in the non-respondent sample is as varied as those of the respondent sample. Second, for non-response bias to occur the non respondent has to interpret what the questionnaire is focused on in order to make a decision to not respond. Two issues are relevant here. First, non-response bias is more likely to occur when the questionnaire is a poll about a specific issue. Such issues can be controversial and potential respondents may have strong reasons to participate or not participate. For example, in assessing opinion about environmental management, it could be expected that farmers not caring for their environment would be less likely to respond to the questionnaire for fear of

showing themselves in a bad light; or at the least, in a mode of thinking that does not fit the popular view at that point in time. In this case the characteristics of the respondents would be different from non respondents, hence the sample would not represent the population. The questionnaire in this survey asked a broad range of questions rather than being focused on a single issue so this source of bias was unlikely to occur. Second, a potential non respondent may decide not to participate if the questions do not allow for their opinion. The questionnaire was designed to allow for wide variety in respondent opinion. In fact, in this regard, some questions designed for diversity were commented upon by some farmers as 'stupid' thereby indicating that the questionnaire was broadly framed and well designed for diversity of opinion.

The issue of non-respondent bias was addressed in the sector survey report. Results from a non-respondent survey suggested that there was little evidence of systematic non-response bias and that non respondents reported that the questionnaire was difficult to complete. While these results do not necessarily apply to this survey, they are consistent with our observations about question difficulty and suggest that while the sample is small it may still reasonably represent the population of farmers. Further, the non-respondent survey found that 16 per cent of sampled farmers were no longer farming and the response rate was adjusted upwards by six per cent, an adjustment that could equally apply to this survey.

Notwithstanding these considerations, the response rate of 16 per cent is low and we can look to some obvious characteristics of the sample to see how it compares to known standards. For example, we know from Table 1 what the distribution of main farm types is for AsureQuality data. Table 3 shows the population and sample data for the main farm types and the percentage distributions are similar. The chi-square was 2.8 which for two degrees of freedom at the 0.05 level is not statistically significant. This result indicates that the relative proportion of farm types responding was similar to their relative proportion in the total farmer population as represented by the AsureQuality database.

Table 3: Population and sample farm type data compared

	AsureQuality population data		Sample data	
	No.	%	No.	%
Horticulture	6,952	11	8	8
Dairy	12,188	19	14	14
Sheep/beef	44,240	70	77	78
Total	63,380	100	99	100

A final point relates to the kind of inference that can be made from a small sample. Sampling theory shows that any sample can represent a population but that consideration must be given to the standard error of an estimate and that the error term is wider for small samples. For a sample size of 106 at the 95 per cent confidence level and for equal proportions, the population estimate is plus or minus 9.7 per cent. The estimated standard error is highest for the assumption of equal proportions.

1.6 Data checking and adjustments to the samples

The questions about management systems rely on accurately identifying the management system used by the farmers. The disparity between participants' self-applied assignment to either conventional or modified conventional management in questions A1 and A2, noted above, were addressed by considering how each farmer filled out question A1. In some cases, the farmer selected an option within 'conventional management – with other system', which we take to be conventional management but then in question A2 selected the modified

conventional management option. In such cases, in the absence of clear evidence that the farmer met the definition of modified conventional management, which emphasised constraints on inputs, the response was amended from option 2 to option 1. Attention was given to other questions in order to confirm this decision. For the original data, there were 65 (62%) conventional farmers and 35 (33%) modified conventional management farmers; with the strict definition of modified conventional management there were 89 (84%) conventional farmers and 13 (12%) modified conventional management farmers (the rest being classified as organic or 'other'). The pattern of response for question A2 suggests that many New Zealand farmers have a preference for seeing themselves as progressive and not following conventional management.

The question on farm types was used to check on the classification of farmers as supplied by AsureQuality. In some cases the respondent used a different classification and this is to be expected since farmers can change land uses and some properties may contain several classification types. Some respondents classified themselves as half in one type and half in another. In such cases, the responses to other questions were used to find clues as to the nature of their farming operation. If, for example, they had a large dairy herd but also some cropping they were included as dairy farmers. Some large horticultural properties in the North Island classified themselves as cropping and these were included in the horticultural sector.

1.7 Data analysis and limitations

An important dimension of the intended data analysis was to compare farmers by management system (i.e., compare those using conventional management with those using modified conventional management). Note, however, that the potential for this analysis is limited by the low number of cases of modified conventional management. The sample, there were only 13 farmers who used modified conventional management compared to 89 who used conventional management. As a result, the analytical objectives of this report are modest and the original aim of examining how management system was reflected in farmers' attitudes and beliefs could not be achieved. Instead, the main goal is to describe and analyse the data for the sample as whole in order to indicate how New Zealand farmers think about the different management system available to them and other topical issues related to farm sustainability. We also indicate where further analyses of these data would be insightful. The conclusion includes a section which describes future research of this type.

For the questions relating to good management of the environment, farm plans, emissions trading, and water and irrigation, selected demographic variables were used to identify any distinctive groupings. The relevant demographic data used in this analysis were education (chi-square tests), age and level of debt (ANOVA). Gender was not used since nearly all respondent were male. Gross farm revenue data were highly variable and with the small sample size were not suitable for analysis.

Chapter 2
Results

2.1 Introduction

This chapter begins with a description of the farms and farmers. It then considers the management system used, future intentions to use different management systems, and then compares changes in intentions over time. The subsequent section considers farmers' opinions about different management systems and their perceived barriers to using these alternatives. The last sections include how farmers think good environmental management can best be achieved, and attitudes to farm plans, emission trading, and water and irrigation.

Note that while the sample excluded known organic farmers there were two respondents who stated that they were organic and they were included in the dataset. This small number does not detract from the focus of this report[2].

2.2 General character of the farms and farmer profile

The sample included mainly sheep/beef farmers (73 per cent) with smaller numbers of dairy farmers (13 per cent), horticulturalists (eight per cent), specialist livestock farmers (three per cent) and 'others' (two per cent). Table 4 shows data which give a general idea of the character of the farms. The initial farm size data showed a wide disparity between total hectares and effective hectares so the data were checked and one outlier with 68,000 total hectares was removed. The average farm had 316 hectares which produced over $300,000 in two recent financial years.

Table 4: Profile – farm size and revenues

Total hectares	Effective hectares	Average gross revenue 2006-7 ($)	Average gross revenue 2007-08 ($)
316	283	325,467	383,002

Table 5 shows data relating to level of debt. The largest group of farmers (39%) were debt free, and 33 per cent had 0-20 per cent debt. Generally, farmers had low levels of debt.

[2] We use the term 'farmers' inclusively. While most of the sample comprises sheep/beef and dairy farmers there were also horticulturalists.

Table 5: Debt levels

	Over 80	80-60	60-40	20-40	20-0	Debt free	n	Don't know
Frequency	1	2	9	17	33	39	101[3]	1
Per cent	1	2	9	17	33	39		

Table 6 shows data relating to level of satisfaction with current level of economic viability. The spread of responses was broad and all levels on the seven-point scale were used. While there were large groupings at the mid point of the scale there was also a large group who were unsatisfied (including ratings of 1, 2 and 3).

Table 6: Satisfaction with current level of economic activity

	1 Very unsatisfied	2	3	4	5	6	7 Very satisfied	n	Mean
	22	13	10	19	20	8	13	105	3.7
Per cent	21	12	10	18	19	8	12	100	

Table 7 shows data which give an indication of the farmers' profile. Nearly all of the respondents were men (87 per cent). They were on average 57 years old, had been associated with their farm for an average of 22 years, had been farming for 33 years and expected to farm for another 13 years. Since the average age of the farmers was 57 this would mean that they intend to retire at the age of 70 years. Sixty-nine per cent of farmers expect to live in the community in ten year's time. Most of the farmers (68 per cent) classified themselves as full-time farmers.

Table 7: Profile – personal information

% of male respondents	Average age	Years associated with farm	Years farming	Years expect to farm	% expect to live in community in 10 years	% full time
87	57	22	33	13	69	68

Table 8 shows the educational attainment of the farmers sampled. There was a majority with secondary school education, consistent with the high average age of farmers, but also some who have additional qualifications, including 14 per cent with a university degree.

[3] Note that from here on the sample size will change to reflect changes in the number of people who responded to the questionnaire item.

Table 8: Profile – highest level of education completed (%)

Attended secondary school	Trade technical qualification or similar	Undergraduate diploma or certificate	University degree	Total (N)
50	11	26	14	104

2.3 Farm or orchard management system

The objective of this section of the survey was to identify participants' commitment to a broadly defined management system. The expectation was that preference for conventional systems would demarcate more conservative response to challenges to established practice, whereas those expressing a modified conventional or organic preference would be more likely to consider alternative practices. The first questions were designed to clearly establish which management system each farmer used, and to identify their specific system within the overall management. This was followed up by a simpler version of the same question which allowed the farmers to make an overall assessment of their status in terms of management system. This question allowed us to check for consistency – farmers may use a modified conventional system but still see themselves as conventional, or vice versa. The third set of questions continues a theme that has been included in three earlier surveys, concerning intentions to use different management systems in the next ten years. It included for the first time differentiation into registered and not registered, and the latter was worded as 'organic methods' because that is how it was asked before. It also includes the use of GM plants or animals. The last items in this section on management systems were open ended questions asking if farmers were planning to change their management system and if so to indicate to what and why. These questions were designed to identify farmers who have tried modified conventional or organic systems but are moving back to conventional systems. In this way we can determine if there is any cycling back or between management systems.

