



Climate Issues Facing Farmers

Sustainable Land Management and Climate Change Research Programme

Prepared for the Ministry for Primary Industries

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Ministry for Primary Industries
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CLIMATE ISSUES FACING FARMERS

Sustainable Land Management and Climate Change Research Programme

REPORT PREPARED FOR:
THE MINISTRY FOR PRIMARY INDUSTRIES

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CLIMATE CHANGE SNAPSHOT

Key highlights of changes in farmer awareness, perceptions, actions and needs since 2009.

STATE OF CHANGE	FOCUS	2009	2018	CHANGE	HIGHLIGHTS
 ADAPTATION Do farmers understand the potential impacts and implications of climate change?	Making their farm more environmentally sustainable*	78%*	92%*	▲	An increase is apparent in self-assessed action taking over the past 5 years to make their farms more environmentally sustainable. Specific actions mentioned show an increase, notably riparian/shelter planting, waterway control, improved fertiliser management and more efficient irrigation systems.
	Issues farmers face in becoming more environmentally sustainable*	Amended*	37%*		Land management issues (fertilisers/nitrogen management, soil, effluent discharge and planting) are the biggest issue for farmers (37%). Water quality and availability rank second (29%) with financial/profitability issues and compliance with legislation and government regulations a close third (both 28%).
	Focus on making farms more resilient to severe weather patterns	79%	69%	▼	Compared with 2009 farmers have had less focus over the past 5 years on making their farms more resilient to severe weather patterns, and greater focus on managing soil erosion (66% up from 50%) and managing farm labour (60% up from 51%).
	Impact of current climate or severe weather patterns on their farm and business	51%	52%		The proportion of farmers who think their farm and business is <i>moderately</i> or <i>majorly</i> impacted by current climate or severe weather patterns has not changed since 2009. But the proportion of farmers reporting <i>no</i> impact at all has declined (19% to 10%). 59% anticipate a <i>moderate</i> or <i>major</i> impact over the next 20 years.
	Expected farm focus for the future	44%	54%	▲	Working to improve financial management and profitability is a strong focus for farmers. 89% have placed <i>moderate</i> or <i>major</i> focus on this over the past five years and 54% anticipate <i>increased</i> focus in the future. 50% expect <i>increased</i> focus on using water more efficiently and farm production management is also a key focus for the future.
MITIGATION	Belief in human contribution to climate change	54%	63%	▲	Farmer agreement that human activity is contributing to climate changes has increased. However, it lags behind NZ general population perception (82%) ¹ .

¹ https://www.mfe.govt.nz/sites/default/files/media/About/Environmental_Attributes_SEP_2018.pdf: Note: general public were asked about *belief that human activity is at least partly contributing to climate change*



MITIGATION

What efforts are farmers taking to reduce future climate change?

FOCUS	2009	2018	CHANGE	HIGHLIGHTS
Understanding of actions to take to reduce farm's emissions of greenhouse gases	New	50%		50% of farmers have <i>little or no</i> understanding of actions they can or need to take in order to reduce their on farm GHG missions. However, 25% have at least a <i>reasonable</i> understanding.
Assessment of on-farm greenhouse gas emissions	New	14%		14% of those with livestock say they have estimated or calculated their emissions in the last two years, although only 2% know their on-farm GHG emissions over the past two years. Among those who are focusing on reducing GHG emissions, main actions include riparian plantings, reducing stock numbers, using more efficient machinery and more efficient crop plantings.
Expected focus on GHG emissions compared with past 5 years	30%	23%	▼	27% of farmers have placed a <i>moderate or major</i> focus on reducing their GHG emissions in the past 5 years (compared with 31% doing so in 2009). 23% anticipate an <i>increased</i> focus on GHG over the next 5 years (compared with 30% anticipating an increase in 2009).
Extent to which farmers seek information	62%	46%	▼	Fewer farmers have actively sought information about land management practices or climate change issues in the last 12 months than in 2009.
Seek information from MPI	New	20%		Farmers do not look directly to MPI for information or advice. Their main sources of information are industry events/fielddays (55%), rural professionals (53%) and industry companies/suppliers (48%).
Consistency of information from government	30%	19%	▼	Perceived consistency of information from the government has declined, with 19% rating it <i>good or very good</i> in 2018 (30% in 2009). (42% rate information consistency <i>poor or very poor</i> compared with 45% in 2009).
What further information do farmers want?*	47%*	63%*	▲	Despite not having actively sought information, farmers express interest in further information or advice about improving resilience to climate change. Managing severe weather events such as droughts, floods, and harsh winters is most commonly mentioned.
Encouraging farmers to take action to be more environmentally sustainable for the future	New	58%		Financial assistance, incentives or subsidies are most likely to encourage action to make their farms more environmentally sustainable. Seeing initiatives <i>work on other farms/businesses similar to theirs</i> increases farmer confidence that actions will be effective. There is also a role for government, with 46% saying that <i>clear government policy guidelines will help them take action</i> .



EXTENSION

Communicating research findings to farmers, growers and other primary industry professionals to directly influence change

NOTES: 'New' indicates a new question in 2018; * indicates that the question is 'open ended', not one with pre-coded response lists.

'Change' ▲ or ▼ indicates statistically significantly higher or lower result at a 95% confidence interval

OVERALL SUMMARY

ATTITUDES TO CLIMATE CHANGE

The impacts of climate change are projected to intensify over the coming decades - both environmentally and economically. Both domestic and international expectations about the response to climate change and sustainable use of resources have risen.

This research highlights that 63% of farmers *agree* or *strongly agree* that global human activity is contributing to climate change, a significant increase on the proportion agreeing in 2009 (54% agreement), but lower when compared with opinion among all New Zealanders (82% believe human activity is at least partly contributing to climate change)².

Nineteen per cent of farmers feel the Government is doing enough to prevent and reduce the impacts of climate change, showing the growing expectation that governments will lead initiatives to mitigate this impact.

ADAPTATION: AWARENESS AND UNDERSTANDING OF CLIMATE CHANGE

Key issues facing farmers: Thirty-seven per cent of farmers cite **land management issues** (37%) such as fertiliser usage, chemical usage and effluent management, as the key area of concern they face in making their farm or business more environmentally sustainable for the future. Ensuring the availability of water, efficient use of water and working to ensure good **water quality** ranked second with 29% mentions. Ensuring **financial sustainability** to be able to finance sustainability practices ranked third equal at 28%, along with navigating a raft of ever increasing and more costly **regulations and legislative requirements**.

What long-term climatic change means for farmers: Perceptions of what the long-term climatic changes mean for farmers are mixed. Fifty-one per cent the farmers surveyed think climatic changes present both an opportunity and a threat to their business, but there is also greater uncertainty than in 2009 - 9% are uncertain about what long-term climatic changes will mean to their farm or business in the future.

Extent to which climate change is impacting and will impact farmers: 52% feel their farm is **currently** being impacted *moderately* or *majorly* by climate change and severe weather patterns, a proportion which stays the same when asked about their farm **over the next five years** – this is similar to 2009 results. This increases to 59% of farmers who believe that climate change and severe weather patterns will have at least a moderate impact **in the long-term (next 20 years)**. Farmers perceive that the impacts will be felt more strongly beyond their farm, in terms of their wider region, New Zealand and the world.

Importance of New Zealand contributing to global efforts: The proportion of farmers considering it important that New Zealand contributes (in proportion to our size) towards a global effort to combat the negative environmental impacts of more severe weather patterns has increased since 2009 (62% in 2018 cf. 52% in 2009).

Compared with 2009, fewer farmers feel the agricultural sector is doing enough to adapt to the environmental impacts of more severe weather patterns and changing climatic conditions (63% cf. 67% in 2009). This means there is an opportunity to communicate to farmers about how their on-farm decisions and actions can contribute to the effects undertaken across the region, New Zealand and the world.

² https://www.mfe.govt.nz/sites/default/files/media/About/Environmental_Attributes_SEP_2018.pdf

MITIGATION: CURRENT AND INTENDED ACTION

Actions taken to be more environmentally sustainable: 92% of farmers have made changes or improvements to their farm in the past five years specifically to be more environmentally sustainable for the future - a significant increase on the 78% doing so in 2009. However, these have been more environmentally focused, in line with sector regulations (such as fencing of waterways and riparian planting). There has been less focus on specific actions (such as fertiliser and soil management, crops, and animals) to be environmentally sustainable.

Key focus over the past five years and into the future: Farmers have focused primarily on financial sustainability in ways that include working to improve financial management and profitability, decreasing production costs and increasing returns per unit of product.

Such financial aspects are anticipated to remain a key focus.

Of note, farmers expect greater focus on water quality over the next five years.

Working to reduce greenhouse gas emissions: Farmers have minimal knowledge of emissions (both total and per animal) and limited understanding of the actions they can take to reduce their emissions (49% said they have little or no understanding). A comparatively low proportion of farmers place an emphasis on working to reduce their greenhouse gas (GHG) emissions (27% cf. 30% in 2009)

As a result, short-term mitigation within the agriculture sector will remain a challenge. However, there is also an opportunity. Despite having little or no understanding of how to reduce their emissions, 16% of those with a limited level of understanding, plan to increase their focus on reducing their GHG emissions over the next five years. Ensuring they have good science to base their actions on is vital.

EXTENSION³: INFORMATION NEEDS AND RESOURCES

Information sources: Farmer information sources are changing. In terms of media, traditional methods such as rural newspapers and magazines are the predominant source of information. However, farmers are becoming increasingly digitally aware, and they currently place greater reliance on industry events, organisations and rural professionals (who are becoming increasingly important as farmers are less active in their search for information). The internet is also a common information source.

Low confidence in the quality, relevance and consistency of information: There is relatively low confidence in the quality, relevance and consistency of information about land management practices to improve resilience to severe weather patterns and climatic changes - particularly information from the Government. Generally, farmers appear pessimistic about climate change information presented from this source. Sector organisations and sources are considered to be more reliable and consistent (particularly among dairy farmers).

Information sought: Significantly fewer farmers than in 2009 consider they have enough (or enough of the right) information, highlighted by the 63% who want further information or advice on topics related to improving resilience to climate change (compared with 47% in 2009 wanting such information).

In 2009, a growing need to provide information about carbon issues and regulatory requirements was identified. While such information matters to the same proportion of farmers in 2018 (8%), information about managing severe weather events received greater mention (12% in 2018).

³ Note: 'Extension' was formerly referred to as Technology Transfer, that is the communication for practice change

Verbatim feedback about issues farmers face and comments about the types of information they seek highlight the importance of the availability of neutral, science based information, that is consistent across agencies, and contains clear guidelines and environmental sustainable practices that are proven to make a difference.

The likelihood of seeking information about land management practices to further improve their resilience to severe weather patterns and climatic changes is correlated with farmer beliefs in climate change, and leads to action. Those who have sought information are significantly more likely to believe in climate change than those who have not actively sought information.

To encourage farmers to take more sustainable action: Farmers (particularly younger farmers and those with shorter property tenure) consider they would most benefit from receiving financial assistance (whether via incentives or subsidies), given a focus on financial profitability and need to ensure their financial viability. However, they will also have greater confidence if they know that the actions they take will actually make a difference to their farm and their business, and seeing proof in what other farmers do.

FARM TYPE DIFFERENCES

Analysis of results by farm type highlights differences in levels of climate change awareness, mitigation actions and needs, and differing experiences and expectations based on land use. As highlighted in Table 1 below, dairy farmers are the stand-out sector, compared with other farm types.

Table 1: Relative performance for adaptation, mitigation and extension by farm type

FOCUS	DAIRY	LIVESTOCK – SHEEP, BEEF, DEER	ARABLE	HORTICULTURE & VITICULTURE	OTHER [^]
Adaptation for Climate Change	High	Low	Mid	High	Low
Mitigation Actions	High	Low	Mid	Mid	Mid
Extension	High	High	Mid	Low	Mid

Scale: High (above average), Mid (average or 50th percentile), Low (below average)

[^]Other includes Apiary, Pig & Poultry, Other livestock (e.g. goats, alpaca), and other specified farm types

AGE MATTERS

New Zealand's agriculture sector has an ageing population. As might be expected, the level and types of action taken to undertake sustainable land management vary by farmers' age.

Farmers aged under 40 years have taken significantly more actions over the past five years than those aged 60 years plus) and intend to increase their focus on sustainable measures over the next five years. Those aged over 60 years are at a time in their farming career, when taking on debt to improve climate change resilience may be a less palatable option, and they are potentially looking ahead to retiring from active farm management.

Hence, consideration of farmer age and tenure on-farm is important in communications development.

IMPLICATIONS

Farmers' agreement that human activity is contributing to climate change and their recognition of the potential impacts of climate change for their farms and businesses have increased since 2009. But there is some uncertainty among farmers about the longer term impacts of climate change, and the associated opportunities and risks it poses to their farm and business. While farmers are taking actions to be more environmentally sustainable, these are not necessarily the most effective actions or the actions that have the greatest potential to reduce greenhouse gas emissions.

The following are areas for consideration for the Ministry for Primary Industries.

- **Providing proof (evidenced-based science):** The lack of reliable and consistent information appears to be a barrier to increasing acceptance of climate change and achieving behavioural change. There is an appetite for consistent, evidenced-based information about managing severe weather events.
- **Illustrate to farmers how they will be directly impacted at a local/farm level to mitigate against their optimism bias:** Farmers show optimism bias towards the impact of changing climates on their own property, compared with what is happening and what will happen in the long-term beyond their farming region - both nationally and globally. Therefore, being able to illustrate the 'total' impacts on a regional/local level may demonstrate how farmers are and will be more directly affected by climate change.
- **Develop and support sector-specific adaptation and mitigation initiatives:** One size does not fit all. While there are similarities nationally, practices differ by farm type and region (for example, animal feed practices among dairy farmers to reduce emissions), as do the challenges.
- **Bottom-up approach to information sharing:** Farmer perceptions of information consistency from sector organisations are more favourable than perceptions of Government originated information. Collaborating with industry specific organisations to communicate best practices is important ('what success looks like') as farmers want proof that their actions will have a positive effect. A bottom-up approach is important. Driving change through a 'what I do impacts my community' approach is important. Implement at a local and regional level, ensuring local and regional councils, iwi and industry bodies and professionals have been engaged.
- **Support farmers to quantify their carbon footprint:** Farmers do not know the extent of their greenhouse gas emissions (only 14% of those with livestock have calculated or estimated these in the past two years). Awareness of their on-farm emissions is the starting point to taking action at the farm level.
- **Support to identify the risks and opportunities:** Factors such as farmer age (within an ageing demographic), length of time running the property, current and expected income affect their ability and willingness to implement change and the rate of changes they are willing to make. Therefore, the risks and opportunities for an older demographic could be framed in the context of the community beyond a farmer's tenure on their property.
- **Provide incentives to assist farmers to make their farms more sustainable:** Encouraging successful technology transfer through positive (incentives) rather than negative (tighter monitoring and enforcement) reinforcement is important.
- **Changing consumer demands:** With growing consumer awareness of the environmental impacts of agricultural activity, changes in consumption patterns are starting to emerge. Identifying opportunities from changing consumer preferences may help to spotlight the potential profitability of meeting consumer demand for sustainably sourced products.

RESEARCH NEEDS ASSESSMENT

OVERVIEW

New Zealand's primary industries rely on a relatively stable, predictable climate, to maximise the use and productivity of national resources within environmentally sustainable limits and be resilient to adverse climatic and biosecurity events. However, New Zealand's agriculture and livestock contribute about half New Zealand's total greenhouse gas emissions. The Ministry for Primary Industries (MPI) is working to support the primary sector to reduce the amount of agricultural greenhouse gases it produces, support the expansion of forests where appropriate, and ensure that the sector is both responsive and resilient to a changing climate.



A warming planet means we must diversify our economy while still making the most of our competitive advantage in the primary sectors – our precious and productive soils, access to freshwater, and temperate climate.

(Investing in tomorrow: Sustainable Land Management and Climate Change research programme, 2007-2018)

HON. DAMIEN O'CONNOR
MINISTER OF AGRICULTURE

In 2009, MPI (then the Ministry for Agriculture and Forestry) undertook a baseline study to assess rural land owners' and land managers' knowledge, attitudes and behaviours related to sustainable land management and climate change issues. Since the 2009 study, there has been an increased focus on issues relating to sustainable land management and climate change.

The aim of this project is to understand the impacts of, and adaptation to, climate change; mitigation of agricultural greenhouse gas emissions, and improvements to farming knowledge, practices and infrastructure. As identified in the 2009 survey, and supported through the Sustainable Land Management and Climate Change (SLMACC) research programme which has been active since 2007, three key stages are addressed in this research - adaptation, mitigation and extension.



ADAPTATION

Understand the potential impacts and implications of climate change, to address and future-proof the risks associated, thereby enhancing resilience to a changing climate and moving toward a low carbon future.

MITIGATION

Efforts to reduce the impact of future climate change. Develop practical options for managing the rate and extent of observed and projected changes, thereby, reducing greenhouse gas emissions from agriculture and creating options for managing emissions.



EXTENSION

Communicating these newest research findings to farmers, growers and other primary industry professionals in a way that can directly influence engagement (through awareness of climate change), implementation (provide practical on-farm options) and lasting behaviour change.



Source: *Investing in tomorrow: Sustainable Land Management and Climate Change research programme, 2007-2018*



RESEARCH OBJECTIVES AND OUTCOMES

The primary objective is to compare current results with the original baseline data from 2009, highlighting the change in attitudes among farmers and identify behavioural trends.

In this research, there is also an increased emphasis on understanding farm greenhouse gas (GHG) emissions.

Importantly, the report identifies trends and presents analysis to allow MPI to identify knowledge and capability gaps and implement change through;

- **Communication:** Inform communications and MPI's engagement with key stakeholders across sectors;
- **Evaluation:** Increase accountability and acceptance of climate change from primary industries. Allow MPI to evaluate future performance and progress using follow-up monitoring in relation to technologies and practices. Increase the number of options available to mitigate and adapt to climate change; and
- **Education and upskilling:** Identify how informed farmers are about land management practices to improve resilience and how barriers to such implementation can be reduced. Use research to enhance decision making and allow for evidence-based policy recommendations and identify ways that the findings, options and research can be widely shared to inform the farmers, growers and communities.

RESEARCH DESIGN

WHO

We targeted each of the main farm types, to ensure robust sub-samples by main farm type for analysis.

01 | Dairy

02 | Livestock - sheep/beef/deer

03 | Arable

04 | Horticulture & Viticulture

05 | Other - alpaca, apiary, goat, pig, poultry, and other

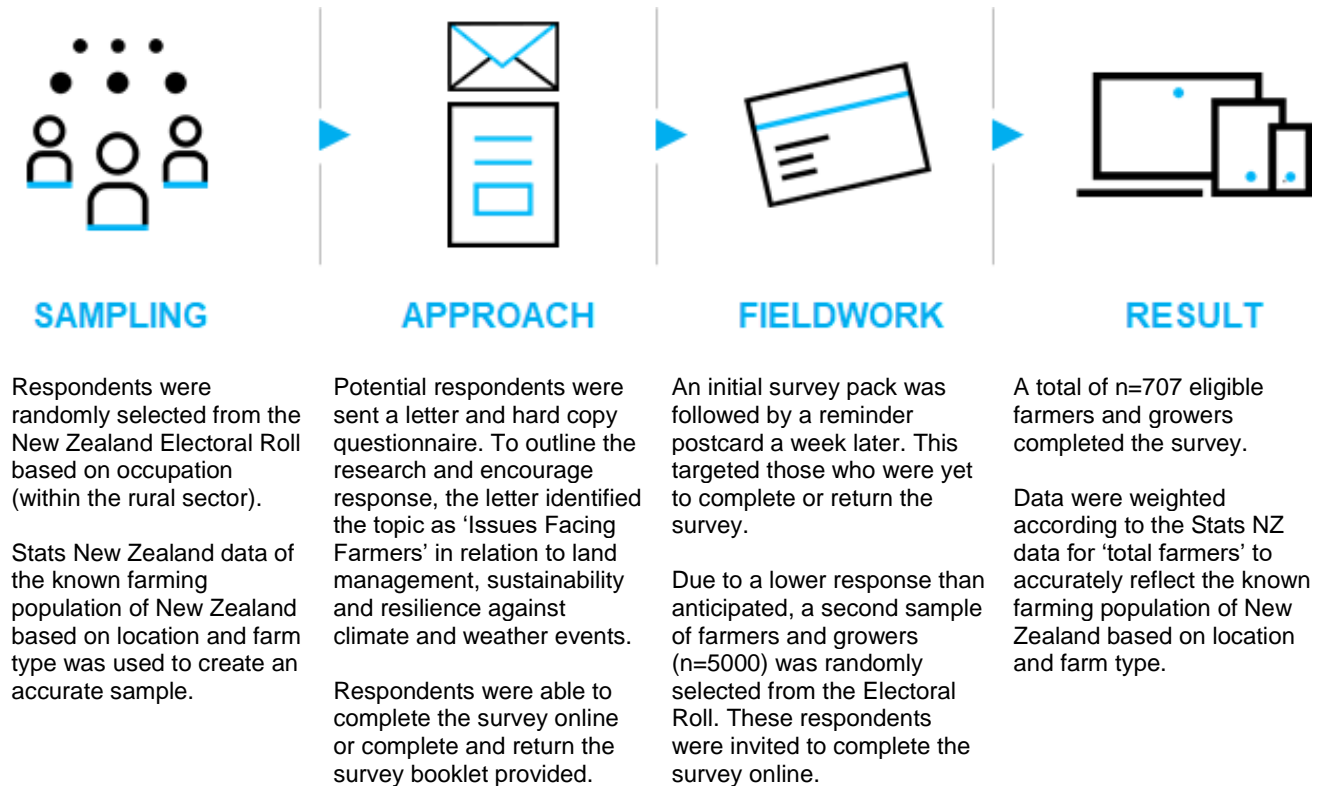


The sample included farm owners, managers and share-milkers but did not include lifestyle farmers or other farmers who do not derive their main income from the farm property.

At the analysis stage, we weighted the results to ensure that the results reported at a 'total farmers' level accurately reflect the known farming population of New Zealand.

HOW

We undertook a quantitative survey using a mixed survey methodology (postal and online), with fieldwork dates of 29 October to 5 December 2018. Respondents were randomly selected from the New Zealand Electoral Roll. MPI was identified as the survey sponsor.



Note: in 2009 a telephone methodology was used. However, in 2018 the methodology was updated to provide MPI with a more cost-effective, future proofed method, offering enhanced representativeness.

HOW MANY

The total sample achieved was 707 farmers. For this sample the maximum margin of error on is **+/- 3.7 per cent**, at the 95% confidence level. Details of the sample profile are included in Appendix 1, including both weighted and unweighted figures.

Response rate: The overall response rate was **9.4%**. Please refer to Appendix 2 of the report for further details and full methodological breakdown.

NOTES TO THE REPORT

Climate change and rural New Zealand during the fieldwork period:

In mid-2018, the Zero Carbon Bill was publicly introduced for consultation and during the survey period (October to December) there were a number of extreme weather and natural events including the California wildfires and some major global conferences and summits - including the U.N. Climate Summit and Intergovernmental Panel on Climate Change (IPCC). These events attracted extensive national and international media coverage, and potentially heightened and consciousness of climate issues among farmers.

Qualitative research in 2008, carried out by Nielsen, identified that the use of 'climate change' could elicit an immediate negative response. For the purposes of this research, as in 2009, 'climate patterns and more severe weather patterns' were referenced.

Reporting of results:

- The word 'farmer' is used throughout the report to refer to both 'farmers' and 'growers'.
- Base sizes (and the make-up of the result reported) are noted on all charts.
- Respondents were provided an option to select 'doesn't apply to my farm' (not applicable), due to a methodological change to self-completion. Such responses are excluded from reported percentages, and percentages have been re-calculated based on those who indicated a particular behaviour was applicable to their property.
- Statements from the questionnaire are shown in *italics*, as are response options.
- Analysis focuses on the 'top two boxes' (for example, '*tend to agree*' or '*strongly agree*') responses for comparison with the 2009 survey data.
- Attitudes toward climate change are reported in terms of whether farmers believe in climate change or do not (i.e. those who believe in climate change '*tend to agree*' or '*strongly agree*' that *global human activity is contributing to the climate changing above and beyond natural weather cycles*. Those who do not believe in climate change '*tend to disagree*' or '*strongly disagree*' with this statement). The term 'sceptics' has been used in the report to refer to this latter group.
- Due to rounding, the net figures shown in the report (e.g. % '*great extent*' and % '*moderate extent*' and total results) may differ from the numbers shown on charts and in data tables by a percentage point.

Statistical significance:

Statistically significant differences are highlighted or commented on in this report.

