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New Zealand Farmer and Grower Attitude and Opinion Survey:

Analysis by Sector and Management System

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Summary

General sketch of New Zealand farmers

In general, farmers in the survey were mainly male (88 per cent), 56 years old and Christian. Eighty per cent were with a spouse and 45 per cent had a child or children living in their household. Most were from a rural background, one third was bought up on the farm, and for a further one third their upbringing was from less than 100 kilometres away from their farm. From 23 to 35 per cent stated that they had a successor to take over the farm. Farmers had been on the farm for 23 years, they were satisfied with farming, and in five years they still planned to be farming with most income from farm work. From 11 to 20 per cent of household food was sourced from the farm. One third of farmers had off-farm work, on average for 35 hours per week, and the average off-farm income was $50,000. Typically the farmer made the key decisions but 19 per cent had a manager making key decisions.

The farmers used a variety of quality assurance management systems and generally agreed that they were important for the sustainability of New Zealand's primary production. They were not keen on using GMOs, were neutral about using organic methods, and were slightly positive about using integrated management. Farmers stated that they were moderately dependent on chemicals and fertilisers; those with stronger intention to use organic practices were less dependent on chemicals and fertilisers. They believed that some environmental conditions have improved in the last five years. Most felt that they were part of their land, and most had a cultured view of nature – seeing that humans were part of nature rather than seeing humans as separate from nature. The farming practices rated most important referred to using farm and local knowledge, recognising social needs, acknowledging natural cycles and respecting livestock and plants.

Sector differences

In terms of sector differences, dairy farmers had smaller farms, higher incomes, less off-farm work and a higher proportion with a successor. More dairy farmers assessed the future as bright or very bright and more saw themselves as still farming in five years' time. More horticulturalists had attended short courses. Horticulturalists had more use of quality assurance systems and a stronger intention to use them in future. They stated that they were more dependent on chemicals and fertilisers. Horticulturalists expressed more support for the principles of supporting and enhancing things that influence ecosystem quality and pest control using natural enemies. They also expressed more disagreement with the pure nature viewpoint indicating that they were more disposed to the cultured nature viewpoint.

Management system differences

Organic farmers had higher levels of education. This was definitely the case in horticulture with a suggestion that this also applied in sheep/beef and dairying. Organic farmers most strongly favoured using quality assurance management systems, had a strong intention to use organic methods and not to use GMOs. They favoured the pragmatic and committed organic farming positions, were dependent on composts, manures, and organic remedies, and produced greater proportion of household food from their farms. They were more positive about the future and were neutral about environmental conditions five years ago, and when compared to the present reported a larger improvement in environment conditions. Organic farmers gave more emphasis to practices involving microbes and soil, maintaining diversity, natural enemies and avoiding dependency on external inputs. More organic dairy farmers agreed that their land is mysterious. They definitely agreed with the nature's revenge environmental position and definitely disagreed with the technological optimism position. Only sheep/beef organic farmers showed some support for the pure nature viewpoint.

Chapter 1
Introduction: Background, Objectives and Outline

1.1 Background

The core of the ARGOS research design is a longitudinal panel study. Panels of 12 farms were selected to represent conventional, integrated and organic management for the sheep/beef sector, Kiwigreen, gold and organic 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 of production from environmental, economic and social points of view and the design rests on testing the null hypothesis that there is no difference between management systems. Farms in the panels were generally typical of their sectors in terms of obvious characteristics such as size[1], level of production etc. Farms from a range of geographies and with different levels of intensity of production were chosen in order to achieve results that would be applicable to a broad range of farms.

Behind this design is the assumption that the panels are reasonably representative of the sectors to which they belong. To test this assumption, it was necessary to survey both the panels and the various sectors making up agricultural production in New Zealand, gathering data on a number of dimensions of farming in order to make comparisons. A companion report, entitled 'The Representativeness of ARGOS Panels and Panel Comparisons', addresses the issue of how well the panels represent their sectors.

The survey provides the means to examine farmer attitudes and practices more broadly and to assess what differences may occur in the different sectors and for farms under different management systems. It is important to note that the requirements for testing the panels has had important affects on the design of the surveys, a point that will be elaborated in Chapter 2.

1.2 Research Aim and Objectives

The survey research investigates farming generally and makes assessments of a number of issues relating to the sustainability of farming. 'Sustainability' is a concept widely used in debates about the wise use of the world's finite, renewable and undiscovered resources. The term and associated ideas have gained credence along with realisation that many seemingly common global resources will become scarce or that some seemingly abundant energy sources (e.g., coal) have prohibitive pollution costs. Sustainability as a concept has breadth, depth and complexity as it can involve conservation, innovation and concerns over the welfare of future generations. Because it can be difficult, for example, to both conserve and foster new things while considering the priorities, needs and welfare of future generations, sustainability is difficult to define. Because it may not be useful to use the word 'sustainability' if specific definitions are needed, in this report it is used as a covering term for a range of ways of talking and thinking, and a range of ideas relating to the wise management of both resources and the environment with a long-term view in mind.

These investigations were conducted using the data from a national survey. The questionnaire used was developed with contributions from the team of ARGOS researchers drawing from a number of issues in the literature with a view to establishing some knowledge about farmers' attitudes, beliefs and practices.

[1] The size of farms was limited by the need to match non-organic farms with the available organic farms and in some cases organic farms were smaller than the industry average.

The survey generated a large amount of data. In order to make the results easier to comprehend we have presented them in three separate outputs, as follows:

1. Analysis of agriculture generally by focussing on the three main sectors (sheep/beef, dairy and horticulture) and the three main management systems (conventional, integrated and organic), this report.
2. Analysis of the kiwifruit sector comparing gold, green and organic production.
3. Further analysis of the survey data.

The first two outputs systematically cover all the questions in the questionnaire and therefore give an account of attitudes, beliefs and practices that relate to the general theme of sustainability. They are presented as ARGOS research reports. The latter output builds on the first report and provides some detailed analysis and interpretation of the data in order to provide greater insight into farmers' thinking. It is intended to be published later as an article.

The specific research objective addressed in this report is to assess the main primary production sectors (sheep/beef, dairy and horticulture) on a number of topical dimensions. In addition, a related objective is to assess each of the three sectors by management system (conventional, integrated management, and organic). The general focus of this report is on a largely descriptive account of the results but providing analysis, where appropriate, of relationships among the variables. The aim is to provide a summary sketch of farmers generally, to give an account of sector differences and to give an account of management system differences. Some attention is given to interpreting the results in terms of these differences, the character of family farming and succession. This report is largely descriptive and does not provide detailed interpretation of the results. It is important to publish this report, even if in modest terms, in order to make the core results available to the farming industry.

1.3 Outline of report

Chapter 2 gives an account of the considerations relating to the design of the research, the questionnaire and the survey details. Chapter 3 presents the results starting with the sectors then covering the management systems. Finally, Chapter 4 summarises the results and presents some general points of discussion.

Chapter 2
Survey Design and Methods

2.1 Introduction

A self administered postal questionnaire was used to collect data from farmers in New Zealand. In this chapter detail is provided about the construction and design of the questionnaire followed by response rates for the various farm sectors.

2.2 The questionnaire

A number of ARGOS researchers contributed to the development of the questionnaire. The subject matter for questions was open to a range of topics considered important across all ARGOS objectives. The overall scope of the questions fitted within the rubric of sustainability and this theme was used to order the items and provide some coherence to the questionnaire. The following sub-sections review each part of the questionnaire. At this point the aim is to introduce the questions. In Chapter 3 when the results are presented some more explanation of the rationale for the questions will be provided.

The questionnaire comprised a 12 page A4 booklet with printing on both sides of each page. A copy of the questionnaire is provided in the appendix. A separate covering letter introduced the questionnaire and explained the purpose of the study.

The general layout and format of the questionnaire followed an established design from earlier national surveys of farmers and growers (e.g., Cook, et al., 2000; Fairweather, et al., 2003). The questionnaire requested approximately 150 responses, depending upon the particular situation of each respondent. This size of the questionnaire in terms of the number of responses may have been slightly above the number generally considered necessary to obtain a good rate of returned questionnaires as well as a greater proportion of fully completed questionnaires (e.g., Dillman, 2000). The use of an established layout and design from earlier studies suggested the questionnaire would be easy to understand.

To pre-test the questionnaire 16 people involved in farming completed a draft of the questionnaire and subsequently provided their thoughts and opinions on its content and structure. Only minor changes were made prior to finalising the questionnaire. The finalised questionnaire was posted on August 12th, 2005 and a reminder postcard was sent to encourage further responses on September 20th, 2005.

General questions

The questionnaire began with Section A, a set of general questions about the respondent's background to farming or growing.

First, an enquiry was made regarding whether the respondent's background was either one of four presented options. The options were 'mainly farming', 'rural non farm or orchard', 'mainly horticultural' and 'urban'. Second, the distance to the main location of the respondent's upbringing was measured using four categories. The categories ranged from 'on this farm or orchard' to '100 kilometres or further'.

In an enquiry targeted at determining how the farm or orchard came to be owned by the present owner, the importance of various means of ownership were sought. Measurements on five point scales of importance/unimportance were taken for each of six factors including inheritance and various means of borrowing. An 'other' category was included with provision

for specifying what means of ownership this referred to. In addition, to further clarify the importance of succession, respondents were asked to indicate whether there was a successor who would eventually take over their farm or orchard.

A further general question asked how many years the respondent had managed, owned or been associated with their farm or orchard. Also, for a simple point of clarification, respondents were asked if they lived on their farm or orchard.

To ascertain who had the role of key decision maker, a question set presented a number of options and combinations of options including farm or orchard operators and family owners as well as an 'other' category.

Farm or orchard management system

Section B began with a series of questions to enable a comprehensive assessment of current management systems and intentions to use management systems. First, a question set was presented to ascertain current use of and percentage of gross revenue from the current management system as well as intentions to use particular management systems. Nineteen currently available management systems were listed as well as options for 'other' management systems.

To more clearly ascertain future plans of farmers, immediately following the management system question was a question designed to examine in detail, intentions to use any management system over the next ten years. In addition, further inquiry was made of the general importance of management systems for the sustainability of New Zealand's primary production.

Of similar design to the question regarding intentions to use management systems were three questions designed to respectively measure intentions to use genetically modified plants or animals, intentions to use organic methods and intentions to use integrated management. Intentions to use genetically modified plants and intentions to use organic methods have been measured in previous national surveys of farmers and growers (Cook, et al., 2000; Fairweather, et al., 2003). The inclusion of these questions enabled comparison over time of responses to these topical issues.

A question set was then used to ascertain reasons for accepting or rejecting alternative management systems. Five statements related to the use of these systems were presented for the agreement or disagreement of respondents. The statements were directly related to the conclusions of Darnhofer et al. (2005) who documented reasons for converting to organic farming by Austrian farmers. The study led to the identification of five types of farmers: 'committed conventional', 'pragmatic conventional', 'environment-conscious but not organic', 'pragmatic organic' and the 'committed organic'. The discussion of each type enabled a short summary to be prepared which encapsulated the key attributes of each type. After confirming with the lead author that the summary was accurate, each was used in the questionnaire. A rating of each summary was sought rather than the selection of the one that respondents thought best represented their view. This was done because it was possible that some respondents would not clearly identify with just one position and hence an assessment of each statement would allow for more subtle assessments at the same time it would still be possible to identify which one was most strongly identified with where this was indicated.

Dependency on chemicals fertilisers and a number of organic practices was then measured. These questions were designed to provide an indicator of reliance on agrichemicals which could then be compared to organic methods to replace or reduce the use of chemicals. A five point dependency scale was used to measure these responses.

To determine the level of farm or orchard produce consumed by the respondent's household, percentages of household food obtained from the farm or orchard was gathered. Similarly, the percentage of household food sourced from hunting, fishing, or gathering was also measured.

A general measure of satisfaction was taken on a five point-scale anchored by 'very dissatisfied' and 'very satisfied'. A further question measured future prospects for the respondent's farm or orchard with a measurement taken on a five point 'very bleak' to 'very bright' scale. Further details of future expectations for five years time was presented as options which included 'still farming, with most income from farm work' and 'land sold and working in another job' as well as an 'other' option.

Farm or orchard environment
Section C included measures of the physical environment of the farm or orchard.

The first question set was designed to measure perceived changes in aspects of the environment by recording the 'condition at present' with the 'condition five years previously'. On a five point 'excellent' to 'poor' scale general conditions of soil health, exotic species diversity, stream health and native species diversity were measured both at present and at an estimated condition five years previously.

Farm or orchard practices
Section D on 'farm or orchard practices' contained a question set measuring the importance of 15 practices. This question set was derived from Milestad and Darnhofer's (2003) consideration of three elements of organic orientation applied to the farm level, including: the amount of change the system can undergo while maintaining its functions and structure, the degree of self organization, and the capacity for learning and adaptation. The components of each element were then considered against the IFOAM basic standards to show that organic farming has a number of promising characteristics for building organic orientation. Milestad and Darnhofer produced a summary table which showed the characteristics of farm organic orientation and the matched aspects of the IFOAM basic standards. This table provided the means to develop a list of questions to assess New Zealand farmers' assessment of the importance of organic practices. Since the IFOAM basic standards specify actual on-farm practices, it was possible to frame each standard as a farm practice and ask respondents how important each was.

All practices were in some way related to organic or 'green' production as indicated by the IFOAM standards, although it was expected that conventional farmers or growers may have undertaken the practices as part of their normal farm or orchard management. Thus the practices are not definitive as distinguishing organic farming and do not preclude the kinds of practices undertaken by conventional farmers. We have labelled the practices as 'organic practices' in order to indicate the context of our enquiry. At the least, they are the minimum standard set by IFOAM. The point is not so much the provision of definitive criteria but of practices that might get a different response from organic and conventional farmers. We hypothesised that farmers with an organic orientation would rate these statements as more important.

Relationship to the land
Five questions were used to measure respondent relationships with the land (Section E). Each asked for a simple 'yes' or 'no' response and, because of the possibility of respondents being presented with an unfamiliar line of questioning, respondents could choose to indicate they were uncertain. Respondents were asked whether they felt a part of their land, whether they could sense when all is well with their land and whether there was a mysterious or unknowable aspect to their land. Respondents were also asked if they believed they had a relationship with their land after their death, assuming the respondent or a family member still

owned the land and whether they believed they would have relationship with their land after death, assuming the land had been sold.

Maori Connections
Six questions enquired about relationships with local Maori (Section F). First, a question sought evidence of the respondent's family relationships with Maori in the past and whether this relationship was positive or negative. Second, an enquiry was made of knowledge of Maori battles, old pathways and former pä sites near or on the respondent's land. Respondents were asked if they knew Maori names of rivers or mountains in their locality as well as the stories behind these names. It was also asked whether the respondent was a Maori descendant, whether they had a relationship with Maori, and whether they were actively involved with an iwi or hapu. Together these questions were designed to enable a view of relationships with local Maori to be developed.