Management system used

The variety of management systems in use by farmers in New Zealand means that some care was needed to distinguish between farmers using conventional management with no other system and those using conventional management who also used some other formal system. The issue was whether the additional system constituted modified conventional management (or integrated management). A number of formal systems were judged to be ancillary to conventional management since they did not require constraint on inputs in order to improve environmental outcomes and to better meet market demand. With this distinction in mind the question was constructed to include the four main options of conventional only, conventional with other system, modified conventional management or organic management. For each main category a number of options were included in order to identify exactly which management system was used.

Table 9 shows the data for the management system in use at the time of survey. The number of responses exceeds the total in the sample because some farmers used more than one system. The percentages provided indicate the relative extent to which a given management system was used. Nineteen per cent of all management systems used were conventional. Combining these with those also using another system (66 per cent) gives a total of 85 per cent of management systems being used. (This is very close to the 84 per cent conventional farmers mentioned earlier). Of all the remaining systems being used, there were 11 per cent using modified conventional management and five per cent using organic management. Clearly, many conventional farmers were using conventional management in conjunction with another system. The most frequent other systems used were a meat company assurance programme and the GROWSAFE system, which relates to the safe use of chemicals not to

the limitation of their use. Among the modified conventional management systems used the results show an even spread among the options but none were using AvoGreen or Green Tick, most likely because there were very few horticulturalists in the sample. Among the organic management options, most were using an uncertified system. (The two registered organic farmers, BioGro and Organic Farm New Zealand, were subsequently excluded from the dataset.)

Note that there were only 13 farmers who used modified conventional management (more than one box was ticked within the modified conventional management options). This small number places a limit on the potential to analyse the data in terms of management system, that is, to compare responses from farmers who used conventional management with those who used modified conventional management.

Table 9: Farm or orchard management system in use

Conventional management	No.	%	%
With no other system	32	19	19
Modified conventional management (integrated management)			
AvoGreen	0	0	11
FarmSure	4	2	
GlobalGAP	5	3	
Green Tick	0	0	
NZGAP (Fresh Produce)	1	1	
Pipfruit Integrated Fruit Production	3	2	
Sustainable Winegrowing NZ	1	1	
KiwiGreen	4	2	
Conventional management – with other system			
Code of Practice for Nutrient Use	16	10	66
Market Focused	13	8	
Meat company assurance programme	39	23	
Merino NZ Ltd - Zque programme	2	1	
NZS8409:2004 Management of Agrichemicals (GROWSAFE)	40	23	
Organic management (fully certified or in conversion)			
AsureQuality	0	0	5
BioGro	1	1	
Demeter	0	0	
Organic Farm New Zealand	1	1	
Not officially certified	4	2	
Any other system, please specify	1	1	
	167	100	100

Intentions to use management systems

After the respondents had indicated which management system they used, they were then asked about their intention to use particular management systems within the next ten years. This question was a way of assessing general intentions over a long timeframe. Farmers who selected 5, 6 or 7 on the seven-point scale were taken to indicate an intention to use a particular management system. We are unable, with the one question asked, to ascertain whether intention means ‘willing to consider or ‘planning to use’. It is possible that both senses are likely to be included here.

As shown in Table 10, there were varying intentions to use any of these systems in the next ten years. Generally, there was an intention to use conventional or modified conventional management systems in the future, each being rated with a mean score of 5.3. However, the

spread of scores was wide with some farmers stating that they had a very strong intention not to use them in future indicating an interest in different management systems. Sixty one per cent expressed an intention (5, 6 or 7 on the scale) of using conventional management, and 46 per cent expressed an intention to use modified conventional management. These questions were not mutually exclusive so these results appear to be suggesting a certain ambiguity among farmers about their intentions or perhaps their unfamiliarity with the distinctions between them. However, it needs to be remembered that the timeframe of ten years would allow multiple systems to be investigated. These results indicate that farmers are likely to use both systems in the next ten years, and since most are using conventional management at the time of survey it is likely that these farmers in particular would change to modified conventional management in future. Some additional data support this interpretation. There were 58 farmers who answered both of these intention questions. Of this 58 there were 28 (48 per cent) who intended to use both systems, 12 (21 per cent) who intended to use only modified conventional management, four (seven per cent) who intended to use only conventional management, three (five per cent) who intended to use neither system, and 11 (19 per cent) who were neutral.

Table 10: Intentions to use management systems

	1 Very strong intention not to use	**2**	**3**	**4**	**5**	**6**	**7 Very strong intention to use**	**n**	**Mean**
Conventional management									
Frequency	6	4	3	11	17	12	32	85	5.3
Per cent	7	5	4	13	20	14	38	100	
Modified conventional management									
Frequency	4	3	2	11	6	22	18	66	5.3
Per cent	6	5	3	17	9	33	27	100	
Organic management (registered)									
Frequency	31	12	6	7	3	0	3	62	2.2
Per cent	50	19	10	11	5	0	5	100	
Organic methods (not registered)									
Frequency	23	9	8	12	5	5	6	68	3.1
Per cent	34	13	12	18	7	7	9	100	
Genetically modified plants or animals, if they become available									
Frequency	33	4	4	10	3	8	1	63	2.6
Per cent	52	6	6	16	5	13	2	100	

There was less enthusiasm for registered organic methods with an average score of 2.2 and 50 per cent of farmers who stated that they had a very strong intention not to use it, consistent with the fact that that there were only two organic farmers in the sample. However, there were six farmers (ten per cent) who indicated a positive intention to use registered organic methods but these do not account for all those farmers who had a very strong intention not to use conventional or modified conventional management. Intention to use organic methods without pursuing certification was more positive but still with an average of 3.1, lower than the neutral point of four. There were 16 (23 per cent) who indicated a positive intention and this proportion better matches those who intended not to use conventional or modified conventional management. Matching the lack of enthusiasm for organic methods was the low intention to use genetically modified plants or animals (GMOs), if they became

available. The average was 2.3 with 52 per cent stating that they had a very strong intention not to use them.

It may be that intentions to use management system depend on the age of the farmers, so that younger farmers would be more likely to consider modified conventional management or organic management. Exploring these data by age did not reveal any statistically significant results but younger farmers (54 years of age on average) had an intention not to use conventional management compared with older farmers (58 years of age on average) who intended to use conventional management. Younger farmers (average age 51) had a stronger intention to use organic methods (if these were not registered) than those who intended not to use them (average age 55). The age data were too variable, however, to give these analyses any power to definitively differentiate between age groups. The most interesting result was that younger farmers (average age 51) were neutral about the use of GM plants and animals compared with those of an average age of 60 who expressed an intention to use them. The farmers who expressed an intention of being unlikely to use GM plants and animals had an average age of 55, in the middle of the former groups, but this was not a statistically significant difference.

Intended changes in management systems

The next question asked if the farmers were thinking of changing their management system, and if so, to specify what they would change from and to. There were 18 farmers who replied to the first part of this question and of these 17 said they would change from conventional production. For farmers making a change, about one third (37 per cent) said they would change to modified conventional management, about one third (32 per cent) said they would change to organic production (similar to the six reported in Table 10 who intended to use registered organic methods within the next ten years) and 26 per cent said they would change to a semi-organic or biological farming system. The remainder (one case or five per cent) said they would change to using GMOs. Generally then, among farmers in New Zealand there is potential to change from conventional management for 17 out of 106 or 16 per cent, or 13 out of 85 or 16 per cent (from Table 10). For this 16 per cent of farmers in New Zealand, one third would change to modified conventional management and the remainder would change to organic methods but about one half of the latter would be unregistered.

Change in intentions over time

Results for the intention question asked over a number of past surveys from 2000 are shown in Table 11. It also describes some of the characteristics of the separate surveys in order to show comparability. Note that in 2005 stratified sampling was used by way of separate samples for each of the sheep/beef, horticulture and dairy sectors.

Generally, the results from the four surveys spanning eight years have indicated reasonably stable intentions. While intentions to use organic methods dropped from 38 per cent in 2000 to 23 per cent in 2002, similar levels occurred in 2005 (the average across the three sectors was 24 per cent) and in 2008. In 2008, the total of those intending to use either registered organic methods or unregistered organic methods was 33 per cent. These options were not presented as mutually exclusive so some farmers may have expressed an intention to use both. Analysis of the relevant data showed that only three farmers did so. The combined 33 per cent suggests that in 2008 there was more interest in the intention to use organic methods of some type compared to 2002 and 2005. Intention to use GMOs has been stable at about 20 per cent. Intentions to use integrated or modified conventional management appear to have increased from 2006 to 2008. In fact, the sector in 2006 with the strongest interest in integrated management, horticulture at 69 per cent, was matched by the 69 per cent intending to use modified conventional management in 2008. This 2008 sample contains mostly pastoral farmers and their level of interest is indicating a broader interest in modified

conventional management. Overall, there is a good indication that by 2008 there was an increase in interest in the alternative management systems.

Table 11: Intentions over time - percentages

	2000	2002	2005			2008
Type of sample	Simple	Simple	Stratified			Simple
Original sample size	2,000	2,240	1,200			1,000
Respondent sample size	656	805	495			104
Number of points on the scale	7	7	5			7
% Organic intenders - registered	-	-	-			10
% Organic intenders - unregistered	-	-	-			23
% Organic intenders - not specified	38	23	Sheep/beef	25		
			Horticulture	18	24	
			Dairy	28		
% Gene technology intenders	22	-	-			-
% GMO intenders	-	22	Sheep/beef	10		20
			Horticulture	18	16	
			Dairy	20		
% Integrated management	-	-	Sheep/beef	44		
			Horticulture	69	52	
			Dairy	43		
% Modified conventional management	-	-	-			69

2.4 Farming systems: outcomes and barriers

Questions about the perceived benefits and the barriers to using modified conventional production and organic production are very important in understanding farmer attitudes towards changes in management systems. They are also important for identifying different pathways to sustainable farming, pathways that are likely to be achieved through the adoption of changes in the use of management systems.