- Unless otherwise stated, all references to significant difference refer to the difference between the reported results and the 'total' or 'average' result. Where no highlighting has been used (or no commentary about a subgroup included), it may be assumed that differences are not statistically significant or they are not pertinent.
- When comparing results, 'cf.' is used as an abbreviation of 'compare'.
- Statistically significant differences in this report are significant at the 95% confidence level. That means that the difference is a true difference statistically, and not due to random variation.

ACKNOWLEDGEMENTS

We would like to express our thanks to all farmers who responded to the survey request and provided their opinions on this important topic.

ATTITUDES TO CLIMATE CHANGE

CLIMATE CHANGE IN 2018 - GENERAL CONTEXT

This section of the report provides general context for farmers' views and behaviours around climate change.

The reality of climate change is becoming more widely recognised with changes in the intensity and frequency of extreme weather patterns and events⁴. In today's world, it is widely accepted by climate scientists (97% agree) that changes in climate trends are extremely likely due to human activities⁵.

As science and measurement techniques have improved over the past decade, so too the learnings and potential mitigation techniques underpinned by good science.

KEY NUMBERS

Concern about climate change

31%

of New Zealanders are concerned about climate change and global warming

Belief in climate change

82%

of New Zealanders believe human activity is at least partly contributing to climate change

Government action

19%

feel the Government is doing enough to prevent and reduce the impacts of climate change on New Zealanders

NEW ZEALANDERS' ATTITUDES

Other recent surveys of the general public show that in 2018, 31% of New Zealanders are worried about climate change and it is cited as the sixth most important challenge that is facing New Zealand over the next 20 years (reducing poverty in New Zealand being the number one challenge facing New Zealanders)⁶. Eighty-two per cent of New Zealanders believe human activity is at least partly contributing to climate change, while only 19% feel the Government is doing enough to prevent and reduce its impacts.

The potential impact of climate change on New Zealand's agriculture sector is expected to be major, through climate variability and climatic extremes. This impact can be seen from both an environmental and commercial perspective as New Zealanders' changing attitudes carry over to awareness of the impacts which may be at odds with consumer preferences.

For example, Fonterra's latest Sustainability report states "to maximise the effectiveness of inhibitors

⁴ <http://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/adapting-to-climate-change-stocktake-tag-report.pdf>

⁵ <https://climate.nasa.gov/scientific-consensus/>

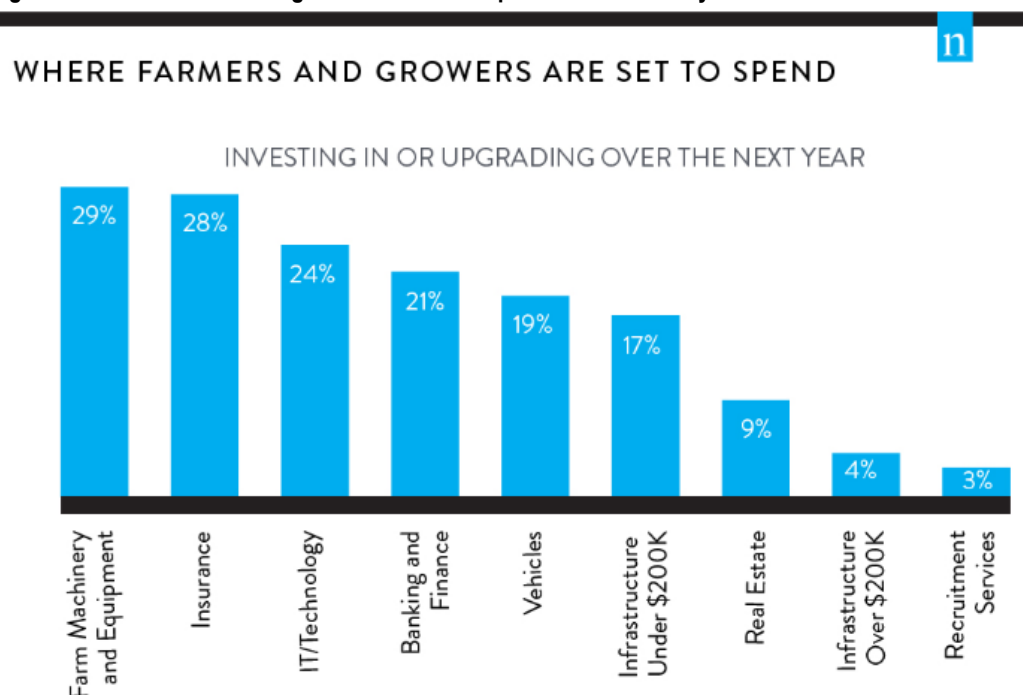
⁶ https://www.mfe.govt.nz/sites/default/files/media/About/Environmental_Attitudes_SEP_2018.pdf

administered through supplementary feed, the cows would need to spend more time in sheds or on feed pads being fed the special feed. This not only increases the farming costs, it is at odds with the growing consumer demand for dairy produced from grass-fed cows”⁷.

The Rabobank Rural Confidence Survey (December 2018) suggests rural confidence remains low from an agricultural economic perspective, and there is pessimism within the sector as a result of government policy, falling commodity prices, overseas markets/ economies and rising input costs⁸.

As highlighted in Figure 1 below from the Nielsen Rural Report, 28% intend mitigating risk through insurance.

Figure 1: Where farmers and growers are set to spend over the next year



Source: Nielsen Rural Report 2016

With the impact of climate change projected to intensify over coming decades, mitigating the impact of behaviours that contribute to climate change is increasingly important.

⁷ <https://view.publitas.com/fonterra/sustainability-report-2018/page/1>

⁸ <https://www.rabobank.co.nz/knowledge/rural-confidence-survey/> (December, 2018)

ADAPTATION: AWARENESS AND UNDERSTANDING OF CLIMATE CHANGE

INTRODUCTION

Adaptation relies on farmers' awareness and understanding of the potential impacts and implications of climate change to address and future-proof the associated risks, thereby enhancing resilience to a changing climate.

This section examines the following topics:

- Key issues farmers and growers say they currently face in making their farm and business more environmentally sustainable for the future.
- Whether farmers agree that human activity is contributing to a changing climate and if they consider it important that New Zealand contributes, proportionately, to mitigating the negative environmental impacts that greenhouse gas emissions bring.
- The perceived impact of changes in climate and severe weather patterns on their farm and business, region, the agricultural sector within New Zealand, New Zealand as a whole and the world - now and in the future.
- Whether farmers perceive long-term climatic changes as an opportunity or threat and different options that may help them cope with these changes Areas of focus over the past five years to be more environmentally sustainable and the level of focus on specific on-farm actions over the past five years.
- Level of focus farmers expect to have on making their farm more sustainable for the future.

KEY NUMBERS

In the last 5 years

92%

commented they have made changes to or introduced new features to make their farm more environmentally sustainable

▲ 78% in 2009

Current impact on farm or business

52%

feel current climate or severe weather patterns are having a *moderate* or *major* impact on their farm and business

51% in 2009

Over the next 5 years

69%

have a *major* or *moderate* focus on working to become more resilient to severe weather patterns

▼ 79% in 2009



KEY ISSUES FARMERS FACE

Farmers were asked to consider the key issues they face in making their farm/business more environmentally sustainable for the future. Key themes are identified in Figure 2 overleaf, four of which received widespread mention.

- **Land management** is the most commonly mentioned theme (37%). Key aspects include the use and sustainability of fertilisers, managing how effluent is discharged, knowing how to reduce the amount of nitrogen used, and planting trees for shade/shelter and/or for riparian reasons to protect waterways.
- **Water** was the second most widely mentioned theme (29%). This included discussion about ensuring the availability of water, managing water and irrigation more efficiently, and protecting the quality of water in waterways
- **Financial considerations** were the third main theme (28%). Farmers talked of the need to be financially viable to have the capability to undertake environmental work, the need for improved profitability to be more environmentally sustainable, and the increasing costs of compliance in becoming more sustainable.
- **Government legislation/regulation/protocols** ranked third equal with financial considerations (28%). Farmers talked of increasing compliance requirements, changing requirements and the additional burden these place on their farming operations.

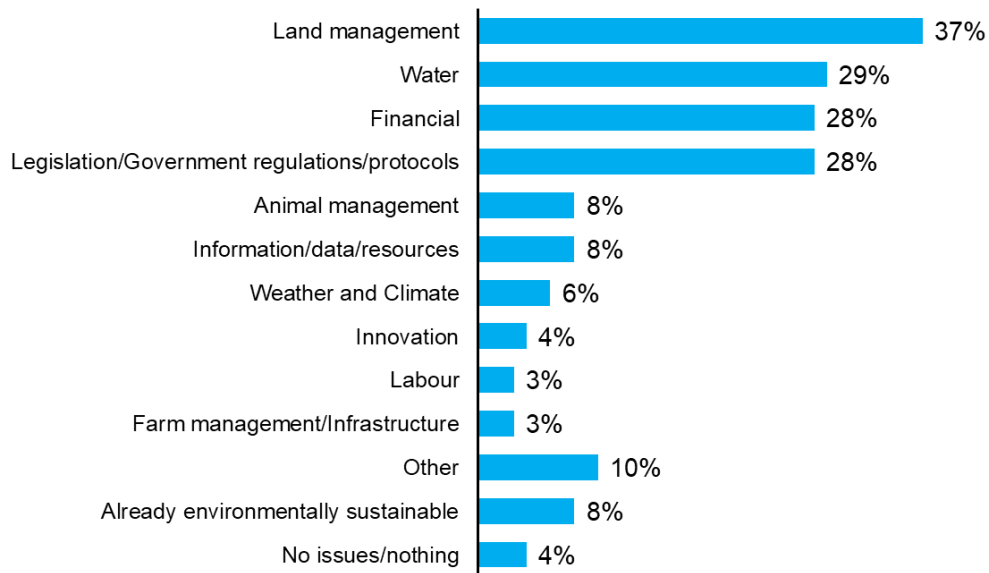
Eight per cent consider their farm or business to already be environmentally sustainable.

COMPARED WITH 2009

Results are not directly comparable with the 2009 survey results, as the question emphasis in 2018 is on issues that affect farmers' "environmental sustainability" rather than "general sustainability".

In 2009, farmers were asked what they saw as the "*key issues you face in making your farm and your business more sustainable for the future*". Hence, financial issues were most commonly mentioned (60% mention), while there was only 20% mention of environmental issues in 2009.

Figure 2: Key issues in making farms or business more environmentally sustainable for the future (%)



Base: All respondents (excluding don't know) (n=624)

Q6. Firstly, what do you see as the **key issues** you face in making your farm and your business more environmentally sustainable for the future?

SUBGROUP DIFFERENCES

There were differences in the issues mentioned by farmers of different farm types. Key issues that were mentioned **significantly more** often by different farm types included:

- **Dairy:** Financial (36% cf. 28% total), information/data/resources (13% cf. 8% total)
- **Livestock (sheep, beef, deer):** Water, including irrigation, waterway fencing, flood protection (35% cf. 29% total)
- **Horticulture and viticulture:** Labour resource issues (9% cf. 3% total), innovation needs (11% cf. 4% total)

A selection of verbatim comments is included overleaf to provide further understanding of the issues different farm types face in becoming environmentally sustainable.

Snapshot of key issues each farm type faces in making farms or business more environmentally sustainable for the future



"Water quality. The availability to use at a low cost."

- Dairy, Auckland

"Being forced into changes that aren't scientifically proved and financially viable. Then there could be a lack of knowledge in what is viable best practice."

- Dairy, Canterbury

"The farm business needs to remain profitable, so that we have the discretion to be able to invest in ways of continuing to reduce our environmental footprint while increasing productivity, to continue farming we must improve as the cost of everything increases. The cost of compliance issues is becoming a huge burden."

- Dairy, Waikato



"Current compliance regulations [healthy rivers plan change 1] are not workable or enforceable in their current form and hill country farmers do not have much traction in gaining relevant sub-catchment approach to environmental issues. The cost of compliance regarding fencing of small waterways in hill country is uneconomical and not necessarily good for the land [extra work with benching, problems with weed control and spraying drains]."

- Livestock, Waikato

"Soil Health: We have just started to look at the soil health of our property; learning about Regenerative Agriculture. Researching innovated solutions for growing soil, restoring the health of our ecosystem, creating conditions in which the soil biology can thrive again and improving the profit of the family farm."

- Livestock, Southland



"Irrigation regulation and compliance. Rural/urban divide."

- Arable, Canterbury

"Having regional policies that are based on public perception and visual mitigation farms that are not inline with the science and are not the most effective methods of reducing environmental loads."

- Arable, Canterbury



"Availability to find staff including unskilled labour. Border control - unwanted pests and diseases entering NZ. Cost of removing plastic out of our business."

- Horticulture & Viticulture, Wellington

"Biosecurity of invading exotic pests (insect, fungal, bact. viral) which leads to greater use of control chemicals. Spread of summer rainfall to maintain available soil moisture capacity as no irrigation available. Carbon taxes can negate finance for carbon sink plantings (even small scale woodlots have value)."

- Horticulture & Viticulture, Bay of Plenty

"The cost of undertaking environmental improvements with little or no financial return (e.g. planting native trees in an unproductive area of the farm). Lack of evidence-based alternative horticultural practices (e.g. organic). Will an alternative farming system be at least as profitable as our current systems? Are our current practices truly unsustainable? Climate change i.e. less certain weather patterns."

- Horticulture & Viticulture, Bay of Plenty



"Environmental pressure from external groups. Agricultural awareness from non-rural Kiwis.."

- Other, Otago

"Pests, disease, compliance."

- Other, Bay of Plenty

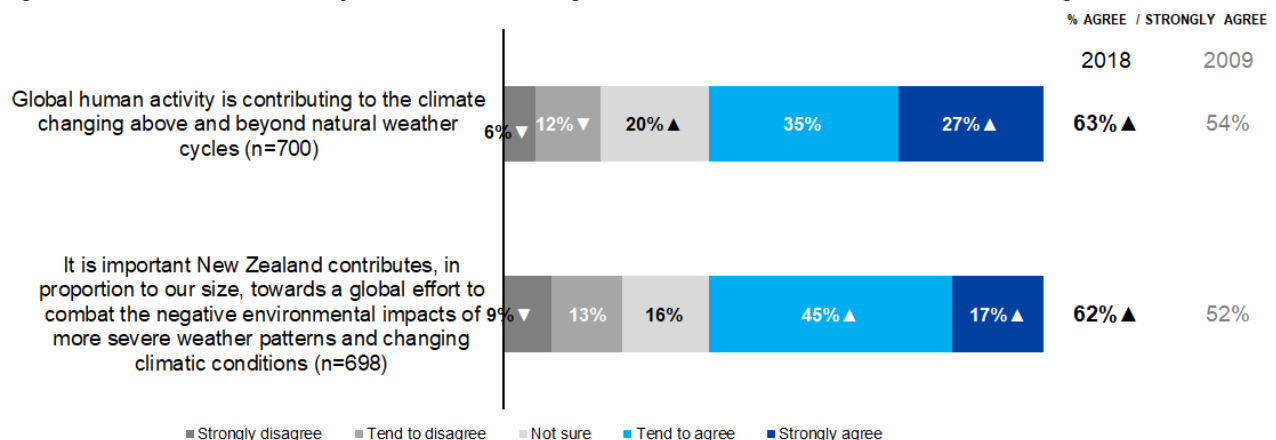
BELIEF IN CLIMATE CHANGE AND THE CONTRIBUTION OF NEW ZEALAND TO GLOBAL EFFORTS IN COMBATING CLIMATE CHANGE

As highlighted earlier, climate scientists (97%) widely accept climate change. Among the New Zealand farmers, 63% believe in climate change (*tend to agree* or *strongly agree*), specifically that *global human activity is contributing to the climate changing above and beyond natural weather cycles*. Twenty-seven per cent *strongly agree* (a significantly higher proportion than in 2009 (17%). See Figure 3 below.

Although farmers are more accepting of climate change, and this is a significantly higher proportion of farmers than in 2009 (63% cf. 54% in 2009), it is not as high as might be expected. A relatively large proportion remain dismissive of climate change (17% *tend to disagree* or *strongly disagree*). However, *disagreement* that humans are contributing to climate change over and above natural cycles has decreased since 2009 (from 31% in 2009 to 17% in 2018), with only 6% *strongly disagreeing* that humans are contributing.

A similar proportion (62%) also *agree* or *strongly agree* that *it is important New Zealand contributes, in proportion to our size, towards a global effort to combat the negative environmental impacts of more severe weather patterns and changing climatic conditions*. However, the importance of New Zealand doing its bit globally proves to be more disputed amongst farmers, with 22% saying they *disagree* or *strongly disagree* - particularly among those who do not believe in climate change sceptics (68% cf. 9% for those who do believe).

Figure 3: Views on human activity related climate change and New Zealand's contribution to combating it



Base: All respondents (excluding not answered) (2018, n= 698-700, 2009 n=1000); ▲/▼ significantly higher/ lower than 2009 result

Q22. How strongly do you agree or disagree with the following statements...

Those who *tend to agree* or *strongly agree* that global human activity is contributing to climate change are more likely to:

- **Increase focus** on working to **reduce their greenhouse gas emissions** over the next five years (80% cf. 63%)
- Have a gross **on-farm income** in the last financial year **between \$750,001- \$1million** (78%)
- Have a **farm sized** between **10 and 49 ha.** (76%)
- Have **actively sought information** on land management practices (76%)
- Have had a **major** or **moderate focus** over the past five years **on working to reduce your greenhouse gas emissions** (74%)

- Have been running their property for **20 to 29 years** (72%)
- Have farms that are currently impacted to a **major** or **moderate** extent by climate change or severe weather patterns (70%) in contrast to those whose farms are **not** impacted currently by climate change or severe weather patterns (52% agreement).

Farmers who believe in climate change are more likely to be actively doing something about it.

Those agreeing that global human activity is contributing to the climate changing are more likely to:

- Have **sought information** about land management practices (45% cf. 34% among climate change sceptics),
- Have had a **major or moderate focus** on **working to reduce their greenhouse gas emissions** (32% cf. 13% among climate change sceptics) and
- Expect focus on **reducing greenhouse gas emissions** to **increase** in the next five years (28% cf. 6% among climate change sceptics)

PERCEPTIONS OF CLIMATE CHANGE NOW AND IN THE FUTURE

IMPACT OVERALL

Now: Farmers consider themselves well prepared currently for the potential impacts of a changing climate or severe weather patterns. Yet, they are less optimistic about impacts for the agricultural sector, region, New Zealand and the world. They perceive a greater impact of climate or severe weather patterns on the *world* (74% having a *moderate* or *major* impact), *agricultural sector as a whole* (69%), *New Zealand* (65%), and *their region* (57%) than they do on *their own farm and business* (52%).

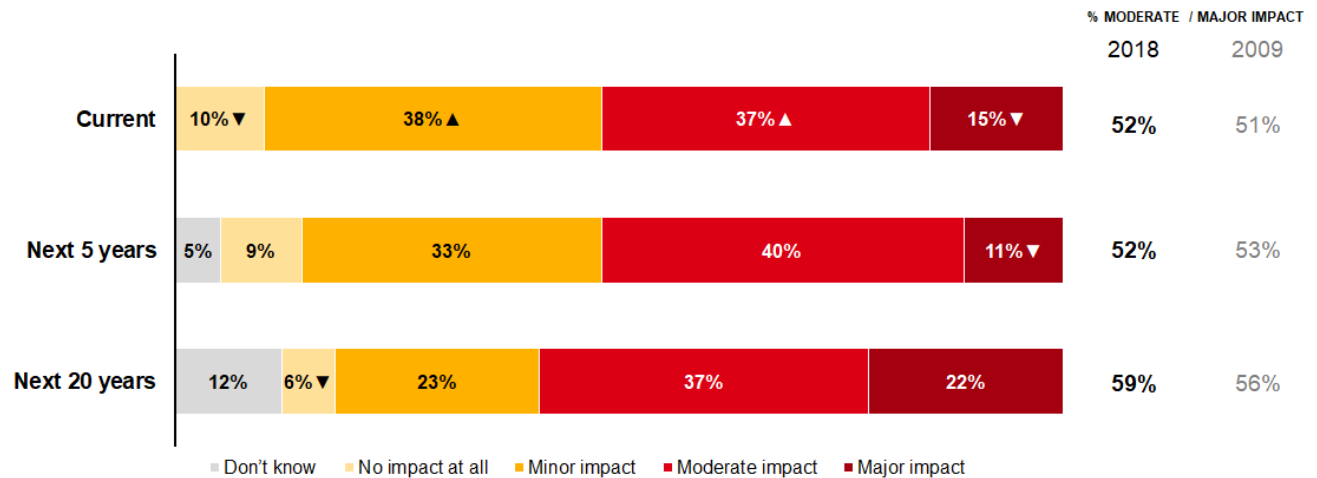
Future: A similar trend is apparent for perceptions of the short-term (next five years) (52%), while farmers are more pessimistic about the impact of climate and severe weather patterns in the long-term (20 years) (59%). Farmers appear more confident about their own farm and business (potentially because they feel they have greater control). When asked about their level of focus on different challenges, 70% of farmers think their level of focus on working to become more resilient to severe weather patterns will '*stay the same*' as it has been over the last five years, although 20% anticipate an increased focus on this.

Those who believe that human activity is contributing to climate change are significantly more likely to feel current climate is having a *moderate* or *major* impact on their farm or business currently, than those who disagree with climate change (58% among believers cf. 31% among climate change sceptics). This difference in perception widens looking further into the future, with a higher proportion considering there will be a *moderate* or *major* impact over the next five years (60% among believers cf. 25% among climate change sceptics) and 20 years out (70% cf. 25%). This trend is consistent with the perceived impact for their sector, New Zealand and the world.

IMPACT ON FARM AND BUSINESS

Fifty-two per cent of farmers think that the current climate or severe weather patterns are having a *moderate* or *major* impact on their business now, and 52% think that it will do over the next five years. They are less optimistic and more uncertain about the next 20 years (12% say they *don't know*) (see Figure 4 below).

Figure 4 Perceived impact of climate change on own farm and business



Base: All respondents (excluding not answered) (Q16 n=703, Q17 n=700-701)

Q16. What level of impact do you feel current climate change or severe weather patterns are having on...

Q17. And, how much of an impact do you feel changes in climate and severe weather patterns will have on...

SUBGROUP DIFFERENCES

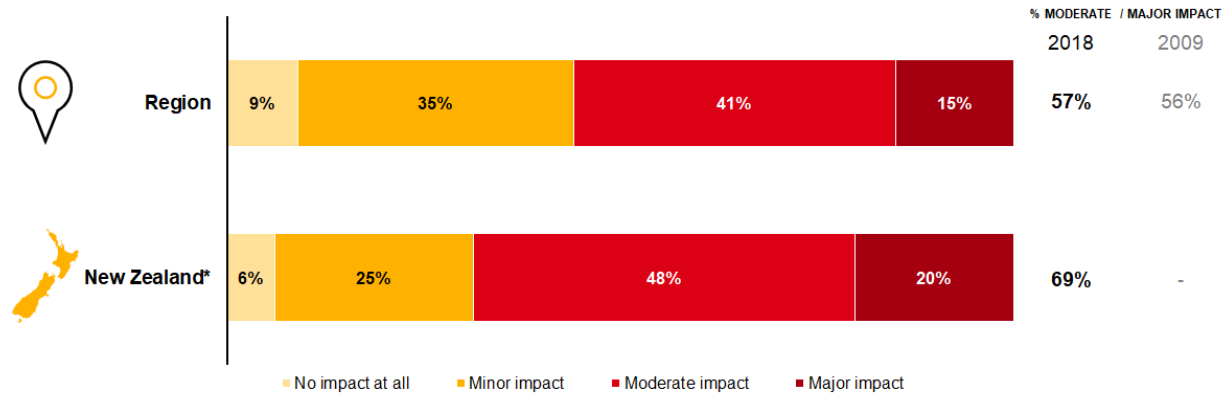
- **Livestock farmers** (sheep, beef, and deer) are **significantly more** likely than other farmers to consider climate change and severe weather patterns are having only a *minor* or *no impact* to their farm or business currently (54% cf. 48% total).
- **Northland** farmers are significantly more likely than farmers in other regions to predict only a minor or no impact to their farms over the next five years (58% cf. 43% nationally) and 20 years out (45% cf. 29% nationally).

IMPACT ON AGRICULTURAL SECTOR - REGIONALLY AND ACROSS NEW ZEALAND

When asked about the impact that current climate change or severe weather patterns are having on the agriculture sector **in their region**, 57% of farmers indicate that these climate changes are having a *moderate* or *major* impact (see Figure 5 below). This proportion is similar to that in 2009 (56%).

Sixty-nine per cent indicate that the **overall New Zealand** agricultural sector is being *moderately* or *majorly* impacted (20% *majorly* impacted).

Figure 5: Perceived impact of climate change on agriculture in their region and New Zealand



*New question in 2018

Base: All respondents (excluding not answered) (Q16 n=698, Q17 n=700)

Q16. What level of impact do you feel current climate change or severe weather patterns are having on...

