May 2025
Report

LINCOLN
UNIVERSITY
TE WHARE WĀNAKA O AORAKI

The Future Use of Land and How to Fund it

Optimising land use to accelerate New Zealand's financial, environmental and social progress

Summary of full academic report

Foreword

At ASB, we're proud supporters of the food and fibre sector and the role it plays in New Zealand's success. Across seasons and cycles, we've seen that when farmers thrive, regional communities and economies prosper, creating jobs and growth for all New Zealanders.

From the hundreds of farmers and industry leaders we speak with every week, we hear the drive to care for land and create businesses that build generational prosperity. However, we also see customers who are struggling with viability, as the current use of their land is not providing them with the income they need to fund land optimisation or enable succession.

New Zealand has a long history of adapting land use, and generations have worked to make food and fibre the backbone of this country's economy. Today we're seeing headwinds increase, with demographic, environmental and operating conditions testing farming systems and driving the need for further change.

Land optimisation could have a transformative impact on New Zealand, boosting GDP by at least $10 billion, while creating jobs in regional communities and environmental benefits that boost our sustainability credentials in important export markets. However, the right way forward, in particular financing land-use change, isn't clear cut.

To help our customers, the sector and us at ASB to understand how to best unlock this opportunity, we partnered with Lincoln University's Centre of Excellence in Transformative Agribusiness and 25 leaders from across the food and fibre industry on this research report. We are conscious there have been many reports on how we could best use our land, but little discussion on what is required to enable that shift.

To explore the challenge facing the industry of how to meet economic, environmental and social goals simultaneously, the industry representatives helped to identify four scenarios that could have a big impact on the future of the sector. The report explores these scenarios and deliberately pushes them to their outer limits, to demonstrate the risk to the sector, the economy and the environment on focusing on any one strategic objective or strategy in isolation.

The scenarios don't make for easy reading, but they lay an evidence base from which seven possible pathways have been identified to support the sector to attain a balanced approach to land use.

This change won't be possible without the full food and fibre ecosystem working collectively – this includes the finance sector supporting the change needed with the right funding. The research highlights the need for us all to challenge traditional thinking around both debt and equity finance.

ASB is doing just this. We are leaning in and putting our balance sheet, expertise and network to work to support the land optimisation pathway. Our new Every Hectare Matters programme will span in-house support via our own team of agri-specialists, access to external advisory, a land transition model that advisors can leverage and a tailored approach to funding. A key component of the programme is connecting farmers to farm-specific guidance on options and trade-offs for different land optimisation choices because we know no two farms are the same.

Optimising land underpins a prosperous future for New Zealand. There are brilliant examples of farmers already on this journey, including our customer High Peak Station New Zealand which converted its sheep and beef farm to a sheep, hunting, honey and tourism business. This has created diversified income streams and enabled multiple members of the next generation to remain on the farm. This, however, wasn't an easy journey and we recognise that we can make it easier. We have an ambition for our customers to achieve productive growth, and to support regional prosperity and national progress. We are optimising how we can back other farmers to make the right changes for their land and future generations.

Thank you to industry for contributing to this report. Ultimately this is about working alongside farmers ready to explore new opportunities – enabling change across generations and helping farms stay in families. We're not just backing farmers with capital. We're backing them with insights, partnerships and the long-term thinking that makes meaningful transformation possible.

We trust this report creates conversation, provides useful guidance, and sows the seeds for action.

Ngā mihi, Aidan Gent
ASB General Manager,
Rural and Ruawai Farmer

ASB
ONE STEP AHEAD

For the purposes of this report, food and fibre sector is defined as the chain of activity involved in creating a product – harvesting to processing to selling – using raw material produced in agriculture and forestry.

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Executive Summary

New Zealand's economic success is tied to a resilient and prosperous food and fibre sector. Of our merchandised exports, 80 percent derive from our biggest natural asset – our land. Further to this, one in seven New Zealanders are employed by the sector; and within some regions up to 60 percent of regional GDP is linked to food and fibre. Yet while the sector's absolute contribution to New Zealand's economy is growing, it is at a slow rate. Today a subset of farmers are struggling to maintain profitability (the expected average profitability across all classes of sheep and beef farms is forecast at $45,300 for 2024/5*) which is impacting intergenerational transfer. These struggles are likely to increase with climate change.

The sector is encountering a dichotomy – how to achieve economic prosperity while meeting environmental targets and managing social impacts. Our dedication to environmental sustainability is crucial for marketing New Zealand's high-quality, sustainably produced goods at competitive prices. As market demands and climate impacts evolve, there is increasing pressure on farm incomes, affecting generational transitions and regional employment. It is now essential to transition from recognising the challenges and robust discussion to informed action at the farm, industry and national level.

The team, led by Professor Alan Renwick, has conducted research to understand if productive and diversified land use can generate strong economic outcomes (on-farm revenue, regional prosperity, GDP) along with positive social and environmental outcomes. Beyond this, and what differentiates this report from prior research into land use, is a focus on what is needed to fund land use change. The following report summarises the academic study titled "Future use of land and how to fund it". The study reviewed and consolidated existing insights into land use and engaged with 25 representatives from across the food and fibre sector, including farmers, industry bodies, government agencies, advisors, accountants, insurers, processors, wholesalers, fertiliser companies and investment managers. This informed the development of scenarios which allowed an in-depth examination of the impact of known targets, goals and viable market outcomes on land use and the food and fibre sector. Each scenario focuses on the achievement of a single goal, at the expense of other objectives, but together they create a platform of evidence to better understand the risks that exist across environmental, social and economic factors. It is important to understand that the outcomes of the scenarios are reflective of today's technologies (i.e. no vaccines or genetic improvement) and farm systems and do not account for progress anticipated in these areas which would materially alter scenario outcomes.

The scenarios are as follows:

1. Reduced Greenhouse Gas (GHG): Achievement of New Zealand's domestic and internationally agreed 2030 greenhouse reduction targets* with no advancements in technology and science.

2. Alternative dairy protein: Market disruption from alternative proteins.

3. Low-input dairy: Reduced application of nitrogen fertiliser is put in place in the dairy sector.

4. Increased exports: Doubling the value of New Zealand exports through increasing existing primary production.

*MPI Situation & Outlook Report 2024

Two of the scenarios provide an extreme and oppositional view of the impacts of potential trajectories for food and fibre: reduced GHG and increased exports. These two scenarios have led to the conclusion that there is a driving need for a less binary approach that enables achievement of both economic prosperity and environmental targets.

Key insights:

The scenarios provide strong evidence that a single focus is not a tenable way forward for New Zealand, based on existing technology and farm systems. For example:

- Reduced GHG scenario – Scenario results in a 10 percent reduction in emissions, 72.9 percent loss in land value and 3,000 jobs, assuming no advancements in science and technology. These changes are considered high risk for most of the North Island, with moderate social and environmental risks in the South Island.

- Increased exports scenario – Focussing only on increasing production of existing produce "disregarding GHG emissions targets" results in an increase of up to 16.9 percent in emissions, a land value increase of +12.2 percent and

69,000 jobs created. Despite these economic gains, risks are identified in the eastern North Island, particularly in the economic and social domains, and across all three domains (economic, social and environmental) in parts of the southern South Island.

While optimising our status quo within current systems is useful, more transformative action is required given the rate of external changes impacting the sector – from factors such as climate change and weather events to market dynamics.

Seven pathways have been identified. There are examples of these pathways being employed in New Zealand and this report provides case studies of these, but adoption at scale will be needed.

The right pathway to optimise land use and increase productivity will be different at the farm and regional levels; however, two pathways were recognised by stakeholders as being essential for transformation:

- Diversification of on-farm systems and income from land – a shift from a tendency towards single land use, to diversified and optimised use of every hectare.
- Facilitating Māori to grow value from their land holdings – enabling access to capital for multigenerational and iwi-owned land.

The role technology plays in enabling scaled land transition cannot be understated. Advancements are critical to the ongoing mitigation and adaptation requirements of climate and environmental impacts, and it is clear greater investment is required to enable on-farm access to new technologies.

Shifts in both debt and equity funding is required at all levels of optimisation and transformation. Traditional lending approaches will be challenged due to factors such as risk, and the ability to provide start-up capital and create finance models that facilitate upfront investment while accepting delayed returns.

Outcomes and action required:

Given that the majority of New Zealand's total land area is used for food and fibre production, how we optimise the use of this land is of fundamental importance to the country. Optimising land use also provides the opportunity for significant gains. The report shows that if we optimise land in the right way, we can win on both fronts. For example, unlocking even a 10 percent lift in productivity through the right action would concurrently reduce hidden environmental costs within the food and fibre sector by 10 percent, resulting in an additional $10 billion to GDP from the food and fibre sector within five to seven years.

Action is required at all levels of the food and fibre ecosystem to realise the benefits:

- To optimise value from the land, a balance between optimising farm system and the use of the land is required.
- Sector consultants need to support landowners with informed land transition advice.
- The finance sector needs to support with funding that enables development within farm systems. For example, finance for changing parcels of land – to renewable energy production or new food and fibre enterprises.
- The finance system also needs to unlock access to capital for intergenerational and Māori Land ownership models. In addition to encouraging equity funding for larger scale transformations (such as Kiwisaver funds, NZ Superfund) and foreign direct investment with operating models to link capital to operational capability.
- Central and Local Government needs to support with the right policy and regulatory settings and remain open to providing funding where public good benefits accrue.

Context and Scenarios

Context and Scenarios

New Zealand's success is tied to a resilient and prosperous food and fibre sector

The food and fibre sector directly utilises 50 percent of New Zealand's total land area. The sector continues to make a significant and meaningful contribution to the New Zealand economy, with its absolute contribution growing.

The latest available official figures show that:

- Primary production and manufacturing accounts for just under 9 percent of GDP and considering knock-on effects (indirect and induced) this figure increases to around 20%.
- 360,000 people were employed in the sectors in 2023, making up just under 13% of the workforce.
- The sectors are primarily export-focused, and account for over 80 percent of New Zealand's merchandise exports, which have grown on average 3.6 percent every year in the past decade.
- The sectors are rapidly changing. For example, in 2002 there were 70,000 farms, and by 2022 that figure had been reduced to 47,000, showing that production is increasingly coming from a smaller number of larger farm businesses.

Status quo is no longer viable to access new opportunities or offset challenges

While global population growth, rising wealth and changing consumer demand (for example, around health and nutrition) are creating new and exciting opportunities, there are significant challenges that threaten the status quo, let alone the achievement of significant growth within the sector.

These include:

- Maintaining and enhancing profitability and productivity across the food and fibre sector.
- The urgent need to mitigate environmental impacts.
- Limits imposed on businesses by a complex and fragmented regulatory system.
- Increasing frequency and severity of climatic shocks as well as general climate change.
- Social issues including ageing farm population and succession.

The scale and significance of these challenges should not be underestimated. In terms of climate, Cyclone Gabrielle is estimated to have cost between $400 million and $500 million in initial lost output and large costs in terms of clean-up and reestablishing production. Increasing severity and frequency of these events means that we must act to ensure our land use is more resilient, otherwise the costs will become too high for the sector to bear.

More generally, the environmental (external to the food and fibre businesses) costs of our food and fibre system are extremely high – one estimate from the Food and Agricultural Organisation is that for every dollar of gross value added generated by food there are 84 cents of hidden environmental costs. Unless action is taken this is only going to rise.

Current profitability in some sectors is not sufficient to effectively support intergenerational renewal. For example, the expected average profitability across all classes of sheep and beef farms will be only $45,300 for 2024/5, 7 percent lower than a year earlier, which in itself was a 54 per cent decline on the previous year. With low levels of profitability, we will continue to see declines in this sector, with the threat of loss of critical mass in regions and subsequent economic impacts including for example closure of processing plants.

The future of the sector, and consequently New Zealand, depends on how the sector responds to these opportunities and challenges. A critical component of this, is how we optimise the use of our natural assets – our land.

Historical land use has often been driven by full system change (i.e. sheep and beef to dairy) with at times a focus on a single economic outcome. Therefore, this study has sought to understand the implications of having a focus on a single outcome.

Four scenarios provide clarity around the challenges facing industry in how to meet enviromental, social and economic goals simultaneously

In conjunction with a review and consolidation of existing insights related to land use, industry representatives were engaged from across the food and fibre sector to develop scenarios as a method of examining the various challenges and opportunities facing the sector.

