



Steering into the food transition

Rethinking the climate change challenge for
New Zealand food and agribusiness

Rabobank New Zealand White Paper August 2022



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Overview

Agriculture will need to feed many more people with a smaller carbon footprint

With so much information flying around about climate change, this paper seeks to cut through the noise to help understand the opportunities within the challenges, especially for farmers and growers on the frontline of the food and agri sector who may be wrestling with the changes required.

While this paper is focused on greenhouse gas emissions, we acknowledge there are other top-of-mind environmental issues facing New Zealand agriculture such as freshwater quality and biodiversity.

Drawing on a wide range of global and local research, including Rabobank's own 75-strong team of agri-analysts, and on-the-ground experience here in New Zealand banking over 5,000 New Zealand farmers and growers, the paper makes the case for five key conclusions—

1. We need to feed more people while cutting back on emissions

The world's population is increasing and is projected to reach over 10 billion people by 2050. At the same time, the scientific and political consensus – the Paris Agreement – is that we must contain global warming to 1.5°C. Food producers are faced with the challenge to feed a larger population while reducing carbon emissions. In New Zealand, we earn our living through food and agriculture, and as efficient food producers, we have an obligation to continue to supply the world. Article 2(b) of the Paris Agreement makes it clear we should not reduce food production in pursuit of climate goals.



2. New Zealand can set the standard for the world

New Zealand farmers and growers are in a strong position to set the standard for the rest of the world. We already have relatively low emissions profiles per kg of food production and are starting to make further inroads. Our biggest emitter, the dairy sector, is the most carbon-efficient in the world. History shows that New Zealand agriculture is innovative and adaptive when presented with a problem and given the time and resources to solve it. New Zealand farmers and growers are keen to do the right thing and are getting strong signals from the consumer, government and community to do this.

3. Reducing emissions is challenging, but there's a way

With the right strategies, actions and commitment, we can meet the 'challenge for the ages' of increasing production while reducing emissions. By moving, over time, towards a combination of high-efficiency production, healthy and plant-richer diets and reduced waste, we can get across the line with room to spare according to research by Oxford University's Michael Clark and other researchers.

There are four areas of particular promise for New Zealand:

- Taking a 'swarm' approach to innovation on farm, off farm and system wide to move the worst performers more towards the best performers.
- Embracing precision agriculture – measuring and optimising what we produce and how we do it.
- Tackling unnecessary food waste. Food waste is a major source of emissions, both at the consumption stage and from producing and distributing the food. In New Zealand, households throw away an average of 86 kg of food waste each year, with an economic value of some \$3.1 billion.
- Building biodiversity while responsibly offsetting. We can't let forestry eat into broad swathes of our productive farmland, but it does have a strong complementary role.



4. Steering the food transition beats having it imposed

It's up to the food and agriculture sector to help steer the transition. If we do nothing, our planet will reach a 2 degrees warming threshold from agriculture alone. Farmers, growers and producers will arguably be more affected than anyone else if we don't turn the tide on climate change – which will bring more adverse weather events, droughts and disease. Retailers, consumers, competitors and regulators will impose their solutions on us, if we don't get ahead of the curve. In almost all cases, over the long-term, sustainable business is also good business.



5. We need to work together to make it happen

Business does not like uncertainty. With climate change regulation and impacts both in New Zealand and overseas, we are heading on a voyage into the unknown. At the same time, governments around the world are making tentative steps toward climate change adaptation and mitigation.

Here in New Zealand, the government needs to create an environment where research and innovation can thrive. This includes providing both financial support and, more importantly, a regulatory environment that encourages research into innovative solutions. Without this, research will stall and New Zealand will be at a relative disadvantage to our competitors.

Reducing uncertainty requires proactive steps while maintaining flexibility. This is easier said than done since some farmers, growers and businesses can be reactive and inward-looking when taking steps to mitigate climate change. Overcoming this natural reaction requires leadership from organisations like Rabobank and at every level across the farmer and grower community, and some of this work is already underway. Although good progress has already been made, this is a national change, and we are still scratching the surface. We believe unity is needed within the farmer, grower and producer community and would love to hear from others who also want to steer the transition.



1. Introduction

Rabobank is embracing a future where agriculture will produce more food and do it in a carbon-neutral or carbon-positive way.

We are taking this stance over the medium to long term for a number of reasons:

- Biological systems take time to modify. Therefore, we need to urgently put in place the initial changes required.
- Innovation will be central to changing farming practices. Innovation is uncertain, and we will need to negotiate and overcome seemingly insurmountable roadblocks.
- Being proactive will drive the momentum needed to increase production while moving down the decarbonisation pathway.

1.1 New Zealand farmers and growers have done a lot, but...

The New Zealand food and agri sector has already made large advances over recent years to mitigate climate change. Still, climate change is complex, and farmers, growers and other stakeholders within the New Zealand food and agri sector are at different stages of the journey of acceptance and response.

We need to do more across the agriculture sector to meet the commitments made and signed up to under the Paris Agreement. Currently, policy incentives are in place to produce more food without reference to carbon emissions. This will now need to change, with a strong shift to incentivise reduced emissions as proposed under He Waka Eke Noa, the primary sector climate action partnership between government and industry. New Zealand has a carbon price and a well-formed Emissions Trading Scheme

(ETS), but the impact is not enough to meet the Paris Agreement commitments.

Further changes will increase costs for farming and the food supply chain, although it is unclear who will pay for those costs. The introduction of emissions reduction plans is needed and will be hugely positive. He Waka Eke Noa includes work to equip farmers and growers to measure, manage and reduce on-farm agricultural greenhouse gas emissions and adapt to the realities of climate change.

Farmers, growers, processors and marketers need to be proactive – taking advantage of the government's support rather than sitting on the sidelines. While it is still unclear what policy process will be successful, it is very clear that sanctions will be used in one form or other if financial and other inducements fail. Being proactive and engaging with the government is also the least-cost method of achieving results, staying in business and thriving.

This paper is geared to support the 'concerned but conflicted producer'. It focuses on carbon and emissions. However, we also acknowledge other top-of-mind issues facing New Zealand agriculture such as freshwater quality and erosion of biodiversity.



2. Coming, ready or not – a challenge for the ages

New Zealand earns its living through its agricultural competitiveness. This is what we do, have done for many years and need to continue to do. It is a process of producing food efficiently, guaranteeing quality and responding to world markets. With the proper frameworks in place, the upcoming food transition provides opportunities for New Zealand’s farm sector to remain a global leader and be stronger than ever.

2.1 New Zealand agriculture has a history of successful transitions, and this one will be no different

Grappling with climate change is far from the first major hurdle New Zealand agriculture has met, and innovation has been a big part of overcoming these challenges.

We have a history of overcoming adversity and meeting the challenge of changing market environments. Our farmers, growers and farming systems are adaptable and flexible, given the technology and time to adjust. Our farmers and growers are renowned for experimenting in the face of challenges to their circumstances. The sudden withdrawal of subsidies in the 1980s under Rogernomics is a good example of New Zealand farmer adaptation. In some circles, agriculture was seen as a sunset industry - something belonging to New Zealand’s past. Yet today, agriculture is the super-competitive industry that drives the economy forward, even in the troubled waters of COVID-19.

Productivity growth remains consistently high in the agricultural sector as the sector has adapted and changed relative to other sectors in the New Zealand economy (See Table 1).