Perceived outcomes of the three management systems

The next question asked about the contribution of each management system to eleven different outcomes. The mid point was defined as neutral and the question explained that if the respondent did not know the answer they were to put a dash in the box. Table 12 condenses the core results from the detailed tables shown in Appendix 2. The data in the appendix show that for this question there was a wide range in assessments made, with some farmers choosing the extreme ends of the scale. The appendix also shows that only about 60 farmers responded to this question, with from one to 12 stating that they did not know how to rate the outcomes. Thus, the data are derived from just over 50 farmers.

Table 12 shows that all of the ratings were above the mid point of 4.0 except for improving biodiversity, where conventional management was rated at 4.0. In all cases but one the rating for modified conventional management was significantly higher at the five per cent level of significance from that for conventional management. The only contribution rated with a similar score was low input costs. These data indicate that farmers see modified conventional management as making a greater contribution to nearly all of the listed outcomes. The pattern for organic management was not quite so regular with five contributions rated the same as modified conventional management (and therefore also significantly different from conventional management). These outcomes related to challenge, markets and the environment. For two outcomes, quality of product and personal satisfaction, organic and

conventional management were seen as making a similar contribution, different (at a five per cent level of significance) with a lower rating for farmers using modified conventional management. Thus the perceived distinctive contributions of modified conventional management were its quality product and challenge. For one outcome, price premiums, the rating of organic management was statistically significantly different (five per cent level) and higher than both conventional and modified conventional management.

Table 12: Rating of contribution of each management system

	CV	MC	OM
Traceable product	5.0[b]	5.6[a]	5.5
Quality product	5.2[b]	5.7[a]	4.9[b]
Personal challenge	4.7[b]	5.6[a]	5.7[a]
Personal satisfaction	5.1[b]	5.8[a]	5.0[b]
Meeting customers' demands	5.1[b]	5.6[a]	5.6
Low input costs	4.6	4.6	4.6
Price premiums	4.4[c]	5.0[b]	5.7[a]
Market security	4.6[b]	5.3[a]	5.2[a]
Market access	4.7[b]	5.4[a]	5.5[a]
Improving biodiversity (the number and type of productive and unproductive species)	4.0[b]	5.0[a]	4.9[a]
Improving the environment	4.3[b]	5.4[a]	5.5[a]

Note: 1. If the superscripts do not match then the difference between the two means is significant at the 5 per cent level.
2. The means may vary slightly from those shown in Appendix 2 because each paired comparison may have had a different sample size, due to whether or not the respondents had answered both parts of the question. The number of paired comparisons varied from 44 to 57.

Barriers to using other management systems

The next question covered barriers to each management system but directed the respondent to answer for the two systems they were not using. Each barrier or reason for not using a management system has been found in earlier decision tree research (Fairweather, 1999; Darnhofer et al., 2005). The farmers were asked to tick the box if they considered the factor to be a barrier. In some cases the options provided were more of an inhibitor to change rather than a barrier, for example, the option 'no need to change'.

Table 13 and Table 14 show the responses from conventional farmers and modified conventional management farmers respectively. For conventional farmers, there were fewer responses regarding modified conventional management. For all but one item (lack of benefits to the environment) the percentages for each barrier to modified conventional management were lower than the percentages for barriers to organic management. For modified conventional management farmers, the top three barriers to modified conventional management, at 30 per cent or more, were 'product quality is not better', 'my lack of experience with the methods it requires' and 'no need to change'. There were then eight other barriers with at least 20 per cent agreement and these included: lack of incentive, low production yields, high compliance costs, high production costs, low financial returns, prohibitions, high labour requirements, and lack of benefits to the environment. For conventional farmers, the top four barriers to organic management were: 'my lack of experience', 'the untidy appearance of farms under this system', 'low production yields', and 'prohibitions against certain fertilisers and chemicals'.

For modified conventional management farmers, there were very few responses regarding conventional management. The top five barriers to organic management were 'no need to change', 'low production yields', 'prohibitions against certain fertilisers and chemicals', and

'the untidy appearance of farms under this system'. All of these had over 46 per cent agreement. Other important barriers included lack of experience, alternative image, lack of incentive, high production costs, high compliance costs, low financial returns, prohibitions, high labour requirements, and product quality no better.

Table 13: Conventional farmers' view on barriers to using an alternative management - percentages

N = 89	Modified	Organic	Significance (p value)
My lack of experience with the methods it requires			
	30	55	0.000
No need to change			
	30	45	0.000
It has an alternative image			
	17	40	0.000
The untidy appearance of farms under this system			
	18	55	0.005
Lack of challenge			
	15	19	0.000
Lack of incentive to get involved			
	27	37	0.001
Lack of specific inputs			
	16	26	0.000
Low production yields			
	24	60	0.001
High compliance costs			
	24	42	0.000
High production costs			
	26	33	0.002
Low financial returns			
	24	44	0.001
Prohibitions against certain fertilisers and chemicals			
	20	61	0.032
High labour requirements			
	21	43	0.000
Lack of benefits to the environment			
	25	22	0.000
Product quality is no better			
	34	47	0.000
It is not technically possible			
	14	19	0.000

Note: Fisher's Exact Test was used to determine significance.

Table 14: Modified conventional farmers' views on barriers to using alternative management systems (percentages)

N = 13	Conventional	Organic	Significance (p value)
My lack of experience with the methods it requires			
	0	23	[4]
No need to change			
	31	46	0.021
It has an alternative image			
	0	31	
The untidy appearance of farms under this system			
	0	54	
Lack of challenge			
	8	8	0.077[5]
Lack of incentive to get involved			
	8	31	1.000
Lack of specific inputs			
	0	15	
Low production yields			
	8	62	0.385
High compliance costs			
	0	46	
High production costs			
	8	31	0.308
Low financial returns			
	8	31	0.692
Prohibitions against certain fertilisers and chemicals			
	0	38	
High labour requirements			
	0	38	
Lack of benefits to the environment			
	15	8	0.846
Product quality is no better			
	0	62	
It is not technically possible			
	0	0	

Note: Fisher's Exact Test was used to determine significance.

[4] Note, when there is no spread of frequencies across the categories it is not possible to do any statistical testing.
[5] Only one farmer finds organics or conventional methods a barrier for this reason. 8% represents one farmer.

A short question asked if using another management system was something that the farmer would never do. There were 18 per cent who agreed with this, 42 per cent who disagreed and 40 per cent who were unsure.

As stated earlier, it is likely that views about management system are related to age. If younger farmers are more likely to consider alternative management system then it is plausible to expect that the barriers will be differentially perceived. In line with this thinking the analysis showed that for those who thought low financial returns were a barrier to changing to a conventional management system had an average age of 48 compared with 58 for those who did not (p=0.011). There were no significant differences by age to the barriers to modified conventional farming but there were five barriers to changing to organic farming related to age. Older farmers found its alternative image (59 years compared with 55, p=0.056), untidy appearance (59 years compared with 54, p=0.012), lack of incentive to get involved (59 years compared with 55, p=0.089), lack of specific inputs (61 years compared with 56, p=0.049) and high production costs (60 years compared with 56, p=0.081) to be barriers to farming organically.

2.5 Means of achieving good environmental management

The overall ARGOS research design is centred on examining the issues relating to different pathways of achieving improved sustainability in New Zealand farming. The next question was designed to present to farmers these different pathways and to ask them how important or unimportant they were. In effect, each pathway entails a different model for the governance of the environmental consequences of farming. Each pathway has a different consequence for the relative autonomy for farmers in the management of their farm. The question was worded by asking the importance of each way of ensuring good management of the environment, thus indicating which pathway the farmers thought were desirable. Since they rated each of the seven options the resulting average scores provide a basis for assessing the relative importance of each option. The range of options included the provision of industry support, the use of QA systems, leaving it up to farmers (a hands off policy), using government assistance (a carrot approach), using regulations (a stick approach), or using community-based groups to assist farmers.

The results in Table 15 were examined in two ways, first by referring to the mean score and second by attending to the distribution of scores. In terms of means scores, the results show that farmers rated only two options slightly positively. For 55 per cent of farmers the option with the highest mean score was to be left alone to manage the farm environment well with this option receiving an average score of 4.8. Analysis of these scores confirm that the two highest scoring items received a statistically significant higher score compared to four other options, but not different to the rating for using regulations and penalising farmers. The next favoured option, with an average score of 4.7 and rated important by the greatest proportion of farmers (60 per cent), was to use industry support to assist farmers to manage the farm environment well. The least popular option, receiving a score of 3.5, was using QA systems without a net financial benefit, and the mean score for this item was statistically significant compared to all the other options.

There was only modest support (mean score of 4.3 or 4.4) for three options: (1) using government subsidies or tax incentives, (2) using regulations and penalising farmers who do not manage the farm environment well and (3) using QA systems with a net financial benefit. Farmers were neutral about the remaining option of using local community groups or trusts to encourage, advise and facilitate farmers to voluntarily manage the farm environment well. There is a strong aversion to the word ‘subsidies’ in NZ agriculture and this might explain the strong response to that question with 21 selecting the very unimportant option and fewer selecting the 2s and 3s.