Wetlands
A focus was taken on the use of wetlands using two sets containing four questions each (Section G). Respondents were asked to rate the importance of recreational and sporting activities as well as simply looking at, and presumably appreciating, wetlands. In addition, where applicable, the importance of four possible barriers to wetland development on the respondent's properties were measured.

Nature
The six questions in Section H measured attitudes towards nature. These questions reflect a distinction between conceptions of pure nature versus cultured nature (Newton et al., 2002). The first question represented the idea that interfering with nature could be disastrous. The second question suggested that people had the ingenuity to fix problems with nature and another suggested that human beings were themselves a part of nature. Three further questions were designed to ascertain the degree to which respondents thought their properties were manmade as opposed to being natural.

Farming Information
A further section (I) measured farm information including the size of the orchard or farm and the predominant farming activity. Gross revenue was also measured both for the previous year as well as an estimate for the 2004-5 financial year.

Demographic information
Seven questions gathered demographic information about the survey respondents (Section J). The questions were designed to gather data sufficient for testing the representativeness of the survey sample against New Zealand census data. The question about religious beliefs departed more than the other questions from census questions by including 'agnostic', 'atheist' and 'spiritual but not religious'. Of note, this question did not ask for adherence to a particular denomination but was a more general inquiry of religious beliefs. The remaining questions recorded age, gender, ethnicity, province in which the farm or orchard is located, household size and composition, and education. Further measures were taken of tertiary agricultural or horticultural qualifications and an open response was sought to gauge the respondents' perceptions of the importance of such qualifications. Participation in any off-farm/off-orchard employment was measured and details were taken of the type and years of off-farm work. To further clarify this aspect, off-farm work respondents were asked to indicate whether they had any off-farm or off-orchard employment in the last year as well as the approximate income obtained from this source, hours per week worked off-farm or off-orchard, and reasons for off-farm/orchard employment.

2.3 Sampling and response rates

The sampling in this study has some unusual characteristics compared to normal surveys. As noted in Chapter 1, the surveying was part of a broader research goal of assessing the

representativeness of the ARGOS panels. This meant that for each ARGOS panel it was necessary to obtain a sample for the respective sector of sufficient size to allow good comparisons to be made. In addition, if we used a simple random sample of farmers and horticulturalists in New Zealand there would not have been sufficient number of kiwifruit orchardists[2] and for this reason the design included a specific survey of the kiwifruit sector. The same considerations applied to the organic sector. The objective of comparing management systems within sectors required a specific survey of registered organic farms in order to have sufficient numbers on which to base a comparison. In this case all registered organic farmers were surveyed.

We requested a proportionate stratified sample of 2,000 farms across each of the five main farming sectors using a classification of farms into types of production but excluding those classified as lifestyle properties. A proportionate stratified sample means that the proportion of subjects in each category is the same as the population. Such a sample would have automatically covered the different numbers of farms in each sector, allowed for inference to the farm population as a whole, and provided sufficient numbers of farms in each of the main sectors. However, Quotable Value supplied a simple random sample of 400 from each of the main categories. The sample supplied does allow us to study each sector adequately but prevents us from making easy inferences to the population. In effect, the design is really a series of separate sector studies. The similar levels of numbers in each sector sample allows for good statistical comparisons.

For registered organic farmers the lists of all those registered under BioGro and AgriQuality were provided by the respective organisations and so a questionnaire was sent to the entire population. (For the sheep/beef sector the 12 organic ARGOS farmers were excluded from this post out. There was no ARGOS dairy panel at this time.) Table 1 shows that the response rates ranged from 49 to 74 per cent giving an overall response rate of 53 per cent. Each organisation provided a letter of support for the survey and this was very likely to have contributed to the high response rate.

Table 1: Registered organic population in 2005 (excluding kiwifruit) and sample numbers by sector

	S/B	Dairy	Hort	Other	Sum
Population - BioGro	33	20	93	15	161
Population- AgriQuality	36	19	35	12	102
Subtotal	69	39	128	27	263
	less 12				
Target population	57	39	128	27	251
No. of responses	28	23	63	20	134
Response rate (%)	49	59	49	74	53

In summary, it is then best to look at this study as a collection of separate surveys, one for each sector with specific surveys of registered organic farmers. In the data presentations that follow there is therefore no summation across the sectors to avoid inference to the overall farming population.

[2] There are 2,549 kiwifruit orchards and 12,083 horticultural properties in total, so kiwifruit orchardists are 21 per cent of the total. The sample of 123 horticulturalists (from Table 2 above) would have included 25 kiwifruit orchardists.

Details of the post out and response rates are provided in Table 1 for those involved in organic production and Table 2 for other farmers. Not shown in the tables are the numbers of letters explaining why a respondent had not completed the questionnaire. Fifteen letters were received from people who were elderly, disabled or had retired from farming. Two had refused to answer the questionnaire because they felt it was 'too green'. One considered it too complicated and one had no time to complete the questionnaire. The replies from those no longer farming or elderly suggest the postal list was somewhat out of date.

For New Zealand farming as a whole Quotable Value data for farm types were used. Table 2 shows the relevant data for the population numbers and samples. Note that these data include both 'units' (a farm supporting one family) and 'other' (substantially unimproved or with homestead and buildings but not an economic size). The former are definitely farms but the latter are often smaller parcels associated with the former. In some cases single farms are made up of more than one unit. The response rate was consistent across the three main sectors at about 32 per cent.

Table 2: New Zealand farming population (June 2005) and sample numbers by major farm type

	S/B	Dairy	Hort	Other farm types	Total
Units	10,767	10,374	6,947	4,049	32,137
Other	46,164	15,601	5,135	3,901	70,801
Total	56,931	25,975	12,082	7,950	102,938
Proportion of population	0.55	0.25	0.12	0.08	1.00
Original target sample	1,106	505	235	154	2,000
Sample as supplied	400	400	400	800	2,000
Actual sample	131	127	123	150	531
Response rate (%)	33	32	31	19	27

The 'other' category includes specialist livestock and arable farms, two quite different types of farming. The other category has not been reported in this study for the following reasons: (1) they are a small proportion (eight per cent) of the New Zealand agricultural production, (2) they had a lower response rate and (3) including another major category would have made the tables overly complex.

The particular demand of the research objectives on the sampling has some important implications. The first is the need to avoid sending duplicate questionnaires to the one farm household. Duplicate questionnaires have the potential to complicate the surveying procedure and may have affected the response rate, either positively or negatively. Therefore since the sample provided for the sector surveys included kiwifruit orchards, the lists were checked and all such orchards were removed. The same procedure was applied for the registered organic farmers. The second implication is that ideally some of the farms or orchards in the specific sector surveys that had been removed should be put back in with the main samples in order to make the main samples complete. However, while this could be done, it would have made for more complexity in what are already quite complex samples. Further, in presenting results, in some cases the 'corrected' samples would be used but in some cases they would not, and in some comparisons these farms would be in both of the groups being compared.

Consequently, the horticulture data presented in this report is for horticulture excluding kiwifruit. This fact leads to the question of whether kiwifruit is similar of different from

orcharding generally. If it is similar, then the horticulture data reported here can be taken as a reasonable indicator of horticulture generally. The report on the kiwifruit sector makes this comparison and concludes that kiwifruit, while sharing some characteristics, is also distinctive in some ways. Thus the horticulture results presented here may not be completely faithful representation of all of horticulture, that is, horticulture including kiwifruit. Similarly, the sector results are based on samples that do not contain registered organic farmers. In this case, since the number of such farmers is very low, at about one per cent of all farmers, it is not expected that this omission has any significant effect on the results.

2.4 Sample representativeness

In previous AERU farm surveys, we have found that when the sample is compared to known characteristics of the farm population, preferably taken from the same source as the sample, the sample gives a good match on many farm characteristics. In some cases the match is not perfect and where there is some deviation, typically on farm size, it is because more full-time farmers tend to respond to the questionnaire. We accept that a questionnaire seeking details about current farming would not appeal to small-scale farmers who are preoccupied with other activities. This bias towards full-time farmers has occurred in this survey. Table 3 shows the average size of farms in the complete sample compared to the average for the sample for those who responded. The data show that the farm sizes for the actual sample are much larger, indicating that more full-time farmers responded to the questionnaire.

Table 3: Average farm size by sector for the complete sample and the sample for those who responded

Farm type	Total sample average size (ha)	Actual sample average size (ha)
Sheep/beef	191	464
Dairy	100	187
Horticulture	12	34

2.5 Statistical Analysis

The analysis of the questionnaire data used the usual methods – frequencies, cross tabulations and ANOVAs. Most questions in the questionnaire used categorical data and a major assumption is made in treating this data as continuous for analysis purposes. This approach reduces the amount of data that needs to be included in each table thus avoiding the use of very complex and large tables. The robustness of the normal distribution is also assumed. It also enables us to produce statistically significant differences between means whereas just using the perhaps more appropriate chi-squared tests on cross-tabulations only shows up relationships between variables which are far more difficult to express succinctly. Sometimes the tests between three means showed that the variances were not homogenous and in this instance Tamahere's T2 Test was used which just compares two means at a time using each variance separately rather than producing a variance calculated from the three groups. Hence, Tamahere's T2 Test is very conservative due to its limitation on the degrees of freedom compared with the original, and significances that would show up initially disappear. In addition it is worth noting that some means may appear to be obviously different but sometimes the sample sizes are so different, are not statistically significant because the samples sizes and variances are different.

It is sometimes useful for questions that use five point scales to look at the frequencies for each point in the scale rather than just referring to the mean score across the five point scale. However, to provide these numbers in every case would make all the relevant tables

quite complex and they would take up more space than is currently used – for tables that are already large since they have, usually, a breakdown into three categories. Partly for this pragmatic reason, but mainly because tests with means are better statistically, we have chosen to work with means only, rather than frequencies. Recall that our research objectives entail testing the data to determine if there are differences across sectors or differences across management system. We acknowledge that means are not perfect and do not necessarily reflect all the characteristics of the data. However, this approach is directly relevant to our research objectives. We also acknowledge that in using means we are making assumptions about the nature of data from Likert scales which, while defensible, may not be agreeable to all researchers.

To help put the means in perspective, the following data in Table 3a illustrate the relationship between mean and frequency data in this particular case. The analysis shows that the average for sheep/beef and dairy is significantly different from horticulture. The mean for horticulture is two while for the other two sectors it is just over 2.5. The data in the table show that the mean of two for horticulture corresponds with 44 (38 per cent) of horticultural respondents who selected strong intention to use any management system compared to only 11 and 12 (nine and ten per cent) for the other sectors. The general point is that a mean score at just one point away from neutral (three) requires significant numbers of respondents to choose the extreme point on the scale, in this example, strong intention to use.

Table 3a: Intention to use any management system in the next ten years

	S/B	**Dairy**	**Hort**	
1=strong intention to use	11	12	44	67
2=Intention to use	37	49	41	127
3=No intention either way	61	44	21	126
4 & 5 Intend not to use/Strong intention not to use	15	12	10	37
Sum	124	117	116	357
Average	2.66[a]	2.54[a]	1.99[b]	
Chi square 53.4, df 6, p 0.00				

Chapter 3
Results

3.1 Introduction

This chapter starts with analysis of the similarities and differences for each of the sectors studied – sheep/beef, dairy and horticulture. The effect of the management system – conventional, integrated and organic – and how this may vary across sectors is then considered. The order of presentation reflects the order of questions asked in the questionnaire. Note that the presentation excludes data from organic farmers in order to prevent skewing the results in each sector, since the organic sample has a larger proportion of respondents than is present in the sector populations. The results for kiwifruit orchardists are included in a separate report.

3.2 Analysis of the sheep/beef, dairy and horticulture sectors

This section focuses on the three separate samples for the sheep/beef (n = 131), dairy (n = 127) and horticultural sectors (n = 123). In most cases data are presented for each sector to enable comparisons. In a few cases, especially where the results are similar for each sector, the average across the sectors is reported in order to simplify the presentation. This should not be taken to suggest that this average is typical of farming as a whole.

General character of the farms and farmer profile

Table 4 shows some data which give a general idea of the character of the farms for the sample in each sector. Sheep/beef farms were largest and horticulture units were smallest. Dairy farms had the highest average gross revenue and the smallest proportion with off-farm income for the previous year. Both sheep/beef and horticulture had average gross revenues about one half of the dairy farms, and presumably these lower incomes were a factor in deciding to have off-farm income. For both of these sectors 35 per cent had off-farm income in the last year while the dairy sector reported 14 per cent showing a significant relationship across the sectors with far fewer dairy farmers involved in off-farm work (Chi-squared test = 20.9, d.f. = 4, p = 0.000). Those with off-farm work claimed an average annual off-farm income before tax ranging from $43,000 to $55,000 across sectors and worked from 31 to 39 hours per week on average off-farm. When asked to rate each of six reasons for off-farm income (not shown in the table), the most highly rated reasons were personal interest (3.8, quite important) and as a secondary income source (3.3, neutral to important).

Table 4: Profile for sheep/beef, dairy and horticulture farms sampled – farm information

Farm type	Average farm size (ha)	Average gross revenue 2003-4 ($)	Percentage with off-farm income in last year	Average off-farm income 2003-4 ($)	Average hours worked off-farm per week
Sheep/beef	237[3]	176,285[a]	35	55,206	31
Dairy	187	382,390[b]	14	43,078	38
Horticulture	34	187,225[a]	35	51,498	39

Notes: 1. If two numbers bear different letters they are significantly different ($p < 0.05$).
2. A very large farm has been removed from the sheep/beef data to avoid distortion.

Table 5 shows data which give an indication of the farmers' profile. Most of the respondents were men, most expressed Christian religious beliefs and almost all declared themselves to be New Zealand Europeans. Farmers from all three sectors had similar average ages, ranging from 55 to 57 years old. Other data show that for all three sectors combined, when asked which people lived in their household, 87 per cent reported husband, wife or partner, and 45 per cent reported son(s) and/or daughter(s).

Table 5: Profile for sheep/beef, dairy and horticulture farmers sampled – personal information

Farm type	Percentage of male respondents	Percentage declaring Christian religious beliefs	Percentage declaring N Z European ethnicity	Average age
Sheep/beef	88	56	96	56
Dairy	88	68	97	55
Horticulture	89	54	92	57

Table 6 shows the educational attainment of the farmers and horticulturalists sampled. There was no significant relationship between the sector and the distribution of qualifications. Those who left school without attaining any qualifications ranged from nearly one third for dairy farmers to around 20 per cent of the sheep/beef farmers and horticulturalists. Thirty-nine per cent of the sheep and beef farmers had school qualifications. There were similar percentages with technical, undergraduate and graduate qualifications across each sector. An additional question asked about agricultural or horticultural qualifications. The relationship between sector and participation in short courses was very significant (Chi-square test = 10.01, d.f. = 2, $p = 0.007$): 66 per cent of horticulturalists had attended short courses compared with 52 per cent of sheep/beef farmers and 44 per cent of dairy farmers.