Table 1: Strong agricultural productivity growth spurred on by facing competitive markets

1978–2020, average annual percent change

| Sectors | 1996–2020 | 1978–2020 |
|---------------|-----------|-----------|
| Agriculture | 3.1 | 2.2 |
| Manufacturing | 1.2 | 0.8 |
| Services | 1.4 | 1.5 |

Source: Statistics New Zealand, <https://www.stats.govt.nz/information-releases/productivity-statistics-19782020>.

Due to the growing demand for agricultural products, New Zealand’s overall GDP growth rates have been consistently high over the past 20 years. New Zealand now has a diversified set of land-based industries, and the problems faced are problems of success, not failure.



2.2 Productivity and decarbonisation go hand in hand

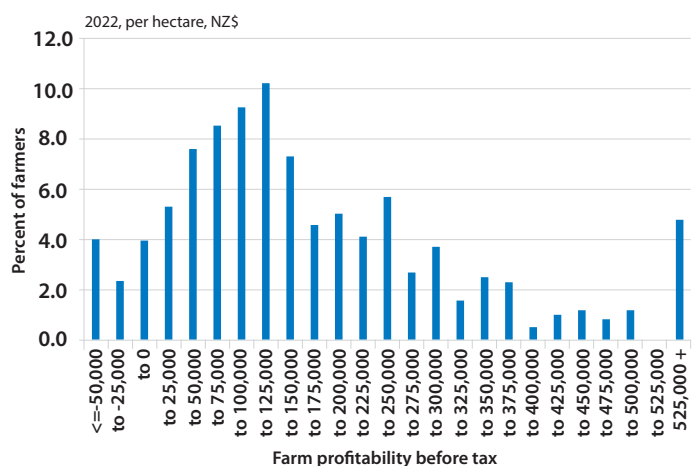
[Productivity and climate change are tightly linked](#)¹. What we know about meeting the challenge of increased productivity/decarbonisation is that farmers and growers who can improve productivity through innovation will give themselves headroom to build a decarbonised farming future. That is, the same high-level methods and processes that improved their productivity can also assist the approach to decarbonisation.

The distribution of farmer and grower productivity is wide (see Figure 1 and Table 2). For example, the performance of the most-profitable sheep and beef farms is three times that of the average farm on a per-hectare basis. In dairying, profitability for the top 50% of farmers is 36% higher than the average.

A vital way forward is to shift the performance of the average farmer to levels that are on par with or close to the most productive farmer. This will drive productivity but also assist in the decarbonisation process.

To succeed, all farmers and growers should have access to the tools and techniques to help them maintain and improve productivity and decarbonise. Rabobank is committed to helping our clients move along the decarbonisation pathway.

Figure 1: All classes of sheep and beef farms: farm profitability before tax



Note: (1) median = NZ\$ 122,000 and mean = NZ\$ 164,000. Source: Beef + Lamb New Zealand, Economic Service Insights.

¹ <https://www.nzier.org.nz/publications/fast-forwarding-technology-to-address-climate-change-nzier-insight-100>

Table 2: Dairy New Zealand analysis of owner-operated dairy farm profitability

2020

| | Average | Top 50% |
|--------------------------------------|---------|---------|
| Kg milk solids per cow | 420 | 453 |
| Cows/full-time equivalents (FTE) | 152 | 158 |
| Dairy operating expenses (\$ per kg) | 5.53 | 4.98 |
| Operating profit (\$/ha) | 2,816 | 3,842 |

Source: Dairy NZ, <https://www.dairynz.co.nz/business/dairybase/benchmarking/latest-dairybase-benchmarks/>

2.3 New Zealand doesn't have a major influence on setting the international agenda for climate change

Countries such as New Zealand are international policy takers. Despite our significant exports in temperate zone agricultural products, we do not have a major influence on setting the climate change international agenda.

As a policy taker, we need to adhere to international rules and be seen to do this.

By signing the Paris Agreement, New Zealand confirmed we would adhere to international rules to reduce emissions. And while some progress has already been made towards meeting environmental goals, this is not enough.

Recent government actions include investing the proceeds from the ETS on emissions reduction and the announcement of the He Waka Eke Noa partnership with industry. A key feature of the He Waka Eke Noa partnership is a farm-level pricing system to encourage reduced emissions:

- Levy costs are derived from on-farm emissions rather than national averages.
- Farms calculate their short-lived and long-lived gas emissions through a single centralised calculator (or existing tools and software linked to the centralised calculator).
- Reduced emissions from on-farm efficiencies and mitigations are recognised as they become available.
- Incentives are provided to take actions (practices and technologies) to reduce emissions.
- Different levy rates are applied to short-lived - and long-lived gas emissions (split-gas approach).

The Climate Emergency Response Fund establishes a \$4.5 billion fund to be invested in transport, energy, industry, agriculture and forestry. Specifically, this includes:

- research into new technologies to reduce agricultural emissions to bridge the gap between existing agricultural emissions research and actual on-farm implementation (\$338 million)

- subsidies to help industry and business decarbonise by replacing coal boilers with alternative power sources (\$652 million) - this is particularly important in agriculture since several agricultural industries are dependent on coal-fired boilers (e.g. dairy and covered crops)
- incentives for planting native forests by supporting nurseries and seed plantations (\$100 million).

A number of strategies are cemented into place. For business, these include a national energy strategy, a national infrastructure strategy for EV charging, a transport climate research plan, a gas transition plan, a hydrogen roadmap, an action plan for decarbonising the industrial sector, a New Zealand Energy Efficiency and Conservation Strategy and a transformation plan for forestry and wood processing. These strategies also impact agricultural supply chains, given their heavy reliance on logistics solutions and needs for processing energy.

2.4 How do we stack up against other industries and nations?

2.4.1 New Zealand and global agriculture need to play their part...

[Agri food systems contribute 31% of world emissions²](#) while in New Zealand, nearly half (48%) of our emissions come from agriculture (see Figure 2). New Zealand's heavy reliance on agricultural production means we produce a lot of methane and nitrous oxide, which have a greater short-term warming effect than carbon dioxide.

Currently, among those who have signed up to the Paris Agreement, New Zealand's gross emissions ranked 24th among the Annex I countries, but New Zealand's emissions per person were the sixth highest at 16.9 tonnes of carbon dioxide equivalent (CO₂e) per capita.