It is important to note that the intention of these scenarios was not to present likely futures for New Zealand, but rather to explore potential futures and their various possible outcomes. In particular, the intent of the scenarios (and the corresponding findings) is to explore and give visibility to the trade-offs between an "at all costs" focus on one dimension of sustainability – be that environment or economic. A balanced approach to the dimensions of sustainability is needed for New Zealand to unlock opportunity. Twenty five industry stakeholders contributed to this work, and these scenarios reflect their views on land-use decision-making over the next ten years.

Two future trajectories for the food and fibre sector bookend the analysis. The first assumes we focus on and achieve our internationally agreed GHG emission reduction targets for 2030. The second assumes the government's aspiration to double the value of exports is met through expanding food and fibre production from land. Two other scenarios provide insights into market and regulatory developments by considering the potential market disruption from the scaling of alternative proteins and the impact of reducing nitrogen use in dairy.

The four scenarios are:

1. **Reduced GHG:** The food and fibre sector plays a full role in enabling the achievement of New Zealand's domestic and internationally agreed 2030 greenhouse reduction targets – which involves a 26% reduction in net farm carbon dioxide equivalents and 10% reduction in biogenic methane emissions to meet GHG targets set for 2030.

2. **Alternative dairy protein:** Reflects the rise of alternative proteins that will compete with dairy-based proteins in the marketplace.

3. **Low-input dairy:** Assumes that restrictions on the application of nitrogen fertiliser are put in place in the dairy sector.

4. **Increased exports:** Assumes that the food and fibre sector contributes fully to the government's aim of doubling the value of New Zealand exports.

The outcomes of the scenarios are compared with the current situation, including current farm systems and technologies. They do not account for such factors as adoption of new technologies such as vaccines or genetic improvement; the implications of not meeting trading partners' and customers' emissions requirements on demand; and the implications of a continued decline in ecosystem services (e.g. water quality).

Each Scenario Highlights Trade-Offs

Base year = 2022 with monetary values expressed in 2022 prices	Baseline prediction	Scenario 1 Reduced GHG	Scenario 2 Alternative dairy protein	Scenario 3 Low input dairy	Scenario 4 Increased exports
		Percentage change from baseline			
Land use change	—	—	—	—	—
Grain crops	—	32	10	5	-87
Cereal, fodder & silage feed crops	—	-8	-6	-8	10
Dairy pasture	—	-13	-20	50	46
Sheep & beef pasture	—	-12	4	-11	-11
Sheep & beef extensive grazing		-4	0	0	-7
Horticulture (pipfruit, kiwifruit, apples)	—	5	125	5	45
Exotic forestry	—	19	0	1	29
Farm income and risk	—	—	—	—	—
GM = Cash available for drawings, taxes, overheads & debt redemption ($ million)	12,170.4	-2.6	-3.5	-9.3	16.9
Market value of high-quality crop and pasture land (LUC 1-2) ($/ha)	38,844	-72.9	-74.1	-59.9	12.2
Risk = (standard deviation of GM/GM)	8.4%	12.1	-1.3	11.9	24.6
$ output/$ input	1.74	2.1	-3.0	-6.7	-4.5
Environmental indicators (t million)	—	—	—	—	—
Agric CO2-e emissions	43.8	-10.0	-9.9	-0.6	16.9
Agric share of CO2-e stored by forestry	15.3	19.6	0.0	0.7	29.6
Farm sector net CO2-e emissions	28.5	-26.0	-15.3	-1.2	10.0
Wider economic impact	—	—	Aboslute	Change	
Output ($ bn)	—	-0.6	+9	-1.3	+17
Gross value added ($ bn)	—	-0.5	4	-0.7	+8
Employment	—	-3,000	+45,000	-2,000	+69,000
Initial farm level capital required ($ bn)	—	+3	+9	+7.5	+8.5

Detailed results are presented in the main academic report, but are summarised in the table above

As the table illustrates, each scenario produces positive and negative results (highlighting the trade-offs). Technology advancements not yet available could have significant impact against all scenarios modelled, if they become available in the future.

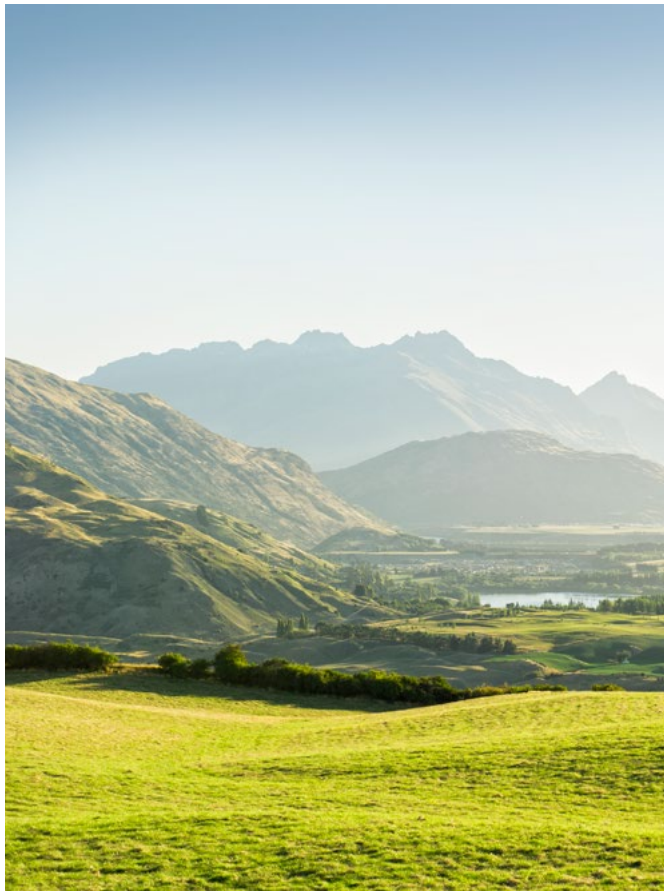
For example, compared with the current situation:

- An "at all costs" or sole focus on achieving the two key environmental commitments, which are designed to reduce GHGs, results in significant environmental improvements but a reduction in farm profitability as measured by gross margin (-2.6 percent) as well as an overall reduction in wider economic activity as measured by gross value added (-$1.5 billion). The decline in benefits from farming (reduced income and higher risk) leads to a marked fall (-72.7 percent) in the market value of higher-quality farmland (Land Use Class 1 and 2) – significantly impacting farmers' wealth and creditworthiness.

- The market shock from the emergence of alternative proteins reduces profitability at the farm level (-3.5 percent) but boosts the wider economy ($3 billion) due to subsequent changes through the supply chain. The fall in dairy production leads to a reduction in farm level GHG emissions (just under 10 percent) but also the largest fall in higher quality farmland prices (just under 75 percent). This is driven largely by reduced demand from dairy – one of the highest value land uses.

- Limiting nitrogen, primarily to improve water quality, creates an economic cost at the farm (-9.3 percent gross margin). Estimated farm level GHG emissions are predicted to fall, but only slightly (-0.6 per cent) while other environmental indicators are generally predicted to improve.

- Driving exclusively for an increase in exports would greatly improve profitability at the farm (+16 per cent gross margin) and wider economy levels (+$5 billion gross value added) and provide significant employment opportunities (+70,000). However, the negative impacts include a rise in farm-level GHG emissions (+16.9 percent) as well as increases in other environmental and social risks.



Social, economic and environmental impact of the scenarios and the trade-offs that emerge vary considerably across the regions

The regional implications of the scenarios are also considered. In New Zealand, regions vary considerably in terms of the composition of the food and fibre sector, its contribution to the regional economy, the level of emissions to the environment, as well as susceptibility to general changes and climate shocks. This means the wider social, economic and environmental impact of the scenarios and the trade-offs that emerge vary considerably across the regions of New Zealand.

Detailed results are presented in the full academic report; however the following maps summarise the changes in GHG emissions, gross value added and employment across the regions. A high level summary is presented. The level of economic, social and environmental risk associated with the changes brought about by the scenarios are presented within each region. These risks are measured through changes in the indicators highlighted in the table. Based on these indicators, we flagged changes to land-use that pose increased risk and made an overall risk assessment (low, increased, high) based on the number of flags raised. As an example, environmental risk in Canterbury scored high risk under the expansion scenario because the land-use changes led to a decline in a significant number of the environmental quality indicators.

The risk factors which are measured

Environmental indicators

- Air pollution
- Biodiversity
- E. coli
- GHG emissions
- Ground water quality

- Macro-invertebrate index
- Mahinga kai
- River water quality
- Soil quality
- Swimming index

Social indicators

- Access to basic amenities
- Life satisfaction (current)
- Life satisfaction (future)
- Public transport

- Self-rated health
- Voting status

Cultural indicators

- Discrimination
- Sense of belonging

Economic indicators

- Capital requirements
- Time to commercial yield
- Maturity of market
- Volatility of returns
- Entrepreneurship required

High-Level Summary of Regional Impacts

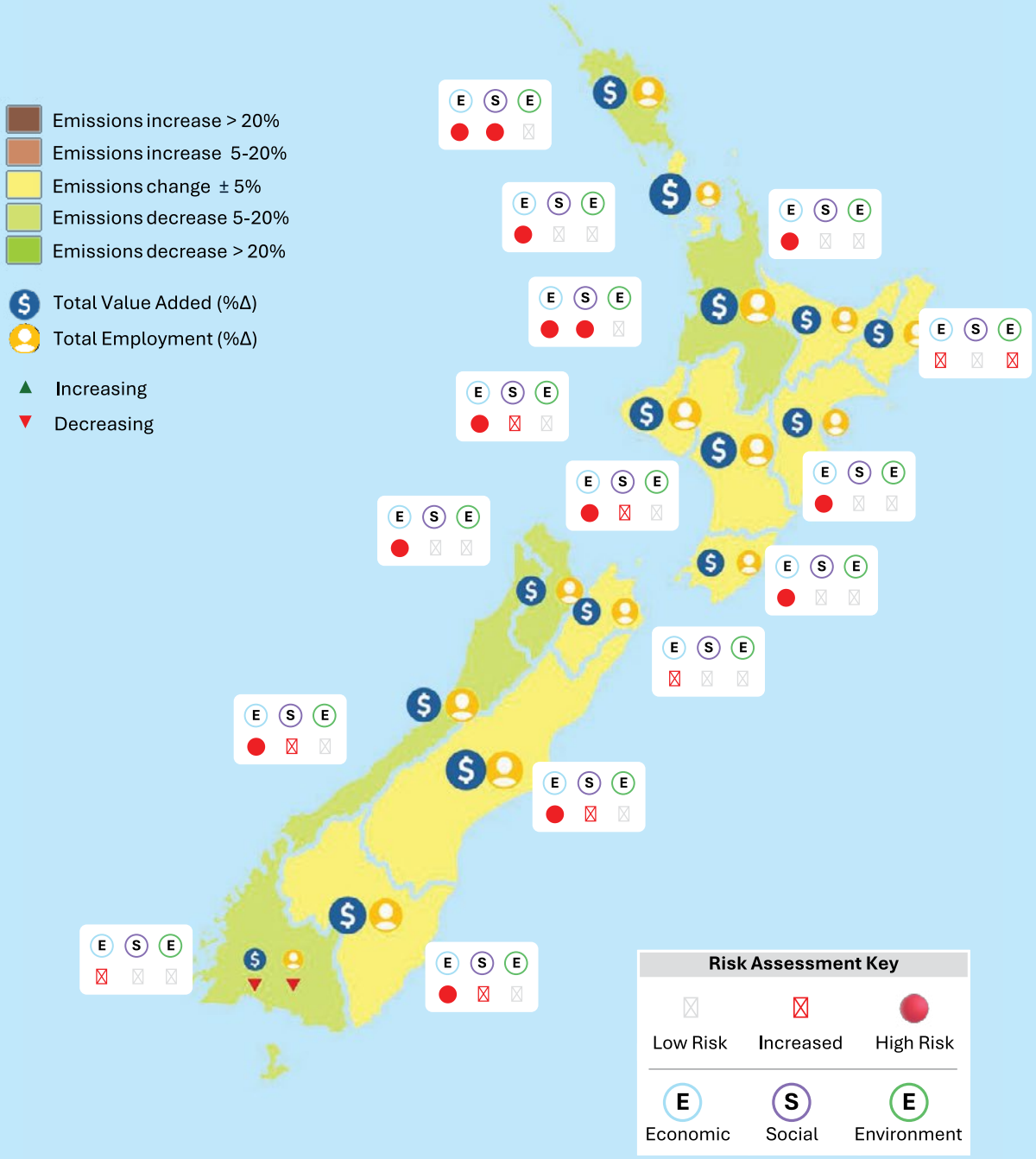
The scenarios highlight the social, environmental and economic trade offs.