[3] An outlier of 30,000 ha has been removed from this calculation.

Table 6: Profile for sheep/beef, dairy and horticulture farmers sampled – highest level of education completed

Management system	Percentage who attended secondary school but left without qualifications	Percentage who attended secondary school and left with qualifications	Percentage with a technical trade certificate	Percentage with undergrad diploma or certificate	Percentage with university qualification	Total (N)
Sheep/beef	19	39	13	8	21	131
Dairy	31	30	14	9	17	126
Horticulture	22	29	17	11	22	121

Background questions

From data gathered at the start of the questionnaire, most of the respondents were from a rural background. Averaging across the three sectors, 87 per cent were from a mainly farming or horticultural background while nine per cent were from an urban background. One third of all respondents had their upbringing on the farm or orchard, but for nearly one third the distance to the main location of their upbringing was more than 100 kilometres away. The remaining one third were within 100 kilometres.

Question 3 asked about the importance of a number of factors in enabling the farm or orchard to be owned by the present owner. Inherited land, succession of lease, money from other farming business, money made from outside farming and borrowing from family were all rated according to importance (range 1 = very unimportant to 5 = very important). Borrowing from the bank was more important than the other factors, receiving an average score of 3.9, meaning important. Dairy farmers rated it significantly higher with a score of 4.2 meaning borrowing from the bank was more important for them than for those in the other two sectors.

When asked if there was a successor who wanted to take over the farm or orchard, for sheep/beef and horticulture there were 23 per cent who said 'yes', while for dairy there were 35 per cent who said 'yes' (Chi square = 8.9, P=0.065).

The farmers and horticulturalists surveyed have owned or been associated with their current farm or orchard for many years. The overall average was 23 years. Sheep/beef farmers at 24 years had a statistically significantly higher age compared to 20 years for horticulturalists. Most respondents (91 per cent) lived on their farm or orchard. For most (80 per cent) it was mainly the principal farm/orchard operator who made the key decisions on the farm or orchard, although two thirds stated that it was both the spouse or partner and the farm/orchard operator together, and 20 per cent stated that the farm family including parents and children who made the key decisions.[4] On average, 19 per cent of the farms had a farm manager making key decisions.

Farm or orchard management system

Farmers can use a variety of management systems on their farms, applied either to the whole farm or to part or their farm. These systems usually relate to environmental management or to quality assurance of some type. To date, there has been no systematic attempt to assess the proportion of NZ farmers using market audited or industry accredited

[4] Note that these totals do not add together in a simple way. This is due to these questions being asked separately so some people responded positively to more than one of them.

management schemes. This survey was the first such attempt to judge the scale and extent of such systems.

The question on management system sought to record which management system was being used, how much of the gross revenue was covered by that system and to ask if the respondents intended to use it in future. Table 7 shows the frequency for each management system. Data from Statistics New Zealand were used to get an idea of the population size for each sector because their data give a more accurate estimate than the Quotable Value data used to procure the samples. Please note that the population estimate has a standard error ranging from plus or minus four per cent for proportions near to one per cent, to plus or minus seven per cent for proportions near 50 per cent.

Table 7 indicates that there were few farms involved in the first four management systems (Green tick, Organic Standard-Demeter, Project Green, Smartplan). However, for sheep/beef there was two per cent of the sample who used Green Tick, hence an estimated 521 farmers in the sector used it. Sustainable Wine growing was used by a small proportion of horticulturalists. Market Focused, which emphasises environmental sustainability, was more common in terms of numbers and occurred mainly in the two livestock sectors. Nearly 40 per cent of horticulturalists stated that they used KiwiGreen, an integrated management system compulsory for those in kiwifruit production. Since kiwifruit orchardists were excluded from the survey of horticulture, this response reflects that some horticulturalists have part of their orchard operation in kiwifruit but they are classified as some other type of horticulture. The very small number in dairy and sheep/beef would be due to the occurrence of some kiwifruit production on these farms. EUREPGAP, which only recently has been able to be applied to sheep/beef and dairy as well as horticulture, was nevertheless most common for horticulture. An estimated 6,012 horticulturalists participated in this certification system which is the most frequently used (47 per cent) of any. The NZ Fresh Produce Approved Supplier Programme applied to 17 per cent of horticulturalists. From five to six per cent of sheep/beef farms used DeerQA, AFFCO Select or the FernMark Quality Programme. Eight per cent of horticulturalists used Pipfruit Integrated Fruit Production. The Agrichemical Code of Practice and Fertiliser Code of Practice were relatively commonly used in each of the three sectors at between 17 and 38 per cent. The Fertiliser Code of Practice was the management system with the largest following in sheep/beef (23 per cent) and dairy (35 per cent) and was the fourth most important system for horticulture. The Agrichemical Code of Practice was important for horticulture where it was used by 38 per cent. Some farms in each sector used the Fertmark management system. Among the other systems used, there was a modest proportion of sheep/beef farmers (16 per cent) who nominated something for lambs. Inspection of the data showed that most respondents merely indicated that they used another system while those that did specify it identified the Alliance assurance programme. There were 12 per cent who referred to other systems for horticulture and these included mainly AvoGreen. (Note that these responses do not have to be mutually exclusive. For example, all kiwifruit production will be both KiwiGreen and EUREPGAP certified.)

Sixty-three per cent of the sheep/beef respondents did not use any of these quality assured systems and 28 per cent of them were involved in one or two. This compares with dairy in which 58 per cent were not involved but 34 per cent were involved in one or two systems. However, horticulturalists were the most involved with only 24 per cent not involved at all, 45 per cent involved in one or two and 27 per cent involved in three or four. Two horticulturalist respondents were involved in six different quality assured systems.

Overall, horticulture shows up as the most progressive in terms of using these named management systems. The table shows that horticulture has some high percentage use: not only for specific quality assurance systems such as EUREPGAP, but also for the Agrichemical Code of Practice. Only the dairy sector exceeds horticulture for its use of the Fertiliser Code of Practice.

Table 7: Farm or orchard management system in use at present

	S/B			Dairy			Hort.		
Sample size	131			127			123		
Population size	34,130			14,000			12,750		
	No.	%	Popn Est	No.	%	Popn Est	No.	%	Popn Est
Green Tick	2	2	521	1	1	110	0	0	0
Project Green	1	1	261	0	0	0	0	0	0
SmartPlan	0	0	0	0	0	0	0	0	0
Sustainable winegrowing	0	0	0	0	0	0	4	3	415
Market Focused	6	5	1,563	10	8	1,102	1	1	104
KiwiGreen	1	1	261	1	1	110	48	39	4,976
EUREPGAP	2	2	521	1	1	110	58	47	6,012
NZ Fresh Produce Approved Supplier Programme	1	1	261	1	1	110	21	17	2,177
DeerQA	8	6	2,084	1	1	110	0	0	0
AFFCO Select	6	5	1,563	1	1	110	0	0	0
FernMark Quality Programme	7	5	1,823	1	1	110	0	0	0
Pipfruit Integrated Fruit Prod.	0	0	0	0	0	0	10	8	1,037
Agrichemical Code of Practice	22	17	5,732	24	19	2,646	47	38	4,872
Fertiliser Code of Practice	30	23	7,816	44	35	4,850	34	28	3,524
FertMark	13	10	3,387	14	11	1,543	6	5	622
SpreadMark	0	0	0	0	0	0	0	0	0
Other system relating to deer	4	3	1,042	1	1	110	0	0	0
Other system relating to cattle	9	7	2,345	14	11	1,543	2	2	207
Other system relating to lambs	21	16	5,471	2	2	220	2	2	207
Other system relating to fruit	0	0	0	0	0	0	15	12	1,555
Other system	4	3	1,042	5	4	551	4	3	415

Note: the population estimates have a standard error ranging from plus or minus four per cent for proportions near to one per cent, to plus or minus seven per cent for proportions near to 50 per cent.

Intentions to use general management systems

After the respondents had indicated which management system they used by filling out the table referred to above, they were then asked about their intention to use any of these quality assurance management systems within the next ten years. This question was a way of assessing general intentions over a long time frame and used a five point measurement scale.

As shown in Table 8, there were varying intentions to use any of these systems in the next ten years among the three different sectors. The table shows that there was some interest in using any of the management systems in the sheep/beef and dairy sectors but overall these sectors were more or less ambivalent compared to the horticultural sector. Unlike these two sectors the horticultural sector tended to have a positive intention to use any of the management systems in future. In fact, there were 40 of horticultural respondents who stated that they had a strong intention to use any management system, compared to nine per cent for sheep/beef and ten per cent for dairy. This positive intention is consistent with the finding noted above that horticulture has higher usage of these quality assurance management systems.

In a further question, respondents were also asked about the importance of these management systems for the sustainability of New Zealand's primary production. Most gave some agreement to this view with the score showing that these management systems were judged by farmers in each of the sectors to be important .

Also shown in Table 8 are intentions to use GMOs, organic methods and/or integrated management systems. There was a consistent response from sheep/beef, dairy and horticultural farmers with a position between 'neutral' and 'intending not to use GMOs'. The scores were generally lower for intentions to use organic methods meaning that they were close to neutral. Intentions were more positive towards the use of integrated management than they were for organic methods - the intention score for integrated management (IM) being between 'neutral' and 'intend to use'. In this instance horticulturalists expressed a stronger intention to use integrated management than those in the other two sectors. In fact, there were 31 per cent of horticulturalists who stated that they had a strong intention compared to 12 per cent for sheep/beef and 11 per cent for dairy. These results suggest that many horticulturalists are already using IM.

Table 8: Intentions to use management systems

Intention (1=have a strong intention, 2=intend to use, 3=no intention either way, 4= intend not to use, 5=have a strong intention not to use)	**S/B**	**Dairy**	**Hort**
To use any of the (above) management systems within the next ten years	2.66[a]	2.54[a]	1.99[b]
To either use or not use genetically modified plants or animals on your farm or orchard within the next ten years, if they become available	3.48	3.25	3.40
To either use or not use organic methods on your farm or orchard within the next ten years	3.03	3.16	3.16
To either use or not use integrated management (conditions or constraints on some management practice to minimise negative impacts) on your farm or orchard within the next ten years	2.56[a]	2.56[a]	2.09[b]

Types of management strategies and values

Research on farmer decision making regarding the use of organic methods has highlighted reasons for making the decision to convert to organic production and reasons for not converting (Fairweather, 1999; Darnhofer et al. 2005). Fairweather et al. (1999) used ethnographic methods to denote two positions, committed organic and pragmatic organic, and Darnhofer et al. (2005) extended this work to derive five positions ranging from being committed to conventional management while opposed to organic alternatives through to being committed to organic alternatives as opposed to conventional methods. Each of the five positions was used to develop a short description of the position that was used in the questionnaire. In essence this question attempted to measure degrees of opposition and support for conventional and alternative management systems. The question asked each position to be assessed on an 'agree' to 'disagree' scale. This has the advantage that each position can be rated and if a respondent agrees equally with more than one position the question can cater to this. However, it also means that, in as much as this happens, there may be respondents for whom their one preferred position cannot be stated. The question was also a little clumsy in that each option contained a number of separate elements making it hard for respondents to agree to all elements as it may have some elements with which they agreed and some with which they disagreed.

Table 9 shows the sector averages for each of the five positions. There were similar responses from those in each sector with no statistically significant differences between each sector. The general pattern is for increasing levels of disagreement working down the list but the second position has the highest score of nearly three meaning neutral. The level of support for the last two options was at or below two, meaning between strongly disagree and disagree. In general, proportionately fewer respondents tended to be positive about alternative management systems compared to the larger proportion that were opposed, and even the conventional position did not receive strong support. This question did not work well since few respondents agreed with any position. In fact only ten per cent or less agreed with each of the four statements (1, 3, 4 and 5) and 16 per cent agreed with the second. No-one strongly agreed with any statement. (This may be for the reasons already stated above.) However, as later analyses show, this question did have some use.

Table 9: Positions on alternative management systems

Item (1=strongly disagree, 2=disagree, 3= neither disagree nor agree, 4=agree, 5=strongly agree)	**S/B**	**Dairy**	**Hort**
(1) Opposed to alternative management systems (Committed Conventional)	2.49	2.67	2.49
(2) Ambivalent about alternative management systems but change is a risk (Pragmatic Conventional)	2.89	2.89	2.91
(3) Practiced alternative management systems but not formalised (Environmentally Conscious but not Organic)	2.42	2.30	2.44
(4) Positive about alternative management systems (Pragmatic Organic)	2.27	2.17	2.29
(5) Positive and committed to organic philosophy (Committed Organic)	2.00	1.87	1.97

Dependency on inputs

One of the most common associations with 'alternative' management systems concerns perceptions of either reducing inputs, or having to change from conventional to alternative inputs. This section questioned whether respondents perceived their system to be highly input dependent.

Respondents were asked to rate the dependency of their farm or orchard on seven inputs. Table 10a shows that for the first three inputs the levels of dependency were described as nearly moderately dependent to approaching 'very dependent'. Horticulturalists were significantly more dependent on chemicals for the control of pests or parasites, composts, organic remedies for the control of pests or parasites, though the latter two were very low, only approaching 'slight dependency'. Sheep/beef farmers were less dependent than the others on chemicals to control weeds. Across all sectors, manufactured fertilisers were rated at least as moderately dependent with dairy being more dependent than sheep/beef. Manures, though also being of a higher dependency to dairy farmers than sheep/beef, showed only a slight dependence overall. None of the averaged scores indicated farmers or horticulturalists were very dependent or extremely dependent on any of these inputs.