Q17. And, how much of an impact do you feel changes in climate and severe weather patterns will have on...

SUBGROUP DIFFERENCES

Those **significantly more** likely to perceive the New Zealand agricultural sector is *moderately* or *majorly* impacted currently are:

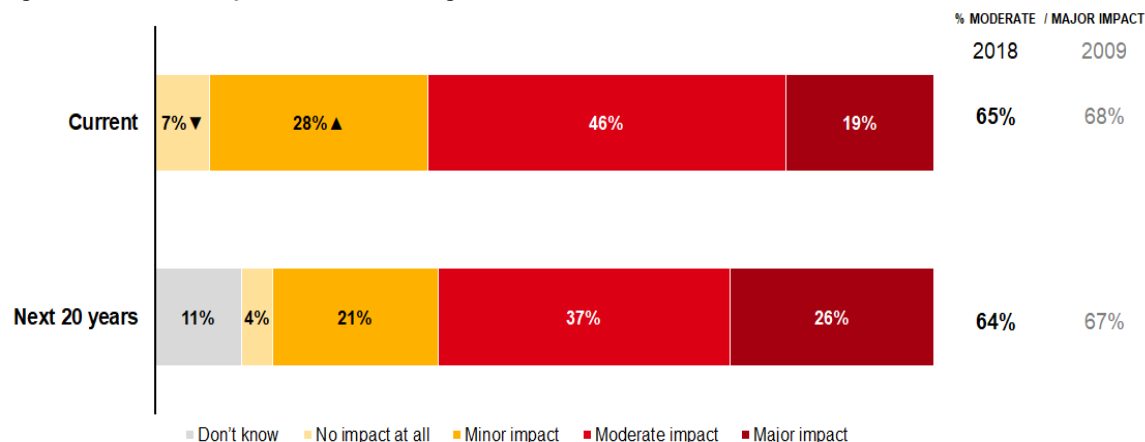
- **Manawatu/Whanganui** farmers (83% cf. 69% nationally)
- Aged **under 40 years** (80%)
- Those whose **farm size is less than 50 ha.** (76%).

Those **significantly more** likely to feel *no impact* on the agriculture sector in their region currently include **Otago** (18% cf. 9% nationally) and **Waikato** farmers (15%).

IMPACT ON NEW ZEALAND

Sixty-five per cent of farmers indicate that current climate change or severe weather patterns have a *moderate* or *major* impact on New Zealand (see Figure 6 below). The percentage of those who say there will be a *major* impact is higher for the predicted impact over the next 20 years (26%), than currently (19%).

Figure 6: Perceived impact of climate change on New Zealand as a whole



Base: All respondents (excluding not answered) (Q16 n=698, Q17 n=700)

Q16. What level of impact do you feel current climate change or severe weather patterns are having on...

Q17. And, how much of an impact do you feel changes in climate and severe weather patterns will have on...

SUBGROUP DIFFERENCES

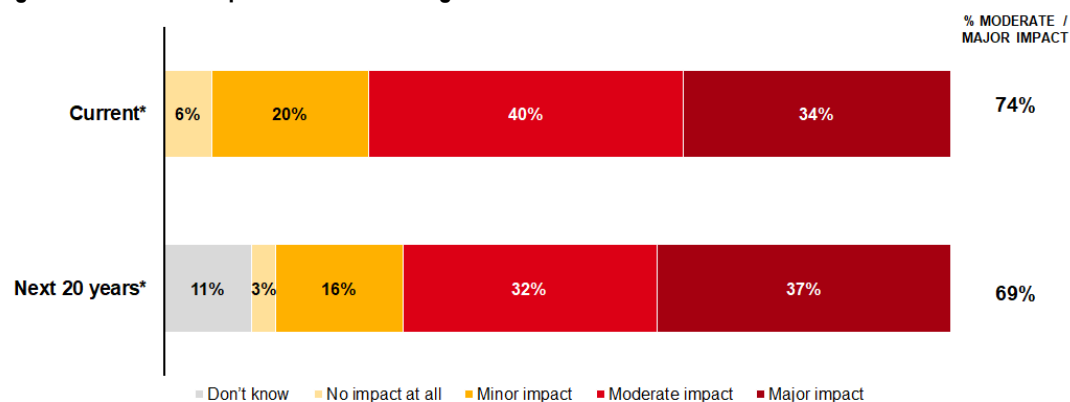
Those **significantly more** likely to say New Zealand is currently being *moderately* or *majorly* impacted:

- **Horticulture and viticulture** growers (75% cf. 65% total)
- Have a **farm size less than 50 hectares** (74%)
- Believe in climate change (74%).

IMPACT ON THE WORLD

Farmers perceive current climate change or severe weather patterns are having the largest impact on the world (74% say *moderate* or *major* impact) (see Figure 7 below). There is greater uncertainty about the likely impact over the next twenty years, with 11% indicating they *don't know what the impact will be*. However, 69% still anticipate a *moderate* or *major* impact.

Figure 7: Perceived impact of climate change on the world





*New question in 2018

Base: All respondents (excluding not answered) (Q16 n=698, Q17 n=700)

Q16. What level of impact do you feel current climate change or severe weather patterns are having on...

Q17. And, how much of an impact do you feel changes in climate and severe weather patterns will have on...

SUBGROUP DIFFERENCES

Those **significantly more** likely to say climate changes and severe weather patterns are currently having a *moderate* or *major* impact on the world:

- Believe in climate change (85% cf. 74% total)
- **Horticulture and viticulture** growers (87%)
- Have been working to **reduce their greenhouse gas emissions** over the past five years (84%)
- Expect to **increase their focus** on *working to reduce your greenhouse gas emissions* over the next five years (83%)
- Having been **running their property for 20-29 years** (83%).

WHETHER LONG TERM CLIMATE CHANGE PRESENTS AN OPPORTUNITY OR A THREAT

Long-term climatic changes can be seen as both a threat and an opportunity around the world and in New Zealand. Climate change has been predicted to have a bigger impact on other food-producing countries, such as the USA and Australia than it will have on New Zealand⁹. Extreme weather events that arise from climate change (such as droughts and floods) may cause food production to decrease in these countries, offering an opportunity for New Zealand farmers financially, as their exported products' value will increase.

Overall, climate change is expected to result in fewer frosts (potentially allowing for the spread of some pests). Western and southern New Zealand regions are expected to have increased rainfall and warmer temperatures, thus potentially creating better growing conditions. However, farms in the eastern and northern regions of the country are likely to experience an increase in drought frequency. The impacts from more extreme rainfall events can create a range of issues at a farm level, such as increased pests on farms from fewer frosts, soil erosion, flooding and slips from increased rainfall¹⁰.

Therefore, it is important to understand if farmers perceive these potential issues as a threat to their business or view the potential benefits as outweighing the challenges that long-term climatic changes might create.

COMPARED WITH 2009

Perceptions of the opportunity or threat that long-term climatic change will bring have changed since 2009.

In 2018, 51% of farmers identified long-term climatic changes as both an opportunity and a threat (see Figure 8 overleaf). The proportion of farmers identifying both threat and opportunity has increased significantly since 2009 (44%), with a corresponding decline in the proportion seeing long-term climatic changes as an opportunity (10% cf. 17% in 2009).

⁹ https://www.nzagrc.org.nz/user/file/96/2_Impacts%20of%20Global%20Climate%20Change%20on%20New%20Zealand%20Agriculture%20-%20Fact%20Sheet.pdf

¹⁰ <https://www.niwa.co.nz/news/fieldays-farming-for-the-future>

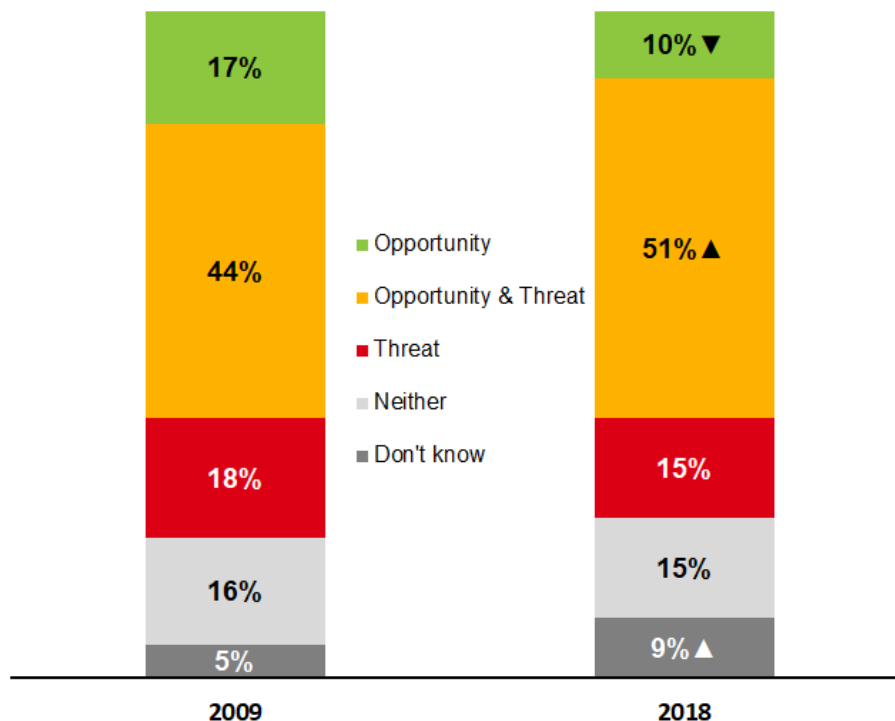
In 2018, 15% of farmers perceive long-term climatic changes as a threat – a lower proportion than in 2009 (18% perceiving a threat), but not a statistically significant decrease.

Overall, perceived threat outweighs perceived opportunity (66% versus 61%).

As in 2009, a significant proportion of farmers consider long-term climatic changes to be neither an opportunity nor a threat (16% in both years).

The percentage of farmers who are uncertain (*don't know*) as to whether long-term climatic changes will be a threat or opportunity to their business has increased since 2009 (9% in 2018, up from 5% in 2009). This indicates the difficulty farmers have in conceiving the perceived potential impacts of climate change over the next 20 years, as noted earlier.

Figure 8: Whether long-term climatic changes present an opportunity or threat for their business



Base: All respondents (excluding not answered) (2009 n=1000, 2018 n=703); ▲/▼ significantly higher/ lower than 2009 result

Q19. Do you see long-term climatic changes being an opportunity for your business, a threat to your business or both?

SUBGROUP DIFFERENCES

Those **significantly more** likely to perceive long-term climatic changes as **neither a threat nor an opportunity**:

- **Dairy farmers** (21% cf. 15% overall).

Those **significantly more** likely to perceive long-term climatic changes as a **threat**:

- **Horticulture and viticulture** growers (23% cf. 15% overall).

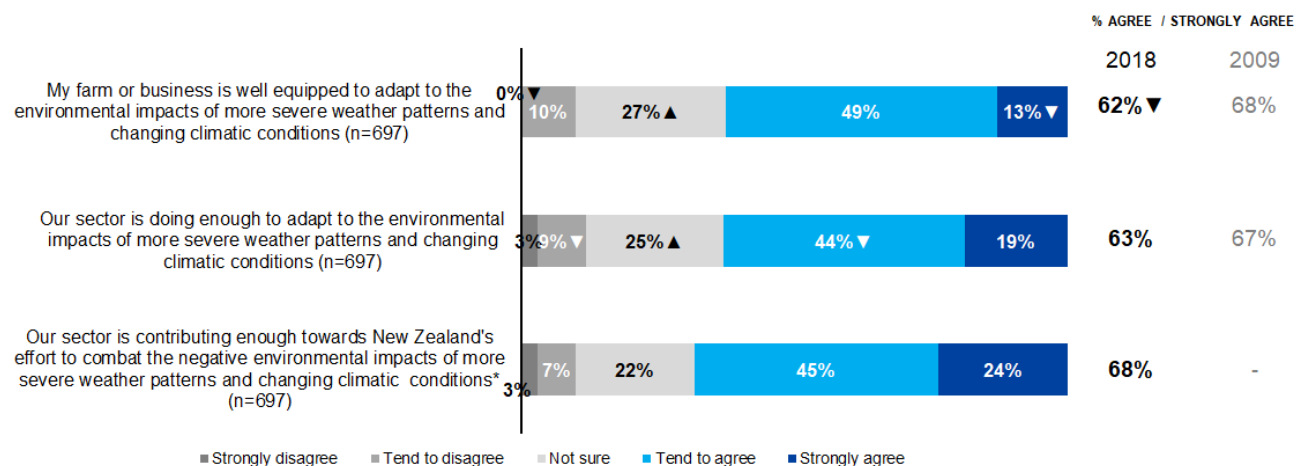
HOW WELL EQUIPPED FARMERS FEEL THEY ARE TO ADAPT TO IMPACTS OF CLIMATE CHANGE AND SECTOR EFFORTS TO CONTRIBUTE TO EFFORTS TO COMBAT ENVIRONMENTAL IMPACTS

Sixty-two per cent of farmers say their farm or business is *well equipped to adapt to the environmental impacts of more severe weather patterns and changing climatic conditions* (see Figure 9 below). The proportion feeling well equipped has declined significantly since 2009 when 68% felt they were well equipped. There is also greater uncertainty in 2018 (27% are *not sure* cf. 15% in 2009).

Compared with 2009, fewer farmers feel the agriculture sector is doing enough to adapt to the environmental impacts of more severe weather patterns and changing climatic conditions (63% in 2018 cf. 67% in 2009) (see Figure 9 below). As with their farm or business, **dairy farmers** are most confident of all farm types (69% *agree* or *strongly agree* the agriculture sector is doing enough, cf. 63% total).

Sixty-eight per cent of farmers feel **the sector** is contributing enough towards New Zealand's effort to combat the negative environmental impacts of more severe weather patterns and changing climatic conditions. (Note: this was a new statement in 2018.)

Figure 9: Views on preparedness of farm or business and sectors' efforts to adapt and contribute to environmental impacts



* New statement in 2018

Base: All respondents (excluding not answered) (2018, n= 697, 2009 n=1000); ▲/▼ significantly higher/ lower than 2009 result

Q22. How strongly do you agree or disagree with the following statements...

SUBGROUP DIFFERENCES

- **Dairy farmers** are most confident (69% *agree* or *strongly agree*) they are well equipped to adapt), with **livestock** farmers and **arable** farmers not far behind (65% agreement and 64% agreement respectively).
- So too climate change sceptics (73% of climate change sceptics feel they are well equipped).
- Conversely, **horticulture and viticulture growers** are *less confident* than other types of farmers that they are well equipped (53%).

Dairy farmers are also most likely to agree that their sector is *contributing enough towards New Zealand's efforts to combat negative environmental impacts of severe weather patterns and changing*

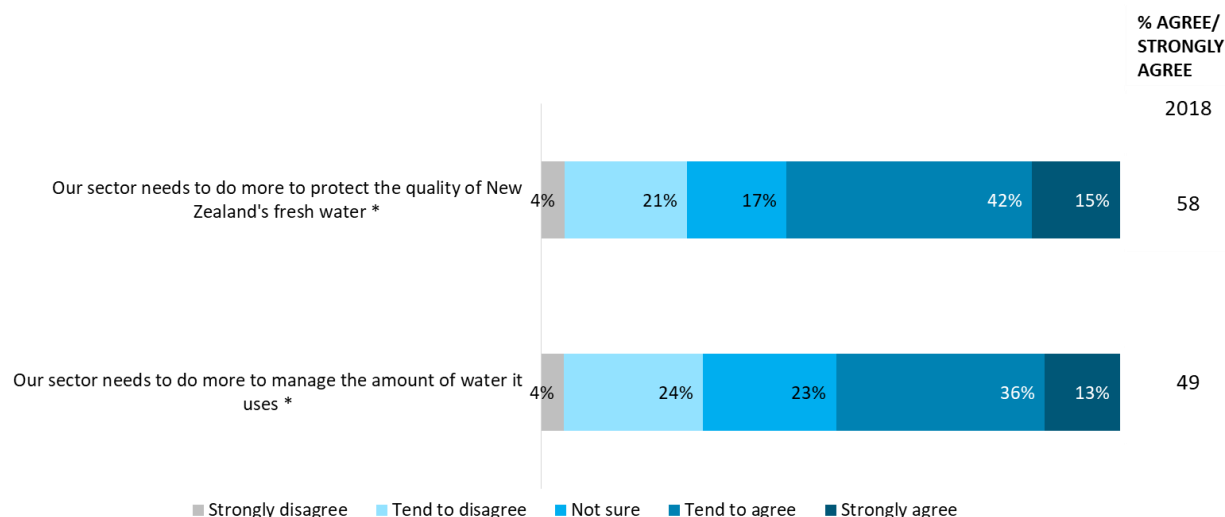
climatic conditions (73% agreeing). Again, horticulturalists are less likely to agree (55% agreement).

WHETHER THE SECTOR IS DOING ENOUGH TO PROTECT AND MANAGE WATER RESOURCES

Farmers were asked about their views on sector efforts to protect the quality of New Zealand's fresh water and to manage the amount of water the sector uses. (These questions were new in 2018.)

The perceived need to *protect the quality of New Zealand's fresh water* is greater than the perceived sector need to *manage the amount of water used* (58% agreement and 49% agreement respectively), as Figure 10 shows.

Figure 10: Views on whether the sector is doing enough to protect and manage New Zealand's water resources



* New statement in 2018

Base: All respondents (excluding not answered) (2018, n= 697-700, 2009 n=1000);
Q22. How strongly do you agree or disagree with the following statements...

SUBGROUP DIFFERENCES

As Table 2 shows, horticulturalists are most likely to agree that their sector needs to do more to protect water quality (62% agreement cf. 58% total).

Table 2: Views on whether the sector is doing enough by farm type

VIEWS OF SECTOR ADAPTATION	TOTAL	DAIRY	LIVESTOCK - SHEEP, BEEF, DEER	ARABLE*	HORTICULTURE & VITICULTURE	OTHER [^] *
Our sector needs to do more to protect the quality of New Zealand's fresh water	58%	51%	59%	56%	62%	63%
Our sector needs to do more to manage the amount of water it uses	49%	47%	48%	58%	49%	54%

Scale: Green (significantly above average)

[^]Other includes Apiary, Pig & Poultry, Other livestock (e.g. goats, alpaca), and Other specified farm types; *Small sample size

Base: All respondents (excluding don't know/NA) (n=629)

Q22. To what extent do you agree or disagree that...?

LEVEL OF FOCUS ON SPECIFIC FARM ISSUES OVER THE PAST FIVE YEARS

The nature of farming means that farmers are always facing a number of challenges and, at any one time, some issues will have greater priority over others, depending on production, climatic conditions, market prices, etc. Farmers were prompted with a list of actions and the level of focus each one may or may not have had (see Figure 11 overleaf).

COMPARED WITH 2009

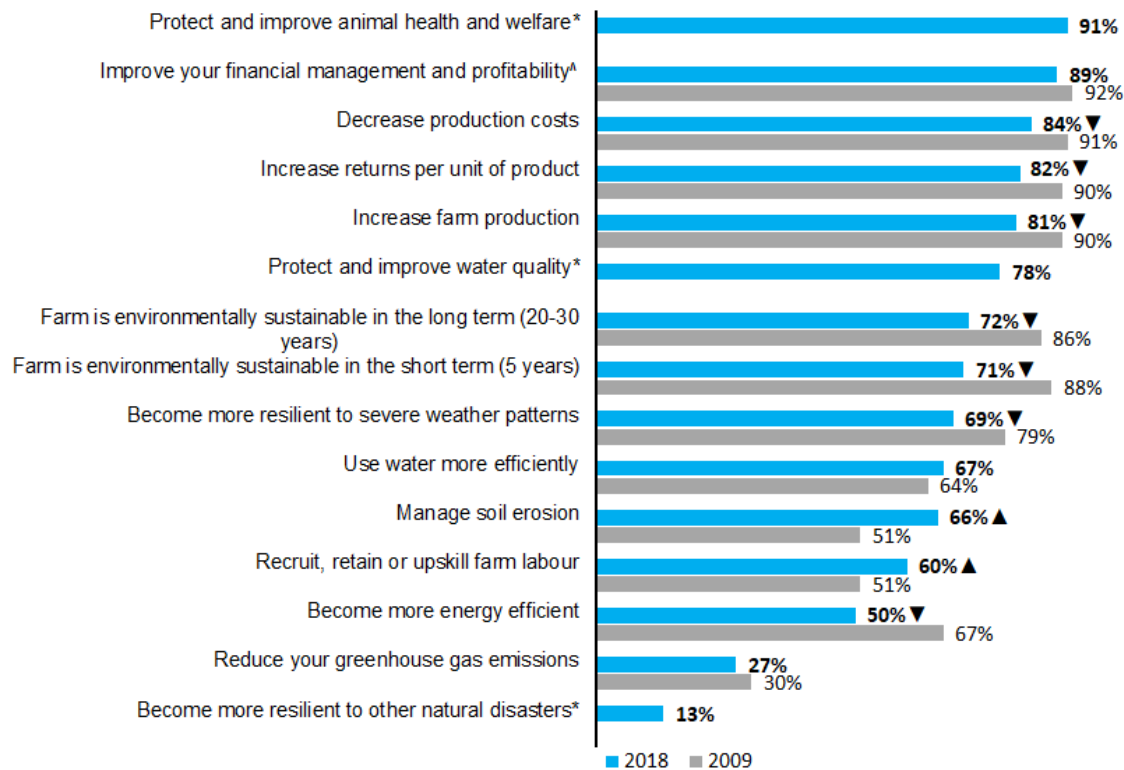
In 2009, the more immediate priorities (that is, ones on which farmers focused on over the last five years) related to on-farm production, specifically- *increasing returns per unit of product, increasing farm production and decreasing production costs*.

In 2018, farmers' top areas of focus over the past five years was *working to protect and improve animal health and welfare* (91% saying this was a *moderate* or *major* focus, - noting that this was a new statement in 2018). Working to improve *financial management and profitability* was the second area of focus (with 89% mention - a similar result to 2009), followed by a focus on on-farm production (that included decreasing production costs, increasing returns per unit produced and increasing farm production).

In 2018, two areas have seen a significant **increase** in farmer focus over the past five years since 2009 - *managing soil erosion* (66% in 2018 cf. 51% in 2009) and *working to recruit, retain or upskill farm labour* (60% in 2018 cf. 51% in 2009) - while other activities remain at the same level of focus or have declined in focus.

Of note, significantly fewer farmers placed a *moderate* or *major* focus on *resilience to severe weather events* (69% cf. 79%) and fewer were *working to reduce their greenhouse gas emissions* over the past five years than in 2009 (27% cf. 30%).

Figure 11: Areas of focus for farmers over the past five years (% moderate or major focus)



* New statement in 2018; ^ Statement wording was changed in 2018; ▲/▼ significantly higher/ lower than 2009 result

Base: All respondents (excluding don't know) (2018 n=665, 2009 n=748-994)

Q8. How much focus has each of the following been for you over the past five years?

LEVEL OF FOCUS OVER THE NEXT FIVE YEARS

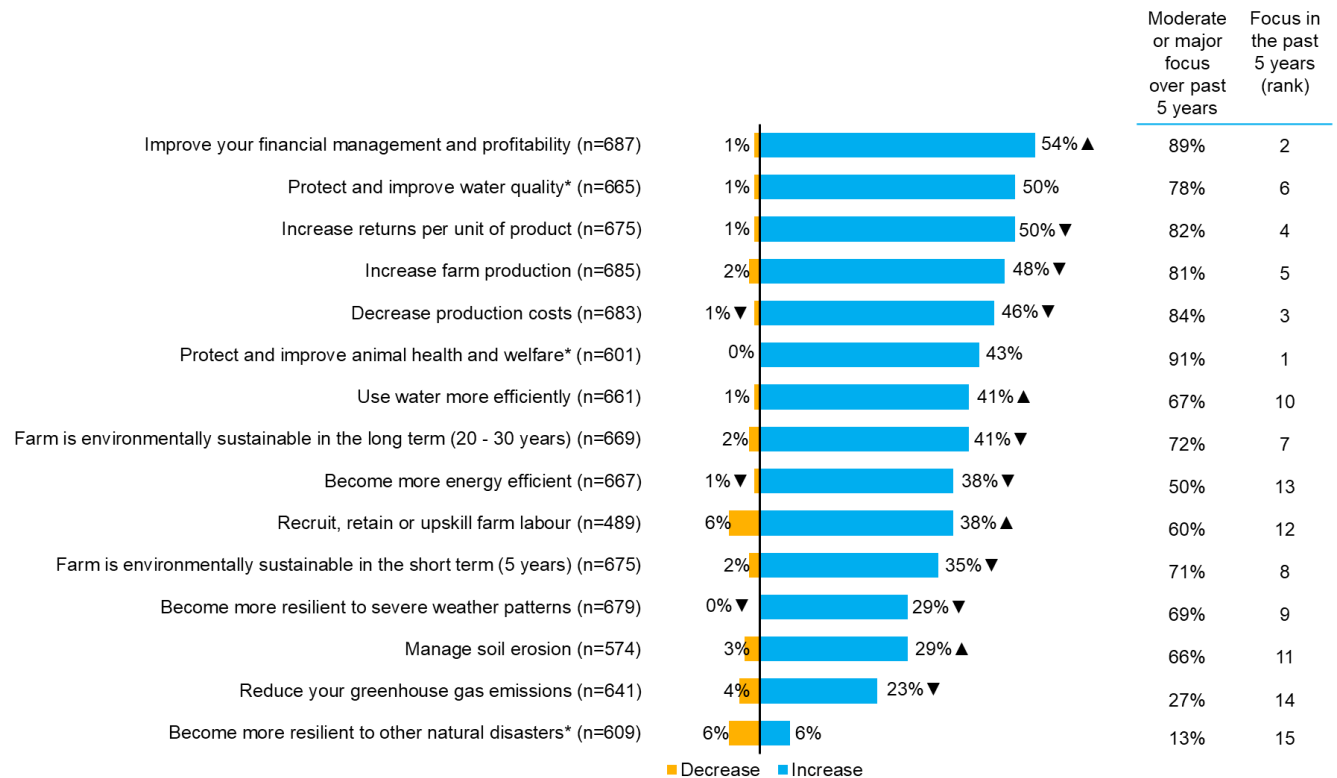
After assessing their level of focus on 12 different areas over the last five years, farmers were asked whether they thought their focus will increase, decrease or stay at the same level for those same issues over the next five years.