The second way to examine the results in Table 16 was to look at the distribution of scores. The spread of ratings was wide for all of the options. For some options there were many farmers who chose ‘very unimportant’ with frequencies that matched those who chose a rating of four, and similarly there were those who chose ‘very important’ with frequencies that also matched those who chose a rating of four.

Table 15: Importance assigned to policy options to ensure good management of the farm environment (frequency)

	1 Very unimportant	2	3	4	5	6	7 Very important	n	Mean
Use industry support to assist farmers to manage the farm environment well									
	8	10	7	16	19	22	19	101	4.7
Use management systems which are checked or inspected and verified (QA) to give assurance that farmers are managing the farm environment well – with no net financial benefit									
	24	7	12	27	12	12	5	99	3.5
Use management systems which are checked or inspected and verified (QA) to give assurance that farmers are managing the farm environment well – only with a net financial benefit									
	10	8	11	28	14	17	12	100	4.3
Leave it up to farmers to manage the farm environment well									
	7	6	7	26	16	16	25	103	4.8
Use government subsidies or tax incentives to assist farmers to manage the farm environment well									
	21	5	3	21	16	18	17	101	4.3
Use regulations and penalise those farmers who do not manage the farm environment well									
	14	6	12	19	16	12	21	100	4.4
Use local community groups or trusts to encourage, advise and facilitate farmers to voluntarily manage the farm environment well									
	18	8	9	22	12	17	15	101	4.1

Note: the percentages have not been included in this table since they closely match the frequencies.

In order to explore which policies could support good farm environmental management we analysed particular qualities of farmers that might be used to target policy approaches to this issue. Unfortunately, with the small sample size we can only suggest possible trends that might be occurring here. We examined the basic demographic data and level of debt expecting these characteristics might be related to farmers' assessments of the different pathways to good management of the farm environment.

Using industry support to assist farmers to manage the farm environment well appealed more to those who had a level of debt of over 20 per cent of their equity. Using a quality assurance system that had no net financial benefit was less important to farmers aged 55 on average ($p=0.103$) compared with 59 year olds on average who were more likely to be neutral about this suggestion. This compares with the use of quality assurance that did give a financial benefit which was more important to those with a debt between 20 to 40 per cent of their equity, those with a university degree and those who were younger (an average of 55 compared with an average of 60 who were more likely to be neutral ($p=0.03$)). Leaving it up to farmers also appealed to those with a debt of over 20 per cent of their equity, those whose education stopped at secondary school level and those who were older. This option was less important to those with a university degree or trade certificate and those with a postgraduate diploma or certificate were more likely to be neutral about it. Using government subsidies or tax incentives appealed more to those with a trade certificate and older farmers were more likely to be neutral. Those with a university degree or trade certificate and those who were younger (average age 53) compared with those who were older (average age 58, $p=0.094$)

felt using regulations and penalising farmers was less important. Using local community groups or trusts to encourage farmers to voluntarily manage the farm environment well was more important to those with a level of debt of over 20 per cent of their equity and was less important to younger farmers. From this it can be seen that having a level of debt over 20 per cent of equity may play an important part in targeting environmental policy. Those who were younger and those who had a higher level of debt may be more influenced by policies that bring with them some promise of financial gain or at least do not cost them any more. (There were very few in the sample with levels of debt above 40 per cent of equity so we need to be aware that the claims made here may not apply to those with very high levels of debt. The statements here need to be compared to those with no debt or debt up to 20 per cent of equity.) Level of education and age may also play a part with older and less educated farmers more supportive of punitive policies. Younger farmers may be less influenced by attitudes in their local communities.

2.6 Farms plans

In the past 15 years, there has been a growing emphasis on the value of documented strategies—or farm plans—to manage for more sustainable agricultural practice. The potential value of farm plans is indicated by their inclusion as integral elements of good farming practice in OECD indicators of socially sustainable farming and in leading farm management texts (for a New Zealand example, see Shadboldt and Martin 2005). Because of the formal structure of farm plans, however, they are often considered an imposition on the independence of the individual farmer and, thus, a potential challenge to existing, shared understandings of farmer identity (for a discussion of this in relation to a *spirit of farming*, see Rosin 2009). In order to gauge the extent to which farm plans challenged current farmer identities, these questions were designed to facilitate comparison with participant's intentions to change their current management practice. The focus was on written farm plans of any type in order to gain insight to farmers' current thinking about and responses to plans. The question emphasised that participants were to consider written farm plans, rather than the plans that they may have in their heads to guide day-to-day, seasonal or long-term strategies.

Table 16 shows a range of responses to the statements about written farm plans with some statements rated above 4.0 and some rated below 4.0 (the mid point between very strongly disagree and very strongly agree). Given most support at 6.0 was the statement that written farm plans are valuable when a manager runs the farm. Also eliciting stronger agreement were the statements that written farm plans were valuable for investment partners and co-owners (5.1) and for financial management of the farm (5.0). These results suggest that written farm plans appeal in situations where the farmer has to devolve management but also in situations where financial management is relevant. Given least support at 3.2 was the statement that written farm plans would help with response to climate change followed by the statement that written plans take too long and are too costly to formulate (3.6). Rated neutrally were the statements that conditions on farms change too much for written farm plans to be valuable (3.8) and that written plans are valuable for farm environmental health management (4.2). For these two statements the distribution of ratings is of potential interest – fewer farmers tended to show strong agreement than disagreement with the first, for example. The other statements received scores between 4.0 and 5.0, showing slight support for the idea that written plans are valuable in themselves, or for feed and stock management. For all statements the spread of scores was wide with high frequencies at either end of the response range. There were only three statements for which the highest frequency occurred at the mid point (4).

Table 16: Level of agreement with statements about farm plans (frequency)

	1 Very strongly disagree	2	3	4	5	6	7 Very strongly agree	n	Mean
Written plans are valuable									
	11	8	2	24	16	22	18	101	4.6
Conditions in my farming operation change too much for written plans to be valuable									
	13	16	13	24	15	17	5	103	3.8
Written plans are valuable for financial management of the farm enterprise									
	8	6	4	19	8	35	21	101	5.0
Written plans are valuable for feed and stock management									
	8	10	12	16	17	20	14	97	4.4
Written plans are valuable for farm environmental health management									
	11	11	15	16	15	21	11	100	4.2
Written plans are valuable for investment partners and co-owners									
	9	7	3	8	12	30	27	96	5.1
Written plans are valuable when a manager runs the farm									
	3	1	1	9	8	32	45	99	6.0
Written plans will help my farming respond to climate change									
	24	22	10	19	6	13	6	100	3.2
Written plans take too long and are too costly to formulate									
	18	18	11	20	9	14	8	98	3.6

Note: the percentages have not been included in this table since they closely match the frequencies.

Nearly one third of the farmers had a farm plan (31 per cent). Of those who did not have a written plan, most (69 per cent) said that they would not appreciate help from a farm advisor or consultant to make a worthwhile plan. Ten per cent said that they would appreciate such help and 21 per cent were unsure. Note that 80 farmers responded to the latter question, not just the 72 who had stated that they did not have a written plan.

Farmers with a written plan were asked some additional questions to determine the general characteristics of these plans and the results are shown in Table 17. Note that while 32 or 31 per cent of farmers said that they had written plans, there were 44 farmers who responded to this question. For some of the characteristics of farm plans there were some farmers, up to 23 per cent, for which that characteristic did not apply. For the 45 farmers involved in an accreditation scheme, 38 per cent required a written plan and 33 per cent did not. Production goals were included for 61 per cent, financial goals for 66 per cent, environmental goals for 48 per cent and succession or lifestyle goals for 32 per cent. Just under one third (32 per cent) had help from a consultant or farm advisor in preparing their plans. The same farmers were asked how often their plans were revised. For most (19 or 57 per cent) of the 33 farmers who answered this question, the plan was revised each year, and for five farmers (15 per cent) the plan was revised every two years. There was one farmer (nine per cent in total) who revised their plans at each of three, four or five year intervals.

Table 17: Characteristics of written plans

	Yes	No	Unsure	Not applicable	n
Is it required by your farm accreditation scheme(s)?					
Frequency	17	15	3	10	45
Per cent	38	33	7	22	100
Are production goals included in the plan(s)?					
Frequency	27	9	1	7	44
Per cent	61	21	2	16	100
Are financial goals included in the plan(s)?					
Frequency	29	8	0	7	44
Per cent	66	18	0	16	100
Are farm environmental health goals included in the plan(s)?					
Frequency	21	13	0	10	44
Per cent	48	30	0	23	100
Are family succession or lifestyle goals included in the plan(s)?					
Frequency	14	18	0	9	44
Per cent	32	41	0	21	100
Did a consultant/farm advisor help prepare your plan(s)?					
Frequency	14	22	0	8	44
Per cent	32	50	0	18	100

Further analysis of the farm plans data showed that only one third of those surveyed actually had a plan and on average they were younger at 54 than those who did not at 58 ($p=0.073$). They were evenly distributed over those who practiced conventional and modified conventional management.

2.7 Emissions trading

A further challenge to existing understandings of the general parameters of farm management involves the issue of agricultural greenhouse gas mitigation. Efforts to reduce methane and nitrous oxide emissions on farms essentially impose a regulation, often in the form of a cost, on an aspect of farming that has never been recognised, let alone measured in the past. As a result, many farmers view greenhouse gas regulations—as well as claims about climate change more generally—as limitations on their freedom to pursue the most appropriate management practices (Rosin, et al. 2008). This question focuses on the extent to which farmers are willing to assume responsibility for reducing greenhouse gases. The range of responsibilities included in the question take into account the most commonly stated rationales among pastoral farmers in the ARGOS project (Rosin, et al. 2008).