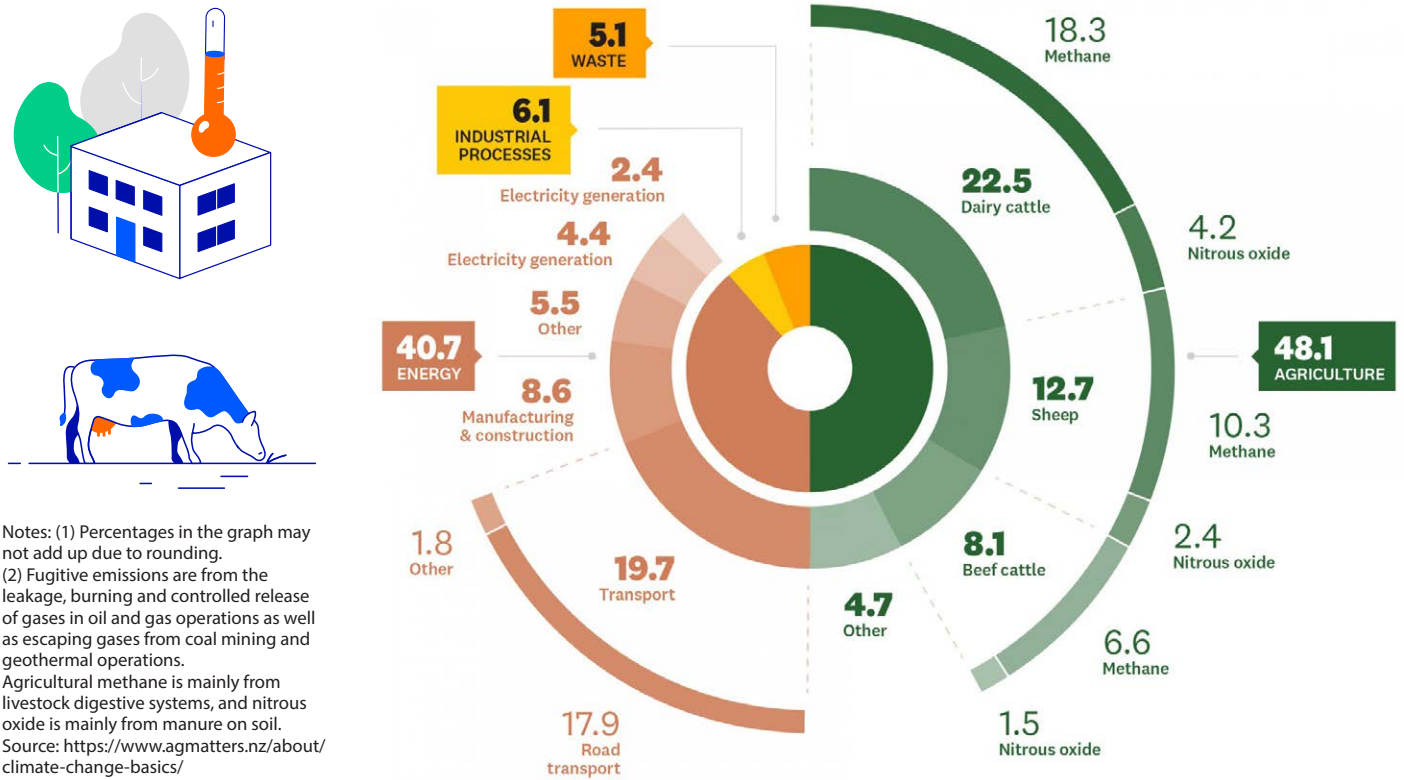
2.4.2 ...but there is good news

New Zealand farmers and growers are very good at what they do. [A report by AgResearch³](#) compares the carbon footprint (total greenhouse emissions per kg of product) of dairy cow milk from New Zealand with a large group of other countries from major dairying regions (See Figure 3). It found (in a systematic review) that New Zealand's carbon footprint is lower than most other producers.



² <https://news.un.org/en/story/2021/11/1105172> ³ <https://www.dairynz.co.nz/media/5794083/mapping-the-carbon-footprint-of-milk-for-dairy-cows-report-updated.pdf>

Figure 2: New Zealand's carbon emissions



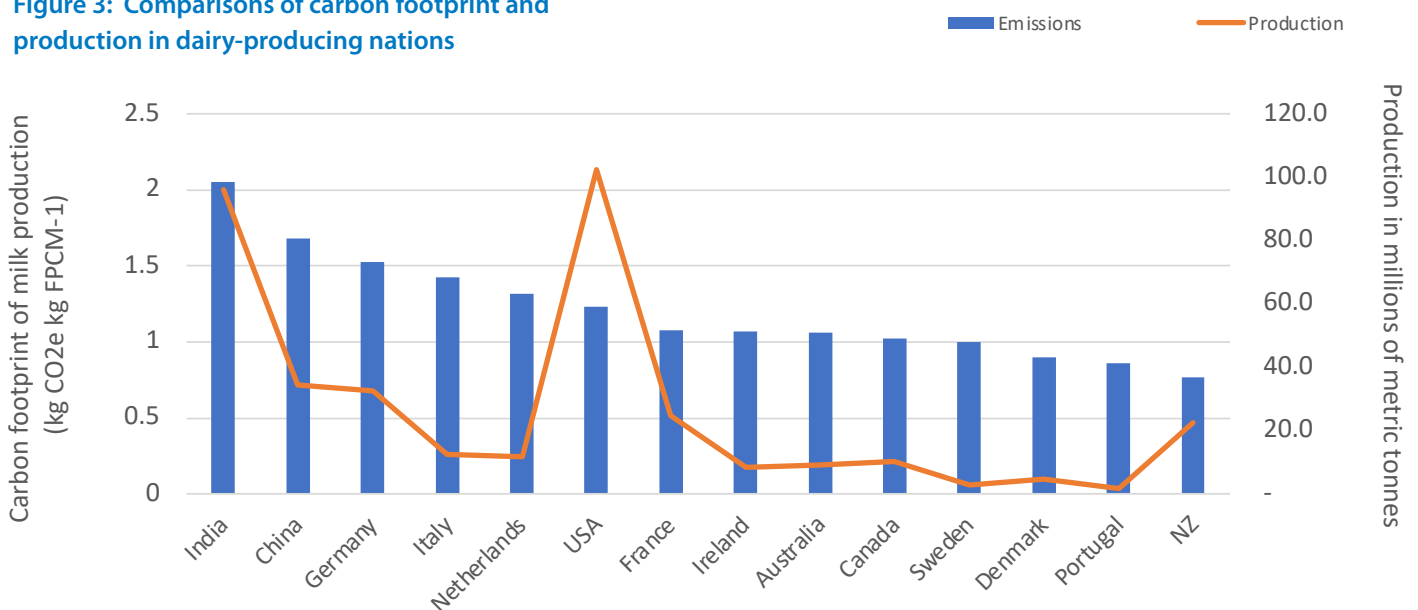
2.4.3 Agriculture, especially the livestock sector, needs to play its part

While New Zealand's relatively low emissions per unit of output are a very encouraging result, the AgResearch report is also likely to have positive implications for sheep and beef industries because of New Zealand's pasture-based systems (although we have not yet seen any research to back this up). However, this does not change the fact that methane

from livestock is a much bigger contributor to New Zealand's carbon emissions than most other countries.

New Zealand's agriculture is based mainly on livestock production, and this is where our emissions need to come down. Despite low emissions relative to other livestock producers, the New Zealand livestock sector needs to play its part in reducing emissions.

Figure 3: Comparisons of carbon footprint and production in dairy-producing nations



Notes: (1) Left-hand side: Carbon footprint of milk production (kg CO2e/kg FPCM-1) in different countries (after correction to common GWP, functional unit and allocation methodology) – NZ data excludes direct land-use change (dLUC) and would be 0.91 if it was included. (2) Right-hand side: Production in millions of metric tonnes. Source: <https://www.dairynz.co.nz/media/5794083/mapping-the-carbon-footprint-of-milk-for-dairy-cows-report-updated.pdf>



3. Facing some global home truths

3.1 The global twin challenges of population growth and climate change mitigation

The world is watching how nations respond to the challenge.

All signatories to the Paris Agreement have committed to determining how they will help global efforts to limit warming to well below 2°C, and pursue efforts to limit it to 1.5°C above pre-industrial levels to reduce the risks and impacts of climate change.