Scenario 1: GHG reduction

Scenario 2: Alternative dairy protein

Scenario 3: Low-input dairy

Scenario 4: Increased exports


Emissions increase > 20%
Emissions increase 5-20%
Emissions change ± 5%
Emissions decrease 5-20%
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Total Value Added (%Δ)
Total Employment (%Δ)
Increasing
Decreasing
Risk Assessment Key
Low Risk
Increased
High Risk
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Environment

High-Level Summary of Regional Impacts

Scenario 1: GHG Reduction

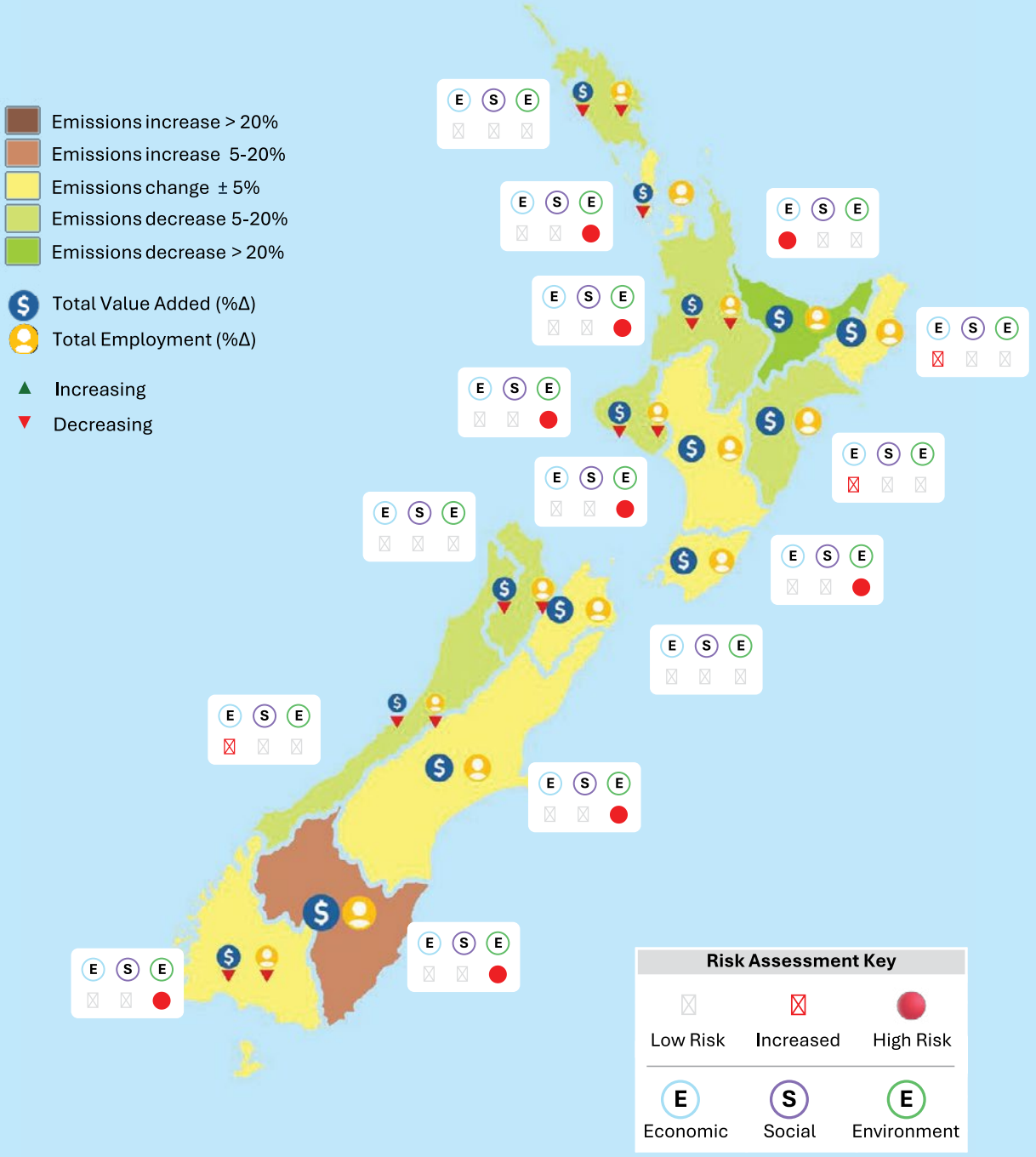
The environmental benefits associated with the GHG emissions reduction are offset by declines in the economy and employment across the eastern North Island, although Wellington sees little change. In the South Island, economic and employment impacts are minimal, except for the West Coast, which experiences a moderate economic downturn. While the environmental risks remain relatively low, the economic and social risks are significant, particularly for the North Island. These changes are considered high risk for most of the North Island, with moderate social and environmental risks in the South Island.

The scenario is classified as:

Economic risk - high, particularly in pastoral regions due to transition costs, market volatility in new sectors and reduced rural incomes. The shift away from high-emission land uses results in a broad reduction in economic activity across the regions. Employment falls sharply in dairy-reliant regions: approximately 600 Full Time Employees (FTEs) are lost in Canterbury, 300 FTEs in Southland, and over 1,000 FTEs in Waikato. Gross Value Added (GVA) declines across most sectors, especially dairy and pastoral farming. While forestry and horticulture gain modestly, they do not compensate for the losses in employment or GVA.

Environmental risk - low, as Green House Gas (GHG), nitrate and E. coli indicators all trend positively in many regions. GHG emissions decline sharply: Canterbury (–30 percent), Southland (–30 percent), and West Coast (–60 percent). Water quality indicators also improve across all regions due to reduced fertiliser use and stocking rates. However, increased monocultural forestry poses biodiversity risks, particularly where exotic species dominate.

Social risk - high, particularly in the regions where pastoral farming dominates. Displacement of labour from traditional sectors, particularly in key pastoral regions, creates risk for communities reliant on dairy and beef farming. The transition demands new skills, and affected workers may face limited short-term alternatives. Community wellbeing may decline due to reduced engagement with the land, employment insecurity and rural economic contraction.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High-Level Summary of Regional Impacts

Scenario 2: Alternative Dairy Protein

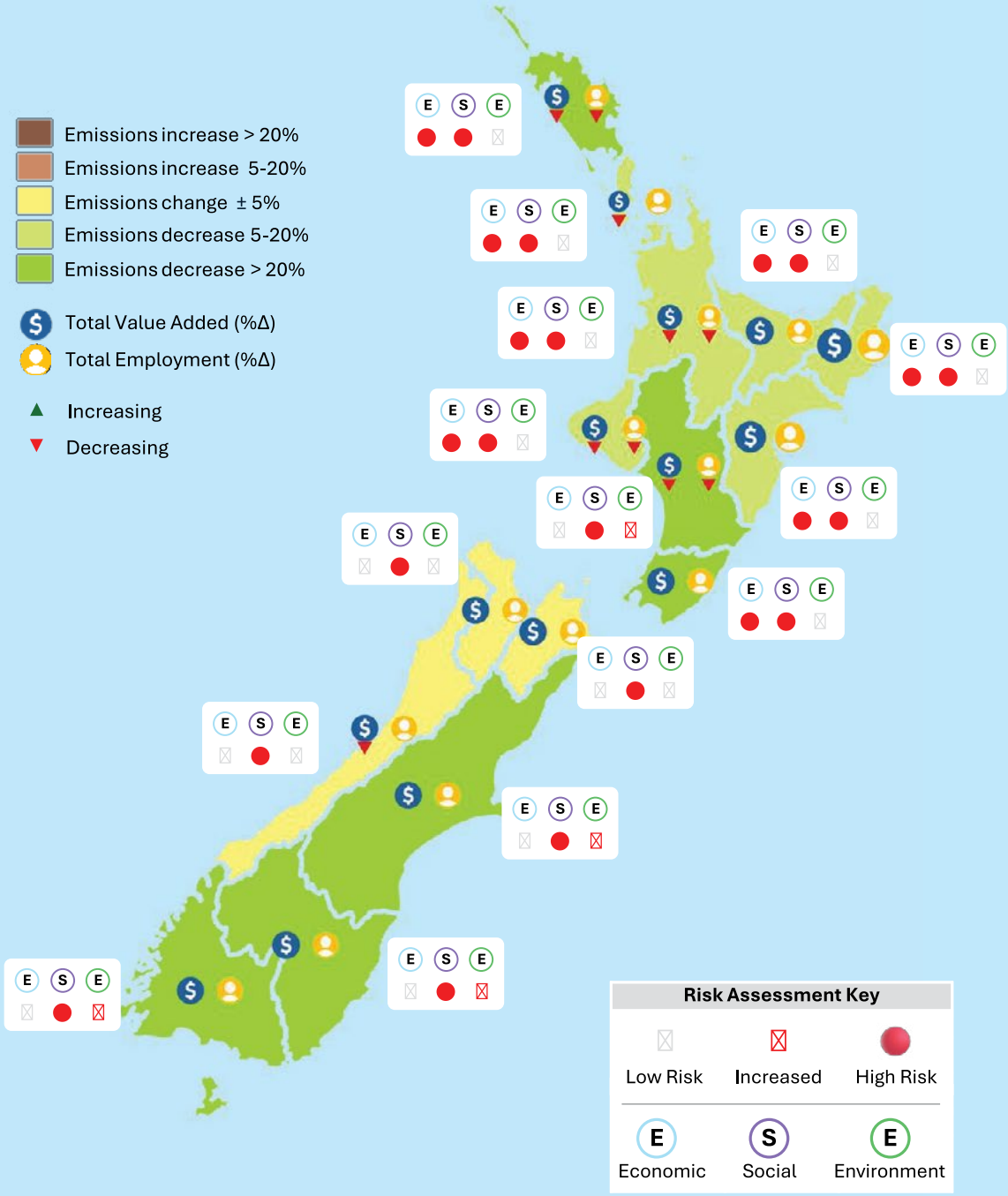
The reduction in demand for dairy results in a nationwide decrease in GHG emissions, though not as significant as the emissions reduction scenario. Most regions experience an increase in economic activity and employment, with the exception of Southland, which sees declines in both measures. The central North Island shows minimal change. Demand for skilled workers is expected to rise significantly in Canterbury and Waikato. While economic risks are substantial across much of the country, social risks are more concentrated in the eastern North Island, southern South Island, and the central North and South Islands. Environmental risks remain very low across all regions.

The scenario is classified as:

Economic Risk – high, not due to losses, but because of exposure to market volatility, capital intensity and long timelines for horticulture to reach commercial yield. The scenario drives substantial changes in land use and investment across regions. Due mainly to significant growth in horticulture, economic benefits occur and these are fairly widely distributed across the regions: Canterbury gains around 10,000 FTEs, Waikato adds about 6,000, and Otago over 3,000. Gross value added rises significantly, particularly in Canterbury (+$800 million) and Waikato (+$400 million).

Environmental risk - low, with clear reductions in GHG, nitrate and E. coli indicators, particularly in the dairy intensive regions. GHG emissions decline moderately in most regions (e.g., Canterbury –5 percent, Southland –5 percent, Waikato –4 percent). Water quality improves in key areas due to reduced stocking rates and fertiliser use. However, there are small increases in air pollution and night sky brightness linked to horticulture intensification.

Social risk - moderate, reflecting both opportunity and transition stress. The scenario causes major shifts in employment patterns. Horticulture is highly seasonal and labour intensive, requiring skilled workers during planting and harvest phases. While the net employment impact is positive – adding 20,000 direct, 20,000 indirect, and 10,000 induced FTEs nationally – there are challenges in retraining, workforce mobility and housing affordability in growth regions such as Canterbury and the Waikato.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High-Level Summary of Regional Impacts

Scenario 3: Low-Input Dairy

Shifting to low-input dairy systems results in a nationwide reduction in GHG emissions, although some regions, such as Otago and Canterbury, experience an increase. This is likely due to the scale of dairy activity in these areas. While low-input dairy systems are less intensive than conventional systems, the increased demand for land leads to the displacement of even lower-impact systems, such as sheep and beef farming. Economic and employment gains are seen in the southern South Island and western North Island, while other parts of the country experience declines. Demand for skilled workers is expected to rise significantly in Canterbury, Manawatū-Whanganui, Northland and Otago. Environmental risks are considered high in several regions, as low-input dairy systems pose higher risks than the systems they replace. Some regions also face increased economic risk.