Table 18 shows that there was agreement with the first four items but disagreement with the last item. For that item the majority of farmers disagreed strongly that market returns will balance the costs of reduction efforts. The strongest level of agreement was recorded for the position that farmers are being asked to assume more than their fair share of responsibility for emissions with an average score of 6.2 and most farmers selecting the very strongly agree option. There was also strong agreement (5.5) that New Zealand farmers should take responsibility only to the same extent as farmers elsewhere again with most farmers selecting the very strongly agree option. The difference in the level of agreement to these two statements suggests that the perceived unfairness of mitigation regulations is partially due to the greater exposure of New Zealand farmers (relative to those with whom the compete) to mitigation costs. The strong level of disagreement with the statement regarding the potential for markets to compensate for the costs of mitigation corresponds with the response to the

previous statements discussed. Farmers have little reason to believe that they would be able to pass on the costs of carbon through the commodity chain. The remaining two options were also agreed with but the distribution of scores in both cases was very wide, with ten per cent of farmers choosing the very strongly disagree option. The responses show that farmers agreed that technological solutions were needed to decrease greenhouse gas emissions. They also show that they did not believe they contribute to climate change and should not take responsibility for decreasing emissions.

Table 18: Level of agreement with various positions on responsibility for reducing greenhouse gas emissions (frequency)

	1 Very strongly disagree	2	3	4	5	6	7 Very strongly agree	n	Mean
New Zealand farmers do not contribute to climate change and should not take responsibility for reducing emissions									
	10	8	15	23	9	6	33	104	4.6
New Zealand farmers should take responsibility only to the same extent as farmers elsewhere									
	8	6	4	8	6	24	46	102	5.5
Farmers are being asked to assume more than their fair share of responsibility for emissions									
	1	5	1	7	7	13	69	103	6.2
Technological solutions are needed to decrease agricultural greenhouse gas emissions									
	10	7	5	15	14	18	31	100	4.9
Market returns will balance the costs of reduction efforts									
	47	16	11	15	5	4	2	100	2.4

Note: the percentages have not been included in this table since they closely match the frequencies.

When exploring the attitudes to emissions trading, the trend appeared to indicate that older farmers (in their late fifties on average rather than their early fifties) were more likely to agree that NZ farmers should take responsibility only to the same extent as farmers elsewhere, and that farmers are being asked to assume more than their fair share of responsibility for emissions. For the latter statement those with a trade certificate were more likely to disagree and less likely to agree. Those with university degrees were more likely to disagree with the statement that NZ farmers do not contribute to climate change and should not take responsibility for reducing emissions while those with a trade certificate are more likely to agree. There was an interesting and unusual result for the statement that technological solutions are needed to decrease agricultural greenhouse gas emissions with farmers of average age 62 more likely to be neutral about this compared to farmers of average age 53 who were more likely to disagree ($p=0.026$) and farmers of average age 56 who were more likely to agree ($p=0.092$). Those who were debt free were more likely to agree as presumably they would be less worried about how the development of such solutions would be paid for. It is worth noting that there are some who think there is more to reducing greenhouse gas emissions than providing technological solutions and that these farmers are younger on average.

2.8 Water and Irrigation

We expect that for agriculture some of the important political and industry issues in the future will relate to water and its availability. This next section reflected a variety of current and

emerging issues relating to water use, including the effects of climate change, the possible effects of increased water use, and issues relating to regulation. Table 19 shows there were two developments respondents judged unlikely to occur. The first linked irrigation to climate change by stating that the latter would lead to lower rainfall and therefore increase farmers' need for irrigation. Farmers gave, on average, a moderately low score of 3.5 and there were 22 per cent who chose the very unlikely option. There were, however, 35 per cent of farmers who did think that this scenario was likely. Farmers also gave, on average, a neutral score of 3.9 to the likelihood that increased use of irrigation will not cause environmental problems, indicating that some (46 per cent) accepted the idea that irrigation use can be problematic in terms of the environment. There was a wide range in the responses to this question. There were three other statements relating to increased use of irrigation and these all received positive likelihoods or expectations that they would happen. Farmers considered that increased demand for irrigation water will deplete aquifers or underground water supplies (5.8), increased irrigation use will adversely affect the quality of water in streams and rivers (4.7) and increased irrigation use will adversely affect the availability of water in streams and rivers (5.4). Then a number of options were presented relating to the management of water and irrigation. Farmers made high assessments of the likelihood that pressures on irrigation water supply will force farmers to improve their management of water (6.0), and that increased demand for irrigation water will require water storage systems (6.3). In addition they believed that pressures on irrigation water supply will make it important to introduce payments for irrigation water to encourage better use (4.6). Finally, farmers judged it likely that they will increasingly need to use irrigation to better meet production goals (4.6). In terms of overall regulation of irrigation development, farmers saw that bureaucratic obstacles would affect them (5.5). However, they acknowledged that improved regulation was needed (5.5).

Table 19: Estimates of the likelihood of water and irrigation developments (frequency)

	1 Very unlikely	2	3	4	5	6	7 Very likely	n	Mean
Climate change will lead to lower rainfall and therefore increase farmers'/orchardists' need for irrigation									
	22	16	9	18	16	16	3	100	3.5
Farmers/orchardists will increasingly need to use irrigation to better meet production goals									
	11	10	4	16	20	22	17	100	4.6
Increased demand for irrigation water will deplete aquifers/underground water supply									
	3	1	2	13	16	22	45	102	5.8
Increased use of irrigation will not cause environmental problems									
	19	12	16	14	13	15	14	103	3.9
Increased irrigation use will adversely affect the quality of water in streams and rivers									
	9	9	8	19	15	15	27	102	4.7
Increased irrigation use will adversely affect the availability of water in streams and rivers									
	4	7	5	11	14	23	38	102	5.4
Bureaucratic obstacles to irrigation development will seriously affect farming/orcharding									
	2	3	7	16	10	24	37	99	5.5
Improved regulation of irrigation is needed to better manage water issues									
	3	7	6	14	10	28	33	101	5.4
Pressures on irrigation water supply will force farmers/orchardists to improve their management of irrigation water									
	3	0	1	3	11	44	39	101	6.0
Pressures on irrigation water supply will make it important to introduce payments for irrigation water to encourage better use									
	14	7	3	17	17	21	22	101	4.6
Increased demand for irrigation water will require water storage systems									
	0	1	2	5	7	25	61	101	6.3

Note: the percentages have not been included in this table since they closely match the frequencies.

We investigated further the attitudes to water and irrigation, looking for possible trends in the data. Younger farmers of age 55 on average, those with debt between zero and 20 per cent of their equity, and those with an undergraduate diploma were more likely to agree that climate change will lead to lower rainfall and therefore increase the need for irrigation while those with a trade certificate or similar educational qualification or with debt over 20 per cent of equity were more likely to disagree. In keeping with this result, those with a trade certificate were also more likely to disagree that farmers will increasingly need to use irrigation to meet production goals. A group of farmers of average age 62 were neutral about whether or not the increased demand for irrigation will deplete aquifers/underground water supply compared with a group of younger farmers of age 54 ($p=0.023$) who disagreed with this. Those with a university degree or a trade certificate were also more likely to disagree with this statement. The statement that increased irrigation use will adversely affect the quality of water in streams and rivers was more likely to be disagreed with by those with a university degree and those who were older (59 years on average) than those who averaged 54 who were neutral

(p=0.106). Those with a university degree were more likely to agree that bureaucratic obstacles to irrigation development will seriously affect farming/orcharding, while those with a trade certificate or similar qualification were more likely to disagree. The statement that improved regulation of irrigation is needed to better manage water issues was less likely to be agreed to by those with a trade certificate or university degree. Increasing debt levels implied increasing neutrality or disagreement with this statement and therefore decreasing agreement. These results in some ways are the opposite to those on greenhouse gas emissions. It seems that younger farmers and those with a university degree are more likely to acknowledge that greenhouse gas emissions are a problem and that global warming may be occurring but they are more reluctant to see water use and irrigation as a problem in the future.

2.9 Conclusion

This chapter has reported in largely descriptive terms the results for each of the questions in the questionnaire. The next chapter considers these results by first providing a summary of the key findings and then discussing them on a number of dimensions.

Chapter 3
Summary and Discussion

3.1 Introduction and overview of the study

The modified objectives of the research were to indicate how New Zealand farmers think about the different management systems available to them and other topical issues relating to farm sustainability. The survey assessed how farmers perceived the three most commonly recognised management systems (conventional, modified conventional and organic). A number of questions covered the precise identification of the management systems the farmers used, their intentions to use different management systems, what they perceived as the outcomes from the use of each management system and the perceived barriers to using an alternative system. It was expected that such data would provide insight to the potential for the adoption of alternative management practices based on claims of greater social, economic and environmental sustainability. In order to further examine the basis for the farmers' response, the questionnaire also queried their attitudes and opinions on a variety of factors associated with environmental practice including: environmental policy; farm plans; climate change responsibility; and water use. Finally, participants were also asked to supply some personal information to determine whether factors such as age, education level, farm size and the like influenced the pattern of response.

The survey data were gathered through the use of a questionnaire posted to a simple random sample of full-time and part-time farmers including all farm types. Most answers were recorded on a seven point rating scale and the mean score and score distributions were examined. The response rate (16%) was low, probably due to the timing of the survey and the difficulty of the questions. The low response rate and the exclusion of smallholders resulted in a sample of 106 cases. While this sample was small, it is possible to make inferences from the results to the farming population in general, although there are limitations to the precision of these inferences.