Table 10a: Assessments of farm dependency on inputs

Input (1=not dependent, 2=slightly dependent, 3=moderately dependent, 4= very dependent, 5=extremely dependent)	**S/B**	**Dairy**	**Hort**
Chemicals for the control of pests or parasites	2.68[a]	2.84[a]	3.50[b]
Chemicals for the control of weeds	2.87[a]	3.11[b]	3.12[b]
Manufactured fertilisers	3.37[a]	3.73[b]	3.53
Composts	1.34[a]	1.31[a]	2.16[b]
Manures (other than directly applied by animals)	1.69[a]	2.11[b]	1.78
Organic remedies for the control of pests or parasites	1.37[a]	1.22[a]	1.77[b]
Organic remedies for the control of weeds	1.35	1.23	1.38

The percentages of farmers rating their dependence on inputs were also of interest. For example, across each sector, 33 per cent of sheep/beef farmers said they were only slightly dependent on chemicals for the control of pests or parasites, whereas 42 per cent of dairy farms said they were moderately dependent, while 39 per cent of horticulturalists said they were very dependent with 15 per cent saying they were extremely dependent. When it came to chemicals for the control of weeds, again 33 per cent of sheep/beef farmers said they were only slightly dependent on chemicals, whereas 35 per cent of dairy farms and 34 per cent of horticulturalists said they were very dependent. When it came to manufactured fertilisers the majority of farmers across all sectors said they were very dependent. When it came to the use of composts over 70 per cent of both sheep/beef and dairy farmers said they were not dependent at all, compared with a range of dependence across horticulturalists. As far as manures were concerned over 60 per cent of sheep/beef farmers and horticulturalists said they were not dependent at all, compared with only 46 per cent of dairy farmers. Across all sectors there was generally no dependence on organic remedies for the control of weeds (74 percent sheep/beef, 87 per cent dairy, 73 percent horticulturalists), with the results being similar for the lack of dependence on the use of organic remedies for the control of pests or parasites (73 percent sheep/beef, 85 per cent dairy) except for horticulture (57 per cent not dependent).

When the responses to the question about intention to become organic were correlated with dependency on farm inputs for each sector (see Table 10b) it is quite apparent that those with stronger intentions to use organic practices were less dependent on chemicals and manufactured fertilisers and more dependent on organic remedies (negative correlations) and vice versa, those with no intention of using organics were more dependent on chemicals and manufactured fertilisers.

Table 10b: Correlation of intention to use organic methods with farm dependency on inputs

Intention to use organics (1= strong intention to use, 5=strong intention not to use) **Input** (1=not dependent, 2=slightly dependent, 3=moderately dependent, 4= very dependent, 5=extremely dependent)	**S/B**	**Dairy**	**Hort**
Chemicals for the control of pests or parasites	0.28**	0.25**	0.47**
Chemicals for the control of weeds	-0.01	0.31**	0.23*
Manufactured fertilisers	0.29**	0.42**	0.46**
Composts	-0.24**	-0.09	-0.18
Manures (other than directly applied by animals)	-0.08	0.09	0.00
Organic remedies for the control of pests or parasites	-0.19*	-0.45**	-0.31**
Organic remedies for the control of weeds	-0.19*	-0.28**	-0.19*

Other attitudes and characteristics

Respondents were asked to estimate the proportion of their household food that was produced on their farm or orchard. This is because some international commentators argue that self-provisioning and supporting local foods systems is indicative of higher commitment to sustainability. On average, a similar proportion was consumed per sector ranging from 11 per cent for horticulture to 20 per cent for sheep/beef. On average 82 per cent sourced some of their food from their farms or orchards. Similarly, respondents were also asked to estimate how much of their household food was sourced from hunting, fishing or gathering by them or their family. The estimate was lower overall at approximately three per cent. These results indicate that farmers, particularly sheep/beef farmers, believe they produce a noticeable proportion of their own household food. The one fifth for sheep/beef farmers probably stems from the provision of meat as well as fruit and vegetables from home gardens.

In terms of satisfaction with their farming or growing situation at the time of the survey, respondents in general indicated they were satisfied. In addition, when asked about future prospects, respondents reported expectations between neutral and bright. However, the average score for dairy farmers was more positive and they rated the future at a level equivalent to bright, probably reflecting the general buoyancy of dairy farming in recent times. (There was a significant relationship between the sectors and how the future prospects were perceived. Seventy-six per cent of the dairy respondents assessed the future as bright or very bright, 66 per cent of dairy and 50 per cent of the horticultural respondents, Chi-squared Test = 25.1, df = 4, $p < 0.001$.)

Each respondent was asked to select an option which best described where they might be in five years time (see Table 11). Most (41 per cent) chose ‘still farming with most income from farm work’, while one fifth chose ‘still farming but with significant income from off-farm work’. A total of 67 per cent saw themselves as being significantly involved in farming. When these results are compared across sectors, 52 percent of dairy farmers saw themselves as ‘still farming with most income from farm work’ compared with 35 per cent of the sheep/beef and 38% of the horticulture respondents. However, only seven percent of dairy farmers saw themselves as ‘still farming but with significant income from off-farm work’ compared with 28 per cent of the S/B and 24 per cent of the horticulture respondents.

The next most popular options were ‘land leased or managed, semi retired or retired’ (17 per cent) and ‘land passed on to next generation, semi retired or retired’ (nine per cent). Within the sectors this broke down to around 20 per cent of the dairy and horticulture respondents seeing themselves as ‘land leased or managed, semi retired or retired’ compared to 13 per cent of the sheep/beef respondents, while around 11 per cent of sheep/beef and dairy respondents saw themselves as ‘land passed on to next generation, semi retired or retired’

compared with five percent of the horticulture respondents. (Chi square = 25.9, df = 10, p= 0.004, with four responses to two other options removed.) Only three respondents saw themselves as 'land sold and working in another job' while five per cent thought they would have sold their land and retired. Overall, about 70 per cent of farmers expect to be farming in five years time, while 30 per cent expect to sell or retire. Since the average age of farmers was 56 years, these data suggest that farmers are planning to farm well into their sixties.

Table 11: Situation in five years time

Situation in five years time	S/B	Dairy	Hort	N
	%	%	%	
Still farming with most income from farm work	35	52	38	152
Still farming but with significant income from new activities on farm	7	6	8	26
Still farming but with significant income from off-farm work	28	7	24	73
Land sold and working in another job	1	2	0	3
Land leased or managed, semi retired or retired	13	19	19	64
Land passed on to next generation, semi retired or retired	11	11	5	34
Land sold and retired	6	4	6	20
Other	1	0	0	1
Total (Total N)	102 (129)	101 (124)	100 (120)	373

Farm or orchard environment

Recent research (see the review by PCE 2004) has indicated a long-term decline in the quality of the agricultural environment in New Zealand. In this section we assess the extent to which respondents agree with this perception. Respondents rated the general condition of four features of the environment at five years ago and at present. The question was framed generally rather than specifically asking about their farm or orchard. It is uncertain whether or not they had in mind the condition of their immediate environment with which they have most experience or of the environment in general. These results are shown in Table 12. It can be seen that the general condition of the four environmental factors was rated with a slightly higher score (worse condition) for five years ago compared to the present for each of the three sectors. When the differences in the ratings are compared across the sectors all the differences were also positive and significantly different from zero with three exceptions. This demonstrates mainly that the farm or orchard environment is thought to have improved. The exceptions were horticulture respondents who did not see the exotic species diversity as any better than five years ago, and both sheep/beef and horticulture respondents who did not see streams as any better. For both five years ago and at present, soil health was rated better than exotic species diversity, stream health and native species diversity.

The ratings show further that for five years ago, soil and stream health were rated for all sectors from 2.8 to 3.0 which means between very good and good. Exotic species diversity was, however, not as highly rated, being between good and neutral. For ratings at present, exotic species diversity was rated at around three, meaning good, while the other three environmental factors were rated with slightly lower scores, meaning between good and very good condition. Thus, across both sets of assessments, five years ago and at present, exotic species was seen to be in poorer condition than the other items.

Table 12: Condition five years ago and at present

General condition (1=excellent, 2=very good, 3=good, 4=neither good nor poor, 5=poor)	**S/B**	**Dairy**	**Hort**
Five years ago			
Soil health	2.97	2.88	2.77
Exotic species diversity	3.47	3.40	3.13
Stream health	2.81	3.03	2.89
Native species diversity	3.21	3.29	3.23
At present			
Soil health	2.39	2.24	2.29
Exotic species diversity	3.10	3.05	2.93
Stream health	2.72	2.45	2.79
Native species diversity	2.99	2.88	2.83
Differences between now and five years ago			
Soil health	0.61	0.64	0.47
Exotic species diversity	0.32	0.35	0.18 (n.s.)
Stream health	0.15[b] (n.s.)	0.60[a]	0.11[b] (n.s.)
Native species diversity	0.24	0.43	0.41

Note: n.s. means that these results were not significantly different from zero, indicating no change in the comparison between the present situation and that five years ago.

Farm or orchard practices

Milestad and Darnhofer (2003) considered three elements of organic orientation applied to the farm level, including: the amount of change the system can undergo while maintaining its functions and structure, the degree of self organization, and the capacity for learning and adaptation. The components of each element were compared to the IFOAM basic standards to show that organic farming has a number of promising characteristics for building resilient orientation. Milestad and Darnhofer (2003) produced a summary table which showed the characteristics of farm organic orientation and the matched aspects of the IFOAM basic standards. Since the IFOAM basic standards specify actual on-farm practices, it was possible to frame each standard as a farm practice and these were used to ask each respondent their views of importance of 15 practices which may reflect aspects of organic orientation. We note that the practices are not exclusively the preserve of organic farming.

The 15 items used in the questionnaire were slightly less than the 18 used by Milestad and Darnhofer (2003) because three did not easily fit the farming situation in New Zealand. Each was assessed by respondents on a five point importance scale with one representing 'very unimportant' and five representing 'very important'.

The statements are shown in Table 13 in order starting with those having the higher importance scores. It was generally agreed by those in all three sectors that it was important to use local knowledge, develop practical farming skills based on specific knowledge, observation and personal experience, achieve social responsibility in production and processing (e.g., by providing good working conditions), and to use varieties and species adapted to local conditions. Slightly lower scores were given to the items to do with keeping good relations with neighbouring or other farmers so as to discuss farming issues, practices, problems or projects with them, managing in a way that is compatible with natural cycles, including unpredictable events, and respecting the physiological and behavioural needs of livestock and/or plants. This group of seven statements were all scored over four meaning that they were important or more than important. Themes here were practices that

emphasised the local or specific farm situation and local knowledge, social needs, natural cycles and respect.

Table 13: Ratings of practices by sector

Farm or orchard practice: (1=very unimportant, 2=unimportant, 3=neither unimportant nor important, 4=important, 5=very important)	**S/B**	**Dairy**	**Hort**	**Mean**
Using local knowledge in farming practice	4.25	4.29	4.21	4.25
Developing practical farming skills based on specific knowledge, observation and experience of my own land	4.30	4.23	4.19	4.24
Achieving social responsibility in production and processing (e.g., providing good working conditions)	4.15	4.24	4.16	4.18
Using varieties and species adapted to local conditions	4.23	4.10	4.10	4.15
Keeping good relations with neighbouring or other farmers so as to discuss farming issues, practices, problems or projects with them	4.09	4.21	4.08	4.13
Managing in a way that is compatible with natural cycles, including unpredictable events	4.13	4.05	4.05	4.08
Respecting the physiological and behavioural needs of livestock and/or plants	4.09	4.06	3.96	4.04
Developing knowledge of the ecosystem on my farm	3.91	3.90	4.00	3.93
Returning microbial plant or animal material to the soil to improve it	3.75	3.96	4.06	3.92
Achieving a balance between crop production and animal husbandry	3.78	3.97	3.84	3.87
Supporting and enhancing the things that positively influence ecosystem quality	3.70[a]	3.89	3.97[b]	3.85
Achieving pest control by protecting natural enemies of pests, (e.g., encouraging beneficial insects)	3.72[a]	3.58[a]	4.04[b]	3.78
Using skills and knowledge to avoid dependency on external inputs such as fertilisers, chemicals, or expertise	3.71	3.49	3.69	3.63
Supporting local and regional markets with the produce from my farm or orchard	3.49[a]	3.18[b]	3.43	3.38
Maintaining and promoting diversity by increasing the number of crop and plant varieties and/or animal breeds	3.25	3.34	3.23	3.28

The next group of five practices were rated just below four meaning they were fairly important. These included: developing knowledge of the ecosystem on my farm, returning microbial material to the soil, balancing crop production and animal husbandry, supporting and enhancing the things that positively influence ecosystem quality, and achieving pest control using natural enemies. In this group there were two things for which horticulture gave a significantly higher score indicating that these were more important - supporting and enhancing the things that positively influence ecosystem quality, and pest control using

natural enemies. These higher scores reflect the greater experience of horticulturalists with integrated management or other management systems as documented in Table 1.

The last group of three practices was rated lower with scores between 3.7 and 3.2 meaning close to neutral. These were: using skills and knowledge to avoid dependency on external inputs; supporting local and regional markets with the produce from my farm or orchard; and maintaining and promoting diversity by increasing the number of crop and plant varieties and/or animal breeds. It is probably seen as impractical by most farmers, particularly dairy farmers (as demonstrated here with a statistically significant difference), to supply local markets given their contractual link to Fonterra, or to increase plant and/or animal diversity given their commitment to dairy farming.

Overall, there were not many differences among sectors in response to these items with 12 out of the 15 statements receiving a similar score. Horticulturalists gave significantly higher scores for two practices suggesting that this sector shows some indication of emphasising the use of resilient practices. They gave a higher score to supporting and enhancing the things that positively influence ecosystem quality and achieving pest control by protecting natural enemies of pests suggesting a stronger ecological orientation or greater/better experience with such practices. Sheep/beef farmers gave higher agreement to supporting local and regional markets with produce from their farm or orchard presumably because they are have more opportunity to do this or are more committed to their local area. Not surprisingly, dairy farmers did not support the supply of local markets, due to the structural nature of their industry.

Relationship to land

In his seminal essay, Wes Jackson (1994) describes the idea of 'nativeness to place' as a key dimension to sustainability. This question was designed to uncover responses around the relationship of growers to their particular piece of land. In answer to the question which asked if respondents feel that they are part of their land, there was a consistent response in agreement across sectors (on average 86 per cent for the three sectors). Similarly, most asserted that they can sense when all is well with their land (on average 86 per cent again). There was less uniformity in answers to the question asking if they believed that their land was mysterious, that is, has an unknowable aspect that they believed exists. There were, on average, 15 per cent who agreed with this idea, 24 per cent who were unsure, and 60 per cent who disagreed. Across the three sectors similar proportions indicated they believed they will have a relationship with their land after death, assuming they or a member of their family still owned the land, with 58 per cent disagreeing with this statement. Even more responded in the negative (76 per cent) when the same question was asked but it was stipulated that they had already sold their land before dying.

Maori connections

Given that the ARGOS project has a strong Maori component, but that secure sampling frames for Maori respondents do not exist in farming (or in many other parts of NZ society), this question was added to adduce the level of Maori connectedness both among ARGOS participants and farmers in general. The questions did not fully achieve this aim as many respondents refused to answer them.

Maori connections were not strong among the respondents. On average, across the sectors, only 12 per cent stated that, if their family had been in the locality for a number of generations, their family had a relationship with Maori. There were 22 per cent who stated they had not long been in the locality. Of those who had a relationship with Maori, across the three sectors, most (63 per cent) stated that the relationship was positive and 20 per cent did not know.