The scenario is classified as:

Economic risk – low, due to relatively stable market exposure and modest investment requirements across the regions. The economic effects of this transition are regionally variable. Waikato experiences a significant decline in employment (–5,000 FTEs), while Otago sees substantial gains (+4,000 FTEs), driven by diversification into horticulture. Value added falls in some regions but rises in others, reflecting both displacement from traditional dairy and the emergence of alternative land uses. The scenario generates a moderate net decrease in FTE (–500 direct, –1,000 indirect, –300 induced).

Environmental risk – moderate, due to mixed progress and localised setbacks. Environmental improvements are less pronounced than anticipated. While water quality indicators show mild gains in several regions, GHG emissions increase slightly in places like Otago (+1%) and Gisborne (+1%). Nitrate and E. coli loads decline modestly overall. Biodiversity impacts remain concerning due to ongoing land use intensity in certain areas.

Social risk - moderate, driven by labour market adaptation pressures. The social impacts are largely transitional. There is more demand for manual labour and specialised skills, leading to workforce restructuring rather than outright gains or losses. While there are few direct effects on life satisfaction or health, the need for upskilling and redistribution of labour creates friction, especially in traditional dairy regions.


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High-Level Summary of Regional Impacts

Scenario 4: Increased Exports

The export intensification scenario results in a reduction in GHG emissions in the North Island. This is driven by significant afforestation which offsets the increased dairy activity. In the South Island, no such offset occurs and emissions increase significantly. Economic output rises across all regions, accompanied by corresponding employment growth, except in Auckland, where employment remains largely unchanged. Despite these economic gains, risks are identified in the eastern North Island, particularly in the economic and social domains, and across all three domains (economic, social and environmental) in parts of the southern South Island. For example, environmental risks are significant in Otago, while economic and social risks are high. Additionally, economic and social risks are high in the western North Island.

The scenario is classified as:

Economic risk – moderate, due to increased capital demands, market exposure, and sectoral restructuring. Economic output rises across all regions, accompanied by corresponding employment growth. In particular, Canterbury gains around 15,000 FTEs and $1.2 billion in value added. Southland and Waikato also see large increases in employment (around 7,000 and 1,600 FTEs respectively) and GVA. Nationally, the scenario adds 40,000 direct FTEs, 20,000 indirect FTEs and 10,000 induced FTEs.

Environmental risk – high, due to broad degradation across multiple indicators particularly in dairy-intensive regions. The environmental impacts are significant and negative. GHG emissions rise in nearly all regions, including +7% in Canterbury, +6% in Southland, and +4% in Waikato. Nitrate leaching and E. coli levels also increase markedly, especially in dairy-intensive regions. Biodiversity is adversely affected by intensified land use and plantation forestry.

Social risk - high, particularly in regions experiencing both growth and restructuring. Social impacts are mixed. The scenario generates major job creation, particularly in agriculture, processing and transport sectors in Canterbury, Southland and Waikato. However, it also displaces labour from extensive livestock farming and increases demand for skilled labour, raising the risk of localised labour shortages and inequality. Communities may struggle to absorb rapid changes in workforce composition and housing needs.

Overall, the scenario analysis clearly highlights the social, environmental and economic trade-offs that are faced by the food and fibre sector across a range of potential futures. To increase value from our land while reducing environmental and social impacts requires a transformation in our land use. Optimising current systems, through adoption of best practice, can get us part of the way, but there needs to be a scaling-up of systems/approaches to land use that can improve profitability and/or reduce environmental impacts.

Seven Pathways to Transform Land Use

What the research makes clear is that changes in land use across New Zealand are required to avoid the extreme outcomes of the scenarios and achieve meaningful change.

In this study a combination of stakeholder interviews, case studies and quantitative modelling were used to delve into the potential trade-offs of alternative futures and identify seven changes necessary to achieve a transformation in the food and fibre sector.

Two changes were identified by stakeholders as being essential for transformation:

1. **Diversification of on-farm systems and income from land – a shift from a tendency towards single land use to diversified and optimised use of every hectare.**
2. **Facilitating Māori to grow value from their land holdings –enabling access to capital for multigenerational and iwi-owned land.**

Five other changes are also important but vary in the extent to which stakeholders agreed they could transform the food and fibre system:

- Significantly grow horticultural production with whole or part farm conversions.
- Adoption of new approaches and technologies such as genetic improvement and smart farming technologies – a critical enabler for optimisation and transition of land use.
- Expansion of systems that may have greater overall benefits to society (for example, those that provide greater ecosystem services) but currently have lower market returns (for example regenerative agriculture).
- Increase collaboration across catchments (water) and landscapes.
- Adding value including processing/manufacturing capability for existing and novel products.

The research acknowledges that land-use change is a personal decision influenced by a wide range of factors, and the right change will vary from farm to farm as well as region to region.

Examples of these pathways being employed can be found in New Zealand and market examples are included below, but adoption at scale will be needed.

Pathway Detail and Market Examples

01.
Diversification of on-farm systems and income from land

Farm diversification involves expanding the range of activities or enterprises on a farm beyond traditional agricultural production or a sole farming system.

Often, though not exclusively, this entails dedicating a small proportion of land to niche production while maintaining the main production under an intensified management regime. Unlike previous New Zealand system changes characterised by complete land-use transformations (for example converting sheep farming to dairy), partial diversification may become more prevalent in the future given its ability to unlock additional income-generating activities alongside, or instead of, the primary farming operation.

The scope of farm diversification is broad and can involve:

- Farmers acting as land owners, supported by specialised farm managers who invest in specific land uses. This approach allows the entire farm unit to be intensively managed by multiple contracted farm managers, thereby diversifying land tracts without requiring individual farmers to become experts across several enterprises (e.g. sheep farmers partnering with horticulture or forestry to facilitate multi-system farming). Farmers may own similarly sized units but manage a portion of their own land while managing or contracting portions of neighbouring properties.
- Intensified diversification, which involves creating varied products from the same land with minimal extra inputs. This can include finding markets for wastes or byproducts or growing diverse crops alongside the main production.
- Reallocating the farm's productive resources – such as land, capital, farm equipment and labour – to other products including non-farming activities.

Further to the above it can also include:

- Alternative crops or livestock
- Agritourism
- Value-added processing
- Renewable energy production
- Rural accommodation

Currently there are a range of potential barriers to diversification, including the risk of a lack of knowledge about production methods, markets and the emotive barriers often associated with single-use systems. In such cases, there may be a role for government and industry to potentially help de-risk diversification by actively supporting field trials and market developments if they can provide longer-term benefits.

KEY BENEFITS

- Diversification of farm income including beyond agriculture.
- Support for farm succession planning.
- Farm operations more resilient from climate change impacts.

MARKET EXAMPLE

PYRAMID

Integration of vineyard into sheep and beef operation

The Pyramid Farm is a three-generation farm in Waihopai Valley, Marlborough. It comprises 602 hectares, with sheep, beef, forestry and firewood, and an apiary operation.

The farm undertook land diversification through vineyard integration into its sheep and beef farming operation, which was financed through a mix of income from forestry operations and rural bank loans. In 2016, the first vineyard of 50 hectares was created, and by 2025 The Pyramid Farm had developed and integrated a total of 130 hectares vineyard on the farm.

Diversified returns have facilitated the farming succession plan, and it is expected that this will provide significant income for future generations while also preparing for drier periods in the region due to climate change. Other adjustments made to cope with drier conditions have also brought a significant improvement in returns. For example, profitability per hectare was an estimated 49 percent higher in 2020 compared to 1980. In 2019, The Pyramid Farm won the Supreme Award at the Cawthron Marlborough Environment Awards for being an economically and environmentally viable operation.

Diversification

MARKET EXAMPLE

Dairy beef farming

The farming practice of dairy beef is growing in New Zealand as sourcing calves from the dairy industry presents an opportunity for the beef industry to reduce its emissions. It is estimated that reduction in GHG emissions could be as high as 48 per cent, enabling dairy beef farming to significantly support New Zealand to reach its GHG reduction targets and the conversion to a lower-emissions agricultural sector.

An example of successful dairy beef farming is the 560-hectare Waipuna Farm near Te Anau in Southland. Farm managers Alex and Ashleigh Field changed their sheep farming systems to grow dairy beef through innovative farming practices that focus on improved dairy beef production and transform how dairy beef calves are reared and finished. Their key strategies in successful dairy beef farming are prioritising calves, implementing rotational grazing and optimising operations. This combination results in fast adaptation and improved growth rates. The farm achieves higher returns and the refreshed systems have enhanced market opportunities and profitability.

MARKET EXAMPLE

Renewable energy production – solar

Rewiring Aotearoa has highlighted that there are significant potential gains for land owners to diversify into renewable energy production, through reducing their own energy cost and also from the sale of electricity. In 2024 Rewiring Aotearoa estimated that on-farm solar generation has potential for cost savings while generating revenue between $300,000 and $1 million plus across a 30-year lifetime of the solar panels.

The projected savings and revenue more than offset the upfront cost ($221,000 for rooftop solar; $111,000 for ground solar).

02.
Facilitating Māori to grow value from their land holdings

For Māori, land is not merely a resource but a cornerstone of identity, culture and wellbeing. This relationship is underscored by values such as kaitiakitanga (guardianship), manaakitanga, (hospitality) and whanaungatanga (relationship).

Māori involvement in the food and fibre sector is significant and continues to grow. In 2018, Māori food and fibre assets were estimated at $14 billion and by 2023 this had risen to $19 billion. Māori agribusinesses account for approximately 30 percent of total New Zealand beef and lamb production, 10 percent of kiwifruit supply and 40 percent of plantation forestry. The table below highlights how the roughly 1.3 million hectares of Māori land is utilised.

Māori land: Land utilisation	Area (ha)	Area (%)
Natural forest	584,862	43.6%
Pastoral farming	327,887	24.5%
Exotic forestry	178,737	13.3%
Ungrazed	93,017	6.9%
Wetland	85,205	6.4%
Dairy farming	49,028	3.7%
Cropping	13,919	1.0%
Other	7,265	0.5%

Source: Climate Change Commission 2023

To date, the development of Māori land has largely involved converting to enterprises such as dairy, kiwifruit, honey and seafood. However, there is increasing recognition and market demand for health and wellbeing products based on indigenous flora and fauna and traditional production techniques.

While there are clear opportunities, a significant proportion of Māori land is not achieving its full economic potential, often due to challenges obtaining finance through traditional methods. This has a flow-on impact whereby iwi, hapū, whānau cannot then utilise the economic potential of the land to drive broader social outcomes (for example, housing, education and health).

Māori horticulture is a success story of growth increasing by 300 percent in 12 years, and there is evidence that greater value can be realised in the coming decade. The scale of Māori assets and the significant potential for sustainable growth highlights that finding ways to overcome these financial barriers can have a major impact on land use across New Zealand.

KEY BENEFITS

- Create market opportunities from products including those that use traditional cultural practices and techniques.
- Achieve greater financial returns from value-added products.
- Increase indigenous biodiversity and lower environmental impact.

MARKET EXAMPLE

Taking the long view to enable intergenerational prosperity

Wakatū Incorporation is a hapū-owned organisation with more than 4,000 members who descend from Ngāti Koata, Ngāti Rārua, Ngāti Tama and Te Ātiawa. Its purpose is to preserve and enhance their taonga for the benefit of future generations, which is encapsulated in Te Pae Tawhiti, its 500-year intergenerational vision.

Wakatū is focussed on land diversification, with a view to creating market opportunities from products that use traditional cultural practices and techniques. This approach has the potential to achieve financial returns from value-added premium products in domestic and overseas markets, while at the same time increasing indigenous biodiversity and lowering the environmental impact.

Currently there are three distinct businesses:

Whenua is the foundation of Wakatū, where 70 percent of the assets are held. This business manages a diverse portfolio of vineyards, orchards and grazing land, as well as residential properties, large retail developments and commercial buildings.

1. Kona NZ is a food and beverage producer and exporter of premium wine, craft beer, pipfruit and hops.

2. AuOra is a consumer-focussed health-solutions business with a focus on wellbeing and active ingredients obtained from natural resources owned by Wakatū, including horticultural and marine sources and indigenous organisms.

Wakatū has relationships with national and international science partners to progress its aspirations for research with indigenous organisms. This includes Tūhauora, its science programme to explore the use of kawakawa as a high-value functional ingredient. In an aligned programme, known as Te Anga Whakamua, Wakatū is leading the development of a streamlined industry pathway for indigenous bioactive ingredients that draws on Mātauranga Māori and Science for economic success.

03.
Boost horticultural production

The expansion of horticulture has the potential to play an important role in enhancing sustainability within New Zealand's agrifood sector.