To understand how farmer and grower priorities are changing, analysis considers where there has been *little* or *no focus* over the past five years, but an *increase* in focus is anticipated over the next five years. Results indicate that this relationship is linear. That is, the level of focus farmers have placed in the past is indicative of the level of focus they intend in the future.

As with the past five years, farmers report a likely increase in focus on **financial aspects**, particularly *working to improve your financial management and profitability* (54%). They also expect a significant increase in focus on utilising *water more efficiently*, *becoming more energy efficient* and *recruiting, retaining or upskilling labour* compared with their level of focus over the past five years. Although four of the top five increased levels of focus aspects are finance based, water quality (*working to protect and improve water quality*) is of particular importance over the next five years.

For each nominated activity, Figure 12 below shows whether farmers expect to increase or decrease focus. The level of focus over the past five years is shown on the graph, and the ranked position of the activity over the last five years. For example, *working to protect and improve animal health and welfare* ranked first in terms of *moderate* or *major* focus over the past five years, and 43% expect their focus on this will *increase* over the next five years. In contrast, *working to become more resilient to other natural disasters* ranked lowest in terms of past focus, and few farmers (6%) anticipate that their focus will increase.

Figure 12: Areas of focus over the next five years (% increase or decrease)



*New statement in 2018

Base: All respondents (excluding not answered/don't know) (n=489-687); ▲ / ▼ significantly higher/ lower than 2009 result

Q9. Over the **next five years**, do you think your focus on each area will increase, decrease, or stay the same as it has been over the past five years?

SUBGROUP DIFFERENCES

Generally, farmers who intend to **increase focus** across the range of activities over the next five years are:

- Younger (under 40 years of age),
- Have been running their farm for less than five years,
- Have farm income greater than \$1 million and expect their farm income to increase over the next 12 months.
- Consider climate change to be having a *moderate* or *major* impact on their farm and business currently and expect that climate change will have a *moderate* or *major* impact over the next five years.
- Information seekers (i.e. they actively seek information about land management practices)
- Farmers who have a farm environmental plan and/or use Overseer or other computer programmes for nutrient budgeting.



Conversely, those who are **less likely to change** (that is to expect their level of focus to *stay the same* or *decrease* across the activities) are:

- Older (aged 60 or 70 plus years),
- Have been running their farm for more than 20 years.
- Expect their on-farm income to stay the same (or they *don't know*)
- Consider climate change to be having a *minor* or *no impact* on their farm and business currently, and to have a similar impact over the next five years.

Livestock farmers (sheep, beef, and deer) and those in Otago are less likely than other farmers to expect to *increase* focus across the nominated activities. This may reflect the fact that such farmers perceive only a *minor* or *no impact* to their farm and business currently and in the short-term (next five years).

Table 3 below lists the differences for each area by farm type.

Table 3: Specific groups significantly more or less likely to intend an increased level of focus over the next five years

AREA		 MORE LIKELY TO INTEND AN INCREASED FOCUS	 LESS LIKELY TO INTEND AN INCREASED FOCUS
Improve your financial management and profitability	54%	<ul style="list-style-type: none"> • Have native forestry block on their property (69%) 	<ul style="list-style-type: none"> • Livestock - sheep/beef/deer (49%)
Protect and improve water quality	50%	<ul style="list-style-type: none"> • Dairy farmers (57%) • Southland farmers (75%) • Those who do not believe in climate change (56%) 	<ul style="list-style-type: none"> • Farm size less than 50 ha. (40%) • Those who do not believe in climate change (33%)
Increase returns per unit of product	50%	<ul style="list-style-type: none"> • Canterbury farmers (61%) • Large farms (greater than 600 ha.) (62%) • Have native forestry block on their property (65%) 	<ul style="list-style-type: none"> • Otago farmers (31%)
Increase farm production	48%		<ul style="list-style-type: none"> • Livestock - sheep/beef/deer (41%) • Otago farmers (25%)
Decrease production costs	46%	<ul style="list-style-type: none"> • Dairy farmers (53%) • Canterbury farmers (64%) 	<ul style="list-style-type: none"> • Livestock - sheep/beef/deer (41%) • Otago farmers (25%)
Protect and improve animal health and welfare	43%	<ul style="list-style-type: none"> • Southland farmers (61%) 	<ul style="list-style-type: none"> • Horticulture and viticulture growers (19%) • Otago farmers (26%)
Use water more efficiently	41%	<ul style="list-style-type: none"> • Dairy farmers (50%) • Canterbury farmers (52%) 	<ul style="list-style-type: none"> • Livestock - sheep/beef/deer (35%) • Those who do not believe in climate change (29%)
Farm is environmentally sustainable in the long-term (20 - 30 years)	41%	<ul style="list-style-type: none"> • Canterbury farmers (60%) • Have some understanding of the 	<ul style="list-style-type: none"> • Bay of Plenty farmers (24%) • Those who do not believe in climate

		actions needed to reduce their farm's emissions (53%)	change (22%)
Become more energy efficient	38%	<ul style="list-style-type: none"> Dairy farmers (49%) 	<ul style="list-style-type: none"> Livestock - sheep/beef/deer (27%)
Recruit, retain or upskill farm labour	38%	<ul style="list-style-type: none"> Horticulture and viticulture growers (49%) Large farms (greater than 600 ha.) (51%) 	<ul style="list-style-type: none">
Farm is environmentally sustainable in the short-term (5 years)	35%	<ul style="list-style-type: none"> Dairy farmers (40%) Canterbury farmers (53%) Have some understanding of the actions needed to reduce their farm's emissions (44%) 	<ul style="list-style-type: none"> Those who do not believe in climate change (20%)
Become more resilient to severe weather patterns	29%	<ul style="list-style-type: none"> Horticulture and viticulture growers (39%) Canterbury and Manawatu-Whanganui farmers (both 39%) Those who believe in climate change (34%) 	<ul style="list-style-type: none"> Those who do not believe in climate change (17%)
Manage soil erosion	29%	<ul style="list-style-type: none"> Livestock - sheep/beef/deer (35%) 	<ul style="list-style-type: none"> Dairy farmers (23%) Those who do not believe in climate change (18%) Farm size less than 50 ha. (16%) Horticulture and viticulture growers (15%)
Reduce your greenhouse gas emissions	23%	<ul style="list-style-type: none"> Dairy farmers (33%) Canterbury farmers (35%) Those who believe in climate change (28%) 	<ul style="list-style-type: none"> Livestock - sheep/beef/deer (18%) Bay of Plenty farmers (10%) Those who do not believe in climate change (6%) Have little or no understanding of the actions needed to reduce their farm's emissions (16%)
Become more resilient to other natural disasters*	6%		<ul style="list-style-type: none"> Those who have not heard of SLMACC (4%)

MITIGATION PRACTICES

INTRODUCTION

This section examines mitigations to make their farm more environmentally sustainable to cope with changes in climate or severe weather, specifically:

- Actions or changes farmers have taken (unprompted)
- Actions farmers have taken specifically in relation to (unprompted)
- Specific actions farmers have taken or are in the process of taking in relation to:
 - Fertiliser and soil
 - Planting and crops
 - Animals on the farm
 - Farm infrastructure
 - Energy efficiency.

KEY NUMBERS

Belief in climate change

63%

agree or strongly agree that global human activity is contributing to the climate changing above and beyond natural weather cycles

▲ 54% in 2009

Limited awareness of actions to take

50%

have little understanding of or don't know what actions they can take to reduce their farm's emissions of greenhouse gases

New in 2018

Change in farmer and grower focus

23%

intend to increase their focus on working to reduce their greenhouse gas emissions

▼ 30% in 2009

ACTIONS TO MAKE THEIR FARMS MORE ENVIRONMENTALLY SUSTAINABLE – TOP OF MIND

Farmers were asked to list (unprompted) the actions they have taken in the past five years to specifically make their farm more environmentally sustainable.

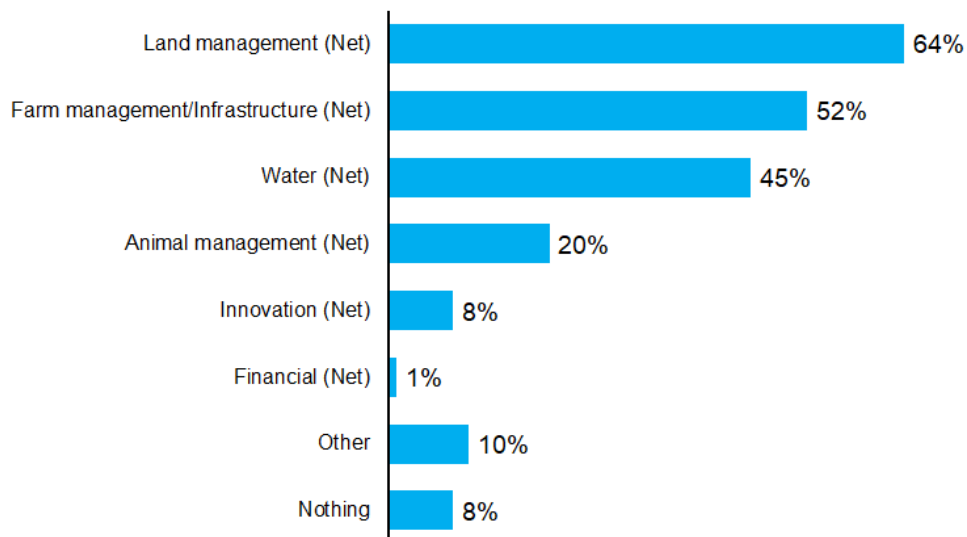
In the past five years 92% of farmers made at least one change or improvement to their farm to be more environmentally sustainable - a significantly higher proportion than in 2009 when 78% said they had done so. A summary of changes made (at the broad thematic level) is provided below in Figure 13. More detail is provided in subsequent sections.

- **Land management changes** are the most common types of action spontaneously mentioned (64%). These include plantings for shade/shelter/riparian planting (33%), improved fertiliser management/using organic fertilisers (19%), and improved soil management (8%).
- Second were comments about **farm management/infrastructure changes** (52% mentions). Typical actions included fencing of waterways/stock control (32%) (particularly among dairy and livestock farmers), improved irrigation systems (15%) and effluent management (10%).
- **Water related** actions were the third broad theme (45% mentions). These include improving irrigation systems for greater water use efficiency, improving the protection of waterways, and monitoring water quality.

Of note, those who believe in climate change have taken slightly more actions than climate change sceptics (an average of 2.4 actions cf. 1.9 actions among climate change sceptics).

In total, 8% said they have done nothing in the past five years to make their farm more environmentally sustainable. These tended to be older farmers and farmers who had been on their property for a long time.

Figure 13: Changes or improvements made on farm over the past five years (%)



**Top 10 commented areas and 'nothing' are shown*

Base: All respondents (excluding don't know/NA) (n=629)

*Q7. And what, if anything, have you changed or introduced on your farm in the past **five years** to **specifically** make your farm more environmentally sustainable for the future?*

SUBGROUP DIFFERENCES



MORE LIKELY TO HAVE MADE CHANGES OR IMPROVEMENTS

- **Dairy** farmers (97%)
- Those who have a gross **on-farm income greater than \$1 million** (98%)
- Those who **expect on-farm income to increase** in the next 12 months (97%).



LESS LIKELY TO HAVE MADE CHANGES OR IMPROVEMENTS

- Those who have **run the farm for more than 30 years** (87%)
- Those **aged 70 plus** (82%)
- **Arable** farmers (76%)
- **Smaller farms** (under 50 ha.) (83%).

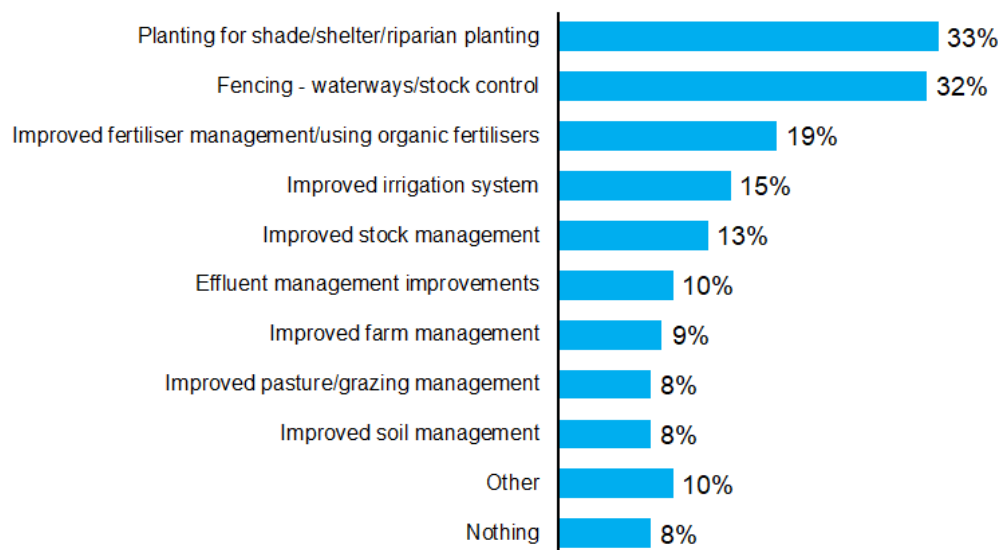
DETAIL ABOUT ACTIONS TAKEN IN LAST FIVE YEARS

More detailed breakdown of these broad themes is shown below in Figure 14 below.

While a large number of individual actions have been taken, the two main actions farmers have taken include:

- Planting for shade, riparian plantings (33%)
- Fencing – to protect waterways and provide stock control (32%).

Figure 14: Changes or improvements made on farm over the past five years (%)



**Top 10 commented areas and 'nothing' are shown*

Base: All respondents (excluding don't know/NA) (n=629)

*Q7. And what, if anything, have you changed or introduced on your farm in the past **five years** to **specifically** make your farm more environmentally sustainable for the future?*

SUBGROUP DIFFERENCES

The type of action taken varies greatly by farm type (see Table 4 below).

Planting for shade/shelter/riparian planting and improved fertiliser management/using organic fertilisers are among the top five actions for each farm type.

Table 4: Top five actions taken by farm type

DAIRY (n=229)	LIVESTOCK - SHEEP, BEEF, DEER (n=251)	ARABLE (n=22*)	HORTICULTURE & VITICULTURE (n=115)	OTHER^ (n=12*)
Planting for shade/shelter/riparian planting (41%)	Fencing - waterways/stock control (44%)	Improved irrigation system/using less water (24%)	Reduced chemical/herbicide/pesticide use (27%)	Planting for shade/shelter/riparian planting (22%)
Fencing - waterways/stock control (39%)	Planting for shade/shelter/riparian planting (37%)	Nothing (24%)	Improved irrigation system/using less water (23%)	Nothing (19%)
Effluent management improvements (39%)	Improved fertiliser management/using organic fertilisers (20%)	Planting for shade/shelter/riparian planting (19%)	Improved fertiliser management/using organic fertilisers (19%)	Invested in/improved infrastructure (14%)
Improved fertiliser management/using organic fertilisers (23%)	Improved stock management/lower stock numbers (17%)	Improved soil management (17%)	Planting for shade/shelter/riparian planting (16%)	Effluent management improvements (12%)
Improved irrigation system/using less water (18%)	Improved pasture/grazing management (12%)	Improved fertiliser management/using organic fertilisers (14%)	Improved soil management (12%)	Pest management/weed control (12%)

Scale: Green (significantly above average), Red (significantly below average)

^Other includes Apiary, Pig & Poultry, Other livestock (e.g. goats, alpaca), and Other specified farm types; *Small sample size

Base: All respondents (excluding don't know/NA) (n=629)

Q7. And what, if anything, have you changed or introduced on your farm in the past **five years** to **specifically** make your farm more environmentally sustainable for the future?



SPECIFIC ON-FARM ACTIONS

Farmers were prompted with a list of changes or actions that they can take to make their farm more environmentally sustainable to cope with changes in climate or severe weather. The five areas covered were:

- Fertiliser and soil
- Planting and crops
- Animals on the farm
- Farm infrastructure
- Energy efficiency.

COMPARED WITH 2009

Overall, nearly all farmers (96%) took specific on-farm actions to make their farm more environmentally sustainable. This compares with 99% doing so in 2009 (see Figure 15 overleaf). Note: a higher proportion mentioned unprompted actions they had taken mentioned in the previous section. This difference between the unprompted result and prompted result may reflect a misalignment between the actions farmers think they need to take to be more environmentally sustainable and what is actually required to be more environmentally sustainable.

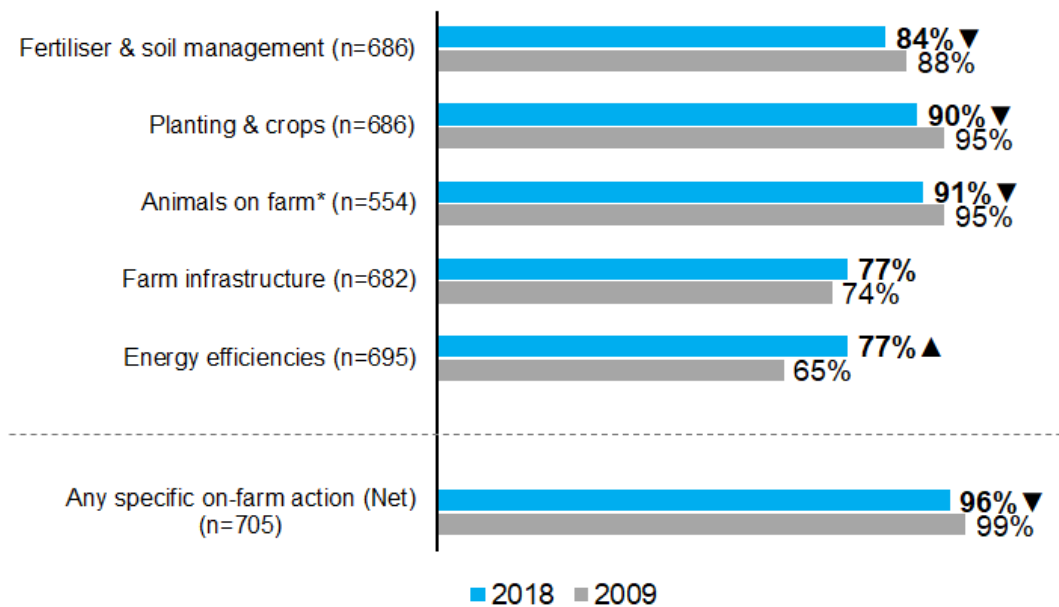
Fertiliser and soil management: Eighty-four per cent made changes, or are in the process of making changes, to fertiliser and soil management (see Table 5 overleaf) - a significantly lower result than in 2009 (88%). Similarly, while a high proportion (90%) took action with regard to **planting and crops**, this is significantly lower than in 2009 (95%). The most common actions are *direct drilling or reduced cultivation* (74%) and *changes to the way fertiliser and nitrogen is used* (70%), the latter is significantly higher among dairy farmers (81%).

Animals on their farm: (refer to Table 6 overleaf), 91% took action to make their farm more environmentally sustainable in relation to their animals (also significantly lower than in 2009 (95%). The most common action is to *make, keep or buy supplementary feed as reserves on the farm* (66%), while the least common among farmers is to *graze stock off-farm in winter* (20%). Of note, significantly fewer indicate they became *more flexible when buying and selling stock* (57% cf. 66% - particularly among dairy farmers (35% cf. 57% total)).

Farm infrastructure: Seventy-seven per cent of farmers made changes to their farm infrastructure for the purpose of making their farm more environmentally sustainable - two in five (37%) have done so specifically for climate reasons (see table 5 on page 32). Effluent systems are most common among dairy farmers (65% cf. 32% across all farms), while growers in horticulture and viticulture are significantly more likely to have made changes to their irrigation systems (58% cf. 32% also). This is also the most common change among arable farmers (71%).

Energy efficiency: A similar proportion (77%) have made changes to drive greater energy efficiencies across their farm – a significantly higher number than in 2009 (65%) (see Table 7 overleaf). The most common change is the *use of contractors* (i.e. contractors with more efficient machinery/ equipment) (55%). This increase overall appears to reflect increased innovation in technology and also a better understanding and measurement of on-farm energy consumption (based on verbatim feedback).

Figure 15: Proportion of farmers who took specific on-farm actions



Base: All respondents (excluding doesn't apply to my farm, don't know, NA), *Respondents who have animals on their farm (excluding doesn't apply to my farm, don't know, NA)

Q10. Over the past five years, what actions have you taken, or are you in the process of taking, specifically to make your farm more environmentally sustainable to cope with changes in climate or severe weather?

Q12. In relation to animals on your farm. Over the past five years, what specific actions have you taken, or are you in the process of taking, to make your farm more environmentally sustainable to cope with changes in climate and more severe weather patterns?

Q13. Have you, or are you in the process of putting in any new infrastructure, or improvements to existing infrastructure, in any of the following areas on your farm for the purpose of making your farm more environmentally sustainable to cope with changes in climate and severe weather patterns?

Q14. Have you made, or are you in the process of making, specific changes for the purposes of being more energy efficient in ...



SUBGROUP DIFFERENCES

The following tables provide detail for each of the nominated areas of action, by farm type.

Table 5: Proportion of farmers who took specific actions or changes in relation to fertiliser and soil or planting and crops to specifically cope with changes in climate or severe weather

	TOTAL	DAIRY	LIVESTOCK - SHEEP, BEEF, DEER	ARABLE	HORTICULTURE & VITICULTURE	OTHER [^]
Fertiliser & Soil		n=161-243	n=188-251	n=20-25*	n=39-108	n=7-9**
Used direct drilling or reduced cultivation (n=514)	74%▲	75%	75%	78%	47%	100%
Made changes to the way fertiliser and nitrogen is used (n=636)	70%▲	81%	68%	60%	65%	71%
Taken action to increase soil carbon (n=457)	47%	37%	45%	60%	61%	47%
Used Overseer ^{^^} (n=545)	35%	64%	24%	44%	9%	25%
Used nitrogen/ urease inhibitors (n=509)	32%▲	50%	24%	51%	17%	0%
NET Nothing (did not take action)	16%	6%	17%	18%	26%	13%
Planting & Crops		n=197-234	n=188-243	n=17-25*	n=46-93	n=7**-11*
Planted crops that provide feed~(n=537)	70%▲	70%	77%	93%	33%	39%
Planted trees for shelter / shade (n=625)	69%	59%	73%	70%	73%	74%
Made changes to types of planting such as species, varieties or cultivars of pasture or crop (n=531)	65%	66%	68%	72%	51%	50%
Planted more deep rooting forage plants for drought (n=510)	50%▲	54%	55%	28%	32%	32%
Planted more riparian plants (n=569)	49%▲	55%	45%	25%	54%	71%
Made increased use of different blocks of land for planting, taking different soil and climatic conditions into consideration (n=502)	47%	40%	50%	41%	58%	40%
Planted trees for erosion control (n=539)	44%	35%	49%	48%	30%	63%
Used precision agriculture techniques (e.g. use of sensors, GIS mapping, sampling to assist variable rate irrigation/ fertiliser application) ^{^^} (n=589)	42%	47%	34%	73%	51%	35%
Made changes to/diversify land usage (e.g. more forestry, crops) (n=509)	38%	25%	41%	31%	50%	44%
Made changes to crop practices (e.g. planting at different times of the year) (n=476)	33%	32%	33%	56%	31%	5%
Considered reducing fire risk when making decisions about planting trees and land management (n=525)	26%▼	20%	27%	42%	28%	23%
Planted trees as a carbon sink (n=572)	23%	15%	24%	17%	29%	52%
Planted trees that provide fodder~(n=540)	19%	10%	23%	20%	18%	34%
NET Nothing (did not take action)	10%	7%	7%	9%	20%	25%

Scale: Green (significantly above average), Red (significantly below average); ▲/▼ significantly higher/ lower than 2009 result

*Small sample size; **Very small sample size; ^^New statement in 2018; ~ change in question wording in 2018 (not comparable with 2009), ^ Other includes Apiary, Pig & Poultry, Other livestock (e.g. goats, alpaca), and Other specified farm types

Base: All respondents (excluding doesn't apply to my farm, don't know and NA)

Q10. Over the past five years, what actions have you taken, or are you in the process of taking, specifically to make your farm more environmentally sustainable to cope with changes in climate or severe weather?