Averaging across the sectors, most respondents (61 per cent) had not heard of (a) battles between Maori tribes that may have occurred near or on their land, (b) old Maori pathways near or on their land or (c) former pä sites near or on their land. However, most of these respondents (65 per cent) did know the Maori names of rivers or mountains in their locality, but most (65 per cent) did not know the stories behind these names. Most (94 per cent) were not of Maori ancestry, most (83 per cent) stated that they did not have a relationship with local iwi or hapu, and most (97 per cent) were not actively involved with an iwi or hapu. Of those with a relationship with local iwi or hapu, 61 per cent described the relationship as positive.

Wetlands

One possible indicator of orientation towards the environment is how farmers act in terms of proactive development of non-productive land into sites of perceived natural value. For this survey, wetlands were selected as an example of such activities. Similar questions could be asked about reserving of native bush and actions around waterways that fall outside productive uses.

Respondents were asked the importance of a number of wetland-related recreational activities on their farm or orchard. Thirty nine per cent or more of the horticulturalists found each of these questions not applicable and these figures were considerably lower for those in the other sectors, dependent on the particular question. This probably indicates the lack of wetlands on horticultural properties.

The importance ratings were scored around 3.0 (neither unimportant nor important) for spending time and money developing wetland areas and spending time looking at wetland areas, and around 2.6 (unimportant to neutral) for waterfowl shooting and fishing. Horticulturalists gave a significantly different and higher score to 'spending time looking at wetlands' which indicated that it was more important to them than to sheep/beef farmers ($p < 0.05$) and it was more important to dairy respondents to go waterfowl shooting than it was to the horticulturalists ($p < 0.05$).

Respondents were also asked about the limitations to wetland development. There were no statistically significant differences between the sectors with the limitations due to money being about neutral, while the other limitations of expertise, the inappropriateness of wetlands for the farm environment and having no interest were considered factors of even less importance.

Nature

A key task of the survey was to adduce the range of views and perceptions about nature held by the respondents. The first two statements in Table 14 draw from earlier work on public perceptions of biotechnology (Cook et al., 2004). Analysis of national survey data showed that a concept labelled 'nature's revenge', measured by four variables about adverse effects of interfering in nature, was strongly but inversely related to attitude towards biotechnology. The first statement was derived from that study and reflects this core idea. Another concept called 'technological optimism' was also related to attitude towards biotechnology and the second statement reflects that idea. The last four statements reflect distinctions between pure or wild nature and cultured nature (Newton et al., 2002). Drawing from a number of New Zealand studies, Newton et al. (2002) showed that people tended either to see nature as separate from humans, and therefore prefer views or experiences of nature that do not have obvious or visible signs of human involvement or activity, or as part of nature and accept human presence provided certain standards are met. This distinction has been inserted in parentheses after each statement in the table.

Table 14 shows that all farmers in all three sectors gave a similar rating of between 'neutral' and 'agree' to the view that when humans interfere with nature it often produces disastrous

consequences. The sectors were also found to have slightly lower scores – just above neutral – for the view that human ingenuity will ensure that we do not make the earth unliveable. These results show that farmers across the three sectors have slight agreement with nature's revenge at the same time they slightly agree with technological optimism.

The four statements reflecting pure nature and cultured nature positions gave more varied scores and differences by sector. The average across all sectors was 3.93 for the 'Human beings are part of nature' and was 3.57 for 'My farm or orchard is mainly human made'. These scores are indicating a modest level of agreement with the cultured nature statements. For the pure nature statements, the average was 2.95 for 'My farm or orchard is more an extension of natural systems...' and 2.82 for 'My farm or orchard is mainly natural'. These scores are indicating a neutral position on the former and some slight disagreement with the latter statement. Clearly, a majority of farmers take a cultured nature view which is consistent with the fact that they routinely work with nature rather than see it as something in which humans should not get actively involved. Perhaps what is surprising is that the scores for the pure nature statements do not demonstrate greater disagreement.

In terms of the sectors, horticulture gave significantly different scores to these cultured nature and pure nature statements. For the two pure nature statements, horticulturalists gave a lower score meaning that they were in some disagreement with each of these statements, indicating that they were more disposed to the cultured nature position. This is partly confirmed with their response to one of the two cultured nature statements, 'My farm or orchard is mainly human made', to which 72 per cent agreed or strongly agreed, similar to the response of dairy farmers (70 per cent agreement). However, there were no statistically significant differences between the sectors for the statement 'Human beings are part of nature'. Perhaps horticulturalists and dairy farmers are working in more obviously modified environments than sheep/beef farmers and therefore are inclined to see their orchard or farm as such, bringing them closer to the cultured nature viewpoint.

Table 14: Attitudes to nature by sector

Attitude to nature: (1=strongly disagree, 2= disagree, 3= neither disagree nor agree, 4=agree, 5= strongly agree)	**S/B**	**Dairy**	**Hort**
When humans interfere with nature it often produces disastrous consequences (nature's revenge)	3.49	3.41	3.34
Human ingenuity will ensure that we do not make the earth unliveable (technological optimism)	3.21	3.19	3.17
Human beings are part of nature (cultured nature)	4.01	3.98	3.80
My farm or orchard is more an extension of natural systems as opposed to a human made system (pure nature)	3.06[a]	3.07[a]	2.71[b]
My farm or orchard is mainly natural (pure nature)	2.91[a]	2.88	2.66[b]
My farm or orchard is mainly human made (cultured nature)	3.34[a]	3.62[b]	3.75[b]

When the responses to the question about intention to use organic practices were correlated with attitudes to nature we found some relationships but only for sheep/beef and horticulture. Those with stronger intentions to use organic methods had stronger agreement with nature's revenge and greater disagreement with technological optimism. There were no correlations for dairy.

3.3 Analysis at the management system level

This section of the results examines differences between farm management system (conventional, integrated management and organic) within each of the three farm sectors (sheep/beef, dairy and horticulture). To undertake this analysis each sector group was divided into management system categories using their responses to section B1 of the questionnaire to form one category of conventional and one of integrated management. The conventional farmers and horticulturalists were those who did not participate in any of these quality assurance management systems, and the IM farmers and horticulturalists were those who used management systems that entailed integrated management (e.g., Pipfruit Integrated Management, Kiwigreen) but were not registered as organic. Then a third group was formed using responses from the specific surveys of organic farmers or horticulturalists. The composition of the various samples is shown in Table 15. In effect, the grouping reflects the current level of compliance with environmental management systems.

Please note that the previous section presented descriptive results for each sector so there is no need to repeat them here. The responses for organic farmers and horticulturalists were not incorporated into those results for fear of skewing each sector because of the larger proportion of organic respondents than is present in the sector populations. (They can be used in this section because we are not looking at overall results for a particular sector but at differences across management systems within each sector). In addition, the approach taken here is to report only those results where statistically significant differences were found. Unless reported otherwise all comparison of means that are presented in the text were significant ($p < 0.05$).

Table 15: Sample sizes by management system and by sector

	Conventional	Integrated	Organic	Total
Sheep/Beef	108	23	28	159
Dairy	114	13	23	150
Horticulture	39	84	63	186

Background

There was a statistically significant difference in 2003-4 gross revenue between conventional and integrated sheep/beef farms ($160,578 compared with $247,750, $p < 0.05$), integrated and organic sheep/beef farmers ($247,750 compared with $120,102, $p < 0.05$), and nearly a statistically significant difference between conventional and organic dairy farms ($384,627 compared with $266,133, $p = 0.053$).

Only nine organic sheep/beef farmers responded to the question on religion and all were Christian whereas for the other management systems within the sheep/beef sector over 50 per cent were Christian and the rest evenly divided between ‘spiritual but not religious’ and ‘no religious beliefs’. In the dairy sector six of 23 organic respondents were women (26%) compared with none in integrated management and 13 per cent in conventional.

Education

Table 16 shows the different levels of education achieved by the sheep/beef farmers across the different management systems. Though no significant relationship between these two variables was able to be demonstrated owing to the small numbers in some categories, conventional farmers appear to be less well educated when compared with integrated and organic farmers.

Table 16: Profile for sheep/beef farmers sampled – educational qualifications

Management system	Percentage who attended secondary school but left without qualifications	Percentage who attended secondary school and left with qualifications	Percentage with a technical trade certificate	Percentage with undergrad diploma or certificate	Percentage with university qualification	Total (N)
Conventional	20	38	14	8	19	108
Integrated	13	44	9	9	26	23
Organic	21	21	11	21	25	28

Similarly, Table 17 shows the educational profile of the dairy farmers surveyed which again could not be tested statistically because of the small numbers in some categories. For the respondents in this survey there were a greater percentage of conventional and integrated dairy farmers with lower qualifications than the sheep/beef farmers, and the organic farmers had a higher percentage with a university qualification.

Table 17: Profile for dairy farmers sampled – educational qualifications

Management system	Percentage who attended secondary school but left without qualifications	Percentage who attended secondary school and left with qualifications	Percentage with a technical trade certificate	Percentage with undergrad diploma or certificate	Percentage with university qualification	Total (N)
Conventional	32	29	12	10	17	113
Integrated	23	39	23	0	15	13
Organic	22	22	4	22	30	23

Table 18 shows the distribution of educational qualifications across the horticultural sector which shows a significant relationship (Chi-squared test = 17.22, d.f. = 8, p = 0.028). More conventional horticulturalists left school without qualifications compared with integrated, or organic (26 per cent compares with 20 per cent compared with 11 per cent). This is balanced out by the 44 per cent of organic horticulturalists who had a university qualification compared with 23 per cent conventional and 22 per cent integrated horticulturalists.

Table 18: Profile for horticulturalists sampled – educational qualifications

Management system	Percentage who attended secondary school but left without qualifications	Percentage who attended secondary school and left with qualifications	Percentage with a technical trade certificate	Percentage with undergrad diploma or certificate	Percentage with university qualification	Total (N)
Conventional	26	23	18	10	23	39
Integrated	20	32	16	11	22	82
Organic	11	11	16	18	44	62

Overall, these data are showing an indication that organic farmers are better educated. This conclusion is strongly indicated by the horticulture data and suggested by the sheep/beef

and dairy data. Organic farmers have a greater participation in tertiary education. This may be related to the observation in the popular press that there is a greater proportion of organic farmers who have come from overseas.

Intentions to use management systems and GMOs

Table 19a shows the management systems already in use by the organic farmers and horticulturalists in the sample across sectors. As would be expected they are mainly involved in BioGro or AgriQuality certification systems with a few Demeter practitioners. Some would appear to be participating in more than one organic certification system. These organic farmers/horticulturalists are involved in a smattering of other management systems such as EUREPGAP and some fertiliser codes.

Table 19a: Farm or orchard management system in use at present by organic farmers/horticulturalists

	S/B	Dairy	Hort.
No. organic in sample	28	23	63
Management system	**Frequency**		
Green Tick	1	0	0
Organic standard - BioGro	14	14	47
Organic standard - AgriQuality	16	13	19
Organic standard - Demeter	1	3	2
Project Green	0	0	0
SmartPlan	0	0	0
Sustainable winegrowing	0	0	4
Market Focused	1	1	2
KiwiGreen	0	0	2
EUREPGAP	0	0	16
NZ Fresh Produce Approved Supplier Programme	1	0	7
DeerQA	1	0	0
AFFCO Select	3	0	0
FernMark Quality Programme	0	0	0
Pipfruit Integrated Fruit Prod.	0	0	3
Agrichemical Code of Practice	0	0	6
Fertiliser Code of Practice	1	1	2
FertMark	1	1	0
SpreadMark	0	0	0

Table 19b below shows that those involved in organic methods and those involved in integrated management had a modest intention to use the management systems listed in the questionnaire whereas those involved in conventional production on average gave a score close to neutral. Over all sectors, the intention was strongest for organic. Further, those involved in organic production had, on average, a strong intention not to use GMOs. Conventional and integrated farmers had an intention between neutral and intending not to use GMOs, but were significantly more positive about them than organic farmers. Regarding intention to use organic methods it is clear that those involved in organic methods intend to use these methods in the near future. This result suggests that their current practice is stable and not likely to change in the near future. Those involved in conventional farming methods gave neutral or slightly negative scores.

For conventional dairy farmers there was slightly less interest in using organic methods than for those involved in integrated management, while for sheep/beef the level of interest was similar for conventional and integrated farmers. For horticulture the score for integrated management farmers and those using conventional farming methods was similar indicating a neutral intention to use organic methods.

Regarding the intention to use integrated management, there were scores indicating an intention to use this farming practice, demonstrating that this option was favourably perceived by most respondents. Not surprisingly, those using organic management had a stronger intention to use integrated management. (These results justify the sorting procedure used to identify the integrated management farmers from the conventional farmers described earlier in that the IM farmers do have a different level of intention to use IM, especially in the sheep/beef sector.)

Table 19b: Intentions to use different management systems and GMOs

Intention (1=have a strong intention, 2=intend to use, 3=no intention either way, 4= intend not to use, 5=have a strong intention not to use)		**CV**	**IM**	**ORG**
To use any of the (above) management systems within the next ten years	S/B	2.74 [a]	2.30 [b]	1.62 [c]
	D	2.62 [a]	1.92 [b]	1.43 [c]
	H	2.51 [a]	1.75 [b]	1.31 [c]
To either use or not use genetically modified plants or animals on your farm or orchard within the next ten years, if they become available	S/B	3.52 [a]	3.30 [a]	4.57 [b]
	D	3.22 [a]	3.46 [a]	4.91 [b]
	H	3.11 [a]	3.54 [a]	4.60 [b]
To either use or not use organic methods on your farm or orchard within the next ten years	S/B	3.04 [a]	3.00 [a]	1.41 [b]
	D	3.21 [a]	2.77 [b]	1.00 [c]
	H	3.05 [a]	3.20 [a]	1.16 [b]
To either use or not use integrated management (conditions or constraints on some management practice to minimise negative impacts) on your farm or orchard within the next ten years	S/B	2.64 [a]	2.17 [b]	1.52 [c]
	D	2.61 [a]	2.08	2.00 [b]
	H	2.27 [a]	2.01	1.71 [b]

Types of management strategies and values

Table 20 shows positions on alternative management systems for the three management systems by sector. As discussed earlier, the items presented form a sequence ranging from the conventional to alternative positions on alternative management strategies. The results show that, logically, those in organic production tended to be amongst those who supported an alternative management system. Similarly, those using conventional production tended to

be those who supported the conventional positions. Generally, conventional and integrated management farmers rated the positions similarly and they gave strongest support for the pragmatic conventional position with scores around 3.8, slightly less support for committed conventional, neutral for environmentally conscious but not organic, and slight disagreement with the organic position. The organic farmers were around 4.0 on the committed organic and pragmatic organic positions, the organic dairy farmers with strongest level of agreement to the committed organic position and to the pragmatic organic positions.