It is viewed as having strong profitability potential, particularly through high-value crops such as perennial fruits. There are realistic opportunities for significant growth in horticultural areas, with crops such as apples benefiting from improving infrastructure (for example, packhouses) as well as service industries in the South Island. It also has the potential to reduce overall GHG emissions.

There are several factors that need to be considered in discussions about growing the horticultural sector, such as return on investment and land suitability, but they are only part of the equation. Other factors include access and competitiveness to sell into international markets, investment in infrastructure, availability of skilled managers, labour availability more generally, cash flow and biophysical factors such as climatic risk and water availability. These factors suggest that currently expansion is most likely to be limited to established pipfruit and kiwifruit sectors (and potentially viticulture).

KEY BENEFITS

- Increase overall returns from agrifood sector.
- Potential to reduce GHG emissions.
- Enhanced sustainability outcomes.

MARKET EXAMPLE

FarmRight
Investing Sustainably

Large-scale horticulture transformation

In Rakaia, Mid Canterbury, planning is underway to convert a dairy farm of approximately 250 hectares into an apple orchard. The venture is being financed through collaborative investment by the New Zealand Superannuation Fund and is being managed by FarmRight and the produce grower and apple exporter T&G Global. T&G Global will be responsible for planning and growing an initial crop of 125 hectares of Joli-branded apples, starting in spring 2025.

After four to five years the first apples will be harvested, will take seven years to fruit at a commercially viable crop level. The harvested apples will be sent either to Central Otago or Hawke's Bay, with future plans to build a packhouse in the region. Initially the apples will be exported to Asia, but as more trees become available, exports to Europe and the United States are planned.

The farm site and total cost of this venture are not publicly available; however, it is likely that this conversion from dairy land into an orchard is a multi-million-dollar investment. While the expected ROI of this investment is not known, any investment by NZ Superfund is expected to produce a higher return than their passive portfolio, although it can be adjusted if the investment has other benefits, for example diversifying risk.

04.
Harnessing power of new technology

The development and adoption of smart technologies will be fundamental to successful land-use change. Technology will have a key role to play in helping to reduce the environmental footprint of land-use systems, lower costs through the supply chain and enhance the value of final products.

Many of the mechanisms to encourage research and development are already in place, but there is a need for increased funding. In addition to finance, regulatory issues around new technologies will need to be tackled. For example, genetic engineering could potentially aid the transition, but there remains a heated discussion as to whether it should be permissible in New Zealand, in part due to the risk of damaging the country's "clean green" image.

As with all sectors of the economy, artificial intelligence also has the potential to significantly change the way we use land, although it is clear we have only just begun to scratch the surface in terms of its use.

A number of investments in new approaches and technologies have the potential to provide significant benefits to the land-based sectors. For example, renewable energy (wind, solar etc) generation could lead to significantly improved returns from marginal lands. In addition, on-farm water storage can provide opportunities for the expansion of higher-value enterprises on farms.

KEY BENEFITS

- Achieve higher economic returns from premium products.
- Support New Zealand to meet its GHG emissions targets.
- Help drive economic growth and economic conditions for future generations.

MARKET EXAMPLE

biolumic

Technology that can reduce emissions

BioLumic has created a groundbreaking seed trait platform powered by light. Its technology activates traits using short, targeted bursts of UV and visible light. The process controls gene expression with light and can activate entire pathways that already exist in the plant. A key advantage is that the process does not involve gene editing or chemicals and therefore does not face the risk of significant regulatory delay.

The technology has a wide range of applications in seed treatment and can generate significant improvements in crop yields. However, for New Zealand a major benefit that has been validated in field trials is that it can lead to a 2–3 percent lipid gain in forage grass that reduces enteric methane emissions by 12 percent from standard practice-fed livestock. A key benefit in terms of uptake is that the seed treatments do not require any changes in grower practices. Seeds go through the same channels as before and are treated in the same way at the farm level.

BioLumic was a 2025 runner-up in the Seed World Global Innovation Showdown.

MARKET EXAMPLE

The benefits of electrification

Electric Cherries in Cromwell began electrifying the cherry orchard in 2020 by importing two 30 kW electric fans to fight winter frost and then, in 2023, purchasing a driver-optional fully electric tractor. The machinery and equipment has been partly funded by the Technology Demonstration Fund, with the aim of reducing emissions and saving energy. Electrification has resulted in greater financial returns and market opportunities – domestically and overseas – for their products.

Recent work by Rewiring Aotearoa has highlighted significant wider opportunities to land owners from electrifying their businesses and installation of solar panels (for example, on farm buildings) to both reduce energy costs and also generate income from the sale of excess electricity.

Another application of smart technologies is the Lincoln University Energy Farm, which will be constructed on a 4-hectare parcel of university-owned land adjacent to the campus.

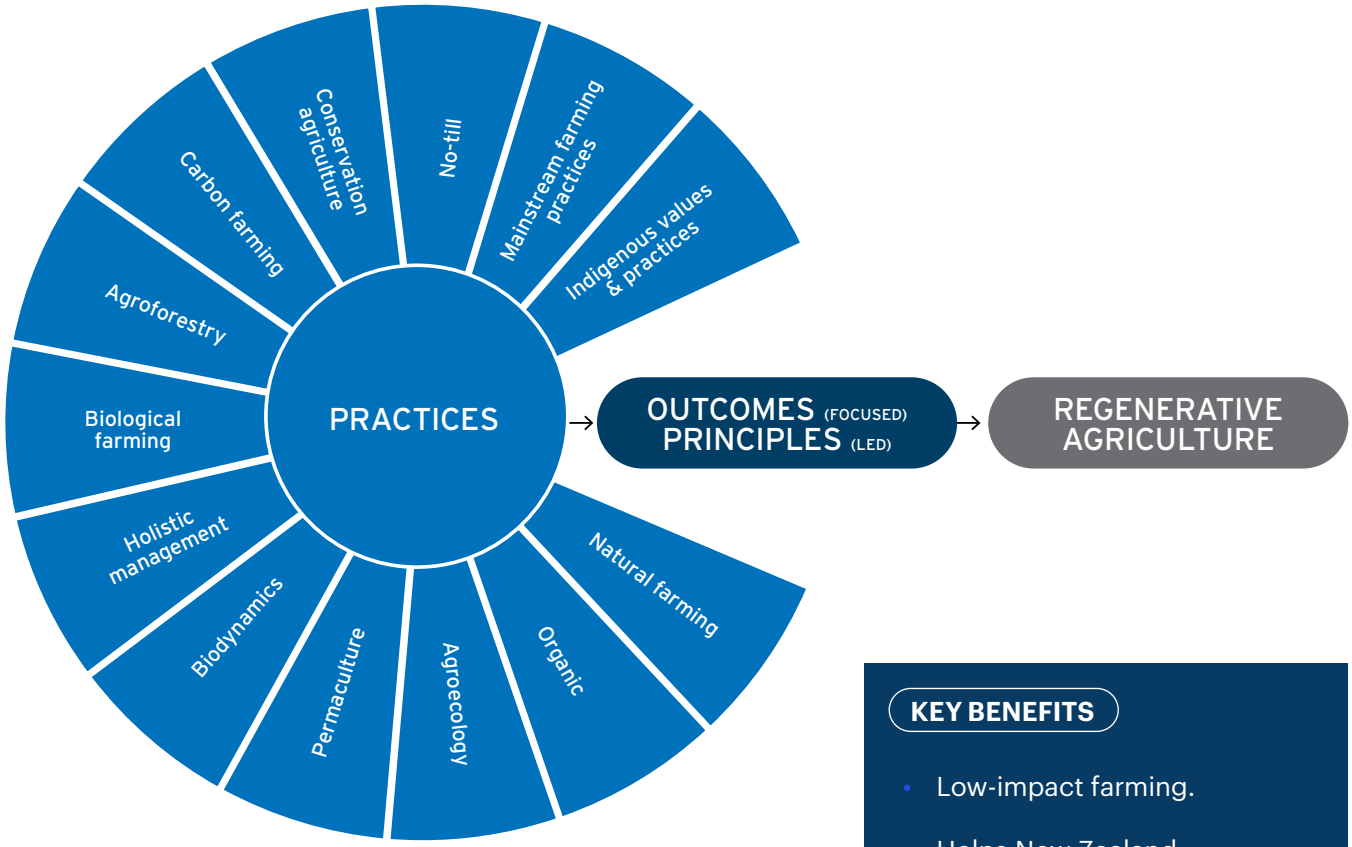
A distinctive feature will be the farm's ability to host a comprehensive range of experiments and crop trials to contribute to the development of leading-edge practices that can be replicated and rolled out across New Zealand. The increase in biodiversity will also be a subject of research, with extensive native planting around, and within, the site for crop wind protection, onsite water management and improved aesthetics.

05.
Expansion of systems that have overall benefits to society

In response to environmental and climate concerns, the practice of regenerative agriculture is being actively explored internationally, and there is a range of different projects underway throughout New Zealand.

Regenerative agriculture draws upon many alternative agricultures and loosely includes practices that seek to enhance biodiversity, soil health and water quality, as well as sequestering carbon and boosting ecosystem services when producing food and fibre products. Studies of regenerative agriculture have shown significant reductions in CO2 emissions, accompanied by higher yields, lower production costs, lower pest incidence and greater ecosystem service provision compared to their conventional counterparts.

While it may be argued that components of regenerative farming practices can be found across many farming systems in New Zealand, there is potential value to be had from extending these. In New Zealand there are large government and industry funded projects, as well as individual farms and cooperatives trialling regenerative farming practices. The concept of regenerative agriculture is outlined in the diagram below.



KEY BENEFITS

- Low-impact farming.
- Helps New Zealand achieve GHG emission targets.
- Improves social, environmental and economic conditions for future generations.

MARKET EXAMPLE

align FARMS
Aligned with nature

Regenerative agriculture – from farm to market

Regenerative farming plays a key role in the sustainable business practice of Align Farms, which manages nine dairy farms in Mid Canterbury. It is currently undertaking a regenerative study with half of the farm's dairy systems under conventional models and half under regenerative models. Data is collected in five key areas – financial, environmental, animal health, milk quality and social impact.

The practice of regenerative farming is appealing to environmentally conscious consumers who actively seek out its offerings. To take advantage of this, in 2024 Āta Regenerative launched Regen to Market, an online platform where New Zealand consumers can purchase produce from regenerative farms. Currently two sheep and beef farms are registered on the platform – Bairnsdale Farm in Hawke's Bay and Rathmoy Estate in Hunterville.

MARKET EXAMPLE

venture TARANAKI
Te Puna Umanga

Resourcing regionally driven land use

Branching Out is a partnership designed to resource regionally driven land use change in Taranaki. It is led by Te Puna Umanga/Venture Taranaki and aligns with the Tapuae Roa strategy for a diversified, well-connected food and fibre system, driven by innovation and high-value production.

The project is jointly funded by the Ministry for Primary Industries' Sustainable Food and Fibre Futures fund, the region's three district councils, Toi Foundation, and the LA Alexander Trust. Additional in-kind support comes from universities, Crown Research Institutes and Taranaki enterprises engaged in the primary sector. This collaboration ensures that the programme is grounded in robust research and market validation, helping de-risk new opportunities for landholders. It shows the potential of land use and value chain diversification, empowering landowners, investors and industry participants with the tools and confidence to explore high-value food and fibre ventures. At its inception, the project aimed to create 50 new jobs, plant 650 hectares of novel crops and attract $8 million of new revenue or investment to the region.

06.
Collaboration across scarce resources

Optimising land use at local, regional and national levels may require land managers to make significant changes to their own farm systems but also collaborate more broadly with each other; for example, ensuring fair and equitable access in water catchments. Trials and collaborative business models are also ways to reduce the risk associated with the land-use change process.

While greater collaboration can be highly beneficial, this approach does present a number of challenges, including governance and the ability to secure finance for land-use change when the ecosystem doesn't fall within the boundaries of an individual property. In addition, extension services and industry/consultant support will be required to aid farmers through the transition.

Changing systems, especially if it involves borrowing, traditionally increases risk, although given the challenges the food and fibre sectors face, and the speed at which these are increasing, doing nothing may incur greater risk.

KEY BENEFITS

- Reduces risk for individual farming businesses.
- Enhanced environmental outcomes by scaling beyond individual farms.
- Not only reliant on landowner to develop new set of skills.