Table 6: Proportion of farmers who took specific actions or changes in relation to farm animals

	TOTAL	DAIRY	LIVESTOCK - SHEEP, BEEF, DEER	ARABLE	HORTICULTURE & VITICULTURE	OTHER^
Farm Animals		n=210-236	n=235-267	n=9-14**	n=19-23*	n=2-4**
Made, kept or bought extra/ supplementary feed reserves on farm (n=531)	66%	77%	62%	68%	52%	74%
Made changes to stock numbers or stocking rate (n=544)	63%	65%	67%	24%	57%	21%
Become more flexible buying and selling stock (n=512)	57% ▼	35%	67%	74%	61%	0%
Made changes to the type of stock feed used or to livestock diet (n=520)	48%	63%	42%	39%	28%	58%
Made changes to breeds, species, varieties or genetics of animals (n=539)	41%	46%	39%	31%	45%	21%
Reduced grazing on some land so native regeneration can occur (n=479)	29%	23%	33%	9%	37%	0%
Grazed stock off-farm in winter^^ (n=512)	20%	41%	10%	38%	17%	0%
NET Nothing (did not take action)	9%	7%	9%	0%	13%	21%

Base: Respondents who have animals on their farm (excluding doesn't apply to my farm, don't know and NA)

Q12. In relation to animals on your farm. Over the past five years, what specific actions have you taken, or are you in the process of taking, to make your farm more environmentally sustainable to cope with changes in climate and more severe weather patterns?

Table 7: Proportion of farmers who took specific actions or changes in relation to farm infrastructure or for the purpose of being more energy efficient

	TOTAL	DAIRY	LIVESTOCK - SHEEP, BEEF, DEER	ARABLE	HORTICULTURE & VITICULTURE	OTHER ^
Farm Infrastructure (for both climate and other reasons)		n=218-242	n=151-256	n=9**-24*	n=34-109	n=7-9**
Water drainage (n=631)	51%	47%	53%	50%	43%	96%
Flood defences, i.e. tracks, culverts, bridges, fences or buildings to cope with flooding (n=590)	47% ▲	41%	52%	45%	33%	89%
Water storage (n=621)	33% ▲	27%	36%	28%	28%	73%
Irrigation system (n=570)	32% ▲	28%	19%	71%	58%	16%
Effluent system (n=445)	32% ▼	65%	7%	24%	16%	51%
Feedpads or stand-off areas (n=449)	22% ▼	38%	11%	46%	7%	13%
NET Nothing (did not take action)	23%	14%	27%	23%	30%	15%
Energy Efficiency		n=152-248	n=86-272	n=6**-26*	n=20*-118	n=2**-11*
Use of contractors (e.g. contractors with their own machinery/ equipment)^^ (n=642)	55%	58%	53%	62%	52%	66%
Your establishment, spraying, husbandry and harvesting of crops or pasture (n=619)	42%	36%	40%	62%	47%	50%
Energy use in irrigation (n=374)	36%	25%	26%	65%	46%	87%
Your use of vehicles and transport (n=675)	35%	36%	31%	40%	47%	26%
Your dairy/ stock shed (n=395)	24%	45%	6%	41%	3%	70%
Your drying, chilling, packing or processing of crops (n=322)	23%	20%	7%	36%	47%	40%
Alternative energy source (e.g. solar, wind) (n=605)	19%	13%	19%	26%	24%	37%
NET Nothing (did not take action)	23%	18%	27%	12%	22%	24%

Base: All respondents (excluding doesn't apply to my farm, don't know, NA)

Q13. Have you, or are you in the process of putting in any new infrastructure, or improvements to existing infrastructure, in any of the following areas on your farm for the purpose of making your farm more environmentally sustainable to cope with changes in climate and severe weather patterns?

Q14. Have you made, or are you in the process of making, specific changes for the purposes of being more energy efficient in ...

GREENHOUSE GAS EMISSIONS

INTRODUCTION

Mitigating the impacts of greenhouse gases requires farmers to understand what their footprint is, and what actions they can undertake that will reduce their emissions. This section considers:

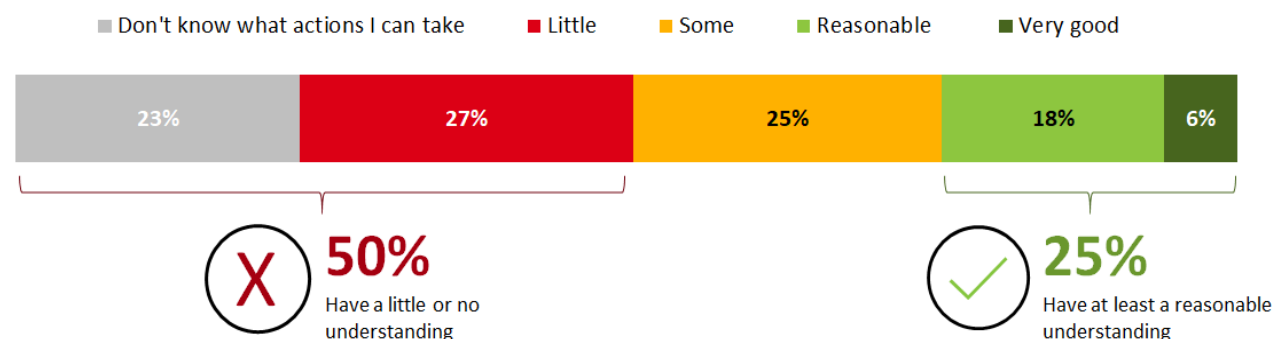
- Farmer's level of understanding of how to reduce their greenhouse gas emissions
- The extent to which farmers measure their carbon footprint
- What actions farmers are taking to reduce their greenhouse gas emissions
- Level of familiarity and use of Overseer and other tools to help manage their business nutrient needs.

UNDERSTANDING HOW TO REDUCE THEIR FARM'S GREENHOUSE GAS EMISSIONS

While 63% of all farmers accept that human activity is contributing to climate change, only 25% of those with animals on their farms have at least a *reasonable* understanding of how to reduce their farm's emissions of greenhouse gases. In total, 50% of farmers say they have *little or no understanding* of the actions they can take to reduce their emissions, as shown in Figure 16 below.

Information seekers (the 9% of farmers who actively seek information about land management practices) have a better understanding of the actions they can take.

Figure 16: Farmers' level of understanding about actions they can take to reduce their farm's emissions of greenhouse gases



*New question in 2018

Base: All respondents who have farm animals on their property (excluding not answered) (n=530)

Q46. Which of the following statements **best describes** your level of understanding of the actions you can take to reduce your farm's emissions of greenhouse gases?

SUBGROUP DIFFERENCES

Those **significantly more** likely to indicate they *don't know* what actions they can take to reduce their farm's greenhouse gas emissions:

- **Don't believe in climate change** (34%)
- Have lower gross **on-farm income - \$250,000 or less** in the last financial year (31%)
- Perceive that changing climates and severe weather patterns will have a **minor or no impact on their farm or business** over the **next five years** (29%)
- Have **not actively sought information** about land management practices in the last 12 months (28%).

Dairy farmers are significantly less likely than other farmers with animals to indicate they *don't know what actions they can take to reduce my farm's emissions* (19% cf. 23% total). But other livestock farmers have a similar level of understanding to dairy farmers, as Table 8 shows.

Table 8: Understanding of actions to reduce greenhouse gas emissions by farm type

FOCUS	DAIRY	LIVESTOCK – SHEEP, BEEF, DEER
Reasonable or very good understanding	20%	26%
Some understanding	31%	23%
Little understanding	31%	26%
Don't know	19%	25%

Base: Respondents who have animals on their farm (excluding doesn't apply to my farm, don't know and NA) (n=530)

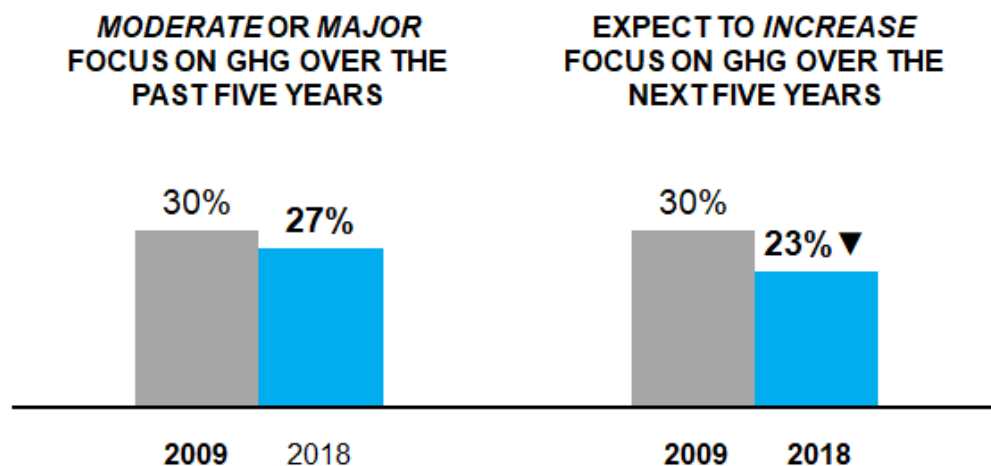
Q46. Which of the following best describes your level of understanding of the actions you can take to reduce your farm's emissions of greenhouse gases?

LEVEL OF FOCUS ON GREENHOUSE GAS EMISSIONS

The proportion of farmers placing *moderate* or *major* focus on greenhouse gases over the past year has declined slightly since 2009; with 27% of farmers placing focus (see Figure 17 below)

Over the next five years, 23% anticipate their focus will *increase* – a decline on the 30% expecting an *increased* focus in 2009. Only a small minority anticipate *decreasing* their focus (4% in 2018, compared with 6% in 2009).

Figure 17: Focus on working to reduce greenhouse gas emissions in past five years and expected focus for the future



Base: All respondents (excluding not answered) (2018: n=639-641, 2009: total n=1000)

▲/▼ significantly higher/ lower than 2009 result

There are always a number of challenges facing farmers and at any one time, you will need to give some issues priority over others. Below is a list of some possible issues or priorities for your farm.

Q8. How much has each of the following been for you **over the past five years**?

Q9. Over **the next five years**, do you think your focus on each area will increase, decrease, or stay the same as it has been over the past five years?

Note: Specific questions about greenhouse gases were asked only of farmers with animals on their properties. (These represented 79% of the total sample, who were primarily dairy and sheep/beef farmers).

KNOWING THEIR GREENHOUSE GAS (GHG) EMISSIONS

In the past two years, 14% of farmers who have animals on their properties have made estimates or calculations of GHG emissions from their farm - whether specific (e.g. using the Overseer model) or rough estimates. Another 6% said they have made estimates or calculations, but not within the last two years, as shown in Figure 18 alongside.

Of those who made estimates, when asked for their best estimate of GHG, only a minority could answer.

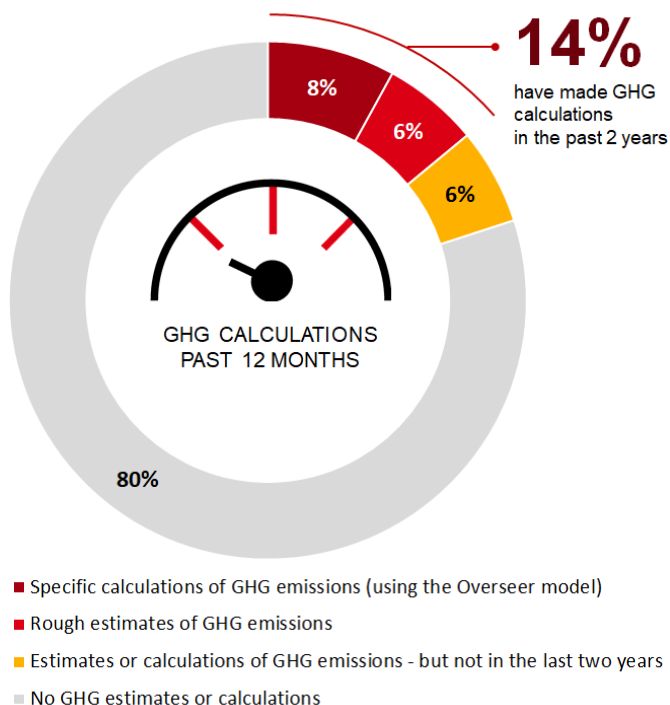
Eighty-seven per cent reported they don't know their *total greenhouse gas emissions* from their farm in the last 12 months, and 94% reported they don't know their *per animal emissions* from their farm.

In summary, only around 2% of farmers with livestock have an indication of the total GHG emissions from their farm and 1% has an indication of the per-animal emissions from their farm.

Among the limited number of respondents who did provide an actual figure, estimates varied greatly based on farm type and farm size.

The lack of understanding about how to reduce GHG emissions (identified in Figure 16 earlier) may be attributed to not knowing what their emissions are in the first place.

Figure 18: Proportion of farmers who made GHG calculations or estimates in the past two years



**New question in 2018*

Base: Respondents who have animals on their property (excluding NA) (n=557)

Q44. Thinking specifically about emissions of greenhouse gases from your farm. Which of the following best applies to you?

Figure 19: Proportion of farmers know their emissions



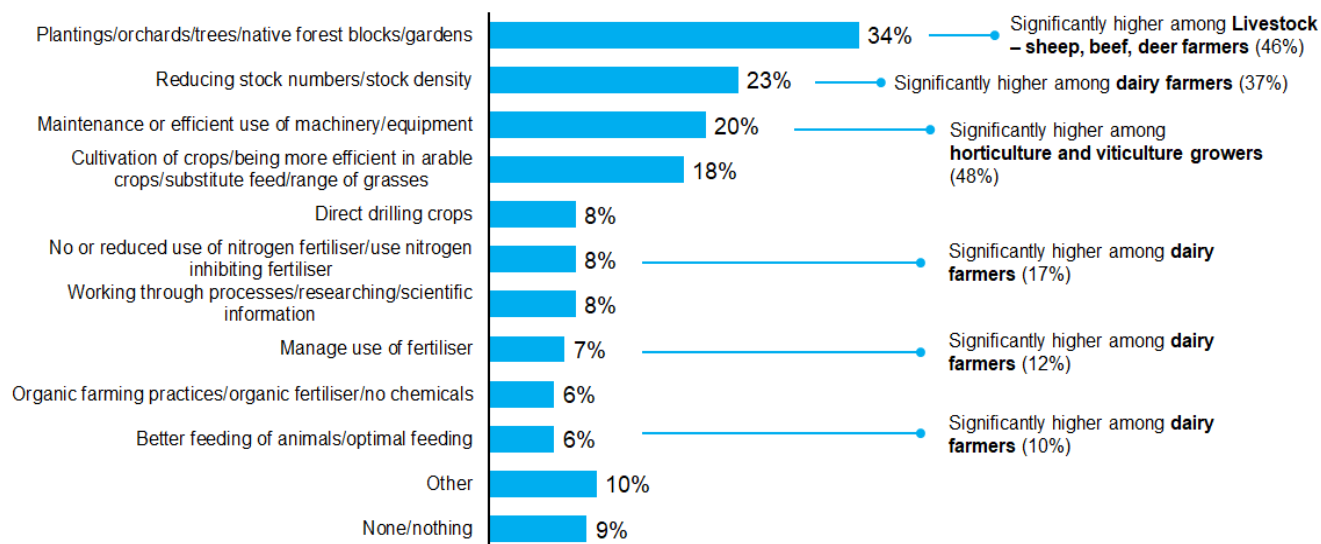
SUBGROUP DIFFERENCES

Dairy farmers were more likely than sheep and beef farmers to have calculated or estimated their emissions (20% of dairy farmers cf. 9% of sheep farmers). And dairy farmers were more likely to have made *specific calculations* – 13% cf. 5% of sheep farmers.

ACTIONS TAKEN TO SPECIFICALLY REDUCE GHG EMISSIONS

When asked what they have done specifically to reduce their GHG emissions, farmers identified the main areas of action below in Figure 20.

Figure 20: Top actions taken specifically to reduce GHG emissions



* New question in 2018

Base: Respondents who have at least minor focus on reducing emissions or will increase focus on reducing emissions over the next five years (excluding doesn't apply to my farm, don't know, NA) (n=294)

Q39. What actions have you taken, or are you in the process of taking, specifically to reduce your greenhouse gas emissions?

More detail for the actions is included in Table 9 below and overleaf, split by dairy farmers and livestock farmers. It highlights the difference in focus across the two groups, with livestock – sheep, beef, and deer farmers focusing on planting, while dairy farmers are focusing on stock density and managing their fertiliser use.

Table 9: Key actions to reduce GHG emissions by Farm Type

THEME	TOTAL	DAIRY (n=117)	LIVESTOCK - SHEEP, BEEF, DEER (n= 111)
1: LAND MANAGEMENT (NET)	58%	58%	66%
Plantings / trees / native forests	34%	22%	46%
Reduce nitrogen fertiliser use/ use nitrogen inhibiting fertiliser	8%	17%	8%
Manage fertiliser use	7%	12%	6%
Organic fertiliser/farming practices	6%	3%	4%
Crop cultivation / efficiency	18%	21%	19%
Direct drill crops	8%	5%	11%
Soil management/soil testing/practices to store carbon	5%	7%	5%
2: ANIMAL RELATED (NET)	29%	48%	31%

Reduced stock density	23%	37%	23%
Optimal feeding	6%	10%	8%
Better breeding	4%	9%	4%
Increase production per unit	4%	2%	7%
OTHER THEMES			
Farm infrastructure (net)	25%	16%	19%
Research / looking at science/ working through options	8%	7%	8%

* New question in 2018

Scale: Green (significantly above average), Red (significantly below average)

Base: Respondents who have at least minor focus on reducing emissions or will increase focus on reducing emissions over the next five years (excluding doesn't apply to my farm, don't know, NA) (n=294)

Q39. What actions have you taken, or are you in the process of taking, specifically to reduce your greenhouse gas emissions?

Verbatim comments about actions taken to reduce their greenhouse gas emissions provide a more tangible sense of what farmers are reporting doing.



"Planting trees on non effective areas, and for shelter/shade. Using additives in tractor fuel." - Dairy, Wellington-Wairarapa

"Specifically we are trying to reduce the amount of cows on our farm by breeding better and more efficient cows." - Dairy, Bay of Plenty

"Increase efficiency feed activities that reduce greenhouse gas - feed pad, reduce power for dairy shed, reduce use of farm fuel." - Dairy, Waikato



"Don't know what to do other than drop stocking rate but need stocking rate to be financially viable. It's only been the last three years where sheep and beef have got ahead and have enough money to do anything. Banks now want principal repayments so money still tight." - Livestock, Canterbury

"Reduced cultivation, genetic improvement through looking at PGRC trials, reduced nitrogen application. Improvement in output per unit. Increased tree and water management." - Livestock, Southland



"Reduce reliance on tractor for mowing orchard and pre-cultivation replanting harvested trees. Increasing soil carbon through good management & holistic grazing." - Arable, Tasman

"It seems a little pointless taking actions when there is no specific calculation available to arable farms that includes all trees (not just woodlots) and all crops in a cropping situation. Until there is proper tools available (Overseer is certainly not suitable), how can we comment." - Arable, Canterbury



"We are going for minimum tillage with control traffic through GPS navigation (less costs) more experimenting required we learn as we go. Old ways with new developments bring advances in technique weather determines which is workable. Grow cover crops instead of direct fertilisers." - Horticulture & Viticulture, Auckland

"We have an electric vehicle. We have only native pastures that result in less methane production in our ruminants. We don't use urea as a fertiliser which affected grass growth both composition and species that in turn lead to the types of bacteria in the rumen that produces more methane. We don't use any superphosphate as this carries carbon miles because it is sourced from overseas. We have planted many trees both native and introduced to offset our emissions." - Horticulture & Viticulture, Otago



"Direct drilling pastures. Walking instead of using the motorbike." - Other, Canterbury

LEVEL OF ENGAGEMENT WITH SPECIFIC PROGRAMMES

All farmers were asked about their use of tools and programmes that help farmers understand and manage their nutrient needs and greenhouse gas emissions:

- Farm environmental plan or budget
- Overseer or another computer programme that calculates the nutrient budget for their property
- Affiliations with Market Assurance programmes such as EureGAP or CarbonZero or other environmental programmes.

In 2018, fewer farmers reported having a farm environmental plan or budget in place (42%, down from 55% in 2009). But there was little change in reported use of Overseer or affiliations with Market Assurance programmes.

KEY NUMBERS

42%

have a farm environmental plan or budget

▼ 55% in 2009

30%

have Overseer or another computer programme that calculates the nutrient budget for on your property

33% in 2009

17%

have an affiliation with Market Assurance programmes such as EureGAP or CarbonZero

19% in 2009

SUBGROUP DIFFERENCES

There are differences in the levels of use by farm type, as shown in Table 10 below.

Table 10: Use of the different programmes by farm type

PROGRAMME	DAIRY	LIVESTOCK – SHEEP, BEEF, DEER	ARABLE*	HORTICULTURE & VITICULTURE	OTHER^*
Farm environmental plan or budget	46%	43%	56%	32%	23%
Overseer or another computer programme	61%	19%	51%	10%	27%
Affiliations with Market Assurance programmes	4%	9%	18%	56%	17%

^Other includes Apiary, Pig & Poultry, Other livestock (e.g. goats, alpaca), and other specified farm types

Green blocking means the result is significantly higher than other farm types. Red blocking means the result is significantly lower.

* Note: small base sizes

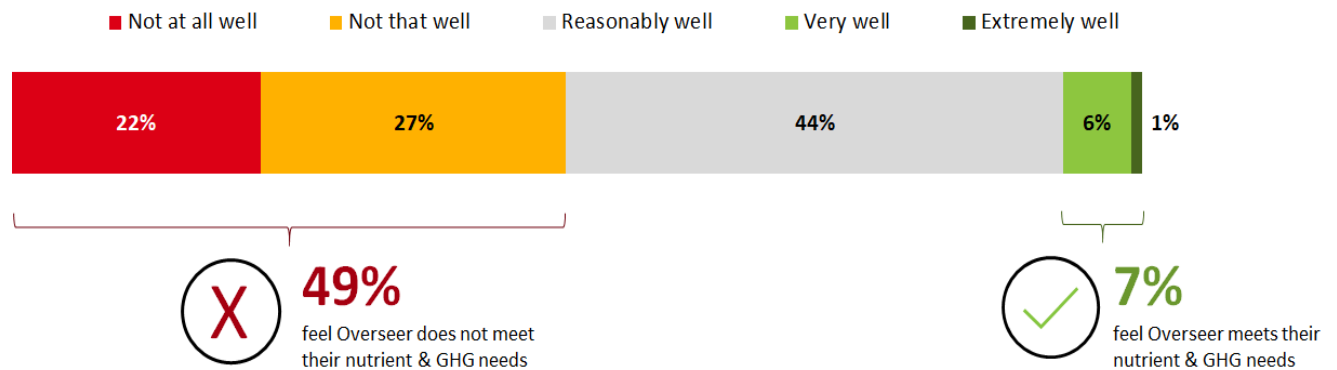
Q15. Which of the following do you have?

Overseer and equivalent programmes: 30% use Overseer or another computer programme that calculates the nutrient budget on their property.

Overseer is generally perceived negatively among users, with 49% of those who have Overseer considering it does not meet their nutrient and GHG needs – see Figure 21 below. They consider Overseer paints too broad a brush and would be more effective if it were more specific to farm type requirements.

For those who find it useful (*very well* or *extremely well*), comments highlight how it gives them an overview, as a starting point to allow them to monitor against over time.

Figure 21: Effectiveness of Overseer in meeting farmer needs



**New questions in 2018*

Base: Respondents who use Overseer or other nutrient budget calculation for farm (excluding doesn't apply to my farm, don't know, NA) (n=167)

Q39. How well does the Overseer decision support programme meet both your business nutrient and greenhouse gas needs?