The specific challenges we must overcome are:

- the urgent impetus to grow food supply as the world's population is projected to increase to 10 billion people by 2050⁵ and with an increasing middle class
- the urgent need to reduce emissions by 43% by 2030⁶ to [contain global warming to 1.5°C](#)⁷ according to the latest science-based report from the IPCC.

Put simply, we need to simultaneously increase production and radically reduce the greenhouse gases that risk us warming our entire planet – all this with biological systems responding slowly to change.

3.2 The evidence for climate change occurring now is overwhelming

How to eradicate hunger and meet the requirements of a burgeoning middle class in a carbon-constrained environment is a major societal challenge.

[van Dijk and colleagues](#)⁸ demonstrate that food demand will increase substantially.

In a meta-study of 57 studies of world food demand, they show that world food supplies need to increase by 35–56% between 2010 and 2050. Considering the impacts of climate change, the range changes slightly (+30% to +62% for total food demand).⁹

To meet the Paris Agreement goals of limiting global warming to 2°C or less, the world's carbon emissions must be reduced considerably, including those from agriculture. [Clark et al.](#)¹⁰ illustrate the issue by showing that, even if fossil fuel emissions were eliminated, emissions from the global food system alone would make it impossible to limit warming to 1.5°C and difficult even to realise the 2°C target (under business as usual). We need major changes in how food is produced if we want to meet the goals of the Paris Agreement.

Clark et al. set out the various strategies and their implications, detailing the likelihood of rising temperatures under all tested scenarios (See Figure 4):

- The business-as-usual scenario means that agricultural emissions by themselves will almost reach the threshold for a 2°C temperature rise by 2050 (just 1% below 2°C). Agriculture will by itself generate enough unacceptable global temperature increases (black column) to do this.
- Other scenarios will bring the world under 2°C by varying degrees, e.g. new high-yield varieties will keep the world under 2°C by 20% (dark blue column).

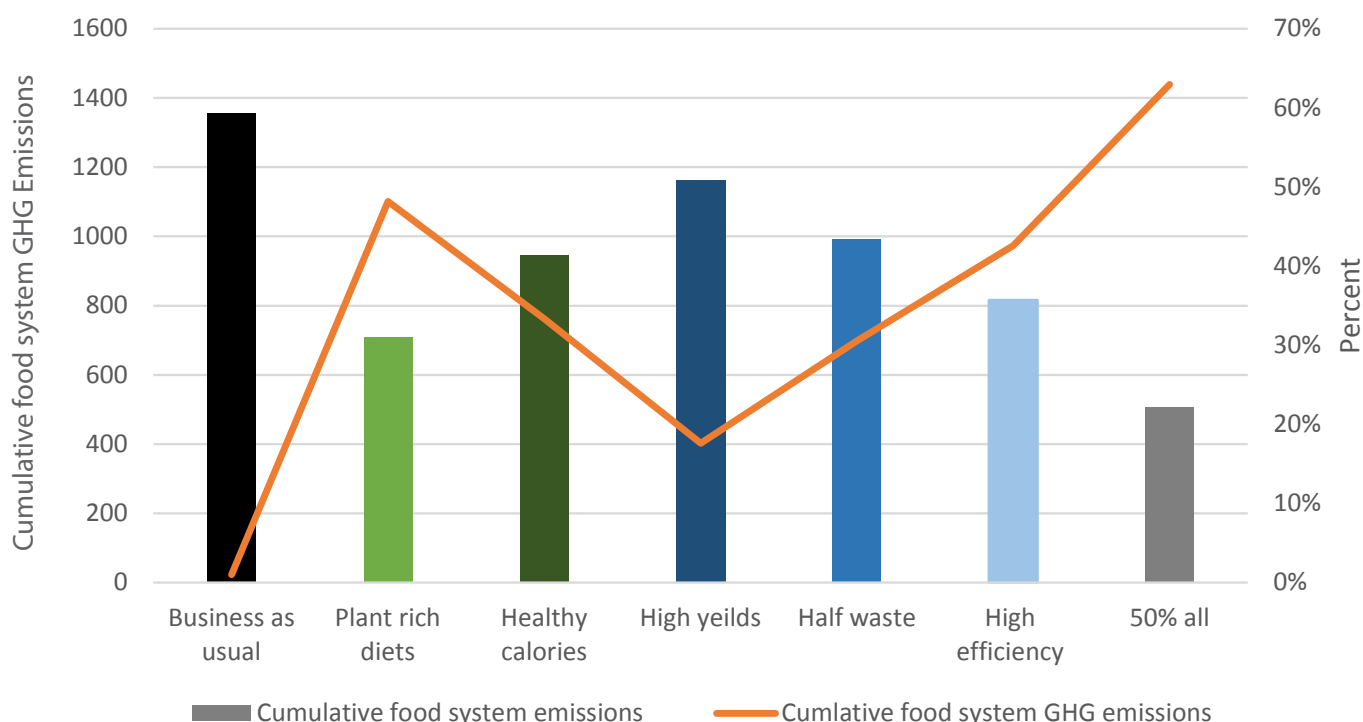
- Combining the scenarios and achieving 50% of each scenario yields the best results (grey column). It estimates that temperatures will be 62% below the 2°C limit.

Of these scenarios, some will be easier to control than others, i.e. we will not be able to tell people what to eat, so

governments cannot simply convert the world to plant-rich diets. Focusing energy on areas that governments can influence, e.g. increasing yields, reducing waste, and improving efficiency, is a much more efficient policy approach to constrain emissions.



Figure 4: Projected emissions from the world food system



Note: (1) 2020. (2) Food system changes are gradually adopted between 2020 and 2050. Bars are coloured by type of change to the food system. The black bar indicates business-as-usual emissions, green bars indicate changes to dietary patterns, blue bars indicate changes to food supply chains and the grey bar indicates combined changes of all five individual strategies. The plant-rich diet scenario is based on EAT-Lancet recommendations, the healthy calorie scenario contains ~2,100 daily kilocalories per person, the high yields scenario involves yields that are 50% above current maximum potential yields, the half waste scenario has food loss and waste reduced by 50% and the high efficiency scenario indicates a 40% reduction in GHG emissions per unit of food produced. The grey column indicates a global transition half way (50% all) to adoption by 2050 of all five strategies: plant-rich diet, healthy calories, high yields, half waste and high efficiency changes. Horizontal lines indicate the maximum cumulative emissions from all sources (food and non-food) compatible with a 50% or 67% likelihood of achieving the 1.5°C (orange) temperature target. Source: Adapted from <https://www.science.org/doi/10.1126/science.aba7357>

⁵ <https://population.un.org/wpp/Download/Standard/Population/> ⁶ The baseline comprises the average annual emission between 2010-2019. ⁷ <https://www.ipcc.ch/2022/04/04/ipcc-ar6-wgiii-pressrelease/> ⁸ <https://www.nature.com/articles/s43016-021-00322-9> ⁹ Bringing 57 studies together with different base years, population growth scenarios, income growth, productivity, land availability, calories required per day and protein consumption is a challenge. The approach taken was to limit the collection and data harmonisation to two indicators: per capital food consumption and population at risk of hunger. ¹⁰ <https://www.science.org/doi/10.1126/science.aba7357>



4. Four areas where we can make a difference

4.1 Setting up a 'swarm' of innovation

A farm's ability to compete in a changing world is linked to its ability to identify and adopt innovations. Introducing new ideas, alternative systems and different technologies enables a farm to change and meet the market. It maintains competitiveness and relevance.