MARKET EXAMPLE

TARANAKI CATCHMENT COMMUNITIES

Rural farm energy project

The Taranaki region provides an example of a funding partnership to support sustainable economic growth and resilience in farming communities. The project is a collaboration between Federated Farmers, Taranaki Catchment Communities (TCC), Taranaki Regional Council, Dairy Trust Taranaki and regional development agency Venture Taranaki.

Its purpose is to .lower emissions and enhance on-farm energy efficiency, resilience and programme delivery to farmers driven by the TCC. The project has enabled farmers in the region to have access to energy advisors for free farm energy assessments to understand how to achieve energy efficiency and make savings on-farm, as well as consider other emerging energy opportunities, for example the use of solar. At the core of this project is the strength and diversity of the farmer-led TCC, creating models and learnings for the industry.

Data and lessons from the Taranaki farm energy assessments have helped with the development of toolkits, quick checklists, products and services, which are now being shared nationally with farmers and rural advisers. Over time this will help future-proof farms in terms of considerations around their energy supply and use needs. It also puts farms at the forefront of efforts to trial, test and implement. New energy technologies and low-emission options savings on farm possible (for example the use of solar). At the core of this project is the strength and diversity of the farmer-led TCC, creating models and learnings for the industry.

07.

Add value with processing and manufacturing capability for new and existing products

If export value is to be increased within the boundaries set by New Zealand's environment there will be a need for increased focus, by participants from across the food and fibre sectors, on adding value to commodities.

This is likely to involve expanding the production of existing products, as well as developing new offerings that meet the changing demands of consumers – for example, products with health and nutritional benefits or those that are associated with lower environmental impact.

To do this within New Zealand will require significant investment in processing and manufacturing infrastructure. In addition, a range of challenges in the export value chain will need to be addressed, in order to facilitate greater collaboration across the value chain, more strategic investments, better marketing, a change in mindset and upskilling of labour.

KEY BENEFITS

- Higher returns for end-user products.
- Meet changing demands of consumers.
- Lower environmental impact.

MARKET EXAMPLE

Leaft Foods

One example of efforts to add value through the value chain is Leaft, the Canterbury-based company that launched in 2019. The company seeks to reduce the environmental impact of food production by extracting Rubisco protein from green leaf crops such as lucerne. This protein has a lower carbon footprint than animal protein, while having an amino acid profile similar to beef. For farmers, this would mean that the crop is planted and then Leaft would extract the liquids from the plant, with leftover plant matter being suitable for animal feed.

By January 2025, the company consisted of 24 employees, including food technologists, process engineers, biotechnologists, farm systems specialists, and sales and marketing experts. A new commercial Rubisco protein production facility in Rolleston demonstrates the scale-up of this innovative approach. However, specific timelines for commercial product launch have not been publicly released. Leaft Foods is currently focused on scaling their internal capabilities and expanding their processing to ensure their product, technology, brand and supply chains are ready for commercial scale.

MARKET EXAMPLE

Moving up the value chain — The Olive Press

The Olive Press, founded by 30 olive growers, processes olives into extra virgin olive oil (EVOO) and operates as a zero-waste producer. A comprehensive initiative is proposed to establish facilities in Southern Wairarapa to support olive cultivation and processing, with a focus on EVOO, biophenols (which occur in olives and have strong antioxidant properties) and functional food products. It would include capabilities for product testing, warehousing, distribution, research and development, vocational training, and farm extension services.

At the core of the initiative is a joint venture promoting a silvopastoral olive farming model, which integrates olive groves within existing pastoral systems. This innovative approach offers pastoral farmers a sustainable method to diversify income, enhance soil fertility and contribute to improved environmental outcomes such as water retention, carbon sequestration and increased resilience to climate change. Champions of this proposal consider it has the potential to develop a $650 million-plus industry through EVOO import substitution, and the export of olive co-products such as biophenolic products and functional foods.

The Olive Press – Olive bioresource value chain hierachy

Process		Products/value
• Microfiltration > separated OMWW permeate • NF/UF/RD > various biophenol fractions • Resin and solvent processing > purification • Specialised dryers > export distribution	Pharmaceuticals	• Freeze-dried biophenol fractions ($2,000+ p/kg): ◦ Hydroxytyrosol ◦ Tyrosol ◦ Oleuropein
• Microfiltration > polyphenols + H_20 (permeate) • Microfiltration > superfine solids &oil (permeate) • Resin and solvent processing > purification • Dryers, bottling > local market distribution	Nutraceuticals	• Dried/liquid biophenol compounds ($250+ p/kg): ◦ Health care & dietary/food ingredients ◦ Body care & cosmetics ◦ Natural meat antioxidant
• Microfiltration > superfine solids & oil (retentate) • De-pitter separation > crushed olive pit • Microfiltration > polyphenols + H_20 (permeate) • Dryer > local market distribution	Functional Food	• Dried ingredients for human & pet food (from MF retentate & pulp): $25 p/kg • Gluten-free olive flour (milled pit): $20 p/kg • Olive tea/tonic (MF permeate): $10 p/kg
• Centrifugation > olive oil, pomace & OMWW • Microfiltration > superfine solids & oils (retentate) • De-pitter separation > olive pulp • De-pitter separation > crushed olive pit • Rotary drum separation > suspended solids • Dryer > local market distribution	Human Food	• Extra virgin olive oil: $20 p/kg • Various other grades of olive oil: $8–15 p/kg • Olive tapenade, crackers, bread etc: $5–10 p/kg
	Animal Food	• Equine/pet/stock food (dried pulp): $2 p/kg • Cat litter & pellet fuel (crushed pit): 50c p/kg • Silage substitute (depitted pomace): 20c p/kg
• Fruit conditioning > consolidated leaf & twig • Centrifugation > olive pomace (pulp & pit) • Rotary drum separation > suspended solids	Commercial Compost	• Combined pomace, leaf/twig & OMWW retentate: ◦ Delivered > $50 p/t (5c p/kg) ◦ Collected > $10 p/t (1c p/kg)
• Agricultural tanker for OMWW discharge • Tipping transporter for OMWW discharge • Fertilising land requires discharge consents	Ground Fertiliser	• OMSW: -$10 p/t (cost) • OMWW: -$25 p/t (cost)
• Specialised tank transporters for carting waste to local or regional treatment facilities • Waste disposal subject to septage fees	Environmental Disposal	• OMWW (local): -$50 p/t (cost) • MF retentate (regional): -$250 p/t (cost)

MF = Microfiltration | OMWW = olive mill waste water | OMSW = olive mill solid waste

Financial Sector Key to Long-Term Success of Food and Fibre Sector in New Zealand

Financial Status Quo Must Change

While the availability of finance is key to enabling the long-term success of the food and fibre sector, there are several unique challenges to overcome. These are predominantly high initial capital requirements, delayed returns, high levels of production and market risk.

International examples show how collaborative approaches to finance during major land-use transitions can potentially be funded. These consider the support farmers need, how this should be funded, and who needs to fund and deliver it.

Within these models a wide range of actors (such as private companies, government, NGOs, philanthropists, financial institutions, etc.) have a key role to play as potential beneficiaries of more sustainable systems. For example, supporting sustainable land use can help private companies achieve wider environmental, social and governance (ESG) goals as well as mitigate emissions.

While it is often argued that New Zealand is capital constrained, the study finds that concerns around securing food and fibre supply and the attractiveness of the country as a place to invest means there is global capital available to support many of the facets of transformation highlighted in this study.

The challenge for New Zealand is packaging opportunities to match the scale and requirements of international capital, while maintaining our environmental integrity. It also needs to be recognised that foreign ownership of New Zealand's natural assets can be an emotive subject.

A theme that runs through discussion of the future supply of capital is the need to consider whether current financial regulations – in terms of foreign direct investment, operation of KiwiSaver funds, bank regulation, co-operatives – are fit for purpose in supporting a positive transition of the food and fibre sector while ensuring safeguards are in place. There is also the potential to expand both domestic and overseas investment in the agrifood sector, in particular through encouraging foreign direct investment and expanding KiwiSaver fund investment beyond its current focus on listed shares into private assets. Properly managed, this could facilitate significant scaling of sustainable land uses, particularly those which are difficult to fund through traditional debt financing. The Government has signalled a desire to alter the regulations concerning both foreign direct investment and KiwiSaver funds.

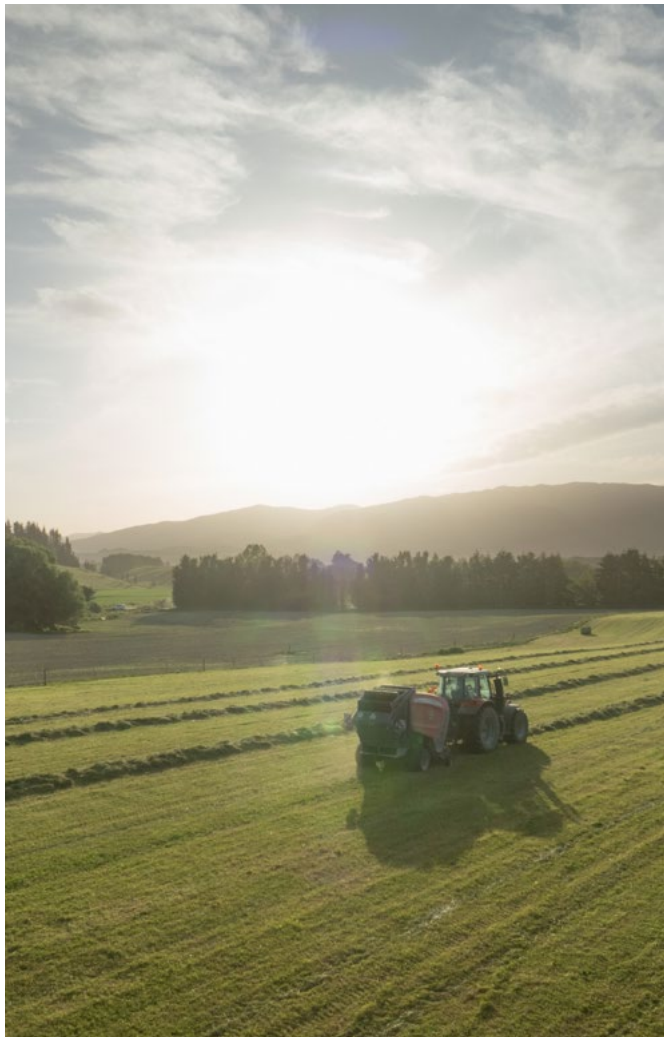
Equity-based finance can aid the transition, but the ability to adopt this approach varies across land managers and sectors. The ability of land managers to adjust will be influenced by their current financial situation, particularly in relation to the level of debt and the ability to cover the debt. There is also the need for a strong network of financial advisors to guide and provide confidence to those supplying the funds.

Banks will also play a key role in bridging supply chain gaps and supporting future markets, with increasing demand for environmental credentials influencing lending decisions. More specifically, finance models that recognise patterns of upfront costs and delayed returns could enable the longer-term financial, social and environmental benefits to be realised. Again, there are international examples of how such models can work.