A selection of verbatim comments about the Overseer programme are included below, to provide further insight into the views of those who rated it positively (n=89 comments) and those who rated it negatively (78 negative comments).

Why the Overseer programme meets their needs well or not well

Not that well or not at all well



"There are a lot of things it doesn't take into account. Chicory and plantain, and break feeding greened maize for example. It needs to be more user friendly and majorly updated." - Dairy, Hawkes Bay

"Overseer programme is very much an estimation. Until programmes become more consistent from version the number is of little value. The trend from season to season is really the only value that is of any use regarding Nitrogen losses & Nitrogen use efficiency. The understanding of how to reduce Nitrogen loss through a variety of techniques is a lot more relevant to our business than the number that 'Overseer' spits out."

- Dairy, Waikato



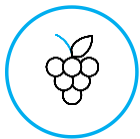
"Overseer seems incapable of factoring in all variables this property has 6 different soil types, slope ranging from swamp to cliffs, river bed, bush, forestry, swamp, wetland, 3 classes of livestock (sheep, beef cattle, deer) dark & sunny faces, crops, improved pasture, variable rainfall & climate. Calculation to date have varied by 50%."

- Livestock, Canterbury



"Overseer was designed as a decision support tool for pastoral farming in the North Island. It was not designed to cope with the complexities involved with Arable farming. The huge array of crops and the husbandry involved in growing those crops is not built in. To get around this, people using them must make assumptions to continue. You simply cannot have assumptions or call one crop something else in order to proceed. Until this problem is resolved it is simply a waste a lot of people's time and money on a very inaccurate result."

- Arable, Canterbury



"SWNZ is more about oversight and less about sustainability."

- Horticulture & Viticulture, Hawkes Bay

Somewhat, very or extremely well

"Overseer highlights the good things that we are doing & gives us a benchmark to improve. It is not 100% in giving us a big picture but it is the best tool the industry has & hopefully it will improve."

- Dairy, Waikato

"Overseer has given us the ability to compare year to year and view progress made."

- Dairy, Canterbury

"Informs me what our nutrient losses are and with adjustments looking forward what our losses could be."

- Livestock, Southland

"Overseer lets us know amount/cost per hectare."

- Livestock, Waikato

"We are part of an irrigation scheme which requires a nutrient budget for consent."

- Arable, Canterbury

"So that we have a starting point with our base line. Also, we operate under the umbrella of our local irrigation water supply company that gives us our N loss levels to work with."

- Arable, Canterbury

"Assists in making fertiliser recommendations for each area on the orchard."

- Horticulture & Viticulture, Tasman

Base: Respondents who indicate the Overseer decision support programme meets both their business nutrient and greenhouse gas needs (excluding doesn't apply to my farm, don't know, NA) (n=167; n=78 'Not that well' or 'Not at all well'; n=89 'Reasonably well', 'Very well', 'Extremely well')

Q40. Based on your response above, why would you say the Overseer programme meets your needs in this way?

EXTENSION: INFORMATION NEEDS AND RESOURCES

INTRODUCTION

Farmers' information needs and requirements are changing. According to the Nielsen Rural Report 2016, traditional media methods - such as rural newspapers and magazines - are the number one resource for farmers when looking for information, new ideas or advice for all their farming materials, machinery and infrastructure requirements. However, farmers are also becoming increasingly digitally focused. Seventy-eight per cent manage their business administration - such as accounting, banking and tax - online, and they also track assets and check the weather frequently.

Effective technology transfer requires planning how best to adapt to change and communicating the newest research findings to farmers, growers, and other primary industry professionals in a way that can directly influence engagement (through awareness of climate change), implementation (provide practical on-farm options), and lasting behaviour change.

This section examines the following topics:

- The type of information farmers have been actively seeking.
- Perceptions of the quality of information about land management practices, how perceptions are changing, and where farmers seek information.
- Level of awareness of specific legislation, schemes and programmes.
- Further information or advice required.
- How to encourage farmers to take more environmentally sustainable action.

KEY NUMBERS

Actively sought information

20%

from MPI in the past 12 months

New in 2018

Consistency of information

42%

rate information consistency from government as *poor* or *very poor*

45% in 2009

Further information or advice

63%

want further information or advice on topics related to improving resilience to climatic change - a further 21% say they have enough information

▲ 47% in 2009



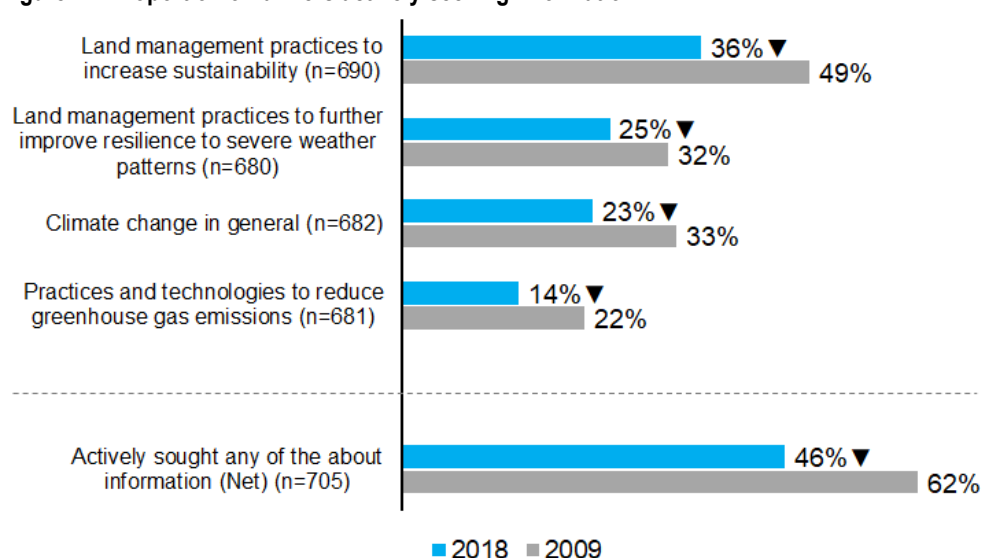
ACTIVE INFORMATION SEEKING

Farmers were asked about whether they have sought information on issues relating to; *land management practices; increase sustainability, to further improve resilience to severe weather; practices and technologies to reduce greenhouse gas emissions; climate change in general.*

In 2018, fewer farmers are actively seeking information on these issues than in 2009 (46% cf. 62%) and information seeking about all four nominated areas has declined significantly, as shown in Figure 22 below.

- The **most commonly sought information** relates to *land management practices to increase sustainability* (36% in 2018, down from 49% in 2009).
- The **least sought after information** is about *practices and technologies to reduce greenhouse gas emissions* (14% cf. 22% in 2009).

Figure 22: Proportion of farmers actively seeking information



Base: All respondents (excluding NA) (2009 n=1000); ▲/▼ significantly higher/ lower than 2009 result
Q23. In the last twelve months, have you actively sought information about any of the following issues?

SUBGROUP DIFFERENCES

Information seeking is closely correlated with beliefs in climate change. Farmers who have sought information are **significantly more** likely to;

- **Believe in climate change** (76% cf. 59% among those who have not actively sought any information)
- Agree or strongly **agree that the sector needs to do more to protect the quality of New Zealand's fresh water** (74% cf. 52%)
- Disagree or strongly **disagree that their sector is contributing enough towards New Zealand's effort to combat the negative environmental impacts of more severe weather patterns and changing climatic conditions** (19% cf. 10%).



Information seekers may be driven to actively seek information because they perceive a greater negative impact from changing climate. They also:

- Consider current climate or severe weather patterns are having a *moderate* or *major* impact **on their farm and business** (61% cf. 43% among non-information seekers).
- Perceive changes in climate will have a ***moderate* or *major* impact over the short-term (five years)** (59% cf. 44%) **and long-term (20 years)** (80% cf. 50%).
- **Perceive long-term climatic changes as an opportunity** for their business (19% cf. 6%).
- Are **action takers** - more likely to have made changes (98% cf. 89%) over the past five years and have made more changes (3 actions cf. 1.9 changes or improvements on average) over this period. Changes specifically relate to:
 - Taking action to increase more soil carbon (77% cf. 37%)
 - Changes to the establishment, spraying, husbandry and harvesting of crops or pasture (72% cf. 52%)
 - Planting more riparian plants (64% cf. 41%)
 - Changes to the use of vehicles and transport (56% cf. 31%)
 - Changes to crop practices (46% cf. 24%)
 - Planting trees as a carbon sink (35% cf. 20%).

There was reasonable consistency by farm type as Table 11 shows, although livestock farmers were more likely than other farmers to have sought information about improving resilience to severe weather patterns (32% having done so in the last twelve months).

Table 11: Types of information sought by farm type

TYPE OF INFORMATION	TOTAL	DAIRY	LIVESTOCK - SHEEP, BEEF, DEER	ARABLE*	HORTICULTURE & VITICULTURE	OTHER^**
Land management practices to improve sustainability	36%	38%	40%	45%	24%	25%
Land management practices to further improve resilience to severe weather patterns	25%	23%	32%	39%	11%	6%
Practices and technologies to reduce greenhouse gas emissions	14%	16%	12%	13%	13%	22%
Climate change in general	23%	24%	22%	21%	26%	23%



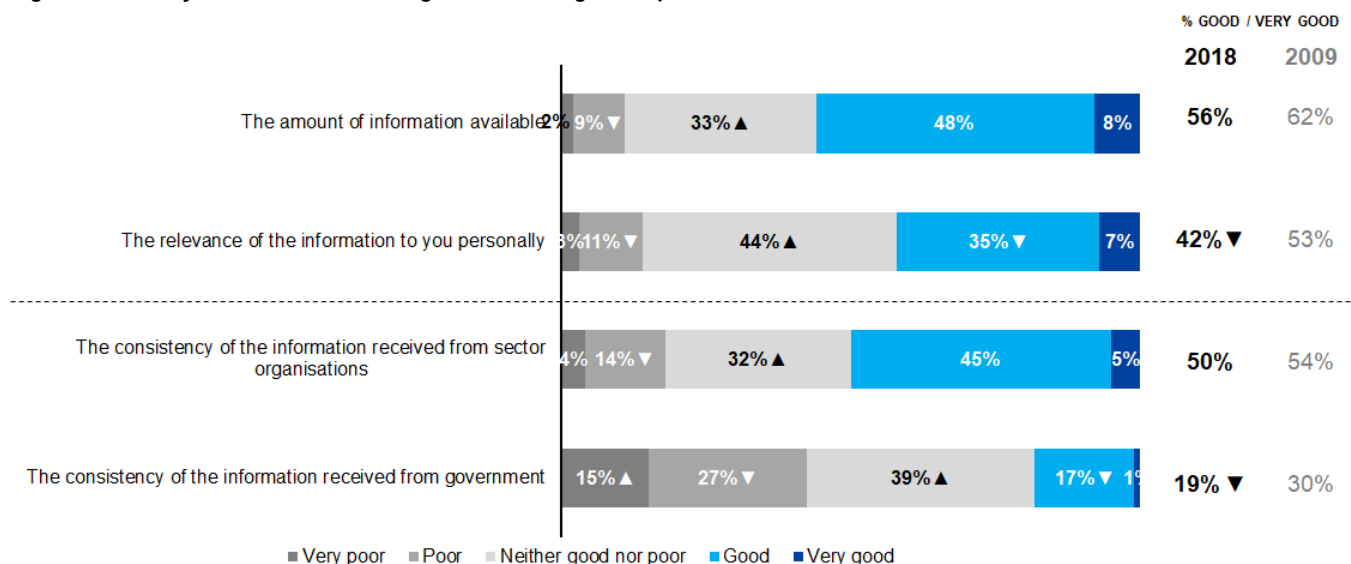
QUALITY OF INFORMATION

Overall, farmers are less positive about the availability of quality information about land management practices than they were in 2009, as Figure 23 below illustrates. Fifty-six per cent of farmers feel the availability of quality information is sufficient (rate *the amount of information available* as *good* or *very good*).

Compared with 2009, significantly fewer rate the *relevance of the information to them personally* positively (42% rate *good* or *very good* cf. 53%) and there has been no improvement in the perceived *consistency of the information received from government* (42% rate *poor* or *very poor* cf. 45% in 2009).

Farmers are more positive about the consistency of information they receive from sector organisations than from Government; 50% rate the consistency of information from sector organisations as *good* or *very good* compared with only 19% rating the consistency of information from government as *good* or *very good*. Perceptions of government information have declined significantly since 2009 (30% down to 19% in 2018), while results for sector organisations have remained relatively consistent (54% in 2009 down to 50% in 2018).

Figure 23: Quality of information relating to land management practices



Base: All respondents (excluding don't know, NA) (2018 n=253-265, 2009 n=561-566); ▲/▼ significantly higher/ lower than 2009 result

Q24. How would you rate the **information relating to land management practices** to further improve resilience to severe weather patterns and climatic changes, in terms of:



SOURCES OF INFORMATION

Farmers seek information about land management practices from four or more sources on average.

Farmers do not look directly to MPI for information or advice (only 20% have actively sought information from MPI in the last 12 months). Their main sources of information outside of general internet sources (62%) are *industry events/fielddays* (55%), *rural professionals/advisors* (53%), *industry companies/suppliers* (48%), and *friends, family and neighbours* (48%).

Table 12 below lists key information sources by farm type. Horticulture and viticulture growers are least active or diverse about their information sources, with high reliance on industry organisations or groups.

Table 12: Key sources of information relating to land management practices and technologies by farm type

SOURCE OF INFORMATION	TOTAL	DAIRY	LIVESTOCK - SHEEP, BEEF, DEER	ARABLE*	HORTICULTURE & VITICULTURE	OTHER ^{^**}
Internet	62%	58%	56%	84%	73%	83%
Industry event, shows or fielddays	55%	57%	55%	54%	47%	63%
Rural professional/ consultant (e.g. AsureQuality, Farm Consultants)	53%	62%	52%	68%	44%	30%
Friends, family and neighbours	48%	44%	46%	73%	44%	67%
Industry company/ supplier (e.g. Fonterra, PGG Wrightson)	48%	67%	38%	65%	46%	46%
Industry body/ association (e.g. Federated Farmers, NZ Farm Forestry Association)	47%	41%	45%	32%	58%	93%
TV documentaries (e.g. Country Calendar)	37%	28%	43%	27%	37%	37%
Research institutions (e.g. AgResearch)	30%	34%	28%	38%	36%	0%
Veterinarian	22%	36%	25%	11%	0%	0%
Ministry for Primary Industries	20%	15%	24%	11%	14%	46%
Local council/regional council	2%	1%	4%	0%	2%	0%

Scale: Green (significantly above average), Red (significantly below average); *small sample size, ** Very small sample size

[^]Other includes Apiary, Pig & Poultry, Other livestock (e.g. goats, alpaca), and Other specified farm types

*New question in 2018

Base: All respondents who actively sought information in the last 12 months (excluding don't know, NA) (n=320)

Q41. And, from where did you seek this information?

FURTHER INFORMATION OR ADVICE REQUIRED

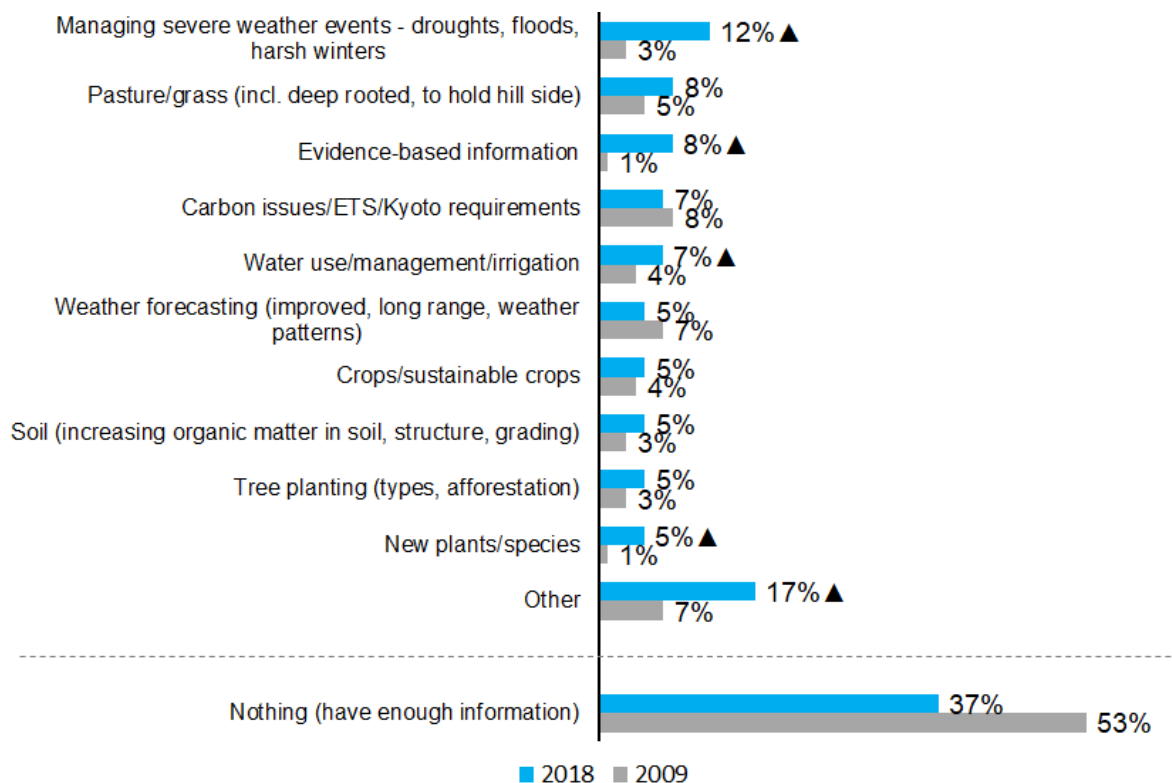
In 2018, 63% of farmers would like further information or advice relating to land management practices to further improve their farm's resilience to severe weather patterns and changing climatic conditions - a significant increase on 2009, when only 47% sought further information.

In terms of specific topics, Figure 24 highlights that *managing severe weather events* (12% cf. 7% in 2009 mentioned *coping with extreme weather*) and *evidence-based information* (8%), are most highly sought after.

Mention of *carbon issues, ETS and Kyoto requirements* was at similar levels to 2009 (7% cf. 8%). However, this was less often mentioned than other areas.

While 50% reported they will have an increased focus on working to protect and improve water quality over the next five years, only 7% mentioned they would like further information or advice on *water related topics*.

Figure 24: Land management topics farmers would like further information or advice on



Base: All respondents (excluding don't know, NA) (2018, n=417; 2009, n=897), ▲/▼ significantly higher/ lower than 2009 result
 Q25. What specific topics relating to land management practices to further improve your farm's resilience to severe weather patterns and changing climatic conditions, would you like further information or advice on, if any?





SUBGROUP DIFFERENCES

Farm types **significantly more** likely to want information or advice on specific topics include:

- **Dairy:** Evidence-based information (14% cf. 8% total).
- **Horticulture and Viticulture:** Managing severe weather events - droughts, floods, harsh winters (27% cf. 12%), and water use/management/irrigation (15% cf. 7%).

A selection of **other verbatim comments** made about the types of information farmers seek are included below. These highlight the importance of providing evidence-based (i.e. neutral science based), reliable information that is consistent across provider, and that is a-political.

Farmers also talked of the desire for government agencies to push-back on lobby groups.

	<p>"Scientifically proven, real world data and recommended management practices from independent and reputable industry bodies (i.e. DairyNZ). So things like pasture growth, grazing management, animal and plant genetics, etc. can be informed by quality R&D and not unsubstantiated 'greenwashed' feel good ideas from people outside the industry who mistake opinions for facts or who want to profit from selling you a product or service that may or may not result in improved environmental outcomes along with long-term economic sustainability."</p> <p>- Dairy, Tasman</p>	<p>"Must be unbiased peer reviewed as conflicting science is frustrating."</p> <p>- Dairy, Waikato</p>
	<p>"It's all become too radical now [and difficult] to pick the real from the false".</p> <p>- Livestock - sheep, beef, deer, Bay of Plenty</p>	<p>"Climate station that is local and provides real time data more information about land use capability, suitability and versatility. Updated LUC information with soil data and slope data e.g. LiDAR."</p> <p>- Livestock - sheep, beef, deer, Waikato</p>
	<p>"More information that relates to our farm [arable & sheep] in our [Tasman] climate...and would love to have a mentor to talk to."</p> <p>- Arable, Tasman</p>	<p>"Getting the media, government, regional and district councils, and the general public with limited agricultural knowledge to understand that as farmers we produce food that they eat and that the land we produce it off is our asset that we are not trying to destroy it but improve it for the future. Paper shufflers, shiny arses, spin doctors and greenies are very good at exploiting what they want to believe but seldom have all the facts."</p> <p>- Arable, Canterbury</p>
	<p>"MPI/government to provide information on new crops/land use that are sustainable."</p> <p>- Horticulture, Canterbury</p>	<p>"More work on pollination including bee substitutes, drought resilient avocado rootstocks and policies that ensure the economically efficient use of water"</p> <p>- Horticulture, Bay of Plenty</p>

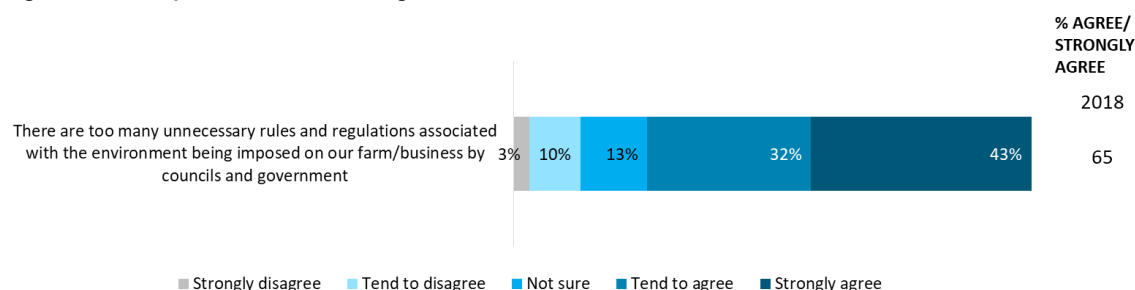


PERCEPTIONS OF RULES AND REGULATIONS

Regulations and compliance were a key theme in issues that farmers said they face in making their farms and property more environmentally sustainable for the future (ranked third equal with financial viability concerns as mentioned earlier).

Farmers were asked their opinion of the amount of rules and regulations (a new question in 2018). Seventy five percent agree that *there are too many rules and regulations associated with the environment being imposed by councils and government on their farm/business*, with only 13% disagreeing. Agreement is strong, with 43% *strongly agreeing* that there are too many unnecessary rules and regulations and 32% *tending to agree* (as Figure 25 shows below).

Figure 25: Perceptions of rules and regulations



As Table 13 below shows, dairy and livestock farmers are more likely to agree that there are too many rules and regulations.

Table 13: Perceptions of rules and regulations by farm type

RULES AND REGULATIONS	DAIRY	LIVESTOCK – SHEEP, BEEF, DEER	ARABLE*	HORTICULTURE & VITICULTURE	OTHER**
There are too many unnecessary rules and regulations ...	76%	77%	69%	62%	97%

Scale: Green (significantly above average); *small sample size, ** Very small sample size

^Other includes Apiary, Pig & Poultry, Other livestock (e.g. goats, alpaca), and Other specified farm types

*New question in 2018

Base: All respondents (excluding don't know, NA) (n=699)

Q22.How much do you agree or disagree that...



A selection of verbatim comments farmers made in response to the question about issues they face in making their farms and businesses more environmentally sustainable for the future are included below.

These highlight concerns with the complexity of some of the regulations, the speed of introducing regulations, and the cost of implementing those regulations.