This report mainly provides descriptive analysis of the data with some additional statistical analyses. For the most part, the latter analyses suggested that age, debt level and level of education provide some explanation of the patterns in the response to the survey questions. In interpreting the findings of the research, we therefore refer to trends and patterns that are likely to be evident in the wider population of farmers. Although it is not possible to establish the precise nature of response in the population, there is a strong likelihood that where significant differences are indicated these represent similar patterns in that population.

3.2 Summary of results

Summary sketch of farmers

Most respondents were pastoral farmers (78 per cent) and nearly all used conventional management. Farms averaged 316 hectares in size, had average gross revenue over $300,000, and had low levels of debt. The mainly full-time farmers surveyed were 57 years old on average and had been in farming many years. Over one half of the farmers had secondary school qualifications as the highest level of education completed, and most of the farmers (87 per cent) were men.

Management systems
Most of the farmers (84 per cent) used conventional management, and, in response to separate questions, within the next ten years 72 per cent expressed the intention of using conventional management, and 69 per cent expressed the intention to use modified conventional management. From six to seven per cent expressed a very strong intention not to use these systems. Only ten per cent of farmers expressed an intention to use organic management but 23 per cent intended to use unregistered organic methods. Of the 16 per cent of farmers thinking of changing their management system, one third would change to modified conventional management, one third would change to organic management and nearly one third would change to semi organic/biological farming, or presumably, unregistered organic. Analysis of intentions since 2000 show that they have been relatively stable but there was an indication of increased interest in alternative management systems in 2008.

Farmers assessed modified conventional management more positively in terms of its outcomes compared to conventional management but had a mixed assessment of organic management. Their view of modified conventional management included improvement in production, quality, providing challenges, improving satisfaction, better meeting market demands, and being better for the environment. They saw fewer barriers to using modified conventional management than to using organic management. Thirty per cent or more of the conventional farmers saw the main barriers (or inhibitors) to using modified conventional management as product quality was no better, their lack of experience with the methods required, no need to change. The top four barriers to using organic management were lack of experience, untidy appearance, low production yields, and prohibitions against certain fertilisers and chemicals. For modified conventional management farmers, the top four barriers to using organic management were no need to change, low production yields, prohibitions, and untidy appearance of farms. Older farmers more frequently selected five of the barriers to changing to organic management. Nearly one half of farmers (42 per cent) disagreed with the statement that using an alternative management system was something they would never do.

Means of achieving good environmental management
Farmers most preferred to be left alone or to use industry support to achieve good management of the environment. However, all other options but one received between 40 and 51 per cent acknowledgement of their importance. Only 29 per cent of farmers found using QA systems which had no financial benefit to be an important means of managing environmental practices.

Farm plans
Written farm plans were judged useful in situations where management is devolved to others (managers, investment partners, co-owners) and for financial management of the farm. Nearly one third of farmers had a written farm plan, and they were seen to contribute to a production, financial and environmental goals.

Emissions trading
A large majority of the farmers surveyed agreed that they were being asked to take more than their fair share of responsibility for reducing greenhouse gas emissions and that they should only take as much responsibility as farmers elsewhere. Opinion was more evenly spread about whether or not they contributed to climate change and the need for technological solutions. The majority of farmers did not agree that market returns will balance the costs of associated with mitigation policies.

Water and irrigation
Farmers were aware of the potential problems of increased irrigation use and the need for regulation. They were sceptical that increased use of irrigation would occur without

environmental problems. They saw that pressures on irrigation water supply would necessitate changes but at the same time stating that bureaucracy surrounding water and irrigation would probably seriously affect them.

3.3 Policy Implications

A number of the results are discussed in terms of policy. The first theme relates to management systems and the potential for change in management systems. Also considered are ways to encourage change in management systems. In addition, policy implications of the other sections of the questionnaire are briefly considered.

Management systems and potential for change

Recent developments in the production, distribution and marketing of agricultural goods are exerting pressures for change in existing farm management practice. The purpose of this report and the associated survey is not to advocate for a particular change in the management systems utilised by farmers in New Zealand. It is, however, imperative to acknowledge the growing emphasis on verified, or audited, best-practice schemes in most of the country's agricultural export sectors. Sector organisations are using such schemes in response to market demands and perceptions of the relative value of alternative management systems. Given that each of the management systems involves varying extents of documented attention to social and/or environmental concerns with perceived levels of financial risk, the willingness to change among them provides some indication of an individual's capacity to incorporate such factors in their management decisions and objectives. Thus, to the extent that flexibility in the application of diverse justifications or rationalisation of management practice are suggestive of more resilient approaches, the response to this section of the survey allows us to draw conclusions as to the potential for sustainable practice in the New Zealand agriculture sector. With this background in mind we consider the prospects for change in existing management systems.

Farmers in New Zealand have an average age that is near to 60 years old and most use conventional management and at first glance these data do not suggest that there is much potential for change in the use of management systems nor that their farming practice is inherently resilient or sustainable. We need, however, to consider the results more closely before making such a conclusion.

Large proportions of the currently conventional farmers said they intend to use conventional and modified conventional management. While this appears contradictory, it is in fact consistent with the other results which show that conventional farmers were favourably disposed to modified conventional management.

There are strong indications of likely change in the use of management systems among farmers in New Zealand. This position is supported by the following key findings:

- 69 per cent of farmers (most of whom were using conventional management) had an intention to use modified conventional management within the next ten years
- 42 per cent of farmers (most of whom are currently using conventional management) disagreed with the statement that using an alternative management system was something they would never do
- Trend data on intentions show an increased interest in alternative (non conventional) management systems in 2008.
- 16 per cent of farmers were thinking of changing their management system

Given that the relative degree of use of available management systems is likely to change, what will be the direction of that change? Change is most likely to be towards modified conventional management:

- 69 per cent of farmers had an intention to use modified conventional management within the next ten years, as noted above.
- Farmers assessed modified conventional management more positively than organic management in terms of outcomes
- Farmers saw fewer barriers to using modified conventional management compared to using organic management.

However, there was still interest in registered organic farming:
- Ten per cent of farmers had an intention to use registered organic management within the next ten years
- Of the 16 per cent of farmers thinking of changing their management system, one third would change to organic management.

Greater interest was expressed in changing to unregistered organic farming:
- 23 per cent of farmers had an intention to use unregistered organic management
- Of the 16 per cent of farmers thinking of changing their management system, one third would change to organic/biological farming or unregistered organic management.

Some caution about the potential for management system change is necessary. Recall that in this survey, farmers self declared if they used modified conventional management. Our results indicate that farmers tended to classify the combination of conventional management and other systems of management (but not those that qualify as modified conventional management) as modified conventional management. In other words, farmers had a tendency to see themselves as using modified conventional management, when by strict definition they were not. This illustrates a tendency for farmers to see themselves as progressive, or something different from the usual.

Against this assessment is the argument that the apparent desire expressed by farmers to change was only in response to their not wanting to appear conservative. The farmers may have given the positive indication of wanting to change but their behaviours might belie their expressed attitudes.

Ways to encourage change in management systems

The survey data also provide insight to the characteristics of alternative management systems that make them more or less attractive to New Zealand farmers. In this instance, the implications for the future sustainability of agriculture lie in the potential to identify those characteristics of best practice and other management schemes that validate compliance from the farmers' perspective. For example, the most attractive features of modified conventional management include its perceived capacity to enhance traceability, product quality, challenge, satisfaction, meeting customers' demands, price premiums, market security and access, biodiversity and environmental health. While farmers recognise the potential benefits from using modified conventional management, the survey data, as well as that in prior qualitative research (Hunt, et al. 2005; Rosin 2008; Rosin et al. 2008, Rosin et al. 2007a, 2007b), suggest that they require further, more solid evidence of the accrual of the perceived benefits over the medium to long term. The survey also identifies several barriers to using modified conventional management, which indicate that existing evidence of benefits does not receive universal acceptance.

The most attractive features of organic management from the farmers' perspective include challenge, market security, market access and improving the environment. Farmers may be more attracted to organic management if there were further evidence available to rebut the attributes perceived negatively, including quality product and personal satisfaction. To address perceived barriers to organic management, it may be effective to show that organic farming did not necessarily have to have an untidy appearance, did not necessarily have low

yields and that the prohibitions against certain fertilisers and chemicals was not antithetical to farming.

Governance of farm management
In terms of farmers' preferences for policy to ensure good management of the environment, there is tension between what farmers would like and how industry typically achieves environmental goals. There was only modest support for QA systems with rewards which are commonly used, but there was stronger support for leaving it to farmers to manage the farm environment well, a policy which may not be acceptable to consumers. Responses also showed that farmers were not overly willing to accept external imposition of environmental practice. There was varying potential acceptance of policy alternatives. There remains a challenge to legitimise costs associated with alternative practice and in promoting alternative practice if it is not considered cost effective.

Farm plans
The main issue with written farm plans is their potential for improving environmental management versus being seen as an imposition. The results showed that there was modest support overall for written farm plans but this support was in areas other than for environmental management. The least specified question asked if written farm plans were valuable and this general question received mixed support – some disagreed, some agreed and the overall mean score equated to slight agreement. The support for plans that was recorded related to the goals of financial management, and farmers had even more agreement with plans for when a manager runs the farm or for investment partners or co-owners. This modest support leads most farmers to disagree with two negative aspects of plans – that they take too long and are too costly, and that farm conditions change too much for plans to be valuable. Thus farmers do not reject written farm plans as impractical so the idea of plans is not likely to be rejected on these grounds.