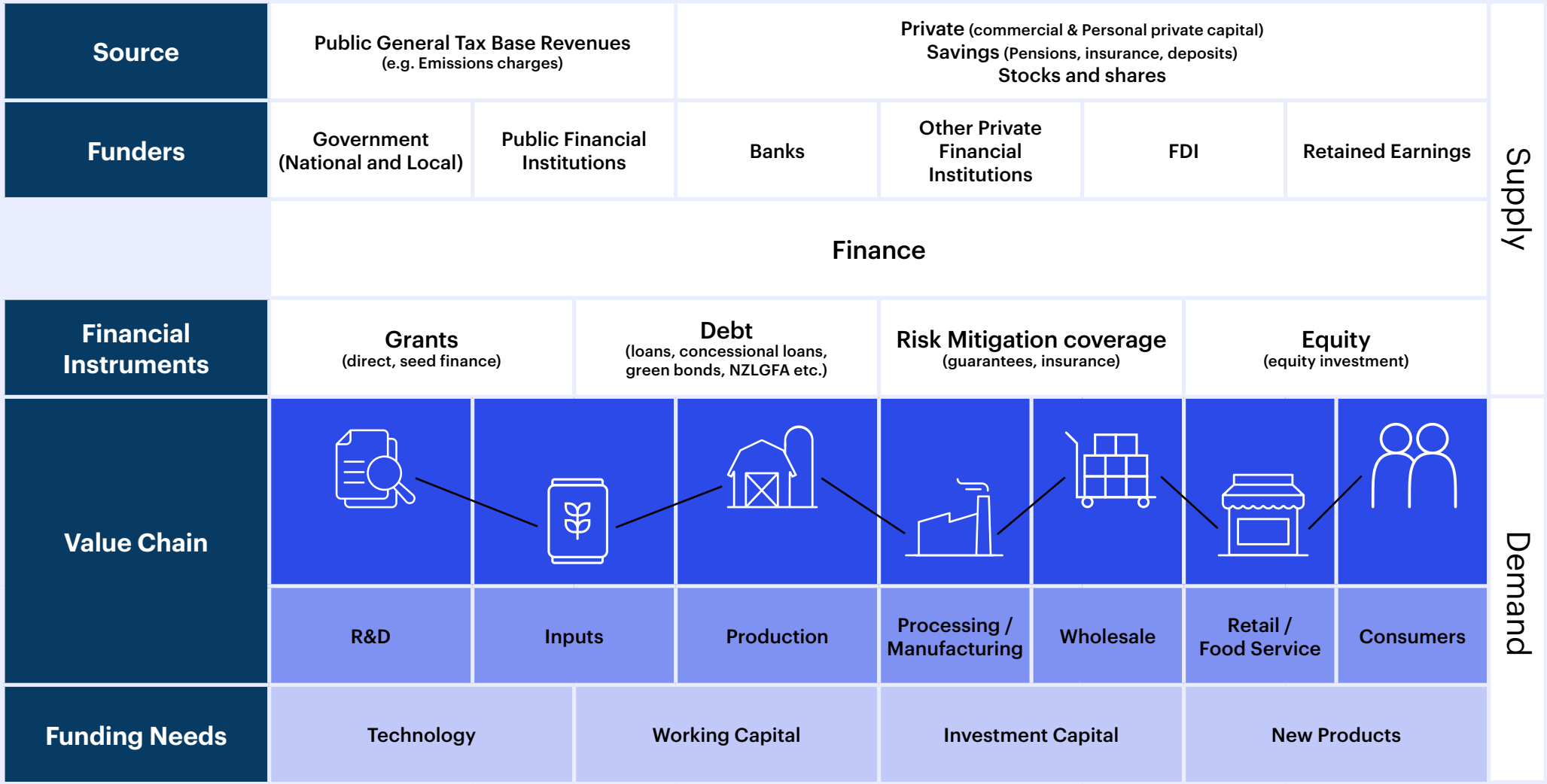
The study highlights that the development and adoption of new technologies will be fundamental to successful land-use change, but significant investment in both R&D and innovation will be required. Access to capital has been identified as a key constraint for agritech and food start-up companies. While venture capital funds exist in New Zealand there is scope for more focus on the agrifood sector, as well as the option of debt-equity models of finance. Other countries and regions appear to have more of these funds available.

The fact that there are both private and public examples of optimising land use in New Zealand suggests that finance should come from both the public and private sectors and be determined by the extent that the costs and benefits of change are felt privately or publicly. National and regional governments, banks, private investors (domestic and overseas) and NGOs all have a potential role to play.

In addition to potentially providing finance, the regulatory role of government is key to the future development of the food and fibre sector. For example, regulatory issues around new technologies will need to be tackled. Genetic engineering could potentially aid the transition, but there is still heated discussion as to whether or not it should be permissible in New Zealand, in part due to the risk of damaging the country's "pure green" image.



The flow of funding



Potential Financing Solutions for Land use

1. Development of funding within farm systems (project finance for a parcel of land) – Increased comfort disaggregating ownership from operating farm e.g. leasing parcels of land to other specialist, energy, kiwifruit, etc.

2. Unlocking access to capital for intergenerational & Māori land.

3. Equity funding including large scale transformation for both production but also environmental enhancements from KiwiSaver/superfunds and foreign investment, impact funds.

The following table from Muller et al (2023) shows the range of financing options that are potentially available to enable transformational change of land use in New Zealand. In addition, as highlighted in the case studies below, real impact can be achieved through collaborative models of finance across these options.

Muller, C., Richards, P., Brazendale, R. & Rei, K. (2023). Novel financing solutions for land use change. *A report prepared for Our Land and Water National Science Challenge.* Retrieved from https://ourlandandwater.nz/wp-content/uploads/2023/07/2023-07-22-OLW-Novel-Financing-Solutions-Report_FINAL.pdf

Financing option	Description
Debt funding (bank loans) including sustainability linked loans and green loans	Traditional bank lending can fund land-use change especially when financially beneficial. Not novel and no requirement for this to be environmentally beneficial.
Government and regional council funding	Funding from government and regional councils includes grants, research funds (e.g. MPI's SFFF), loans (e.g. PGF) and partnerships. Can cover a range of actions but not particularly novel.
Crowd funding	Funding is generated by raising money from a large number of people who each contribute a relatively small amount, typically pooled for specific projects.
Peer to peer (social lending)	Lending money to individuals or businesses typically through online services that match lenders to borrowers.
Blended finance models	A mix of funding sources for a specific project, which can include government funds, private investment, impact funds, etc. Can be time consuming to set up.
New products	Developing and selling new, typically non-tangible, products such as biodiversity credits. Relatively novel, depending on the product e.g. carbon credits are less novel, biodiversity credits are more novel.
Value-added products	Developing new products with an environmental selling point e.g. organic direct to consumer milk, to generate additional income to further fund environmental actions.
Philanthropy and impact investment	Investment capital (often provided by high-net-worth individuals) funding investments that are socially and/or environmentally beneficial and prioritise these beneficial outcomes over financial returns.
Farm-based listed companies	A publicly listed company investing in rural land, typically focussed on financial returns rather than environmental returns.
Private managed investment fund	A managed fund where funds are pooled together with other investors and managed by a central entity. Typically focusses on financial returns rather than environmental returns to date.
Endowment fund	A fund, typically managed by a governing body such as a trust, that individuals can access money from either as a gift or loan. There is a requirement for seed funding to set up a fund and active management to be self-sustaining.
Pooled collectives	A group of entities/people who coalesce around a common benefit, such as economies of scale, shared knowledge or goals, but retain separate ownership of their assets.
Equity partnerships and joint ventures	An equity partnership is essentially a shared ownership of pooled assets, whereas a joint venture is typically shared ownership (or access to) separate assets. Not particularly novel and hard to scale. Requires parties to value environmental outcomes to provide positive environmental outcomes.
Māori to Māori investment collaborations	One or more Māori entities collaborating to lend capital to another or new entity, typically with a transition over time to repay funding and own assets.
Long term lease development partnership	A partner finances the development of a new land-use venture and, after a set time transition, ownership is traditionally handed back.
Dividend reinvestment (whenua Māori)	Instead of paying out dividends to whenua Māori beneficial owners, retaining this for reinvestment in an environmentally friendly land-use or management change. This can be complicated from policy, equity and legal standpoints.
Processor incentives	Financial incentives (e.g. bonus payment) to undertake certain land management actions. Focussed on land management rather than land-use change.

Potential Financial Solutions

MARKET EXAMPLE

Blended finance

Leaft Foods is an example of the use of blended finance for diversification and innovation in the agrifood sector. In April 2022, the company secured $22 million through a Series A investment round. This was led by Silicon Valley-based Khosla Ventures and supported by a number of international and local investors such as Ngāi Tahu Holdings and ACC.

The purpose of this being the building of its R&D capabilities, increasing growth and developing a global value chain, beginning with a launch in the United States (Walker, 8 April 2022).

Leaft Foods leveraged multiple funding sources, combining private and public investment and venture capital to finance its research and development efforts. This has allowed the business to slowly scale up and prepare to enter the international market.

MARKET EXAMPLE

Innovative public–private financing

AgriZeroNZ is a 50/50 public-private partnership which was established in 2023. It is equally owned by the New Zealand government, via the Ministry for Primary Industries, and major agribusiness companies, including Fonterra, ANZCO Foods, Rabobank, Ravensdown, Silver Fern Farms, Synlait, The a2 Milk Company, ANZ Bank, ASB Bank and Bank of New Zealand. AgriZeroNZ aims to accelerate the development and deployment of emissions reduction tools for pasture-based farms in New Zealand with the overall goal of reducing New Zealand's agricultural methane emissions 30 percent by 2030.

AgriZeroNZ employs a venture capital approach, investing in innovative solutions for reducing agricultural emissions. Since its establishment, a public-private partnership has already invested over $29 million in various projects aimed at reducing agricultural emissions. These projects involve the development methane vaccine for ruminant animals (e.g. $9.9 million investment in US ag-biotech start-up ArkeaBio to accelerate the development of a methane vaccine for ruminant animals; AgriZeroNZ and the NZ Agricultural Greenhouse Gas Research Centre are providing $13.5 million to Lucidome Bio for the next phase in methane vaccine research), the development of methane-inhibiting technologies, low emissions pasture solutions and a GHG testing facility for livestock.

Through these initiatives, AgriZeroNZ seeks to position New Zealand as a global leader in sustainable agriculture, balancing environmental responsibility with long-term economic viability.

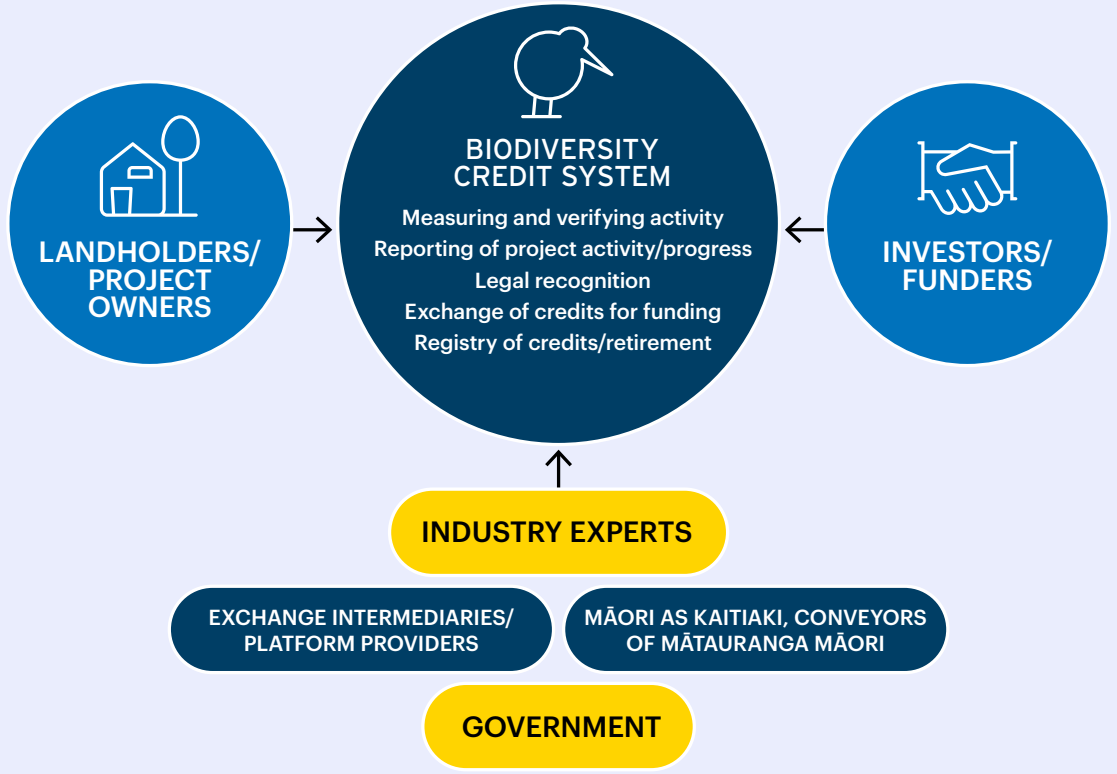
The New Zealand government holds a 50 percent stake in AgriZeroNZ with the commitments to match private sector investments dollar for dollar.