	<p><i>"...Poor central, regional and local government regulatory decision making based on emotive rather than scientific data and modeling."</i></p> <p>- Dairy Waikato</p>	<p><i>"Being forced into changes that aren't scientifically proved and financially viable. But there could be a lack of knowledge in what is viable best practice."</i></p> <p>- Dairy, Canterbury</p>	
	<p><i>"The cost involved and also information is complicated and tends to change leaving us confused."</i></p> <p>- Livestock, Manawatu/Whanganui</p>	<p><i>"Money. Misinformation, regulations been imposed on everyone too quickly."</i></p> <p>- Livestock, Manawatu/Whanganui</p>	<p><i>"Uncertain regulatory environment."</i></p> <p>- Livestock, Waikato</p>
	<ol style="list-style-type: none"><i>"An actual description of what environmental sustainability is."</i><i>Environmental policy is dictated via politics, maybe it should be non partisan."</i> <p>- Arable, Canterbury</p>		<ol style="list-style-type: none"><i>"Irrigation regulation and compliance. Also the urban/rural divide."</i> <p>- Arable, Canterbury</p>
	<p><i>"Government's poor understanding of issues facing growers in NZ.. Don't seem to be interested talking to people who are affected by changes. The cost of change."</i></p> <p>- Horticulture, Bay of Plenty</p>		<p><i>"Too many new rules and taxes from government and council, costing more money & time."</i></p> <p>- Viticulture, Marlborough</p>



AWARENESS OF SUSTAINABILITY RELATED LEGISLATION, SCHEMES AND PROGRAMMES

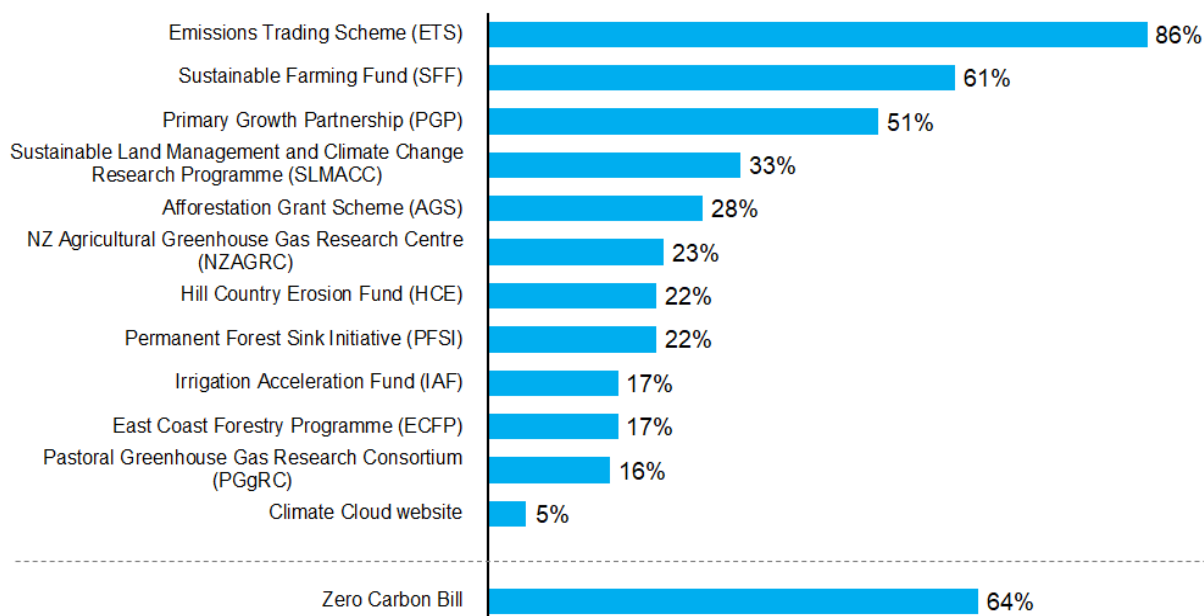
Farmers' current awareness of specific legislation, schemes, programmes and funds relating to sustainability and climate change is mixed, as shown below in Figure 26.

Eighty six per cent have heard of the Emissions Trading Scheme (ETS). Only two other programmes have awareness levels of 50% or above: the Sustainable Farming Fund (61%) and the Primary Growth Partnership (51%).

Only 33% have heard of the Sustainable Land Management and Climate Change research programme (SLMACC).

Sixty four per cent are aware of the Zero Carbon Bill, which is set to be introduced to Parliament in 2019.

Figure 26: Farmer awareness of legislation, schemes and programmes



Base: All respondents (excluding don't know, NA) 2018 (n=662 - 682)

Q432. Have you heard of....?



SUBGROUP DIFFERENCES

Awareness of legislation, schemes and programmes by farm type varies greatly by farm type (see Table 14 below).

Information seeking activity carries over to awareness: livestock - sheep, beef, and deer farmers have greater awareness across many items listed, while horticulture and viticulture growers typically have lower awareness of the specific legislation, schemes and programmes listed.

Table 14: Awareness of legislations, schemes and programmes by farm type

LEGISLATIONS, SCHEMES AND PROGRAMMES	TOTAL	DAIRY	LIVESTOCK - SHEEP, BEEF, DEER	ARABLE*	HORTICULTURE & VITICULTURE	OTHER ^{***}
Emissions Trading Scheme (ETS)	86%	89%	89%	74%	80%	74%
Zero Carbon Bill	64%	69%	61%	60%	62%	88%
Sustainable Farming Fund (SFF)	61%	63%	64%	43%	56%	54%
Primary Growth Partnership (PGP)	51%	44%	64%	35%	32%	39%
Sustainable Land Management and Climate Change Research Programme (SLMACC)	33%	34%	35%	31%	26%	33%
Afforestation Grant Scheme (AGS)	28%	20%	36%	10%	16%	37%
New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC)	23%	25%	25%	16%	19%	21%
Hill Country Erosion Fund (HCE)	22%	19%	30%	22%	7%	3%
Permanent Forest Sink Initiative (PFSI)	22%	12%	28%	21%	16%	23%
Irrigation Acceleration Fund (IAF)	17%	21%	17%	24%	11%	15%
East Coast Forestry Programme (ECCP)	17%	9%	20%	19%	20%	7%
Pastoral Greenhouse Gas Research Consortium (PGgRC)	16%	19%	20%	11%	7%	3%
Climate Cloud website	5%	4%	5%	12%	3%	7%

* New question in 2018

Base: All respondents (excluding NA) (n=667-688)

Q42. Have you heard of...?

Q47. Have you heard of the Zero Carbon Bill?

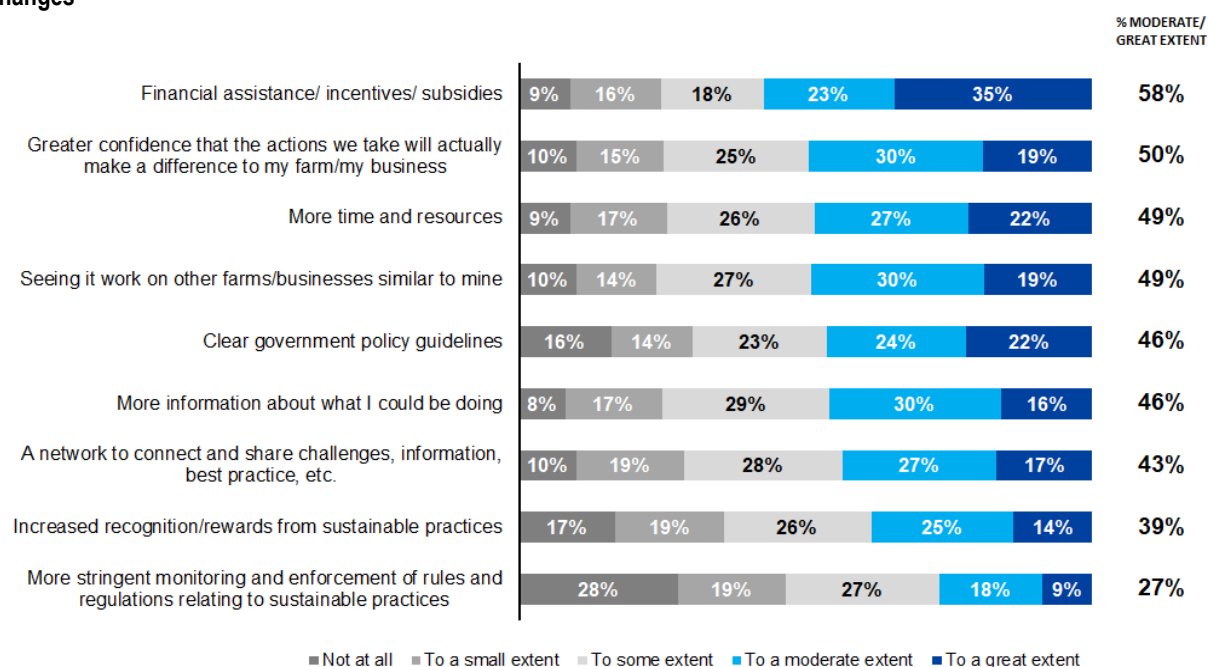


ENCOURAGING FARMERS TO TAKE MORE SUSTAINABLE ACTION

Respondents were asked to think about future changes in climate and severe weather patterns and select the extent to which the options below would encourage them to take action to make their farm more environmentally sustainable to cope with these changes. Positive reinforcement (via rewards), rather than negative (stricter enforcement), appear to be stronger motivators for farmers to take more sustainable action (see Figure 27 below).

- Fifty-eight per cent of farmers said they would be encouraged to take action if they were given *financial assistance/ incentives/ subsidies* to do so.
- Fifty per cent indicate that they would be encouraged to take action, or more action, if they had *greater confidence that the actions they take will actually make a difference to their farm/ business* and similarly *seeing it work on other farms or business similar to theirs* (49%).
- Conversely, having more stringent monitoring and enforcement of rules and regulations relating to sustainable practices is unlikely to encourage farmers from taking action to specifically make their farm more environmentally sustainable. Twenty-eight per cent indicate this would *not at all* encourage them to take action.

Figure 27: Aspects that would encourage farmers to make their farm more environmentally sustainable to cope with changes



* New question in 2018

Base: All respondents (excluding don't know, NA) (n= 647-660)

Q18. Thinking about the climate and more severe weather in the future. To what extent, if at all, might the following encourage you to take action, or more action, **specifically to make your farm more environmentally sustainable to cope with changes** in climate and severe weather patterns?



SUBGROUP DIFFERENCES

Those **significantly more** likely to be encouraged by *financial assistance* are:

- Those **aged under 40** years (76% of this age group, cf. 58% of the total)
- Those who have been **running their property for five years or less** (71%)
- Those whose gross **on-farm income** in the last financial year was **more than \$1.5 million** (74%)
- Both those who **expect their farm income to increase** (67%) **or decrease** (68%) over the next 12 months
- **Dairy** farmers (67%)
- Those who have a **major or moderate focus on reducing their greenhouse gas emissions** over the next five years (66%)
- Those who **believe in climate change** (63%).

Those **significantly more** likely to feel disincentivised by the Government enforcing more stringent monitoring and enforcement of rules and regulations relating to environmentally sustainable practices are:

- Those who **don't believe in climate change** (72% cf. 46% of the total who are *not at all* or *to a small extent* encouraged)
- **Otago** farmers (65%)
- Those with **large farms between 400 and 599 ha.** (63%)
- Those who feel climate change has only a **minor or no impact on their farm or business** currently (60%) or in the future (58%)
- Those who **have at least a reasonable understanding of the actions they can take to reduce their farm's emissions** (57%)
- Those who **own the farm privately as part of trust** (54%)
- Those who **have not actively sought information** about land management practices (53%)
- **Aged between 60-69** years of age (53%)
- **Livestock – sheep/beef farmers** (51%).



APPENDICES

APPENDIX 1: SAMPLE PROFILE

Farm Type		Unweighted		Weighted	
		n	%	n	%
	Dairy	254	36%	160	23%
	Sheep/ Beef/ Deer	283	40%	346	49%
	Arable	26	4%	43	6%
	Pigs and poultry	5	1%	15	2%
	Horticulture and viticulture	130	18%	119	17%
	Apiary	1	<1%	4	1%
	Other	14	2%	38	5%

Region		Unweighted		Weighted	
		n	%	n	%
	Northland	62	9%	52	7%
	Auckland	28	4%	37	5%
	Waikato	109	15%	121	17%
	Bay of Plenty	83	12%	65	9%
	Gisborne/ East Coast	7	1%	7	1%
	Hawkes Bay	41	6%	50	7%
	Taranaki	43	6%	38	5%
	Manawatu/ Whanganui	59	8%	68	10%
	Wellington/ Wairarapa	22	3%	22	3%
	Tasman	21	3%	18	3%
	Nelson	1	<1%	1	<1%
	Marlborough	20	3%	16	2%
	West Coast	14	2%	7	1%
	Canterbury	114	16%	120	17%
	Otago	42	6%	41	6%

	Southland	41	6%	44	6%
Age		Unweighted		Weighted	
		n	%	n	%
	Under 18	1	<1%	2	<1%
	18 - 29 years	15	2%	14	2%
	30 - 39 years	60	9%	52	8%
	40 - 49 years	125	18%	133	19%
	50 - 59 years	177	25%	171	24%
	60 - 69 years	201	29%	197	28%
	70 years and over	117	17%	130	19%

Gender		Unweighted		Weighted	
		n	%	n	%
	Male	490	69%	497	72%
	Female	198	28%	193	28%

Gross on-farm income for last financial year		Unweighted		Weighted	
		n	%	n	%
	Less than \$50,000	67	11%	77	13%
	\$50,000 - \$100,000	98	16%	110	18%
	\$100,001 - \$250,000	113	18%	113	18%
	\$250,001 - \$500,000	103	17%	101	16%
	\$500,001 - \$750,000	59	10%	59	10%
	\$750,001 - \$1 million	49	8%	44	7%
	\$1,000,001 - \$1.5 million	58	9%	48	8%
	More than \$1.5 million	70	11%	64	10%

Farm Size		Unweighted		Weighted	
		n	%	n	%
	Under 10 ha.	79	11%	78	11%
	10 - 49 ha.	84	12%	106	15%
	50 - 99 ha.	94	14%	93	13%
	100 - 199 ha.	153	22%	128	18%
	200 - 399 ha.	138	20%	129	18%
	400 - 599 ha.	54	8%	63	9%
	600 ha. or more	91	13%	98	14%

Ownership structure		Unweighted		Weighted	
		n	%	n	%
	Privately owned as a private company	189	28%	181	27%
	Privately owned as a partnership	222	33%	228	34%
	Privately owned, individually owned	69	10%	76	11%
	Privately owned as a trust	190	28%	189	28%
	Owned as a registered public company	7	1%	6	1%

Role on farm		Unweighted		Weighted	
		n	%	n	%
	Personally or jointly own the farm	618	88%	622	88%
	Sharemilker	30	4%	20	3%
	Farm manager	44	6%	47	7%
	Other	10	1%	13	2%



Tenure		Unweighted		Weighted	
		n	%	n	%
	Less than 1 year	15	2%	15	2%
	1 - 5 years	105	15%	105	15%
	6 - 10 years	90	13%	85	12%
	11 - 19 years	142	20%	140	20%
	20 - 29 years	131	19%	122	17%
	More than 30 years	216	31%	234	33%



APPENDIX 2: METHODOLOGY, SURVEY ACCURACY AND RESPONSE RATE

SURVEY ACCURACY

A change in research design

The benchmark study conducted by Nielsen in 2009 was carried out by telephone - Computer Assisted Telephone Interviewing (CATI). That was a cost-effective method for interviewing the rural population of New Zealand using New Zealand Posts' Rural Database as a sample source. Due to the relatively expensive nature of CATI and with falling use of landlines (Nielsen research indicates that about 25% of farmers now live in households with no landline, with a higher incidence of no phone among younger people), a mixed-methodology was adopted in 2018.

The benefits of this mixed-methodology include:

- **Enhanced representativeness:** potential respondents are selected from the Electoral Roll, which allows for the inclusion of the majority of residents (over 90% of the adult population). Mixed method research is generally superior to a single method in reducing non-response, coverage bias and selection bias. The entries on the Electoral Roll were more likely to be up-to-date, given that the research took place after the 2017 elections.
- **Consistency:** the two methods (online and hardcopy) are both visual, self-administered survey modes and thus the risk of differences in results being caused by mode of response is greatly reduced.
- **Quality of information:** the mixed-methodology allows respondents to complete the survey in their own time, at their own pace and either online or hard copy according to their preference. Based on this topic area, responses are likely to be more considered when respondents can complete the survey in their own time and, potentially, more honest without an interviewer present. Responses are likely to be more considered and more accurate when visual cues are able to be used (e.g. scales).
- **Future-proofing:** this method means that MPI will be able to repeat this study again in future to monitor trends. The proportion of households with landlines will continue to decrease and it is likely that the traditional CATI method, relying on landline numbers, will be phased out.

Impact of methodology change

With a change from a CATI methodology to an online and self-completion methodology, there is the potential for results to be affected. For example:

- In telephone surveys, response scales are read out to respondents, and respondents answer question by question. In online/hard copy questionnaires, respondents can see the response scales, and they can see and read all response options before answering any; thus the ability to consider relativity of responses across questions to a greater extent than is possible on the telephone. The key differences apparent were a reduced use of the top rating point in five-point scales (i.e. 'major impact' or 'no impact at all').
- The time series of the survey has been affected. This reduces the reliability of comparisons with the results from previous measures, as changes in the results may be due to the change in methodology rather than being a change in results over time. It was decided that the benefits of the new methodology (a higher quality sampling frame and lower cost) outweighed the impact of a break in time series.
- Respondents were provided an option to select 'doesn't apply to my farm' (not applicable). These



responses are excluded from reported percentages in reporting, and have, re-calculated percentages based on those who indicated a certain behaviour was applicable to their property. Base sizes are noted on all charts.

- As the questionnaire was to be administered by a mix of online and self-completion, care was taken to ensure questions would be presented as similarly as possible to respondents, to minimise response type bias.

SAMPLING FRAMEWORK

The Electoral Roll (Roll) records the addresses of the majority of New Zealanders adults over the age of 18. Potential respondents were selected from the Roll. The occupation and region of residence of the respondent was gained from the Roll data and used to identify the respondent's farm type and location for classification and target purposes.

Dependent on the specified occupation, potential respondents were allocated to one of the following target groups, see Table 15 below.

Table 15: Sampling criteria based on farm type and region

FARM TYPE		REGION	
1	Dairy	01	Northland
2	Livestock - sheep/beef/deer	02	Auckland
3	Arable	03	Waikato
4	Horticulture & viticulture	04	Bay of Plenty/ Gisborne/East Coast*
5	Other	05	Hawkes Bay
		06	Taranaki
		07	Manawatu-Whanganui
		08	Wellington-Wairarapa
		09	Nelson/ Tasman/ Marlborough*
		10	West Coast
		11	Canterbury
		12	Otago
		13	Southland

* combined regions for sampling due to relatively small known populations.

Due to a relatively small sample of Horticulture, viticulture and arable in each region, if the occupation did not fit into one of the above groupings, there were allocated to "Other - hort/vit/arable" or "Other - general". Each potential respondent was then assigned a strata (six digit allocation) based on farm type (first digit) within region (second and third digits) that accurately reflects the known farming population. Regions are



formed using mesh block area units of the country. Statistics New Zealand (Stats NZ) defines the mesh block as “the smallest geographic unit for which statistical data is collected and processed by Statistics New Zealand. A mesh block is a defined geographic area, varying in size from part of a city block to large areas of rural land. Each mesh block abuts against another to form a network covering all of New Zealand including coasts and inlets, and extending out to the two hundred mile economic zone. Mesh blocks are added together to ‘build up’ larger geographic areas such as area units. They are also the principal unit used to draw-up and define electoral district and local authority boundaries.”¹¹ Mesh blocks were selected using farm type group proportions based on 2012 Stats NZ data and exclude any ‘urban’ address and any address outside of mainland New Zealand.

Each potential respondent within each strata was assigned a unique number and put through a random generator to be pulled into the sample for the mail out. Note, outside of ‘rural’ addresses highlighted, there were no exclusions from the original sample to avoid sampling bias.

There were two sampling frames adopted in this research.

Sampling Frame 1

Sample Frame 1 constituted a random sample of 4,500 people from the Electoral Roll utilising the strata above. Farm type was selected based on occupation within the Electoral Roll randomly selected from mesh block area units of the country.

Postal survey packs were sent to 4,500 potential respondents who identified their occupation within each of the required farm types within the agriculture sector in New Zealand. The survey pack contained a copy of the questionnaire including an addressed letter outlining the objectives of the research, instructions to complete the survey and a freepost return envelope. This was followed by an initial postcard follow-up one week later. Recipients of the survey pack were able to complete the survey via the questionnaire in the pack or online.

Sampling Frame 2

To boost sample size to compensate for sample attrition, a booster sample of 5,000 people was pulled using the sampling framework specified above. This excluded names, previous selected in sampling frame 1, farm types identified as ‘other’ (due to an achieving the required number in this group) and people aged 85 years and over. Due to the number of respondents who identified as ‘retired’ or ‘no longer farming’, those in the upper most age bracket (85 plus) were removed from the Roll to enhance response to the survey.

A postcard was sent to the booster sample, outlining the research and encouraging the respondent to complete the survey online or request a copy of the questionnaire if they were unable to get online to complete the survey. This additional sample did not receive any of the previous survey collateral (letter, survey booklet, first reminder postcard).

The total response rate and those for sampling frame 1 and sampling frame 2 are in Table 16 overleaf.

¹¹<http://archive.stats.govt.nz/methods/classifications-and-standards/classification-related-stats-standards/meshblock/definition.aspx>



SURVEY RESPONSE

Total response rates

To calculate response rate, every individual sent an invitation to complete the survey was tracked and the outcome of the invitation carefully recorded.

By entry into Decipher (Nielsen's survey tool), Nielsen traced which of the letters, postcards or questionnaire packs were returned as 'gone no address'. Any telephone or email notification of refusal to participate was logged into the 0800 number call log. This log also recorded notification that the nominated respondent was not available, capable, or relevant to complete the survey due (e.g. deceased, illness, not in agriculture). Every effort was made to remove any respondent from subsequent communications.

The **return rate** is calculated as follows:

$$\text{Completed surveys} / \text{total number of invitations mailed out (excluding total ineligible)} \times 100$$

The **response rate** is also calculated. This applies the same proportion of ineligible as those we have heard back from to those we have not (i.e. the 8047 "Unknown"). This therefore assumes that there will be the same number of ineligible (deceased, illness, not in agriculture) in the group we did not hear from as is in the group we did hear back from. Table 16 outlines response for the total sample.

Table 16: Total return and response rate

CATEGORY	Total (n=)	Sample Frame 1 (n=)	Sample Frame 2 (n=)
Deceased	1	1	0
GNA (person no longer lives at address)	216	132	84
Not in agriculture sector	50	43	7
Health/Age/Retired	23	17	6
Out of region/ Unavailable	14	11	3
Total ineligible	304	204	100
Refused (do not want to participate)	13	12	1
Incomplete	137	66	71
Screened (lifestyle farmers, not decision maker, no financial interest in property)	292	195	97
Unknown - Mailed Out, No Info	8047	3464	4583
Total "refusals"	8489	3737	4752
Online completes	293	145	148
Hard-copy completes	414	414	0
Qualified completes	707	559	148



Mail Outs	9500	4500	5000
Return Rate	7.7%	13.0%	3.0%
Response Rate	9.4%	15.5%	3.9%

Our target sample size was a sample of n=1,000 farmers. The response rate was lower than expected, and the final sample achieved was n=707, as outlined above.

Reasons hypothesised for the lower than expected response rate include;

- Time of year (the 2009 survey was undertaken in June/July which is a quieter period for some farmers)
- Potential negativity toward MPI due to fall-out over the Mycoplasma bovis (M bovis) scare.

Table 17 outlines response by farm type and region.

Table 17: Total response by farm type and region

Results	Total (n=)	Dairy (incl. sheep and goat milking) (n=)	Livestock - Sheep/beef/ deer (n=)	Arable (n=)	Horticulture and viticulture (n=)	NET Other livestock (e.g. goats/alpacas) (n=)
Unweighted	707	254	283	26	130	14
Weighted	707	160	346	43	119	38

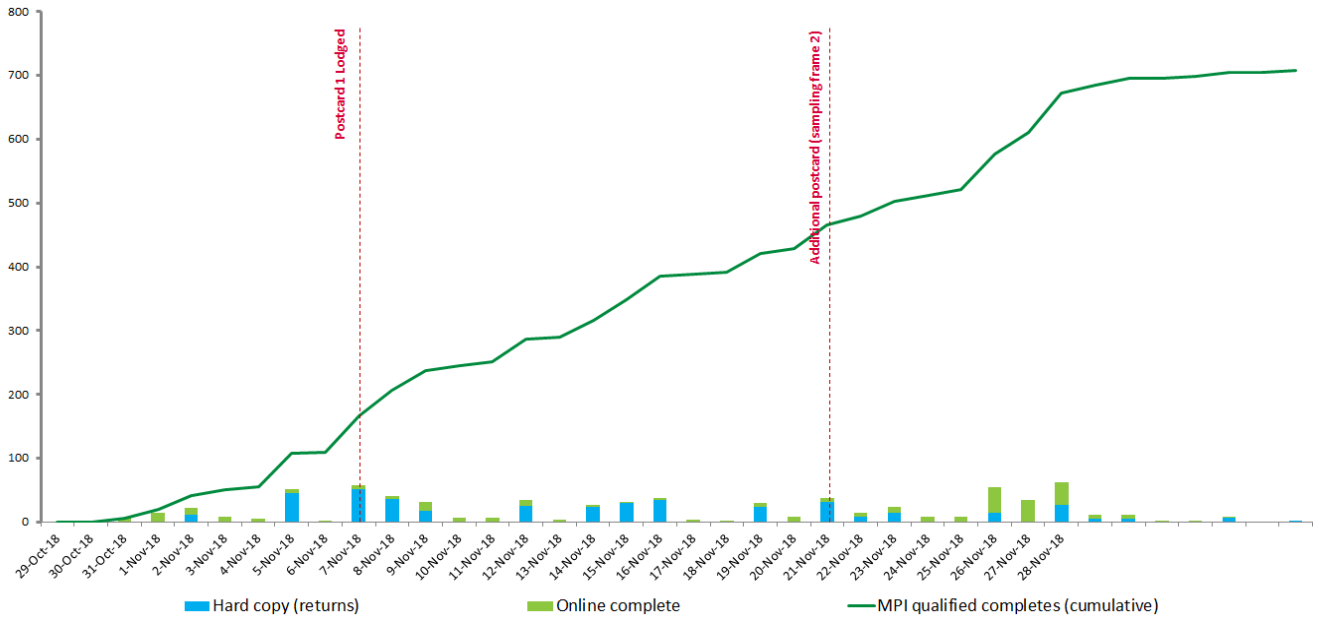


Online vs. Hard-Copy

Three in five (59%) of the total questionnaires completed were via hard-copy, 41% were completed online.