Farming is becoming more complex. Price volatility, climate change and shifting societal expectations on food producers are placing greater demands on farmers and growers. The ability and willingness of farmers and growers to explore new ideas and adopt innovation will be a significant factor in farming success in the future.

There is no escaping it. You also can't control innovation. You can invest in the areas where you might get the best bang for your buck, but innovation is inherently an uncertain process. So what can we do, particularly on farm, to unleash the swarm of innovation needed to address climate change?

4.1.1 Innovation is incremental

Critically, we must understand there will be no one-size-fits-all solution, since it will be the fine details of each industry that determine the approach to mitigation and improved efficiency. Whether the innovation is exceptional or modest, what matters is that it's widespread and dispersed.

If an innovation works, we need farmers and growers to have access to it.

4.1.2 Upskilling the workforce and their contractors

The farmer and grower has to drive the innovation. We know that climate change innovation will involve on-farm and

off-farm expertise. Furthermore, New Zealand's future agricultural success lies in a skilled workforce implementing innovation on farm and along the value chain. New Zealand agriculture needs a workforce that challenges the status quo and seeks creative solutions.

It is also clear that off-farm expertise will be needed to advise farmers and growers on developing integrated farm plans, implementing these plans and best-practice monitoring. The government is currently focused on freshwater. The plans will include:

- farm maps identifying features such as waterways, areas where contaminants are discharged, high erosion-prone areas and other risks
- risk assessments on specific activities such as irrigation, application of nutrients and effluent, winter grazing, stock-holding areas, stock exclusion, offal pits, and farm rubbish pits
- schedules of actions to manage identified features and address identified risks.

These plans will have to be approved by an independent suitably qualified person, audited independently and enforced by regional councils.

This will not be trivial, but it is required to measure the effectiveness of the innovation practice and how it might vary within a farm and between farms and will play a key role in transnational verification of our farming systems at the individual farm level.

It is the industry's responsibility to build these skills in partnership with the government.

4.1.3 Adopting best innovation practice

Successful on-farm innovation requires goal setting, giving problem ownership to the workforce, making incremental advances and moving towards objectives.

To maximise the chances of success, we need several factors to align:

- Farmers and growers need to further control inputs to a farm. This is the first step to understanding the trade-offs between various inputs and how they mitigate or contribute to climate change. Further controlling inputs to any type of farm is a fundamental way of reducing carbon emissions. While many farmers and growers do this, it is not done consistently across farms to an industry standard – again, this speaks to the advantages of integrated farm plans.
- Innovation is inherently unpredictable. Therefore, when an innovation works, it needs to be made as available as possible. It also means that farmers and growers must be even more flexible and open to new approaches and processes.
- Incentivising the workforce to innovate on farm. While training is a major part of ensuring innovation can occur, farmers and growers need to be creative in how they incentivise workers.
- Keeping innovation simple. Once a good idea is identified, move swiftly to introduce it across the whole farming system. Similarly, where trials suggest an innovation is not working, eliminate it (fast failure).



4.1.4 Keeping it simple, while backing innovation, pays off

Many successful farmers and growers have an uncomplicated view of what drives success:

- Embracing innovation and being open to new ways of doing things. This applies not only to farmers and growers but also all along the supply chain.
- Once a good idea is identified, successful farmers and growers tend to move swiftly to introduce the innovation across their whole farming system. This ‘franchising success’ is closely linked to having operational control. This kind of action is one form of scale economy and is strongly supported by research into business practice.

We potentially need an all-of-industry approach to innovation. There is more benefit in collaborating across specific farming industries and, in selected cases, all of agriculture. Innovation by one farmer is helpful, but the real prize is collaborating so that all farmers and growers benefit from innovation that works.

Ensuring that innovation is front and centre to meet climate change action also requires that the policy framework allows for consistent funding of innovation and technology by the government.

4.2 Kicking waste for touch

Cutting food waste can reduce emissions. If food waste was a country, it would have the third-biggest carbon footprint, only beaten by China and the United States. [Food waste produces nearly 10% of global greenhouse gases.](#)¹¹

In industrialised nations, growing, processing, packaging and transporting food contributes to climate change. [For example, about a third of fruit and vegetables are rejected for being the wrong size or shape before reaching the shops.](#)¹² When food is thrown away, it rots and releases more greenhouse gases into the atmosphere.

[In New Zealand, households throw away 86kg of food waste each year.](#)¹³ This has spurred the government to develop a waste reduction strategy:

- **A target to reduce organic waste in landfills by 23% by 2030.** The aim is to divert this stream of waste back into the community through individual and local composting.
- **A focus on methane generated by organics in landfills.** The government is using the waste strategy and the Waste Minimisation Act to drive further reductions in waste. This includes reducing single-use plastics and packaging, e-waste and waste from textiles, construction and demolition.
- **Encouragement for the circular economy.** A circular economy has a 'make-use-return' cycle, with energy from renewable sources.



[The good news is that most New Zealanders believe that wasting food is wrong \(86%\).](#)¹⁴ However, our performance is mixed (see Figure 5). New Zealanders expect to waste more food in 2022 compared to the previous year – estimating 13.4% of their household spend on food is wasted. This translates to around \$3.1 billion of food wasted in the last year. The impact of wasted food is driven by a greater level of food wastage per household and a growing number of families.

New Zealanders recognise the global challenges to minimise our carbon footprint while ensuring the world's population is fed sufficiently. They believe that solving these challenges is the joint obligation of consumers and businesses.









They also realise that, as well as the wasted personal money and feelings of guilt, food wastage has an impact beyond landfills – its impact on climate change.

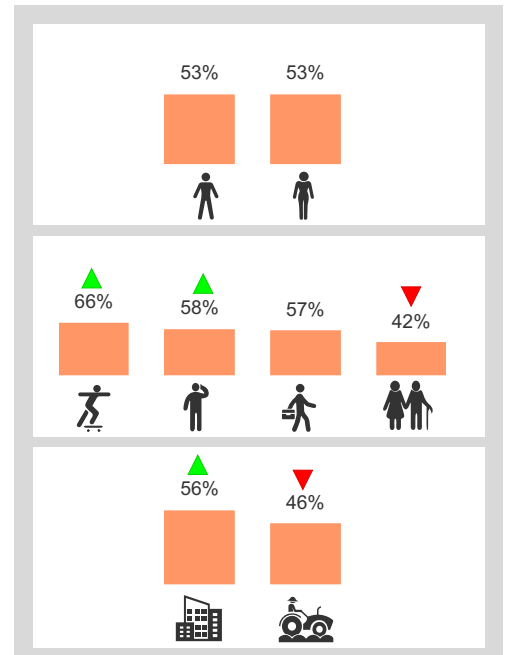
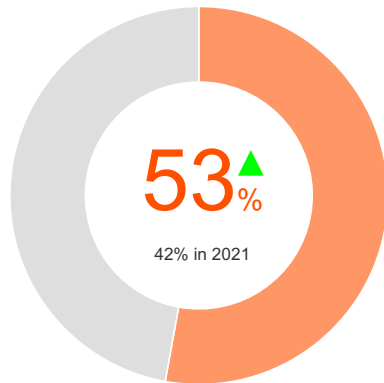


¹¹ <https://lovefoodhatewaste.co.nz/food-waste/the-global-issue/> ¹² <https://www.theguardian.com/news/2021/sep/04/how-food-waste-is-huge-contributor-to-climate-change> ¹³ <https://www.auckland.ac.nz/en/news/2021/09/08/we-throw-away-less-food-during-lockdown.html> ¹⁴ <https://lovefoodhatewaste.co.nz/food-waste/>

Figure 5: Waste not, want not

Proportion of New Zealanders who have purchased food that you ended up throwing away without having tried or eaten it in the last 12 months (2022)

-  Male
-  Female
-  Gen Z
-  Gen Y
-  Gen X
-  Baby boomers & beyond
-  Urban
-  Rural



Note: Red and green arrows denote significantly higher or lower results than the overall average. Source: Adapted from Rabobank (2022)

4.3 Improving productivity and sustainability with precision agriculture

Precision agriculture will be part of the solution to reduce emissions from our farming systems. While farmers and growers have been honing their agricultural practices for centuries, their knowledge of the productive characteristics of their farming unit tend to stay in the heads of individual farmers and growers and not be passed on.