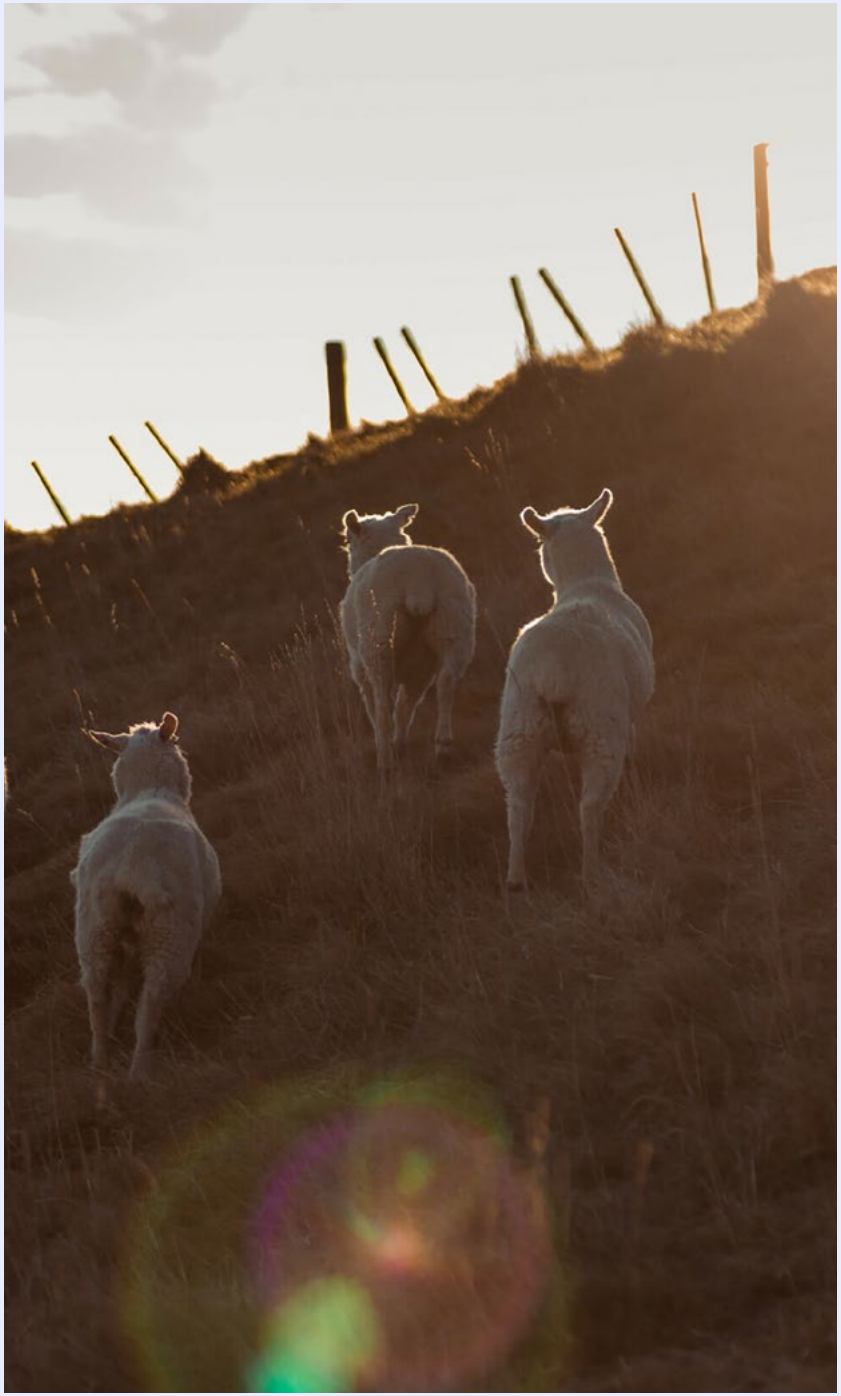
Creation of New Markets

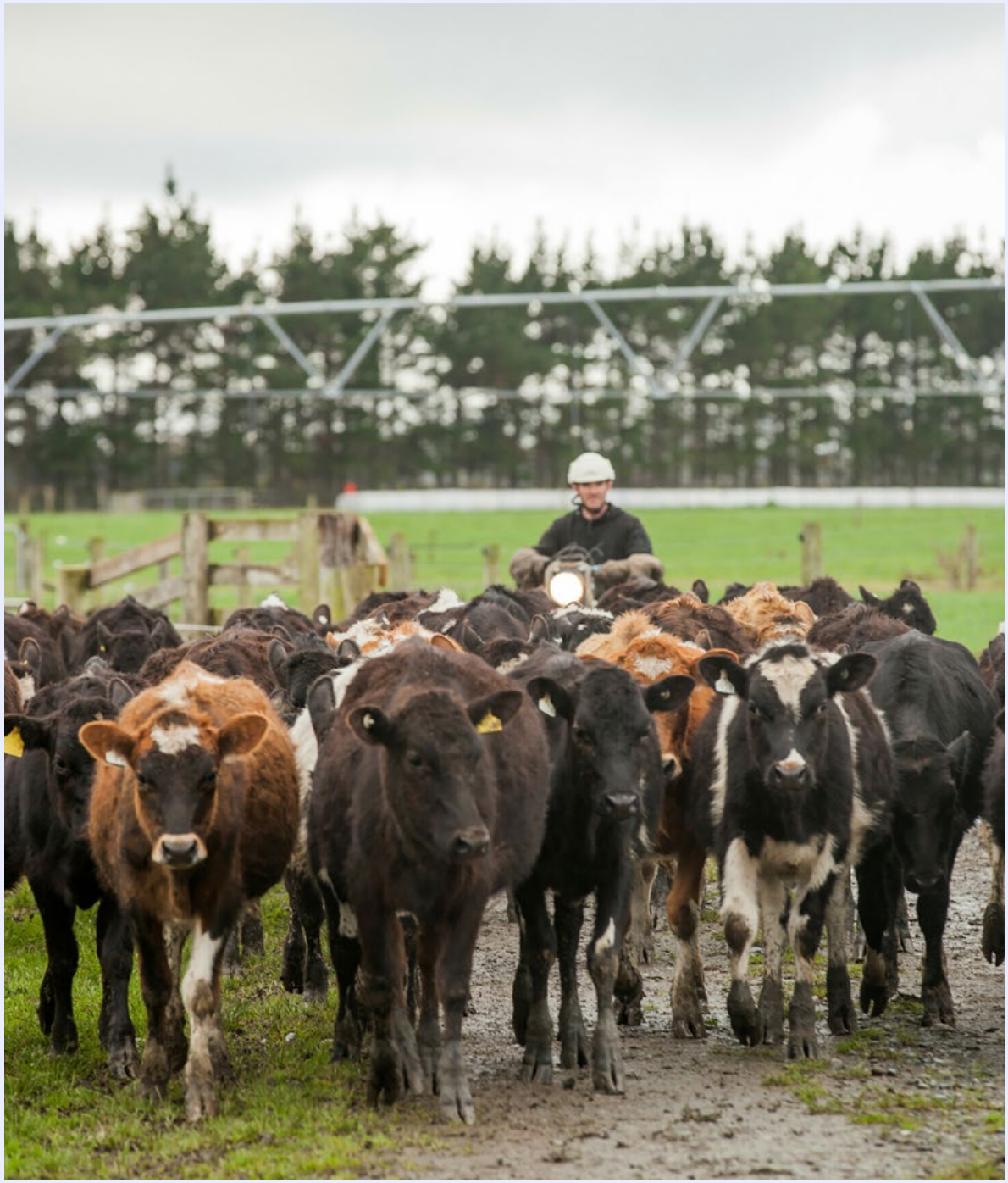
Nature credit markets, including biodiversity credits, are a growing opportunity to finance and support environmental conservation efforts in New Zealand, particularly through verified and standardised systems that ensure measurable ecological benefits.

These markets can incentivise public and private investment, especially in areas such as indigenous biodiversity on Māori land, by providing a structured way to recognise and reward positive environmental actions.

While nature-based markets have emerged in the form of carbon credit markets to meet GHG reduction targets, such as the NZ Emissions Trading Scheme, developing these markets further is challenging and requires new collaborative financial models.







Conclusion

Unlocking even a 10 percent lift in productivity through the right actions has significant economic value

The study highlights that to thrive there is a need for New Zealand's food and fibre sector to overcome significant challenges, including reaching environmental limits, often low and variable profitability, and an ageing population. To do this there is a need to address how land is valued and utilised in New Zealand. Significant threats to both our international markets and our environment brings urgency to this.

The scenario modelling highlights that without the introduction of new technologies and new ways of working and valuing the outputs from land, efforts to attain two policy objectives of cutting emissions and growing output significantly are likely to lead to trade-offs and outcomes that are detrimental to the sector and society, such as through lower land values or environmental degradation. These in turn are likely to lower the desire of the next generation to enter the sector, threatening intergenerational renewal.

Part of the land-use solution involves optimising current systems, including through technology adoption and improved farm management. It is also likely to involve diversification of income streams, including through partnerships that enable farmers to maintain ownership of the land others while others utilise the resource. Large-scale transition of land use from one system to another, often funded through corporate entities, can also contribute.

All those involved at every level of the food and fibre sector have an important role to play in ensuring a vibrant and resilient future for the sector and wider New Zealand.

In particular:

- Local and central government have a key role to play through implementing policies that are aligned and supportive of creating a sustainable and resilient food and fibre sector. Policy settings that signal to the food and fibre sector the true costs and benefits associated with different land uses are required. Appropriate financial and business regulation is also needed, for example surrounding foreign direct investment, KiwiSaver fund investment and, more broadly, co-operatives.
- Wider industry can support farmers to adopt new practices/systems and provide a fair market price for goods produced.
- Sector consultants and those involved in extension need to be equipped with appropriate skills to support landowners with viable transition choices.
- Financial institutions, including banks, should be willing and able to provide capital for every level of transition and to all landowners with a viable business plan.

In addition, collaboration across those involved in the sector is required to ensure each layer can thrive.

The future of the sector depends on how we optimise the use of our natural assets, and there are significant gains to be made. The report shows that if we optimise land in the right way, we can win on both fronts. For example, unlocking even a 10 percent lift in productivity through the right action would concurrently reduce hidden environmental costs within the food and fibre sector by 10 percent, resulting in an additional $10 billion to GDP from the food and fibre sector within five to seven years.

Methodology and Industry Representatives Engaged

Lincoln University's Centre of Excellence for Transformative Agribusiness led the development of the Future Use of Land and How to Fund It study. The study involved extensive review and analysis of existing literature and data as well as interviews with 25 stakeholders from across the food and fibre sectors. An innovative modelling framework is developed that enables the social, environmental and economic implications of land- use change to be examined at both the farm and wider economy level. Illustrative scenarios are developed in consultation with stakeholders, and these are analysed using an innovative modelling framework – the Future Use of Land Model.

The Future Use of Land Model, which informs this report, combines two approaches - Linear Programming (LP) and Integrated Impact Assessment (IIA). Together, LP and IIA generate quantitative and qualitative information about outcomes created by policy interventions, changes in technology and market conditions that affect New Zealand's farm sector.

LP is comprised of four regional models covering the south and north of the South Island, and west and east of the North Island. Each region has its own mix of Land Use Capability classes, and a set of farm enterprises and farming systems that compete for land suited to their production. LP software uses a mathematical algorithm to find the optimum mix of these enterprises and farming systems, subject to land and other relevant constraints, such as licensing restrictions on kiwifruit orchards. In this study, the optimum solution is found by maximising the difference between farm gross margin (GM) and the risk in GM caused by variation in farm product prices. This difference is an indicator of a farmer's financial wellbeing or utility in a risky world.

IIA provides a high-level overview of the economic, environmental and social impacts of land use change using simple inputs. It operates relative to a given baseline, producing indicative – not predictive – results that reflect the likely direction and magnitude of change. It covers a broad set of land uses including sheep and beef, dairy, deer, arable, horticulture, forestry and urban. For each, it estimates:

- Direct impacts such as revenue, employment, and GHG emissions.
- Indirect and induced impacts, including secondary industry effects and household spending.
- Environmental indicators, such as nitrate leaching, E. coli, biodiversity and water quality.
- Social and cultural factors, including life satisfaction, self-rated health, mahinga kai and sense of belonging.
- Economic considerations, such as capital requirements, time to commercial yield, market maturity, and volatility.

The model also performed a risk assessment to further inform the analysis of potential impacts. For economic, social and environmental factors, the indicators were assessed for each domain. Based on these indicators, changes to land use that pose increased risk were flagged and an overall risk assessment is made based on the number of flags raised.

Contributing Industry and Association stakeholders:

The following industry and association stakeholders graciously gave their time, expertise and experience within the food and fibre industry to contribute to this report:

- MyFarm
- BDO Spicers
- FMG
- Superfund
- FarmRight
- Colliers
- Federated Farmers
- Fonterra
- Beef+Lamb
- Horticulture NZ
- Future Food Aotearoa
- DairyNZ
- Silverfern Farms
- Aotearoa Circle
- Wakatū
- AgResearch
- Plant and Food Research
- Land Pro
- Foundation for Arable Research
- Ministry for Primary Industries
- Rewiring Aotearoa
- Co-Operative Business NZ
- NZARES
- Ballance
- Ravensdown

Further details of the methods adopted for the study can be found in the full report that accompanies this summary.

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