Table 20: Positions on alternative management systems

Item (1=strongly disagree, 2=disagree, 3=neither disagree nor agree, 4=agree, 5=strongly agree)		**CV**	**IM**	**ORG**
Opposed to alternative management systems (Committed Conventional)	S/B	3.14[a]	3.32[a]	1.88[b]
	D	3.41[a]	3.83[a]	1.83[b]
	H	3.24[a]	3.10[a]	1.74[b]
Ambivalent to alternative management systems but change is a risk (Pragmatic Conventional)	S/B	3.75[a]	3.87[a]	2.67[b]
	D	3.73[a]	4.08[a]	2.09[b]
	H	3.83[a]	3.73[a]	2.42[b]
Practiced alternative management systems but not formalised (Environmentally Conscious but not Organic)	S/B	3.05	3.05	2.70
	D	2.76[a]	3.69[b]	1.91[c]
	H	3.15[a]	2.98[a]	2.07[c]
Positive to alternative management systems (Pragmatic Organic)	S/B	2.88[a]	3.00[a]	4.24[b]
	D	2.64[a]	3.08[a]	4.30[b]
	H	3.12	2.85[a]	3.68[b]
Positive to alternative management systems and opposed to conventional (Committed Organic)	S/B	2.32[a]	2.14[a]	4.00[b]
	D	2.17[a]	2.08[a]	4.65[b]
	H	2.56[a]	2.19[a]	3.97[b]

Dependency on inputs

In assessment of dependency on inputs, Table 21 below shows a generally consistent pattern of distinction between both conventional and integrated farmers compared to organic. For the first three inputs organic farmers reported less dependency and for the last four inputs organic farmers reported greater dependency. The opposite pattern occurs for both conventional and integrated management farmers. Similar levels of dependency were reported for items that conventional and integrated management farmers said they were dependent on. Specifically, organic farmers had little or no dependence on chemicals or manufactured fertilisers, and reported dependency on composts, manures and organic remedies more than other farmers. According to these factors, organic farmers are distinguishable from other farmers but this is not the case for integrated management. Those involved in integrated management are shown to be no more or no less dependent on chemicals and other inputs than conventional farmers.

Table 21: Assessments of farm dependency on inputs

Input (1=not dependent, 2=slightly dependent, 3=moderately dependent, 4= very dependent, 5=extremely dependent)		**CV**	**IM**	**ORG**
Chemicals for the control of pests or parasites	S/B	2.62 [a]	2.96 [a]	1.59[b]
	D	2.84 [a]	2.85 [a]	1.00[b]
	H	3.42 [a]	3.54 [a]	1.69[b]
Chemicals for the control of weeds	S/B	2.90 [a]	2.70 [a]	1.59 [b]
	D	3.11 [a]	3.15 [a]	1.00[b]
	H	3.27 [a]	3.05 [a]	1.28[b]
Manufactured fertilisers	S/B	3.38 [a]	3.30 [a]	1.63 [b]
	D	3.71 [a]	3.85 [a]	1.45[b]
	H	3.38 [a]	3.59 [a]	1.49[b]
Composts	S/B	1.37 [a]	1.22 [a]	1.85[b]
	D	1.34 [a]	1.08 [a]	2.65[b]
	H	2.00 [a]	2.23 [a]	3.24[b]
Manures (other than directly applied by animals)	S/B	1.71 [a]	1.61 [a]	2.19[b]
	D	2.12	2.00	2.23
	H	1.84	1.75 [a]	2.38[b]
Organic remedies for the control of pests or parasites	S/B	1.35 [a]	1.43 [a]	2.93[b]
	D	1.23 [a]	1.08 [a]	3.91[b]
	H	1.81 [a]	1.76 [a]	3.56[b]
Organic remedies for the control of weeds	S/B	1.53 [a]	1.39 [a]	2.50[b]
	D	1.25 [a]	1.00 [a]	3.13[b]
	H	1.51 [a]	1.31 [a]	2.61[b]

Other attitudes and characteristics

The average percentage of household food produced from the farm or orchard is shown in Table 22. As shown, those involved in organic production in the sheep/beef and dairy sectors stated that they produced more for their households from their own farm or orchard than conventional and integrated farmers respectively. Also shown are the percentages for food sourced from hunting, fishing and gathering which were low at seven per cent or less. There is clearly a difference in reported levels of wild food gathering, as against growing and self-provisioning of food for the household.

These results show that in the pastoral sectors, organic farms are more likely to grow their own food which is an important component of how sustainable practices are perceived by some customers in environmentally sensitised markets. However, we need to note that the high percentage of household food produced by the organic farmers may be due to the higher response rate from organic farmers, thereby including a greater proportion of smaller-scale farmers with a greater inclination to self provision.

Table 22: Sources of household food

Item		**CV**	**IM**	**ORG**
Percentage of household food produced by the farmer	S/B	19 [a]	26	31 [b]
	D	16	11 [a]	28 [b]
	H	14	11	18
Percentage of household food from hunting, fishing or gathering	S/B	4	4	5
	D	3	3	2
	H	7	3	2

Future prospects
Across all sectors organic farmers were more positive about future prospects. Organic sheep/beef farmers were more positive than both conventional and integrated management farmers, organic and conventional dairy farmers were more positive than integrated management dairy farmers, and organic horticulturalists were more positive than those in integrated management. Organic dairy farmers were the most positive with a score of 4.22 – meaning they saw the future as slightly better than 'bright', followed by organic sheep/beef farmers with a score of 4.11. The least positive were those practicing integrated management in the horticultural sector with a score of 3.38 or slightly above neutral.

Options for the future
Forty eight per cent of integrated management sheep/beef farmers thought they would be still farming in five years with most income from farm work compared with 31 per cent of conventional sheep/beef farmers. Eighteen per cent of organic farmers thought they would still be farming in five years but with significant income from off-farm work (compared with less than ten per cent for the others) and no organic sheep/beef farmers thought they would have their land leased or managed and be semi-retired or retired (compared with 12 per cent conventional and 17 per cent integrated management). There were few differences for dairy farmers but integrated management horticulturalists were less disposed than the other horticulturalists (20 per cent) to see themselves still farming in five years but with significant income from off-farm work compared with conventional (34 per cent) and organic (26 per cent), but on the other hand saw themselves as more likely to have their land leased or managed and be semi-retired or retired (23 per cent) compared with conventional (11 per cent) and organic (7 per cent).

Present farm or orchard environment compared with five years ago
All statistically significant differences between management systems about the condition of the farm or orchard environment were for the environment five years ago only, with no differences found in the present (see Table 23). For five years ago, organic farmers across all sectors rated soil health between good and neutral and this was significantly lower than conventional and integrated management farmers who rated it as 'good'. Only organic horticulturalists rated both exotic species diversity and native species diversity five years ago at or near neutral compared with conventional and integrated management horticulturalists who rated these items as 'good'. These last two responses are suggesting that organic horticulturalists are aware of species diversity and their less positive rating suggests that they may see their system more of a monoculture.

When differences were calculated between the condition now and that five years ago, as shown at the bottom of the table, in general the situation was seen to have improved, with most differences on average significantly greater than zero. However, integrated management sheep/beef farmers reported that stream health and native species diversity had not improved, integrated management dairy farmers reporting that everything but stream health had not improved and integrated management horticulturalists reporting that stream health and exotic species diversity had not improved.

Table 23: Condition five years ago and at present

General condition: (1=excellent., 2=very good, 3=good, 4=neither good nor poor, 5=poor)		**CV**	**IM**	**ORG**
Five years ago				
Soil health	S/B	2.95 [a]	3.04	3.46 [b]
	D	2.86 [a]	3.08 [a]	3.87 [b]
	H	2.92 [a]	2.70 [a]	3.47 [b]
Exotic species diversity	S/B	3.43	3.59	3.38
	D	3.47	3.00	3.75
	H	3.14 [a]	3.12 [a]	3.76 [b]
Stream health	S/B	2.90	2.74	2.85
	D	3.00	3.23	3.35
	H	3.00	2.83	3.23
Native species diversity	S/B	3.26	3.00	3.31
	D	3.21	3.73	3.72
	H	3.10 [a]	3.29 [a]	4.07 [b]
At present				
Soil health	S/B	2.41	2.30	2.46
	D	2.21	2.46	2.30
	H	2.34	2.26	2.32
Exotic species diversity	S/B	3.07	3.24	2.83
	D	3.06	3.00	2.85
	H	2.86	2.97	2.92
Stream health	S/B	2.74	2.63	2.50
	D	2.46	2.38	2.89
	H	2.59	2.90	2.88
Native species diversity	S/B	2.97	3.07	2.69
	D	2.82	3.18	3.26
	H	2.80	2.85	2.95
Differences between now and five years ago				
Soil health	S/B	0.58 [a]	0.74	1.00 [b]
	D	0.65 [a]	0.62 [a] n.s.	1.57 [b]
	H	0.58 [a]	0.43 [a]	1.15 [b]
Exotic species diversity	S/B	0.31	0.35	0.52
	D	0.41 [a]	0.00 [a] n.s.	0.90 [b]
	H	0.27 [a]	0.13 [a] n.s.	0.82 [b]
Stream health	S/B	0.17 n.s.	0.11 n.s.	0.35 n.s.
	D	0.57	0.84	0.47
	H	0.41 [a]	0.06 [b] n.s.	0.32 n.s.
Native species diversity	S/B	0.31	0.07 [a] n.s.	0.62 [b]
	D	0.41	0.55 n.s.	0.56
	H	0.40 [a]	0.41 [a]	1.07 [b]

Note: n.s. means that these results were not significantly different from zero, indicating no change in the comparison between the present situation and that five years ago.

Organic farmers and horticulturalists generally reported that the environment had improved the most, but this may simply be because they indicated that it was so much worse five years ago. Organic horticulturalists reported that there had been a greater improvement in five years in soil health and exotic and native species diversity than the other horticulturalists while conventional horticulturalists reported that stream health had improved more than

those in integrated management. Organic sheep/beef farmers indicated that soil health had improved more than their conventional counterparts and that native species diversity had improved more than their integrated management counterparts. Organic dairy farmers reported that soil health and exotic species diversity had improved more than either of their other counterparts.

Farming practices

Table 24 below shows the list of 15 statements used to measure the respondents' ratings of practices associated with organic agriculture and shows the detail regarding each measure of the practices listed for each management system within each sector. The statements are listed in order to show the similarly rated and higher scoring statements at the top. The table shows that ten of the 15 practices show differences across management systems, between conventional and/or integrated management farmers and organic farmers. The practices that did not show any statistically significant differences in most cases were scored above four indicating that farmers thought that they were important. For those practices that did show differences across management systems, there was a greater range of scores, usually between 3.5 and 4.6, indicating that they were rated between approaching important to approaching very important.

Of the ten practices that showed differences across management systems, there were only four where the differences held true for all sectors. Of the remaining six practices, for three the differences occurred only for sheep/beef and for the other three the differences occurred across both sheep/beef and dairy. The lower number of practices with significant differences for horticulture may be because some of the practices were biased against horticulturalists. For example, the seventh item refers to balance between crop production and animal husbandry which probably only applies to sheep/beef production, and the tenth item refers to developing knowledge of the ecosystem of the farm.

We start by considering the four practices which showed highly statistically significant differences ($p < 0.01$) across all sectors. The general pattern was for conventional and integrated management farmers to give similar scores with a rating between three and four, meaning somewhat important, while organic farmers gave a rating over four, meaning more than important. The four practices relate to important aspects of organic management systems, namely: microbes and soil, using natural enemies of pests for pest control, avoiding dependency on external inputs, and promoting species diversity.

The other three practices with significantly higher scores ($p < 0.01$) for organic farmers across sheep/beef and dairy only show that conventional and integrated farmers gave similar scores of around four meaning important, while organic farmers gave a score of around 4.5 meaning more than important. These practices refer either specifically to the ecosystem – developing knowledge of it and in supporting things that positively influence it – or to respecting the needs of livestock and/or plants.

For the three practices which only showed statistically significant differences ($p < 0.05$) for sheep/beef farmers two of the significant differences were between conventional and organic only. The practices were 'Managing in a way that is comparable with natural cycles', 'Achieving a balance between crop production and animal husbandry', and 'Supporting local and regional markets', It is interesting that the latter statement is not more important to organic horticulturalists, and shows a score only approaching important.

Table 24: Ratings of practices by sector and by management system

Farm or orchard practice: (1=very unimportant, 2=unimportant, 3=neither unimportant nor important, 4=important, 5=very important)		**CV**	**IM**	**ORG**
Using local knowledge in farming practice	S/B	4.23	4.35	4.00
	D	4.31	4.08	4.18
	H	3.97	4.31	4.16
Developing practical farming skills based on specific knowledge, observation and experience of my own land	S/B	4.27	4.43	4.46
	D	4.25	4.08	4.48
	H	4.11	4.23	4.44
Achieving social responsibility in production and processing (e.g., providing good working conditions)	S/B	4.11	4.35	4.28
	D	4.28	3.92	4.41
	H	4.03	4.22	4.25
Using varieties and species adapted to local conditions	S/B	4.23	4.26	4.29
	D	4.11	4.00	4.22
	H	4.09	4.10	4.12
Keeping good relations with neighbouring or other farmers so as to discuss farming issues, practices, problems or projects with them	S/B	4.09	4.13	4.14
	D	4.25	3.85	4.13
	H	3.92	4.15	4.02
Managing in a way that is compatible with natural cycles, including unpredictable events	**S/B**	**4.09[a]**	**4.35**	**4.57[b]**
	D	4.09	3.67	4.39
	H	4.11	4.02	4.21
Achieving a balance between crop production and animal husbandry	**S/B**	**3.74[a]**	**4.00**	**4.26[b]**
	D	4.00	3.75	4.19
	H	3.91	3.80	3.66
Supporting local and regional markets with the produce from my farm or orchard	**S/B**	**3.53[a]**	**3.29[a]**	**4.04[b]**
	D	3.19	3.11	3.55
	H	3.56	3.38	3.73
Respecting the physiological and behavioural needs of livestock and/or plants	**S/B**	**4.03[a]**	**4.35**	**4.61[b]**
	D	**4.09[a]**	**3.77**	**4.52[b]**
	H	3.91	3.99	4.02
Developing knowledge of the ecosystem on my farm	**S/B**	**3.88[a]**	**4.04**	**4.44[b]**
	D	**3.91[a]**	**3.83[a]**	**4.52[b]**
	H	3.82	4.08	4.15
Supporting and enhancing the things that positively influence ecosystem quality	**S/B**	**3.71[a]**	**3.64[a]**	**4.41[b]**
	D	**3.86[a]**	**4.08**	**4.43[b]**
	H	4.03	3.95	4.13
Returning microbial plant or animal material to the soil to improve it	**S/B**	**3.71[a]**	**3.95[a]**	**4.61[b]**
	D	**3.96[a]**	**3.92[a]**	**4.61[b]**
	H	**4.15**	**4.02[a]**	**4.49[b]**
Achieving pest control by protecting natural enemies of pests, (e.g., encouraging beneficial insects)	**S/B**	**3.69[a]**	**3.82[a]**	**4.41[b]**
	D	**3.56[a]**	**3.69**	**4.26[b]**
	H	**3.86[a]**	**4.12**	**4.45[b]**
Using skills and knowledge to avoid dependency on external inputs such as fertilisers, chemicals, or expertise	**S/B**	**3.74[a]**	**3.61[a]**	**4.36[b]**
	D	**3.50[a]**	**3.38[a]**	**4.50[b]**
	H	**3.74[a]**	**3.67[a]**	**4.32[b]**
Maintaining and promoting diversity by increasing the number of crop and plant varieties and/or animal breeds	**S/B**	**3.23[a]**	**3.33[a]**	**4.11[b]**
	D	**3.40[a]**	**2.83[b]**	**4.04[c]**
	H	**3.33**	**3.19[a]**	**3.61[b]**

Relationship to land

Organic dairy farmers (48 per cent) were more likely to feel that their land is mysterious, that it has an unknowable aspect, compared with conventional (18 per cent) and integrated (15 per cent) dairy farmers. Organic horticulturalists were more likely to agree with this or to feel unsure about it (56%) compared with conventional (32 per cent) and integrated (35 per cent) horticulturalists ($p < 0.05$). Conventional horticulturalists were more likely to agree (40 per cent) that they will have a relationships with their land after their death, assuming they or a member of their family still owned the land at the time of their death compared with integrated (11 per cent) and organic (18 per cent) horticulturalists ($p < 0.01$). Some hold to this even if they had sold their land before their death (22 per cent) compared with integrated (one per cent) and organic (13 per cent) horticulturalists ($p < 0.01$).