Precision agriculture uses new technology to codify this information and make it more systematic to collect temporal spatial, and other data to support farm management decisions. Bringing this data together from on-farm and off-farm providers can improve efficiency, productivity, quality, profitability and sustainability.

This is important for applying technology to other farms or even other sectors and can also distinguish performance on different parts of the same farm. Critically precision agriculture can provide these benefits:

- Optimise inputs into a production system to drive lower emissions by highlighting trade-offs between the various input attributes.
- Minimise the use of inputs to the precise amounts needed. The input need could be different across farms and on different parts of the farm or even in the same paddock. Factors that could influence these differences are soils, exposure to the sun and slope.
- Optimise farm production by detailing the actions a farmer or grower needs to take on farm in different parts of the farm. Enabling technologies such as sensors, satellite imagery, cameras and drones provide a better understanding of how to lift farm performance.
- Understanding the impact on the farm can have huge benefits along the marketing chain. For crops such as

kiwifruit and apples, for example, technology will make it possible in the near future to detail the quality and quantity of the crop and its harvest timing.

We already know approximately when a harvest is ready and its quality, but in the future, we will be able to reduce costs and save on emissions by precisely understanding the size and quality of the crops. For example, we will know how much energy is required in the packhouse, the quantity from each orchard and when shipping is required.





4.4 Building biodiversity while responsibly offsetting

Planting trees to offset emissions is a sensitive issue in rural communities. By converting sheep and beef farms into forestry, rural communities worry about their rural towns dying.

We note that farmers and growers are interested in developing an integrated approach to planting trees on farms. They fear conversions of whole farms, which becomes more likely as carbon prices under the ETS increase.

By integrating forestry within a farming context, farmers and growers believe they can improve management of landscapes and potentially meet climate change targets. This could possibly be extended to a whole-of-catchment coordination by strategically planting trees in areas where they are of most use. This could be backed up by the use of precision agriculture.

This type of coordination would be a huge challenge for farmers, growers, foresters, the science community and local and central government. But climate change is a huge challenge requiring new ways of thinking.

[BakerAg](#)¹⁶ points to over 47,000 ha of land being approved under two government schemes alone – One Billion Trees and Crown joint venture programmes – to be converted into exotic, indigenous and mānuka planting

within sheep and beef farms (12,124 ha of this in natives and 35,265 ha in exotics) between 2018 and 2020. These schemes gave opportunities for farmers and growers to integrate trees on their farms through the right mix of incentives and individual action.

4.5 Check your mindset

The comforting post-World War II and post-Cold War certainties, if they ever existed, are gone. Climate change is coming and so is government regulation and consumer demand for farmers and growers to produce more food in a transparent, socially and environmentally responsible way.

In a recent survey, SEC Newgate¹⁷ found that environmental, social and governance (ESG) principles have a high level of influence on people's decision to purchase products or services. Across 10 countries it found:

- over half (51%) of respondents said that their perceptions of a company's ESG performance had an influence over their purchasing decisions
- some 32% of respondents had warned others against using a company because of poor ESG performance
- over a quarter (26%) had discussed a company's behaviour online or on social media.

¹⁵ See for example <https://beeflambnz.com/sites/default/files/news-docs/Summary-report-assessment-of-land-use-change-from-pastoral-farming-to-forestry.pdf>

Overall ESG consumer ratings of companies were driven in the environmental space by responsible and sustainable use of natural resources and genuinely working towards being carbon neutral.

Across New Zealand, operating from 28 offices, the Rabobank team are in conversations with hundreds of clients and rural community leaders every day. We see a spectrum of reactions in the local food and agri space:

- **Leading the way.** The exemplars in developing new food and agri methods, products and processes. Go out of their way to advocate climate-positive actions and inspire others with their efforts and successes.
- **Playing their part.** Play an active role in farm planning to meet or exceed regulatory requirements, share information with friends, families, neighbours, learning networks and support groups.
- **Biting the bullet.** Starting to act on the realisation that we need to do something. Taking the first steps to engage with the issues and joining groups to get actively schooled up on the opportunities and challenges.

Other farmers and growers still maintain a wait and see approach. Most farmers and growers know that the climate is changing, they watch the weather closely and interact with the land. A couple of 'once in a hundred year' weather events in quick succession can also lay these issues bare.

They also understand that mitigation will cost and impact the bottom line.

Several studies¹⁷ confirm that farmers and growers agree that the climate is changing. However, some farmers and growers also stand out with their high levels of climate scepticism, preferring to attribute observed changes in climate to natural causes. Some farmers and growers might be quite willing to invest in adaptation but are not prepared to call it mitigation.

We need to address the distributional spread of talent within farming, particularly related to climate change. This is a hard area because of differences in farmers' and growers' motivations – some will do what they want to do, particularly if debt levels are low.

To 'lift all boats' to initiate best-practice mitigation solutions will mean change backed up by regulatory action. It could be that one of the costs of doing this will be some farmers and growers exiting their operations. The extra cost of climate change mitigation efforts is subject to economies of scale. Climate change regulation will add additional cost and more than likely will increase the necessity for farm consolidation.

Under this scenario, there is a role for those wanting to assist this process (entry and exit) and to encourage the incumbent farmers and growers to innovate since it is critical to success.

4.6 Role of government

The alignment between public and private incentives is of overriding importance to meet best practice and make steady incremental gains. The following modifications are needed on farm and off farm to make this happen:

- Government needs to ensure that the high-level agreements signed up to (Paris Agreement and other agreements) translate into positive incentives that farmers and growers face. We need to close this gap in incentive alignment. Otherwise, rhetoric will not match action.
- Given New Zealand is heavily export oriented with up to 80% of production moving abroad in some categories, the government needs to work towards further acknowledgement of sustainability on New Zealand farms for trade agreements, as was somewhat recognised in the recently signed NZ-EU trade agreement.
- We need to align support from institutions such as universities with the tasks at hand: reduced carbon emissions and increased production. This requires a consistent push to harness New Zealand's scarce scientific resources to forge the path ahead.
- We need to ensure an agile regulatory framework and have agencies that can rapidly assess and approve new technologies such as digital trade technologies, a range of methane inhibitors (if they work on farm) and feed additives.