There is potential to build on the positive elements of farmers' perceptions about written farm plans. The challenge for policy directed at environmental goals is to show farmers that written farm plans are an effective tool in this area. Presently, only some farmers accept this. Part of the problem here is recognition that farm environmental health management is an issue. Our work on causal mapping of farmers shows that farm environmental health, while recognised as a factor in the farming system, is however, seen as a factor the affects production rather than production affecting farm environmental health (Fairweather et al., 2007c; Fairweather et al., 2008; Fairweather et al., 2009b). It may be that when the case is made that environmental management is a priority, farmers will be more willing to use written farm plans for this purpose.

Emissions trading
The questions on climate change were designed to examine responsibility for climate change and greenhouse gas emissions and possible solutions. Farmers, overall, agreed that they do not contribute to climate change and should not take responsibility for decreasing emissions. In general, this overall lack of willingness to accept responsibility means that they believe that unfair demands are being made on them with the proposed policies. Farmers think that they are being asked to assume more than their fair share of responsibility, and wish to take responsibility only as much as farmers elsewhere. This limited acceptance of responsibility and sense of unfair exposure to costs of mitigation means that they wish to avoid regulation. Further, they show no desire to be world leaders, in part because they have little faith in the possibility of financial reward or compensation and do not see markets as rewarding any efforts they might make.

The challenge for policy is to put up proposals when the environmental processes are not visible or obvious and involve global actors. Accordingly, policy mechanisms based on increasing costs will meet strong initial resistance, especially if no legitimate means of

proactive (and sufficiently rewarded) action is recognised. However, the responses to the first question on whether farmers contribute to climate change and responsibility for reducing emissions were wide ranging with some, a minority, who disagreed with this view. There is therefore a core of farmers who accept climate change and farmers' role in it and this core may provide a basis for getting some support for emissions trading policy. Further, the results showed that younger farmers were not so adamant about the unfairness of emissions trading policy, and that farmers with a university education were more likely to disagree that farmers do not contribute to climate change. This suggests that over time, it is likely that more farmers will come to accept responsibility.

Water

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

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

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

Sustainability of farming in New Zealand

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

If we accept the possibility of structural factors working against innovation then policies to encourage new entrants to farming may also be useful in fostering adoption of alternative management practices/systems. Furthermore, if there were a reduction in the average age of farmers, there may be associated changes in the relative acceptability of management systems. Any future change toward having a mix of farmers of different ages and backgrounds increases the likelihood of alternative management systems being used.

3.4 Future research

The results deriving from the question on farmers' assessment of the likelihood of different outcomes from the use of management system raises a question about patterns in the responses. Perhaps there is a group of participants who gave consistently lower ratings to organic management, and this group may have a particular management intention. For example, product quality is generally considered to be an attribute associated with organic products – i.e., organic farmers rationalise their practice based on the quality of the product. It would seem likely that those farmers claiming minimal contribution of organic management to quality might reflect those that consistently rank organic management low because they wish to contest any implication that organic is better than their current practice.

The question asking farmers to rate the different environmental governance options could be further examined to see if the same group of farmers gave the most favoured options the higher score. There are changes in the frequency distributions in the data and this raises the question as to whether this represents a shift in a particular group of people, or reflects a slight, and more general, shift upwards.

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Appendix 1: The Questionnaire

Lincoln University
Te Whare Wānaka o Aoraki

New Zealand Farmer and Orchardist Attitude and Opinion Survey:

Change in primary production

Winter, 2008

General instructions:

- Please tick the box or put the number for your best answer in the box provided. In some cases we ask you to write your answer.
- Most of the questions use a seven point scale. The mid point of the scale (4) represents neutral or neither/nor.
- Please return the questionnaire to John Fairweather, AERU, PO Box 84, Lincoln University, Lincoln, 7647 using the Freepost envelope provided.

Definitions:

- Conventional farming - does not use modifications to conventional practice, nor is certified as organic, but can still aspire to best practice.
- Modified conventional management (Integrated management) - accepts some constraints on inputs in order to improve environmental outcomes and to better meet market demand. These systems are also called Environmental Management Systems, usually have their own name, e.g., KiwiGreen, and are not necessarily called integrated management. We do not mean integrating your farm production practices or types of land use.
- Organic farming - registered or certified as officially organic.

A. Farm or Orchard Management System

1. Do you currently use **any** of the following management systems? Please tick the appropriate boxes.

Conventional management	
With no other system	
Modified conventional management (integrated management)	
AvoGreen	
FarmSure	
GlobalGAP	
Green Tick	
NZGAP (Fresh Produce)	
Pipfruit Integrated Fruit Production	
Sustainable Winegrowing NZ	
KiwiGreen	
Conventional management – with other system	
Code of Practice for Nutrient Use	
Market Focused	
Meat company assurance programme	
Merino NZ Ltd - Zque programme	
NZS8409:2004 Management of Agrichemicals (GROWSAFE)	
Other system, please specify _____	
Organic management (fully certified or in conversion)	
AsureQuality	
BioGro	
Demeter	
Organic Farm New Zealand	
Not officially certified	
Any other system, please specify _____	

2. Overall, how would you classify the management system used on your farm or orchard? (Please put the number in the box):

(1) Conventional management

(2) Modified conventional management (Integrated management) - accepts some constraints on inputs in order to improve environmental outcomes and to better meet market demand

(3) Organic management – registered or certified

(4) Other, please specify _____

3. Assume you continue in farming: within the next ten years, how strong is your intention to use **each** of the following?

(Please rate **each** management system using the following range.)

Very strong intention not to use	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very strong intention to use**

Conventional management	
Modified conventional management	
Organic management (registered)	
Organic methods (not registered)	
Genetically modified plants or animals, if they become available	

4. If you are thinking of changing your management system, please tell us what you are changing from and to, and state the main reason why:

From:_____To:_____Why:_____

_____

_____

B. Farming systems

We would like your opinion about all three management systems, even those you are not using.

1. How would you rate the contribution of conventional (**CV**), modified conventional (**MC**) and organic management (**OM**) to **each** of the following outcomes? (If you don't know put a dash in the box.)

Low	1	2	3	4	5	6	7	High
					Neutral			

	CV	MC	OM
Traceable product			
Quality product			
Personal challenge			
Personal satisfaction			
Meeting customers' demands			
Low input costs			
Price premiums			
Market security			
Market access			
Improving biodiversity (the number and type of productive and unproductive species)			
Improving the environment			
Other, please specify _____			

2. Which of the following items is a barrier to you using the **two other** management systems?

Please tick the appropriate boxes in the columns that represent the two management systems that you are <u>not currently using.</u>

	CV	MC	OM
My lack of experience with the methods it requires			
No need to change			
It has an alternative image			
The untidy appearance of farms under this system			
Lack of challenge			
Lack of incentive to get involved			
Lack of specific inputs			
Low production yields			
High compliance costs			
High production costs			
Low financial returns			
Prohibitions against certain fertilisers and chemicals			
High labour requirements			
Lack of benefits to the environment			
Product quality is no better			
It is not technically possible			
Other, please specify_____			

3. Using another management system is something I would never do.

(1) Yes (2) No (3) Unsure ☐

C. Farming environment

1. How important to you is **each** of the following ways of ensuring good management of the farm environment? Please rate each item using the following range:

Very Unimportant	1	2	3	4	5	6	7	Very Important

Use industry support to assist farmers to manage the farm environment well	
Use management systems which are checked or inspected and verified (QA) to give assurance that farmers are managing the farm environment well – **with no net financial benefit**	
Use management systems which are checked or inspected and verified (QA) to give assurance that farmers are managing the farm environment well – **only with a net financial benefit**	
Leave it up to farmers to manage the farm environment well	
Use government subsidies or tax incentives to assist farmers to manage the farm environment well	
Use regulations and penalise those farmers who do not manage the farm environment well	
Use local community groups or trusts to encourage, advise and facilitate farmers to voluntarily manage the farm environment well	
Other, please specify _____	

D. Farm Plans

In these questions please just consider written plans, not the plans that you will all have in your heads that guide day to day, seasonal or long-term strategies for your farm and family.

1. How much do you agree or disagree with **each** of the following statements about written plans to guide your farm operation and enterprise (whether you have them or not)?

Very Strongly disagree	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very Strongly agree**

Written plans are valuable	
Conditions in my farming operation change too much for written plans to be valuable	
Written plans are valuable for financial management of the farm enterprise	
Written plans are valuable for feed and stock management	
Written plans are valuable for farm environmental health management	
Written plans are valuable for investment partners and co-owners	
Written plans are valuable when a manager runs the farm	
Written plans will help my farming respond to climate change	
Written plans take too long and are too costly to formulate	

2. Do you have a written farm plan? (1) Yes(2) No

If no, would you appreciate help from a farm adviser or consultant to make a worthwhile farm plan?

(1) Yes (2) No (3) Unsure

If you have a written farm plan, please answer the following questions:

(1) Yes (2) No (3) Unsure (4) Not appliable

Is it required by your farm accreditation scheme(s)?	
Are production goals included in the plan(s)?	
Are financial goals included in the plan(s)?	
Are farm environmental health goals included in the plan(s)?	
Are family succession or lifestyle goals included in the plan(s)?	
Did a consultant/farm advisor help prepare your plan(s)?	

How often is your plan revised? Every _____ years.