Figure 28 illustrates response over the survey period. The first red dotted line signifies the first reminder postcard (sample frame 1) and the second represents the delivery to the booster sample (sampling frame 2).

Figure 28: Survey response over time



INCENTIVE

Incentive options were pre-tested among the rural community to find an incentive that was most desirable. For successful completion of the survey, respondents were entered into the prize draw for a \$1000 Prezzy Card.



WEIGHTING

Most surveys have biases due to:

- Disproportionate sample selection – e.g. certain sub-populations were over-represented to ensure an adequate base for analyses of these subgroups
- Differential response rates – e.g. in general livestock farmers are more likely to complete the hard copy survey whereas as dairy are more online
- The sample frame used – the Electoral Roll – while almost certainly the best available source, does not include all members of the population being surveyed.

If the bias in the completed sample is not corrected, survey results may not be representative of the population from which it was obtained. Data on the characteristics of the surveyed population are mostly readily available from Stats NZ.

Various methods of weighting survey data are available. The methods employed on this survey took into account the following factors:

- The need to be consistent with past survey weighting methodology
- The requirement that the effect of weighting should not be so drastic as to reduce substantially the effective survey sample size.

Accordingly, we implemented a weighting procedure which brought the total results back to the known farming population of New Zealand. The weighting dimensions formed by five farm types by thirteen regions, thus sixty five weighting cells. The farm types used were dairy, livestock – sheep, beef, deer, Arable, Horticulture and viticulture, and Other (including pigs, poultry, goats, alpacas, other livestock and other). Forestry was excluded.

Where there were insufficient sample sizes, cells were collapsed within farm type, to the closest region.



APPENDIX 3: QUESTIONNAIRE





[ONLINE VERSION OF SURVEY]

To begin with, we have some general questions about your farm. These questions are to help us check we have a representative sample of farmers which is important for this survey.

[Q1] We're interested in talking to people who have a farm or property that provides the main source of their household income. Which of the following provides the main source of household income?

Please select one answer.

Row:

[r1] Farm e.g. dairy, sheep, beef, deer, pigs, poultry

[r2] Orchard, market garden, apiculture, viticulture, horticulture, arable (crops), forestry

[r3] Lifestyle block

[r4] Other - not rural, not a farm, not the main source of income, etc.

[r90] ** Not Answered **

[Q2] Do you personally or jointly own the farm, or are you a sharemilker or the farm manager?

Please select one answer.

Row:

[r1] Personally or jointly own the farm

[r2] Sharemilker

[r3] Farm Manager

[r4] Other

[r90] ** Not Answered **

[Q3] And can I just double check that you are personally or jointly responsible for financial planning and capital expenditure decisions regarding this farm?

Please select one answer.

Row:

[r1] Yes

[r2] No

[r90] ** Not Answered **



[Q4] Which of the following best describes your main source of farm income?

Please select your main income source

Row:

- [r1] Dairy including sheep and goat milking
 - [r2] Sheep / Beef / Deer
 - [r3] Arable including vegetable and seed crops
 - [r4] Pigs and poultry
 - [r5] Horticulture and Viticulture
 - [r6] Apiary
 - [r7] Other livestock (e.g. goats, alpaca)
 - [r98] Other, please specify
 - [r97] None of the above
 - [r99] Don't know
 - [r96] Prefer not to answer
 - [r90] ** Not Answered **
-

[Q35] In relation to any forested land on your property...

Note: This does not include carbon income, rather the harvest of trees

Please select one answer for each of the statements.

Column:

- [c1] Yes
- [c2] No
- [c90] ** Not Answered **

Row:

- [r1] Have you generated income from the harvest of trees on your land in the **last five years?**
 - [r2] Do you intend to generate income from the harvest of trees on your land in the **next five years?**
-

[Q36] Do you own or manage any forest land?

Note: Forest land is at least one hectare of forest

Please select one answer.

Row:

- [r1] Yes
- [r2] No
- [r90] ** Not Answered **



[Q37] What type of forest land do you have?

Please select one answer for each of the statements.

Column:

[c1] Yes

[c2] No

[c90] ** Not Answered **

Row:

[r1] Forestry block (non-native species)

[r2] Native (indigenous) forestry block

[Q5] In which region is your farm located?

If your farm extends to more than one region, please select the region where the majority of your farm income comes from.

Please select one answer.

Row:

[r1] Northland

[r2] Auckland

[r3] Waikato

[r4] Bay of Plenty

[r5] Gisborne/ East Coast

[r6] Hawkes Bay

[r7] Taranaki

[r8] Manawatu-Whanganui

[r9] Wellington-Wairarapa

[r10] Tasman

[r11] Nelson

[r12] Marlborough

[r13] West Coast

[r14] Canterbury

[r15] Otago

[r16] Southland

[r98] Other, please specify

[r99] Don't know

[r96] Prefer not to answer

[r90] ** Not Answered **



[Q6] Firstly, what do you see as the key issues you face in making your farm and your business more environmentally sustainable for the future?

Please be as detailed as possible

[Q7] And what, if anything, have you changed or introduced on your farm in the past five years to specifically make your farm more environmentally sustainable for the future?

Please be as detailed as possible

[Q8] There are always a number of challenges facing farmers and, at any one time, you will need to give some issues priority over others. Below is a list of some possible issues or priorities for your farm.

How much focus has each of the following been for you over the past five years?

Please select one answer for each of the statements.

Column:

[c4] Major focus

[c3] Moderate focus

[c2] Minor focus

[c1] Not really a focus

[c5] Doesn't apply to my farm

[c90] ** Not Answered **

Row:

[r1] Working to become more resilient to severe weather patterns

[r13] Working to become more resilient to other natural disasters (e.g. earthquakes, volcanoes)

[r2] Working to become more energy efficient

[r3] Working to use water more efficiently

[r14] Working to protect and improve water quality

[r4] Working to increase farm production

[r15] Working to protect and improve animal health and welfare

[r5] Working to decrease production costs

[r6] Working to increase returns per unit of product

[r7] Working to recruit, retain or upskill farm labour

[r8] Working to manage soil erosion

[r9] Working to reduce your greenhouse gas emissions

[r10] Working to make sure your farm is environmentally sustainable in the short term (5 years)

[r11] Working to make sure your farm is environmentally sustainable in the long term (20 - 30 years)

[r12] Working to improve your financial management and profitability



[Q9] Over the next five years, do you think your focus on each area will increase, decrease, or stay the same as it has been over the past five years?

Please select one answer for each of the statements.

Column:

- [c1] Increase
- [c2] Stay the same
- [c3] Decrease
- [c4] Doesn't apply to my farm
- [c90] ** Not Answered **

Row:

- [r1] Working to become more resilient to severe weather patterns
- [r13] Working to become more resilient to other natural disasters (e.g. earthquakes, volcanoes)
- [r2] Working to become more energy efficient
- [r3] Working to use water more efficiently
- [r14] Working to protect and improve water quality
- [r4] Working to increase farm production
- [r15] Working to protect and improve animal health and welfare
- [r5] Working to decrease production costs
- [r6] Working to increase returns per unit of product
- [r7] Working to recruit, retain or upskill farm labour
- [r8] Working to manage soil erosion
- [r9] Working to reduce your greenhouse gas emissions
- [r10] Working to make sure your farm is environmentally sustainable in the short term (5 years)
- [r11] Working to make sure your farm is environmentally sustainable in the long term (20 - 30 years)
- [r12] Working to improve your financial management and profitability

[Q11] Do you have any farm animals on your property?

Note: These are farm animals, not pets or horses for the family to ride

Please select one answer.

Row:

- [r1] Yes
- [r2] No
- [r90] ** Not Answered **



[Q44] Thinking specifically about emissions of greenhouse gases from your farm. Which of the following best applies to you?

Row:

[r1] I have made specific calculations of greenhouse gas emissions from my farm in the last two years (e.g. using the Overseer model)

[r2] I have made some rough estimates of greenhouse gas emissions from my farm in the last two years

[r3] I have done some estimates or calculations of greenhouse gas emissions in the past, but not in the last two years

[r4] No, I have not done any estimates or calculations of greenhouse gas emissions from my farm

[r90] ** Not Answered **

[Q45] In the last 12 months, what is your best estimate of...

Please be as specific as you can about total farm greenhouse gas emissions and per animal emissions.

Note: Greenhouse gas emissions are presented as CO2 equivalent (CO2-e)

Row:

[r1] Total greenhouse gas emissions from your farm

[r2] Per animal emissions from your farm

[Q45Unit] Q45Unit

Choice:

[ch1] Kilograms of CO2-e (KgCO2-e)

[ch2] Tonnes of CO2-e (tCO2-e)

[ch3] CO2-e per hectare (CO2-e/ha)

[ch98] Other [Q45O1]

[ch99] Don't know/Unsure

[ch90] ** Not Answered **

[Q45DK] Don't know

Column:

[c1] Don't know



[Q46] Which of the following statements best describes your level of understanding of the actions you can take to reduce your farm's emissions of greenhouse gases?

Please select one.

Row:

[r99] I don't know what actions I can take to reduce my farm's emissions

[r2] I have a little understanding of the actions I can take to reduce my farm's emissions

[r3] I have some understanding of the actions I can take to reduce my farm's emissions

[r4] I have a reasonable understanding of the actions I can take to reduce my farm's emissions

[r5] I have a very good understanding of the actions I can take to reduce my farm's emissions

[r90] ** Not Answered **

[Q38] What actions have you taken, or are you in the process of taking, specifically to reduce your greenhouse gas emissions?

Please be as detailed as possible

[Q10] Below is a list of changes or actions some farmers may or may not have taken specifically to make their business more sustainable to cope with changes in climate and more severe weather patterns.

Over the past five years, what actions have you taken, or are in the process of taking, specifically to make your business more environmentally sustainable to cope with changes in climate or severe weather?

Please select one for each row.

Column:

[c1] Yes

[c2] No

[c4] Don't know

[c3] Doesn't apply to my farm

[c90] ** Not Answered **

Row:

[r1] Made changes to the way fertiliser and nitrogen is used

[r2] Used direct drilling or reduced cultivation

[r3] Taken action to increase soil carbon

[r4] Used nitrogen/ urease inhibitors

[r16] Used Overseer

[r5] Made changes to crop practices (e.g. planting at different times of the year)

[r6] Made changes to/diversify land usage (e.g. more forestry, crops)



- [r7] Made increased use of different blocks of land for planting, taking different soil and climatic conditions into consideration
 - [r8] Planted more deep rooting forage plants for drought
 - [r9] Made changes to types of planting such as species, varieties or cultivars of pasture or crop
 - [r10] Planted crops that provide feed
 - [r17] Planted trees that provide fodder
 - [r11] Planted more riparian plants
 - [r12] Planted trees for erosion control
 - [r13] Planted trees as a carbon sink
 - [r14] Planted trees for shelter / shade
 - [r15] Considered reducing fire risk when making decisions about planting trees and land management
 - [r18] Used precision agriculture techniques (e.g. use of sensors, GIS mapping, sampling to assist variable rate irrigation/ fertiliser application)
-

[Q12] In relation to animals on your farm.

Over the past five years, what specific actions have you taken, or are you in the process of taking, to make your farm more environmentally sustainable to cope with changes in climate and more severe weather patterns?

Please select one answer for each of the statements.

Column:

- [c1] Yes
- [c2] No
- [c4] Don't know
- [c3] Doesn't apply to my farm
- [r90] ** Not Answered **

Row:

- [r1] Made changes to stock numbers or stocking rate
 - [r2] Made changes to breeds, species, varieties or genetics of animals
 - [r3] Become more flexible buying and selling stock
 - [r4] Made changes to type of stock feed used or to livestock diet
 - [r5] Made, kept or bought extra/ supplementary feed reserves on farm
 - [r6] Reduced grazing on some land so native regeneration can occur
 - [r7] Grazed stock off farm in winter
-



[Q13] Have you, or are you in the process of, putting in any new infrastructure, or improvements to existing infrastructure, in any of the following areas on your farm for the purpose of making your farm more environmentally sustainable to cope with changes in climate and severe weather patterns?

Please select one answer for each of the statements.

Column:

[c1] Yes – for climate reasons

[c2] Yes – for other reasons

[c3] No

[c5] Don't know

[c4] Doesn't apply to my farm

[c90] ** Not Answered **

Row:

[r1] Irrigation system

[r2] Water storage

[r3] Water drainage

[r6] Flood defences, i.e. tracks, culverts, bridges, fences or buildings to cope with flooding

[r4] Effluent system

[r5] Feedpads or stand-off areas

[Q14] Have you made, or are you in the process of making, specific changes for the purposes of being more energy efficient in...

Please select one answer for each of the statements.

Column:

[c1] Yes

[c2] No

[c4] Don't know

[c3] Doesn't apply to my farm

[c90] ** Not Answered **

Row:

[r2] Your use of vehicles and transport

[r3] Your establishment, spraying, husbandry and harvesting of crops or pasture

[r5] Energy use in irrigation

[r6] Alternative energy source (e.g. solar, wind)

[r7] Use of contractors (e.g. contractors with their own machinery/ equipment)

[r1] Your dairy/ stock shed

[r4] Your drying, chilling, packing or processing of crops



[Q15] Which of the following, if any, do you have?

Please select one answer for each of the statements.

Column:

[c1] Yes

[c2] No

[c4] Don't know

[c3] Doesn't apply to my farm

[c90] ** Not Answered **

Row:

[r1] A farm environmental plan or budget

[r2] Overseer or another computer programme that calculates the nutrient budget for on your property

[r3] Affiliations with Market Assurance programmes such as EurepGAP or CarbonZero or any other environmental programme

[Q39] How well does the Overseer decision support programme meet both your business nutrient and greenhouse gas needs?

Drag the slider to a point on the scale.

Choice:

[ch1] Extremely well

[ch2] Very well

[ch3] Reasonably well

[ch4] Not that well

[ch5] Not at all well

[ch7] Don't know

[ch6] Doesn't apply to my farm

[Q40] You indicated the Overseer decision support programme does [pipe: Q39 lower] at meeting your needs. Why would you say the Overseer programme meets your needs in this way?

Please be as detailed as possible



[Q16] What level of impact do you feel current climate or severe weather patterns are having on ...

Please select one answer for each of the statements.

Column:

[c4] Major impact

[c3] Moderate impact

[c2] Minor impact

[c1] No impact at all

[c90] ** Not Answered **

Row:

[r1] Your farm and business

[r2] Your region (or the agricultural sector in your region)

[r5] New Zealand agricultural sector as a whole

[r3] New Zealand as a whole

[r4] The world

[Q17] And, how much of an impact do you feel changes in climate and severe weather patterns will have on...

Please select one answer for each of the statements.

Column:

[c4] Major impact

[c3] Moderate impact

[c2] Minor impact

[c1] No impact at all

[c5] Don't know

[c90] ** Not Answered **

Row:

[r1] Your farm and business over the next five years

[r2] Your farm and business over the next twenty years

[r3] New Zealand over the next twenty years

[r4] The world over the next twenty years



[Q18] Thinking about the climate and more severe weather in the future.

To what extent, if at all, might the following encourage you to take action, or more action, specifically to make your farm more environmentally sustainable to cope with changes in climate and severe weather patterns?

Please select one answer for each of the statements.

Column:

[c5] To a great extent

[c4] To a moderate extent

[c3] To some extent

[c2] To a small extent

[c1] Not at all

[c97] Don't know

[c90] ** Not Answered **

Row:

[r1] Greater confidence that the actions we take will actually make a difference to my farm/my business

[r2] Seeing it work on other farms/businesses similar to mine

[r3] More information about what I could be doing

[r4] More time and resources

[r5] A network to connect and share challenges, information, best practice, etc.

[r6] Financial assistance/ incentives/ subsidies

[r7] Increased recognition/rewards from sustainable practices (e.g. Quality Mark, Farm Assured)

[r8] Clear government policy guidelines

[r9] More stringent monitoring and enforcement of rules and regulations relating to sustainable practices

[Q19] Do you see long-term climatic changes being an opportunity for your business, a threat to your business or both?

Please select one answer.

Row:

[r1] Opportunity

[r2] Threat

[r3] Both an opportunity and a threat

[r4] Neither

[r99] Don't know

[r90] ** Not Answered **



[Q22] How strongly do you agree or disagree with the following statements:

Please select one answer for each statement.

Column:

- [c5] Strongly agree
- [c4] Tend to agree
- [c3] Not sure
- [c2] Tend to disagree
- [c1] Strongly disagree
- [c90] ** Not Answered **

Row:

- [r3] My farm or business is well equipped to adapt to the environmental impacts of more severe weather patterns and changing climatic conditions
- [r1] Global human activity is contributing to the climate changing above and beyond natural weather cycles
- [r2] It is important New Zealand contributes, in proportion to our size, towards a global effort to combat the negative environmental impacts of more severe weather patterns and changing climatic conditions
- [r4] Our sector is doing enough to adapt to the environmental impacts of more severe weather patterns and changing climatic conditions
- [r5] Our sector is contributing enough towards New Zealand's effort to combat the negative environmental impacts of more severe weather patterns and changing climatic conditions
- [r6] Our sector needs to do more to protect the quality of New Zealand's fresh water
- [r7] Our sector needs to do more to manage the amount of water it uses
- [r8] There are too many unnecessary rules and regulations associated with the environment being imposed by councils and government on our farm/business

[Q23] In the last twelve months, have you actively sought information about any of the following issues:

Please select one answer for each statement.

Column:

- [c1] Yes
- [c2] No
- [c90] ** Not Answered **

Row:

- [r1] Land management practices to increase sustainability
- [r2] Land management practices to further improve resilience to severe weather patterns
- [r3] Practices and technologies to reduce greenhouse gas emissions
- [r4] Climate change in general



[Q24] How would you rate the information relating to land management practices to further improve resilience to severe weather patterns and climatic changes, in terms of:

Please select one answer for each statement.

Column:

[c5] Very good

[c4] Good

[c3] Neither good nor poor

[c2] Poor

[c1] Very poor

[c6] Don't know

[c90] ** Not Answered **

Row:

[r1] The amount of information available

[r2] The relevance of the information to you personally

[r3] The consistency of the information received from government

[r4] The consistency of the information received from sector organisations

[Q41] And, from where did you seek this information?

Please select all that apply

Row:

[r1] Friends, family and neighbours

[r2] Ministry for Primary Industries

[r3] Rural professional or consultant (e.g. AsureQuality, Farm Consultants, Rural Business Network)

[r4] Industry body/ association (e.g. Federated Farmers, NZ Farm Forestry Association)

[r5] Industry event, shows or fieldays

[r6] Industry company/ supplier (e.g. Fonterra, PGG Wrightson, Ravensdown)

[r7] Veterinarian

[r8] Research institutions (e.g. AgResearch)

[r9] TV documentaries (e.g. Country Calendar)

[r10] Internet

[r98] Other, please specify

[r99] Don't know

[r90] ** Not Answered **



[Q25] What specific topics relating to land management practices to further improve your farm's resilience to severe weather patterns and changing climatic conditions, would you like further information or advice on, if any?

Please be as detailed as possible

[Q42] Have you heard of...?

Please select one answer for each of the statements.

Column:

[c1] Yes

[c2] No

[c90] ** Not Answered **

Row:

[r1] The Pastoral Greenhouse Gas Research Consortium (PGgRC)

[r2] The New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC)

[r3] The Sustainable Land Management and Climate Change Research Programme (SLMACC)

[r4] The Primary Growth Partnership (PGP)

[r5] The Sustainable Farming Fund (SFF)

[r6] The Climate Cloud website

[r7] The Afforestation Grant Scheme (AGS)

[r8] Irrigation Acceleration Fund (IAF)

[r9] The Hill Country Erosion Fund (HCE)

[r10] The Emissions Trading Scheme (ETS)

[r11] The Permanent Forest Sink Initiative (PFSI)

[r12] The East Coast Forestry Programme (ECFP)

[Q47] Have you heard of the Zero Carbon Bill?

Row:

[r1] Yes

[r2] No

[r90] ** Not Answered **



Before we finish up, we have a few questions about you and your household just to make sure we have a cross-section of people in our survey.

Your answers are grouped with those of other respondents and you will not be individually identified.

[Q27] What age group do you fall under?

Please select one answer.

Row:

[r1] Under 18

[r2] 18 - 29

[r3] 30 - 39

[r4] 40 - 49

[r5] 50 - 59

[r6] 60 - 69

[r7] 70 and over

[r96] Prefer not to answer

[r90] ** Not Answered **

[Q28] What is your gender?

Please select one answer.

Row:

[r1] Male

[r2] Female

[r96] Prefer not to answer

[r90] ** Not Answered **

[Q29] Which of the following categories best describes your gross ON FARM income for the last financial year?

Please select one answer.

Row:

[r1] Less than \$50,000

[r2] \$50,000 - \$100,000

[r3] \$100,001 - \$250,000



- [r4] \$250,001 - \$500,000
 - [r5] \$500,001 - \$750,000
 - [r6] \$750,001 - \$1 million
 - [r7] \$1,000,001 - \$1.5 million
 - [r8] More than \$1.5 million
 - [r99] Don't know
 - [r96] Prefer not to answer
 - [r90] ** Not Answered **
-

[Q26] And over the next 12 months, do you expect your gross farm income to ...

Please select one answer.

Row:

- [r1] Increase
 - [r2] Stay the same
 - [r3] Decrease
 - [r4] Don't know
 - [r90] ** Not Answered **
-

[Q30] Which of the following statements best describes the ownership structure of your farm?

Please select the most accurate statement

Row:

- [r1] Privately owned as a private company
 - [r2] Privately owned as a partnership
 - [r3] Privately owned, individually owned
 - [r4] Privately owned as a trust
 - [r5] Owned as registered public company
 - [r99] Don't know
 - [r96] Prefer not to answer
 - [r90] ** Not Answered **
-



[Q31] What is the size of your farm in hectares?

Please select one answer.

Row:

- [r1] Under 10 ha. (Under 25 acres)
 - [r2] 10 - 49 ha. (25 - 121 acres)
 - [r3] 50 - 99 ha. (122 - 245 acres)
 - [r4] 100 - 199 ha. (246 - 492 acres)
 - [r5] 200 - 399 ha. (493 - 986 acres)
 - [r6] 400 - 599 ha. (987 - 1480 acres)
 - [r7] 600 ha. or more (1481 acres or more)
 - [r99] Don't know
 - [r96] Prefer not to answer
 - [r90] ** Not Answered **
-

[Q43] How long have you been running this particular property?

Please select one answer.

Row:

- [r1] Less than 1 year
 - [r2] 1 to 5 years
 - [r3] 6 to 10 years
 - [r4] 11 to 19 years
 - [r5] 20 to 29 years
 - [r6] More than 30 years
 - [r99] Don't know
 - [r90] ** Not Answered **
-

[Q32] And finally, is there anything further you'd like to say?



[Q33] If more in-depth research is to be carried out on this topic in the future, are you willing to provide your contact details so that either the Ministry for Primary Industries (MPI), Nielsen or an agency that continues MPI's work are able to invite you to take part in further research?

Please note that providing your contact details does not put you under any obligation to participate. This information will be held by MPI, Nielsen or an agency that continues MPI's work and will only be used for more in-depth research on the topics identified in this survey. If you would rather not be contacted about further research then your answers will remain confidential and you will still be eligible for the prize draw.

Please select one answer.

Row:

[r1] Yes, I am willing to be contacted to take part in any further research

[r2] No

[Q34] [pipe: ask2]

Row:

[r1] Name:

[r2] Phone number:

[r3] Email:

Thank you. We really appreciate that you have taken the time to complete this survey.

Before you finish, we would like to ask for any feedback or suggestions you have on our online survey. Any comments are appreciated and will help us to improve our future surveys.

If you have any questions, please contact Nielsen during office hours on 0800 400 402.



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