¹⁶ <https://beeflambnz.com/sites/default/files/news-docs/Summary-report-assessment-of-land-use-change-from-pastoral-farming-to-forestry.pdf>

¹⁷ ESG Monitor (2021) Research Findings. SEC Newgate. ¹⁸ Ibid.



Aerial view from space of ecological disaster of fires in the Amazon, South America

5. Thinking the unthinkable

5.1 We cannot sustain the status quo

5.1.1 Doing nothing makes grim reading

Continuing as we are will have environmental, human health and economic consequences greater than the costs of action.

We know from the literature that the following impacts are likely:

- **Increased temperatures.** Some regions will be hotter than others, although how hot will depend on how much mitigation occurs. For cities such as Phoenix in Arizona, the average temperature has increased by 2°C over the past five decades, and it now has over 50 dangerous heat days per year.
- **Increased sea levels.** As the polar ice caps melt, global sea levels will rise and cause major disruption to the infrastructure of low-lying coastal cities.
- **Floods and droughts.** The risk of flooding as the climate becomes more unpredictable will increase significantly. Unpredictable weather patterns will have other consequences such as droughts and severely water-stressed regions.
- **Endangered biodiversity.** Climate change is likely to hasten the extinction of many species critical to the world's ecosystems.

As a result, economic performance will be negatively affected everywhere.

5.1.2 A radical approach, like a world without livestock, won't work either

Would removing all livestock from the land help reduce greenhouse gases? We do not have any analysis in New Zealand that looks at this, but in the United States, work has been done to test assumptions around removing dairy farming to reduce emissions.

Liebe et al. suggest that removing dairy cattle would only modestly reduce emissions ([between 6.8% and 12%](#)).¹⁹

More importantly, milk provides nutrients that the population needs, so climate change is not the only constraint to consider. Liebe et al. found scenarios that removed the dairy industry and did not reduce the micronutrients required by the population emitted similar amounts of greenhouse gas as the dairy industry.

They also commented that removing dairy cattle from United States farmland to combat emissions would be difficult without reducing the nutrient supply to the population.



5.2 New Zealand will also have other things to worry about if it does nothing

Our country will likely face a range of issues that mean we can't meet New Zealanders' expectations of improved environmental, social, cultural and economic performance. Issues such as those discussed below will impact both the supply side (impact on cities and rural activity) and demand side (impact on New Zealand's trading environment).



5.2.1 Rising sea levels and chaotic weather patterns will impact society

As a small island nation with a large percentage of its population living in coastal areas, New Zealand faces well-documented impacts of rising seas. The information suggests that, if nothing is done, sea-level rise could impact infrastructure provision (and the government's ability to fund this), insurance and house prices.

Agricultural activity will also have to adapt as the east coast of both islands becomes water-stressed, and all New Zealand will experience variable weather patterns. Many in farming believe that climate change is already having dramatic impacts on their ability to farm.

5.2.2 Increased potential for market exclusion

New Zealand has always faced market barriers preventing producers from trading on world markets. We realise that we will never be able to trade completely freely on world markets. The buzzword is 'freer' trade, not 'free' trade, when signing trade agreements.

If New Zealand does not meet its obligations signed up to in Paris, we will likely face further barriers to market entry. Our experience has been that countries have always been keen to support local products over imports from countries like New Zealand, and this is unlikely to change. Over and above this, opportunities to put up barriers against New Zealand products in the event of a lack of compliance by New Zealand to climate change rules will not be missed by those countries and are likely to be exploited to the full.

For example, the European Union is instituting a policy whereby importers and non-EU manufacturers will pay for the carbon emissions associated with the goods and materials they sell in the EU. The Carbon Border Adjustment Mechanism (CBAM) does not yet include agriculture products, but fertiliser is already included. There is growing pressure to implement the policy earlier (than 2026) and to widen the scope of products it covers.



¹⁹ Liebe D, Hall M, and White R (2020) Contributions of dairy products to environmental impacts and nutritional supplies from United States agriculture. *Journal of Dairy Science* 103: 10867 – 10881 <https://doi.org/10.3168/jds.2020-18570>



6. Weighing up the benefits and costs

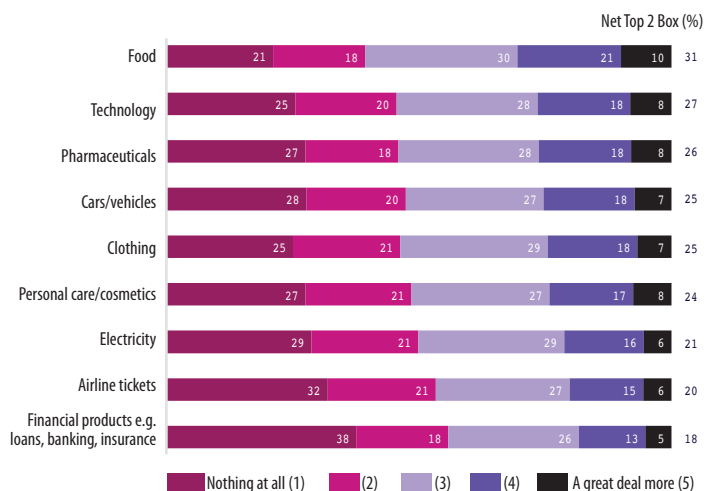
The costs of inaction on climate change are likely to be much greater than the benefits of doing nothing. If we are able to avoid the impacts of doing nothing set out in section 5, the benefits are significant.

6.1 Off-farm benefits of leading the food and climate transition

- Improved social licence to operate, helping to secure the future of farming. Social licence can broadly be described as a farmer's or grower's ability to carry on business because of the confidence society has that it will behave in a legitimate, transparent, accountable, and socially and environmentally acceptable way.
- Providing consumers with benefits over and above just the product sold (enhancing provenance) enhances product standing and durability in the market. One definite trend is that consumers, employees and the public want to hear more from farmers and growers on what they are doing to improve their environmental and social performance.
- The heightened awareness of ESG issues by consumers means that entities being proactive on climate change issues and/or providing products and services that meet higher emissions standards are likely to forge a competitive advantage in the market. Global surveys point to a possible willingness by consumers to pay extra for responsibly produced food. For example, [the SEC Newgate study](#)²⁰ of 10,200 consumers across 10 countries found that food was the item for which they were most prepared to pay extra for higher ESG performance (See Figure 6).

Figure 6: Stated willingness to pay

How much more people would be willing to pay if provider was doing the right thing in terms of ESG (%)



- Tools are being developed to assist farmers and growers to effectively engage with their stakeholders and gain or maintain consumer trust. Having an easily communicable sustainability strategy and transparent, credible reporting can assist farmers and growers to build trust, improve brand and reputation, realise opportunities and lower risk. Ultimately, best-in-class implementation will depend on farmer adaptation as they change production methods and respond to consumers. This is happening globally, so farmers and growers who sell on global markets must be aware of this.

²⁰ https://www.secnewgateesgmonitor.com/wp-content/uploads/2021/10/SEC-Newgate-ESG-Monitor-Research-Report-final_.pdf

- Farmers and growers already face a daunting array of regulatory barriers in overseas markets. They also do not want to face consumer resistance, boycotts and general market hostility. Getting with the climate change programme will not just be a sufficient condition but also necessary.
- There will be increasing demands from retailers to improve carbon footprints. They are often the gatekeepers to consumers, and we believe they will drive change towards lowering emissions in agriculture.
- Being seen to follow international rules and not being shut out of markets. Being policy takers means we need to be proactive and work within frameworks (on climate change) that others have crafted.