Maori connections

There were no differences worth mentioning in the sheep/beef data but the dairy and horticulture data showed some points of interest. Forty-six per cent of the organic horticulturalists said their family had not been in the locality long enough for their descendents to have a relationship with Maori. This compares with 21 per cent of conventional and 37 per cent of the integrated horticulturalists. Thirty-five per cent of organic dairy farmers said they had relationships with local iwi or hapu, compared with 14 per cent for conventional and 15 percent for integrated farmers. Fifteen per cent of the organic dairy farmers described themselves as actively involved, while only two conventional and no integrated dairy farmers claimed this. Of the horticulturalists who said they had a relationship with local iwi or hapu, 71 per cent of integrated horticulturalists said the relationships were positive compared with 46 percent of the conventional and 57 per cent of the organic.

Wetlands

For sheep/beef the organic farmers thought it was more important than the others to spend time and money on developing wetland areas as a recreational activity, and the organic farmers thought it was more important than the conventional farmers to spend time looking at wetlands. The organic sheep/beef and dairy farmers thought a lack of interest in developing wetlands was less of a limiting factor than did the conventional farmers, though this was not seen as an important limitation by either group.

The differences between the horticulturalists showed up for different aspects of the wetland questions. The conventional horticulturalists were neutral about fishing in their wetlands and waterways as a recreational activity whereas the others felt this was unimportant. They all felt that waterfowl shooting was not important but it was even less important to the integrated and organic horticulturalists than the conventional. The organic horticulturalists felt neutrally about wetlands being inappropriate to the environment of their farm as a limitation in wetland development compared to the conventional horticulturalists who felt it was unimportant.

Nature

Attitudes to nature when analysed by management systems within farm types showed differences for five out of the six statements (see Table 25). In general, organic farmers tended to give different responses to the statements. For three of the six statements the results were generally similar across the three sectors with the conventional and/or integrated management respondents having a significantly different level of agreement than the organic respondents. Organic farmers gave a higher score showing agreement to ‘When humans interfere with nature it often produces disastrous consequences’ and ‘My farm or orchard is mainly natural (pure nature)’, and a lower score showing disagreement to ‘Human ingenuity will ensure that we do not make the earth unliveable’. For two other statements there were only statistically significant differences within the sheep/beef sector. Organic sheep/beef farmers gave a higher score than their conventional counterparts showing some agreement with ‘My farm or orchard is more an extension of natural systems as opposed to a human made system (pure nature)’ and a lower score showing some disagreement to ‘My

farm or orchard is mainly human made (cultured nature)'. These results show organic farmers to be wary of technology and cautious about human interference with nature.

In addition, there were no management system effects for the first statement relating to cultured nature - 'Human beings are part of nature', while for the second statement relating to cultured nature - 'My farm or orchard is mainly human made' - the only differences occurred in the sheep/beef sector with organic farmers reporting less support than the conventional farmers. For the first of the pure nature positions - 'My farm or orchard is more an extension of natural systems as opposed to a human made system' again only the organic farmers in the sheep/beef sector showed more support, but organic respondents from all the sectors showed more support for the second position, 'My farm or orchard is mainly natural'. These results are suggesting that organic farmers tend to be more on the pure nature side of the cultured nature to pure nature continuum.

Table 25: Attitudes to nature by management system

Attitude to nature: (1=strongly disagree, 2= disagree, 3= neither disagree nor agree, 4=agree, 5= strongly agree)		**CV**	**IM**	**ORG**
When humans interfere with nature it often produces disastrous consequences (nature's revenge)	S/B	3.58[a]	3.09[a]	4.04[b]
	D	3.39[a]	3.54	4.00[b]
	H	3.39[a]	3.32[a]	3.85[b]
Human ingenuity will ensure that we do not make the earth unliveable (technological optimism)	S/B	3.18[a]	3.35[a]	2.52[b]
	D	3.21[a]	3.00	2.35[b]
	H	3.17	3.17[a]	2.75[b]
Human beings are part of nature (cultured nature)	S/B	3.99	4.09	3.96
	D	3.97	4.00	3.83
	H	3.69	3.85	3.97
My farm or orchard is more an extension of natural systems as opposed to a human made system (pure nature)	S/B	3.06[a]	3.04	3.50[b]
	D	3.04	3.31	3.04
	H	2.69	2.72	3.00
My farm or orchard is mainly natural (pure nature)	S/B	2.89[a]	3.00	3.38[b]
	D	2.85[a]	3.08	3.30[b]
	H	2.69	2.64[a]	3.07[b]
My farm or orchard is mainly human made (cultured nature)	S/B	3.37[a]	3.17	2.88[b]
	D	3.61	3.77	3.52
	H	3.89	3.69	3.62

Chapter 4
Summary and Discussion

4.1 Introduction

The main objectives of the research were to assess factors associated with the sustainability of agricultural production (1) across sectors including dairy, sheep/beef and horticulture and (2) across each of the three sectors by management system (conventional, integrated management, and organic). The questionnaire covered a wide variety of topics relevant to the sustainability of agricultural production. The report is intended to be a largely descriptive account of the results and in this conclusion we provide a summary in terms of sketches of farmers in the different groups used in the analysis of results.

4.2 Summary of results

Summary sketch of farmers

In general, farmers in our survey were mainly male (88 per cent), 56 years old and Christian. Eighty per cent were with a spouse and 45 per cent had a child or children living in their household. Most were from a rural background, one third was bought up on the farm, and for one third their upbringing was from less than 100 kilometres away from their farm. From 23 to 35 per cent stated that they had a successor to take over the farm. Farmers had been on the farm for 23 years, they were satisfied with farming, and they saw that in five years they would still be farming with most income from farm work. From 11 to 20 per cent of household food was sourced from the farm. One third of farmers had off-farm work, on average for 35 hours per week, and the average off-farm income was $50,000. Typically the farmer made the key decisions but 19 per cent had a manager making key decisions.

The farmers used a variety of quality assurance management systems and generally agreed that these were important for the sustainability of New Zealand's agricultural sector. They were not keen on using GMOs, were neutral about using organic methods, and were slightly positive about using integrated management. Farmers stated that they were moderately dependent on chemicals and fertilisers; those with stronger intention to use organic practices were less dependent on chemicals and fertilisers. They believed that some environmental conditions have improved in the last five years. Most felt that they were part of their land, and most had a cultured view of nature – seeing that humans were part of nature rather than seeing humans as separate from nature. The organic practices rated most important referred to using farm and local knowledge, recognising social needs, acknowledging natural cycles and respecting livestock and plants.

Sector differences

In terms of sector differences, dairy farmers had smaller farms, higher incomes, less off-farm work and a higher proportion with a successor. More dairy farmers assessed the future as bright or very bright and more saw themselves as still farming in five years' time. More horticulturalists had attended short courses. Horticulturalists had more use of quality assurance systems and a stronger intention to use them in future. They stated that they were more dependent on chemicals and fertilisers. Horticulturalists expressed more support for the principles of supporting and enhancing things that influence ecosystem quality and pest control using natural enemies. They also expressed more disagreement with the pure nature viewpoint indicating that they were more disposed to the cultured nature viewpoint.

Management system differences
Most of the management system comparisons highlighted differences between organic farmers and the other two systems. Here we emphasise differences found across all three sectors.

Organic farmers had higher levels of education. This was definitely the case in horticulture with a suggestion that this also applied in sheep/beef and dairying. Organic farmers most strongly favoured using quality assurance management systems, had a strong intention to use organic methods and not to use GMOs. They favoured the pragmatic and committed organic farming positions, were dependent on composts, manures, and organic remedies, and produced greater proportion of household food from their farms. They were more positive about the future and were neutral about environmental conditions five years ago, and when compared to the present reported a larger improvement in environment conditions. Organic farmers gave more emphasis to practices involving microbes and soil, maintaining diversity, natural enemies and avoiding dependency on external inputs. More organic dairy farmers agreed that their land is mysterious. They definitely agreed with the nature's revenge environmental position and definitely disagreed with the technological optimism position. Only sheep/beef organic farmers showed some support for the pure nature viewpoint.

On most dimensions, conventional and integrated farmers gave similar responses. They had lower educational levels, did not attach much importance to the use of quality assurance management systems and were only slightly negative about using GMOs. They favoured the committed and pragmatic conventional farming positions, were dependent on chemicals and manufactured fertilisers, and produced a lower proportion of household food from their farms. They were less positive about the future and rated environment conditions five years as good. Conventional and integrated farmers rated the range of farm practices as important but not as highly as organic farmers. Fewer conventional or integrated dairy farmers agreed that the land is mysterious. They slightly agreed with the nature's revenge position, agreed with the technological optimism position and, for the sheep/beef conventional and integrated farmers, gave some support for the cultured nature position.

4.3 Discussion

The results presented provide insights into farming in New Zealand, albeit from the perspective of the sheep/beef, dairy and horticulture sectors and from the perspective of the conventional, integrated and organic management systems. Three topics are considered briefly: the differences between sectors and management systems and family farming and succession.

The sector results show that horticulture, perhaps unsurprisingly since it is not a primarily pastoral production system, is the most distinctive sector. Horticulturalists use more quality assurance systems, are keener on integrated management, and rated two organic orientation practices higher. These results are consistent with a sector which has had to embrace audits on its production systems in large part because fruit goes ultimately into the consumers' hands relatively unchanged. What horticulturalists do to the fruit has a major impact on consumers. They use significant amounts of inputs, as acknowledged by their self assessment of dependency on chemicals and fertilisers. Perhaps horticulturalists have, on average, used more chemicals in the past and this is associated with greater use of quality assurance systems as a result, either because of legal or quality assurance requirements or because of voluntary changes. Their lower agreement with the pure nature position may be related to the intensive character of their production systems meaning that they acknowledge that horticulture involves major human intervention in the ecosystem.

Dairy farming is known to have buoyant returns over recent years and this is evident in the findings of higher than average revenue within the dairy sector when compared to

sheep/beef and horticulture. Investment was also found to be a distinctive factor with borrowing from the bank more important in the dairy sector.

Given the average age of 56 years the interest expressed by farmers in succession and in continuing in farming illustrates the potential tension in managing farm succession in ways that meet the needs of both generations. On the one hand some farmers have a successor but on the other hand they want to keep farming. Finding a way to manage these needs is not straightforward. Succession was more important to dairy farmers. This sector lends itself to succession since there is more incentive for older farmers to devolve daily milking and stock management tasks, plus the industry has policies and structures in place to allow older farmers to provide capital.

The results also show that off-farm work is important but less so in the dairy sector where incomes are higher. This suggests that while lifestyle reasons may propel off-farm work, that is, interest in seeking such work, the main reason is financial need. Also, dairy farmers often need help with milking and this may preclude off-farm employment.

The general theme among the management system results is the distinctiveness of the organic management system. Organic farmers are more positive about quality assurance systems perhaps because they have experience with organic certification and see this as vital to their farm operation. Many would also find it a necessary element of their economic viability – without organic certification to distinguish their product in the market, they would receive less of a price premium. The various distinctive attributes of organic farming fit together well to show a distinctive environmental orientation.

Some might suggest that family farming is becoming increasingly threatened by corporate ownership of farms. Nevertheless, the surveys of the sectors shows that families were strongly involved in farming with 91 per cent of respondents having a spouse, and more than half having children in their household. This does not mean that a corporate is not involved, as a family could be employed by a corporate body, but suggests families are the main functional unit around which farming occurs. Indeed, the finding that 91 per cent live on their farms or orchards suggests farming is mostly carried out by a resident family. In addition, families carried a tradition of farming with 31 per cent having been brought up on their farm or orchard, most having a rural background and only 35 per cent coming from a locality further than 100 kilometres away. The farming background can also be seen in the finding that farmers and horticulturalists had an average length of stay of 23 years on their properties. Nevertheless, for one in five farms a farm manager was employed who made the key decisions. Most farms or orchards therefore have a family as the core unit of their operation but some, possibly those in retirement, at least forgo the management of the farm or orchard to a professional. Yet the farming family is still likely to remain a strong rural element with 23 per cent of sheep/beef and horticultural units and 35 per cent of dairy farms having a successor to take over the farm. Further, many feel linked to their land and 83 per cent on average source food from their property.

Yet while farming appears synonymous with the family unit a good number of farmers and orchardists had off-farm work. Almost 30 per cent of the farmers and horticulturalists in the three sectors had some form of off-farm employment in the year prior to the survey. This was, on average, work for about 35 hours per week gaining an average pre-tax income of $52,000. There were two drivers of off-farm work. First, substantial hours of off-farm work were associated with those who had smaller properties. Second, those who worked more than 30 hours had lower farm revenue. These data suggest that financial factors necessitated off-farm work. However, off-farm work was being sought because of the interest in such work and a need for income - the main reasons stated for off-farm work were for personal interest and as a source of secondary income.