E. Emissions trading

1. How much do you agree or disagree with **each** of the following views about responsibility for reducing greenhouse gas emissions from agriculture?

Very Strongly disagree	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very Strongly agree**

New Zealand farmers do not contribute to climate change and should not take responsibility for reducing emissions	
New Zealand farmers should take responsibility only to the same extent as farmers elsewhere	
Farmers are being asked to assume more than their fair share of responsibility for emissions	
Technological solutions are needed to decrease agricultural greenhouse gas emissions	
Market returns will balance the costs of reduction efforts	

F. Water and irrigation

1. In your opinion, how likely or unlikely is **each** of the following developments?

Very Unlikely	1	2	3	4	5	6	7	Very Likely

Climate change will lead to lower rainfall and therefore increase farmers'/orchardists' need for irrigation	
Farmers/orchardists will increasingly need to use irrigation to better meet production goals	
Increased demand for irrigation water will deplete aquifers/underground water supply	
Increased use of irrigation will not cause environmental problems	
Increased irrigation use will adversely affect the **quality** of water in streams and rivers	
Increased irrigation use will adversely affect the **availability** of water in streams and rivers	
Bureaucratic obstacles to irrigation development will seriously affect farming/orcharding	
Improved regulation of irrigation is needed to better manage water issues	
Pressures on irrigation water supply will force farmers/orchardists to improve their management of irrigation water	
Pressures on irrigation water supply will make it important to introduce payments for irrigation water to encourage better use	
Increased demand for irrigation water will require water storage systems	
Other please specify, _____	

G. Background information

1. What is the size of your farm or orchard?

Total hectares: ☐

Effective hectares: ☐

2. What is your predominant farming activity?

(1) Dairy (4) Arable or cropping ☐

(2) Sheep/beef/deer (5) Horticulture

(3) Specialist livestock If kiwifruit, please tick this box ☐

(6) Other please specify, _____

3. For farmers with livestock, we want to calculate your total number of stock units as at June 2008. Please fill out the following table:

Sheep	Number	Cows	Number
Ewes		Max. cows milked	
Hoggets (ewe or wether)		Total milk solids (Kg)	
Other			
		Deer	
Beef		Rising 1 yr hinds	
Rising 1 yr heifers		Rising 2 yr hinds	
Rising 2 yr heifers		M/A hinds	
M/A cows		Rising 1 yr stags	
Rising 1 yr steers/bulls		Rising 2 yr stags and older	
Rising 2 yr steers and older			
Rising 2 yr and older bulls			

4. In which province is your farm/orchard located: _____

5. So that we can gauge the size of your farming operation, what was the annual gross revenue (approximate figures) from your farm/orchard for the:

2006-07 financial year? Approximate figures only: ☐

2007-08 financial year? Approximate figures only: ☐

6. What is your level of debt at present (approximate)?

(1) Debt is over 80% of equity
(2) Debt is between 60-80% of equity
(3) Debt is between 40-60% of equity
(4) Debt is between 20-40% of equity
(5) Debt is between 0-20% of equity
(6) My farm is debt free
(7) Don't know

☐

7. How satisfied are you with your current level of economic viability?

Very Unsatisfied	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very Satisfied**

☐

☐

8. For how many years have you managed, owned or been associated with your current farm or orchard?

9. For how many years have you been farming or orcharding? ☐

10. For how many years in the future do you expect to be in farming/orcharding?

11. In ten years time do you think you will still be living in your present community?

(1) Yes (2) No (3) Unsure

12. Are you the:

(1) Farmer (2) Spouse or partner of farmer

13. Please provide the year you were born.

14. Are you: (1) Male (2) Female

15. What is your highest level of education completed?

(1) Attended secondary school

(2) Trade technical qualification or similar

(3) Undergraduate diploma or certificate

(4) University degree

16. What type of farm do you have?

(1) Full-time farm

(2) Part-time farm

(3) Lifestyle or hobby farm

(1) Corporate farm

(2) Family farm

Thank you for giving your valuable time.

Please return the completed questionnaire in the freepost envelope.

Appendix 2: Data on farming systems

B1 The contribution of conventional management to the following outcomes

	1 Low	2	3	4	5	6	7 High	n	Mean	Don't know
Traceable product										
Frequency	5	1	7	10	15	15	13	66	4.9	5
Per cent	8	2	11	15	23	23	20	100		
Quality product										
Frequency	3	2	8	4	21	15	17	70	5.2	1
Per cent	4	3	11	6	30	21	24	100		
Personal challenge										
Frequency	3	6	6	19	12	11	13	70	4.7	2
Per cent	4	9	9	27	17	16	19	100		
Personal satisfaction										
Frequency	5	2	3	12	14	12	21	69	5.1	4
Per cent	7	3	4	17	20	17	30	100		
Meeting customers' demands										
Frequency	4	1	2	18	17	12	13	67	5.0	5
Per cent	6	1	3	27	25	18	19	100		
Low input costs										
Frequency	8	7	4	15	9	13	15	71	4.5	3
Per cent	11	10	6	21	13	18	21	100		
Price premiums										
Frequency	7	4	3	23	16	6	11	70	4.4	2
Per cent	10	6	4	33	23	9	16	100		
Market security										
Frequency	8	0	6	18	14	6	15	67	4.6	3
Per cent	12	0	9	27	21	9	22	100		
Market access										
Frequency	7	2	4	17	13	8	17	68	4.8	3
Per cent	10	3	6	25	19	12	25	100		
Improving biodiversity (the number and type of productive and unproductive species)										
Frequency	8	3	6	25	4	7	4	57	3.9	7
Per cent	14	5	11	44	7	12	7	100		
Improving the environment										
Frequency	6	4	3	24	14	7	7	65	4.3	0
Per cent	9	6	5	37	22	11	11	100		
Other										
Frequency	2	0	0	0	0	0	0	2	1.0	0
Per cent	100	0	0	0	0	0	0	100		

B1 The contribution of modified conventional management to the following outcomes

	1 Low	2	3	4	5	6	7 High	n	Mean	Don't know
Traceable product										
Frequency	3	0	2	7	7	22	22	63	5.7	6
Per cent	5	0	3	11	11	35	35	100		
Quality product										
Frequency	3	0	1	6	13	17	26	66	5.7	4
Per cent	5	0	2	9	20	26	39	100		
Personal challenge										
Frequency	2	0	1	10	10	28	12	63	5.5	6
Per cent	3	0	2	16	16	44	19	100		
Personal satisfaction										
Frequency	2	0	1	8	10	16	24	61	5.8	8
Per cent	3	0	2	13	16	26	39	100		
Meeting customers' demands										
Frequency	2	0	2	6	9	24	20	63	5.7	1
Per cent	3	0	3	10	14	38	32	100		
Low input costs										
Frequency	4	2	6	12	16	10	12	62	4.8	6
Per cent	6	3	10	19	26	16	19	100		
Price premiums										
Frequency	3	2	1	14	19	10	15	64	5.1	4
Per cent	5	3	2	22	30	16	23	100		
Market security										
Frequency	4	1	2	11	11	18	15	62	5.2	8
Per cent	6	2	3	18	18	29	24	100		
Market access										
Frequency	3	2	2	10	10	16	21	64	5.4	7
Per cent	5	3	3	16	16	25	33	100		
Improving biodiversity (the number and type of productive and unproductive species)										
Frequency	3	0	5	13	11	15	10	57	5.0	7
Per cent	5	0	9	23	19	26	18	100		
Improving the environment										
Frequency	1	0	2	8	20	15	17	63	5.5	2
Per cent	2	0	3	13	32	24	27	100		
Other										
Frequency	1	0	1	0	0	0	0	2	2.0	0
Per cent	50	0	50	0	0	0	0	100		

B1 The contribution of organic management to the following outcomes

	1 Low	2	3	4	5	6	7 High	n	Mean	Don't know
Traceable product										
Frequency	4	2	2	4	8	12	20	52	5.4	8
Per cent	8	4	4	8	15	23	38	100		
Quality product										
Frequency	4	6	3	6	9	13	13	54	4.9	5
Per cent	7	11	6	11	17	24	24	100		
Personal challenge										
Frequency	3	3	1	3	6	17	24	57	5.7	6
Per cent	5	5	2	5	11	30	42	100		
Personal satisfaction										
Frequency	4	6	2	4	6	8	20	50	5.1	12
Per cent	8	12	4	8	12	16	40	100		
Meeting customers' demands										
Frequency	2	3	0	8	2	17	22	54	5.7	8
Per cent	4	6	0	15	4	31	41	100		
Low input costs										
Frequency	8	4	3	7	8	9	16	55	4.7	5
Per cent	15	7	5	13	15	16	29	100		
Price premiums										
Frequency	2	1	0	5	7	26	18	59	5.8	3
Per cent	3	2	0	8	12	44	31	100		
Market security										
Frequency	3	2	0	11	9	17	13	55	5.2	5
Per cent	5	4	0	20	16	31	24	100		
Market access										
Frequency	2	2	1	8	9	11	22	55	5.6	6
Per cent	4	4	2	15	16	20	40	100		
Improving biodiversity (the number and type of productive and unproductive species)										
Frequency	1	2	5	15	4	9	13	49	5.0	8
Per cent	2	4	10	31	8	18	27	100		
Improving the environment										
Frequency	2	1	3	7	8	14	22	57	5.6	1
Per cent	4	2	5	12	14	25	39	100		
Other										
Frequency	1	0	0	0	0	0	1	2	4.0	0
Per cent	50	0	0	0	0	0	50	100		