6.2 On-farm benefits of reducing emissions

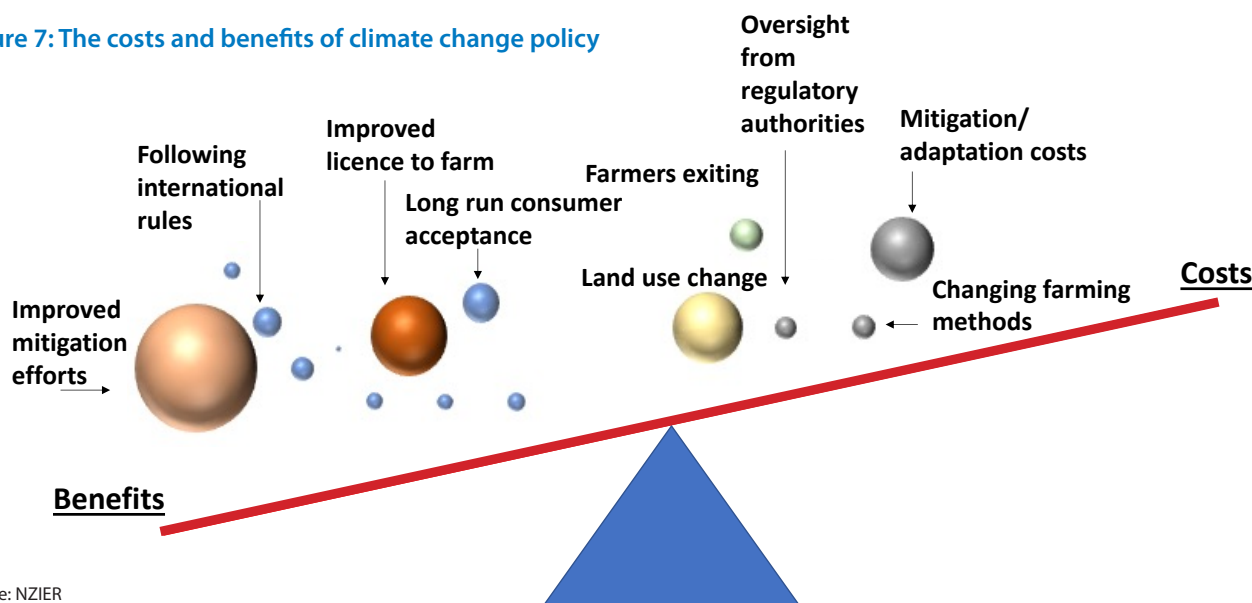
- Importantly efficiency is still preeminent since it allows farmers and growers headroom to deal with the new challenges (and costs). As precision agriculture takes hold, there will be increased ability to deal with the fine details that will drive mitigation.

- The importance of controlling what inputs are used in the farming process. The extent of these activities goes further than membership of fertiliser cooperatives or joint ownership of veterinary clubs to control feed production and the supply of [animals](#).²¹
- Empowering and incentivising quality workers. Having a motivated workforce allows them to contribute to the innovation process.

6.3 Costs of reducing emissions

While there are significant benefits, there are costs (See Figure 7). First and foremost, there will likely be land-use change as the price of carbon credits increases. This will impact some rural communities, and some farmers and growers will exit the business. We are unsure of the impact on rural communities and individual farmers and growers. The extra costs of climate change adaptation/mitigation will bear on farmer decisions to exit the sector.

Figure 7: The costs and benefits of climate change policy



Source: NZIER



²¹ <https://www.mpi.govt.nz/funding-rural-support/farming-funds-and-programmes/integrated-farm-planning-work-programme/>



7. Steering into the food transition

7.1 Uncertainty is the enemy

We are heading on a voyage into the unknown with climate change regulation and impacts both in New Zealand and overseas, and business does not like uncertainty. At the same time, governments around the world are making tentative steps towards climate change adaptation and mitigation.

Reducing uncertainty requires proactive but flexible steps to move forward. This is easier said than done since many farmers, growers and businesses tend to be reactive when taking steps to mitigate climate change. Overcoming this natural reaction requires leadership from institutions such as Rabobank.

A proactive approach will give full effect to the benefits:

- Innovation is uncertain. Therefore, the best place to start is to identify areas where innovation is most needed. For innovation to progress requires resources to be directed into overcoming these innovation bottlenecks. This reduces uncertainty and gives farmers and growers confidence that they can continue to work at meeting their individual climate change goals.
- Farmers and growers will need assistance and off-farm capabilities to assist them with the many adjustments required to reduce their carbon footprint and increase production. There may be opportunities to support the capability building.
- Farmers and growers are innovative. There may be thousands of different approaches taken. While not all of these will be successful, some will likely be. There will be opportunities to champion proven approaches and ensure that those methods reach the bulk of farmers and growers (innovation diffusion).

- It is far better and more efficient to make the changes yourself than have others force you to change. It is unlikely that regulation or overseas supermarket procurement policies will be as efficient as individual farmers and growers making changes in their own time and in ways that suit their property.

7.2 Rabobank is making a start

Third-party industry players such as Rabobank need to do the right thing and be transparent about its approach. By supporting actions to break through the bottlenecks, helping build capability and promoting the diffusion of innovation, Rabobank can play a steering role in transitioning to a low-carbon increased-production future. Alongside producing this white paper, Rabobank has made a start by:

- supporting efforts to reduce emissions by signing up to the UN-convened Net-Zero Banking Alliance
- applying for, and recently receiving, recognition as a Toitū carbonreduce certified organisation. As part of this programme, Rabobank will be working closely with Toitū Envirocare to reduce greenhouse gas emissions across our business.



²² <https://www.toitu.co.nz>

- benchmarking non-financial aspects of client businesses to ensure Rabobank is banking with responsible farmers and growers
- maintaining a long-term partnership with food waste social enterprise KiwiHarvest including an annual comprehensive survey on New Zealanders' attitudes and behaviours around food waste.



We have identified areas where Rabobank could focus interventions on:

- helping clear bottlenecks in the way of mitigation innovation
- investing in farmer education and capability and helping diffusion of innovation through our network of client councillors
- collaborating with our wholesale clients to provide sustainability linked loans to farmers and growers.
- understanding how we can encourage successful climate change practices amongst farmers and growers
- helping to communicate the story from farm to consumer
- financing the transition to accelerate needed change.

We believe collective action is needed across the food and agri sector and would love to hear from others who also want to steer the food transition.

Working together to make it happen.

Rabobank New Zealand is keen to play our part and work with others to steer the food transition.

Rabobank is New Zealand's only specialist food and agribusiness bank. Rabobank was set up in the Netherlands over 120 years ago as a cooperative - by farmers, for farmers. Today, Rabobank operates in 38 countries and is among the world's 30 largest financial institutions.

Here in New Zealand, Rabobank has a focus on supporting Kiwi farmers, growers and food producers.

Our 500 employees work from 28 offices across New Zealand and from our new purpose-built head office in Hamilton. Our employees are deeply committed to communities where they live and work.

Under our global mission of Growing a Better World Together, Rabobank takes a long-term view of food and agri. Rabobank works alongside our rural and wholesale clients, supporting them to achieve their business and sustainability goals.

To find out more about steering into the food transition, visit us at rabobank.co.nz