While our results indicate some characteristics of family farming in contemporary New Zealand rural life, it is possible that this indication is not completely accurate since our sample may be biased away from corporate farms. It is possible that corporate farmers receiving the questionnaire would have been less inclined to respond and if this did happen then this response bias would favour a family farm characterisation. It is equally possible however that corporate farmers would have been keen to represent themselves in a national survey in order to counter any perceived bad press. In the absence of good data on the nature of farm ownership in New Zealand it is hard to assess to what extent this kind of response bias may have occurred. Some bias of this type would not affect the general pattern of results here since the number of corporate farms is much less than the number of family farms.

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Appendix 1: The Questionnaire

Lincoln University

Te Whare Wānaka o Aoraki

New Zealand Farmer and Grower Attitude and Opinion Survey:

Sustainability in Primary Production

2005

General instructions:

- Please put the number for your best answer in the box provided, or in some cases write your answer in the box.
- To preserve the confidentiality of your replies please use the freepost envelope provided.
- Please return the questionnaire to John Fairweather, AERU, P O Box 84, Lincoln University, Canterbury.

A. Farm or Orchard Background

1. What is your background to farming or growing?

(1) Mainly farming
(2) Rural non farm or orchard
(3) Mainly horticultural
(4) Urban

☐

2. What is the distance to the main location of your upbringing?

(1) On this farm or orchard
(2) Not this locality but within 50 kilometres
(3) More than 50 kilometres but less than 100 kilometres
(4) 100 kilometres or further

☐

3. How important was **each** of the following in enabling your farm or orchard to be owned by its present owner?

(1) Very unimportant
(2) Unimportant
(3) Neither unimportant nor important
(4) Important
(5) Very important

Inherited land	☐
Succession of lease	☐
Money made from other farming business	☐
Money made from outside farming	☐
Borrowing from family	☐
Borrowing from bank	☐
Borrowing from others, please specify_____	☐

4. Is there a successor who wants to take over your farm or orchard?

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

☐

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

6. Do you live on your farm or orchard? ☐

(1) Yes (2) No

7. Who makes the key decisions for your farm or orchard?

(1) Yes (2) No

Mainly the principal farm/orchard operator	☐
Mainly the spouse or partner of the principal farm/orchard operator	☐
Both the spouse or partner and the principal farm/orchard operator together	☐
The farm/orchard family, including parents or children	☐
The farm or orchard manager	☐
Other, please specify_____	☐

B. Farm or Orchard Management System

1. Do you currently use, or intend to use, any the following management systems? Please tick the appropriate boxes and indicate the approximate percentage of your gross revenue that is covered by that system.

	Using now	% of gross revenue	Intend to use in future
Green Tick			
Organic standard - Bio-Gro			
Organic standard- AgriQuality			
Organic standard - Demeter			
Project Green			
SmartPlan			
Sustainable winegrowing			
Market Focused			
Kiwi Green			
EUREPGAP			
N Z Fresh Produce Approved Supplier Programme			
DeerQA			
AFFCO Select			
FernMark Quality Programme			
Pipfruit Integrated Fruit Production			
Agrichemical Code of Practice			
Fertiliser Code of Practice			
FertMark			
SpreadMark			
Other system relating to deer _____			
Other system relating to cattle _____			
Other system relating to lambs _____			
Other system relating to fruit _____			
Other system, please specify _____			

2. Which one of the following statements best represents your intention to use any of the above management systems within the next ten years?

(1) I have a strong intention to use such systems
(2) I intend to use such systems
(3) I have no intention either way
(4) I intend not to use such systems
(5) I have a strong intention not to use such systems

3. In your opinion, how important are these management systems for the sustainability of New Zealand's primary production?

(1) Very unimportant
(2) Unimportant
(3) Neither unimportant nor important
(4) Important
(5) Very important

4. Which one of the following statements best represents your intention to either use or not use genetically modified plants or animals on your farm or orchard within the next ten years, if they become available?

(1) I have a strong intention to use plants or animals that have been genetically modified
(2) I intend to use plants or animals that have been genetically modified
(3) I have no intention either way
(4) I intend not to use plants or animals that have been genetically modified
(5) I have a strong intention not to use plants or animals that have been genetically modified

5. Which one of the following statements best represents your intention to either use or not use organic methods on your farm or orchard within the next ten years?

(1) I have a strong intention to use organic methods
(2) I intend to use organic methods
(3) I have no intention either way
(4) I intend not to use organic methods
(5) I have a strong intention not to use organic methods

6. Which one of the following statements best represents your intention to either use or not use integrated management (conditions or constraints on some management practice to minimise negative impacts) on your farm or orchard within the next ten years?

(1) I have a strong intention to use integrated management
(2) I intend to use integrated management
(3) I have no intention either way
(4) I intend not to use integrated management
(5) I have a strong intention not to use integrated management

7. How much do you disagree or agree with the general sentiment of each of the following statements about alternative management systems?

(1) Strongly disagree
(2) Disagree
(3) Slightly disagree
(4) Neither disagree nor agree
(5) Agree
(6) Slightly agree
(7) Strongly agree

I have not really considered alternative production systems and I believe they may not be environmentally friendly, may not produce better products, and may not be technically nor economically feasible. I need to focus on minimising costs and maximising output per hectare. ☐

I don't have a real disagreement with alternative production systems, but changing may be very risky because there may be technical challenges, uncertain prices, or regulatory constraints. I need to be convinced they will work on my farm before I change. ☐

I am committed to using alternative production systems but I am not registered, certified or accredited in any way. I want flexibility in what I do and want to avoid any costs and paperwork involved in being registered. ☐

I use alternative farming systems because they offer me good financial prospects or allow me to develop new production skills that increase my control over what I am doing on my farm. They may allow me to decrease dependency on expensive external inputs, be more flexible or use local knowledge and minimise expenses. ☐

I reject conventional farming with its synthetic fertilisers and pesticides, and use alternative production systems to improve soil health, even if I have to forgo some income. I will adapt my management accordingly to remain true to my philosophy, which is part of a broader social movement. ☐

8. How dependent is your farm or orchard on **each** of the following:

(1) Not dependent at all
(2) Slightly dependent
(3) Moderately dependent
(4) Very dependent
(5) Extremely dependent

Chemicals for the control of pests or parasites	
Chemicals for the control of weeds	
Manufactured fertilisers	
Composts	
Manures (other than directly applied by animals)	
Organic remedies for the control of pests or parasites	
Organic remedies for the control of weeds	

9. Approximately what percentage, if any, of your household food is produced on your farm or orchard? ____ %

10. Approximately what percentage, if any, of your household food is sourced from hunting, fishing, or gathering by you and your family? ____ %

11. Generally, how satisfied are you with your farming or growing situation at present?

(1) Very dissatisfied
(2) Dissatisfied
(3) Neither satisfied nor unsatisfied
(4) Satisfied
(5) Very satisfied

12. Do you see the future prospects of your farm or orchard as:

(1) Very bleak
(2) Bleak
(3) Neither bleak nor bright
(4) Bright
(5) Very bright

13. Which option best reflects where you might be in five years from now?

(1) Still farming, with most income from farm work
(2) Still farming but with significant income from new activities on farm
(3) Still farming but with significant income from off-farm work
(4) Land sold and working in another job
(5) Land passed on to next generation, semi retired or retired
(6) Land sold and retired
(7) Other, please specify_____

C. Farm or Orchard Environment

1. For each of the following items, please estimate their general condition five years ago and at present.

(1) Excellent
(2) Very good
(3) Good
(4) Neither good nor poor
(5) Poor
(6) Don't know/Not applicable

	Five years ago	At present
Soil health		
Exotic species diversity		
Stream health		
Native species diversity		

D. Farm or Orchard Practices

1. Please rate the importance **to you** of **each** of the following statements:

(1) Very unimportant
(2) Unimportant
(3) Neither unimportant nor important
(4) Important
(5) Very important
(6) Not applicable

Developing practical farming skills based on specific knowledge, observation and experience of my own land	
Managing in a way that is compatible with natural cycles, including unpredictable events	
Returning microbial plant or animal material to the soil to improve it	
Achieving pest control by protecting natural enemies of pests, (e.g., encouraging beneficial insects)	
Achieving a balance between crop production and animal husbandry	
Maintaining and promoting diversity by increasing the number of crop and plant varieties and/or animal breeds	
Respecting the physiological and behavioural needs of livestock and/or plants	
Achieving social responsibility in production and processing (e.g., providing good working conditions)	
Using local knowledge in farming practice	

Developing knowledge of the ecosystem on my farm	
Using varieties and species adapted to local conditions	
Using skills and knowledge to avoid dependency on external inputs such as fertilisers, chemicals, or expertise	
Supporting local and regional markets with the produce from my farm or orchard	
Supporting and enhancing the things that positively influence ecosystem quality	
Keeping good relations with neighbouring farmers so as to discuss farming issues, practices, problems or projects with them	

E. Relationship to Land

1. Do you feel that you are part of your land?

   (1) Yes (2) No (3) Uncertain

2. Can you sense when all is well with your land?

   (1) Yes (2) No (3) Uncertain

3. Do you have the feeling that your land mysterious, that is, is there an unknowable aspect to your land which you believe exists?

   (1) Yes (2) No (3) Uncertain

4. Do you believe you will have a relationship with your land after your death, assuming you or a member of your family still owned the land?

   (1) Yes (2) No (3) Uncertain

5. Do you believe you will have a relationship with your land after your death, assuming you had already sold the land?

   (1) Yes (2) No (3) Uncertain

F. Maori Connections

1. If your family has been in your current locality for a number of generations, did your ancestors have a relationship with Maori?

   (1) Yes* (2) No (3) Don't know (4) Not long in locality ☐

   *If yes, would you describe your ancestors' relationship as:

   (1) Positive (3) Neither negative nor positive ☐
   (2) Negative (4) Don't know

2. Do you know about or have heard of any (a) battles between Maori tribes that may have occurred near or on your land, (b) old Maori pathways near or on your land or (c) former pä sites near or on your land?

   (1) Yes (2) No (3) Don't know ☐

3. Do you know the Maori names of rivers or mountains in your locality?

   (1) Yes* (2) No ☐

   *If Yes, do you know the stories behind these names?

   (1) Yes (2) No ☐

4. Are you a Maori descendant?

   (1) Yes (2) No (3) Likely (4) Unlikely (5) Unsure ☐

5. Do you have any relationship with a local iwi or hapu?

   (1) Yes* (2) No ☐

   *If yes, would you describe this relationship as:

   (1) Positive (2) Negative (3) Neither negative nor positive ☐

6. Are you actively involved with an iwi or hapu?

   (1) Yes (2) No ☐

G. Wetlands

1. How important to you is each of the following recreational activities on your farm or orchard?

(1) Very unimportant
(2) Unimportant
(3) Neither unimportant nor important
(4) Important
(5) Very important
(6) Not applicable

Spending time and money on developing wetland areas	
Waterfowl shooting	
Fishing in wetlands and waterways	
Spending time looking at wetland areas	

2. How important to you is each of the following factors limiting wetland development on your farm or orchard:

(1) Very unimportant
(2) Unimportant
(3) Neither unimportant nor important
(4) Important
(5) Very important
(6) Not applicable

I do not have the money	
I do not have the expertise	
Wetlands are inappropriate for the environment of my farm	
I have no interest in developing wetlands	

H. Nature

1. How much do you disagree or agree with each of the following statements?

(1) Strongly disagree
(2) Disagree
(3) Neither disagree nor agree
(4) Agree
(5) Strongly agree

When humans interfere with nature it often produces disastrous consequences	
Human ingenuity will ensure that we do not make the earth unliveable	
Human beings are part of nature	
My farm or orchard is more an extension of natural systems as opposed to a human made system	
My farm or orchard is mainly natural	
My farm or orchard is mainly human made	

I. Farming Information

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

2. What is your <u>predominant</u> farming activity?

(1) Dairy
(2) Pastoral
(3) Specialist livestock
(4) Arable or cropping
(5) Horticulture
(6) Other, please specify

_____

3. What was the annual gross revenue from your farm for the 2003-04 financial year?

Approximate figures only $

4. What is your budgeted annual gross revenue for the 2004-05 financial year?

Approximate figures only $

J. Personal information

1. Please provide the year you were born. ☐

2. Please provide your gender (1) Male (2) Female ☐

3. Which of the following best describes your religious beliefs?

(1) Buddhist
(2) Christian
(3) Hindu
(4) Islam/Moslem
(5) Jewish
(6) Agnostic
(7) Atheist
(8) Spiritual but not religious
(9) No religious beliefs
(10) Other, please specify _____ ☐

4. To which ethnic group do you most identify?

(1) NZ Maori
(2) NZ European/European
(3) Tongan
(4) Samoan
(5) Chinese
(6) Indian
(7) Other Asian
(8) Other, please specify _____ ☐

5. Please provide the province in which your farm is located ☐

6. Which, if any, of the following people live with you in your household?

	(1) Yes	(2) No
Husband, wife or partner	☐	
Mother or father	☐	
Son(s) or daughter(s)	☐	
Sister(s) or brother(s)	☐	
Girlfriend or boyfriend	☐	
Flatmate(s)	☐	

7. Including yourself, how many people live in your household? ☐

8. What is your highest level of education completed?

(1) Attended primary school
(2) Attended secondary school, without qualifications
(3) Attended secondary school, with qualifications
(4) Trade technical qualification or similar
(5) Undergraduate diploma or certificate
(6) University

☐

9. Do you have any of the following tertiary agricultural or horticultural qualifications?

(1) Yes (2) No

Occasional short course ☐
Apprenticeship ☐
Certificate/diploma ☐
University degree ☐

10. Do you think such qualifications are important in farming or growing?

(1) Yes* (2) No* (3) Unsure ☐

*If yes or no please say why:

_____
_____
_____
_____
_____

11. In the last four years, have you had any off-farm/off-orchard employment as well as farming?

(1) Yes* (2) No ☐

***If Yes,** please specify the type of employment and number of years of employment

Type of employment Number of years

_____

_____

_____

__

12. In the last year have you had any off-farm or off-orchard employment?

(1) Yes* (2) No ☐

***If yes:**

(a) What is the approximate annual off-farm income before tax? $ ☐

(b) What were the hours per week? ☐

(c) Please rate the importance to you of **each** of the following reasons for your off-farm employment.

(1) Very unimportant
(2) Unimportant
(3) Neither unimportant nor important
(4) Important
(5) Very important

As a secondary income source ☐

As a primary income source ☐

To subsidise farm and capital investments ☐

For health insurance or other benefits ☐

For personal interest ☐

As primary career ☐

Other, please specify _____ ☐

Thank you for completing the questionnaire. Please return it in the freepost envelope.