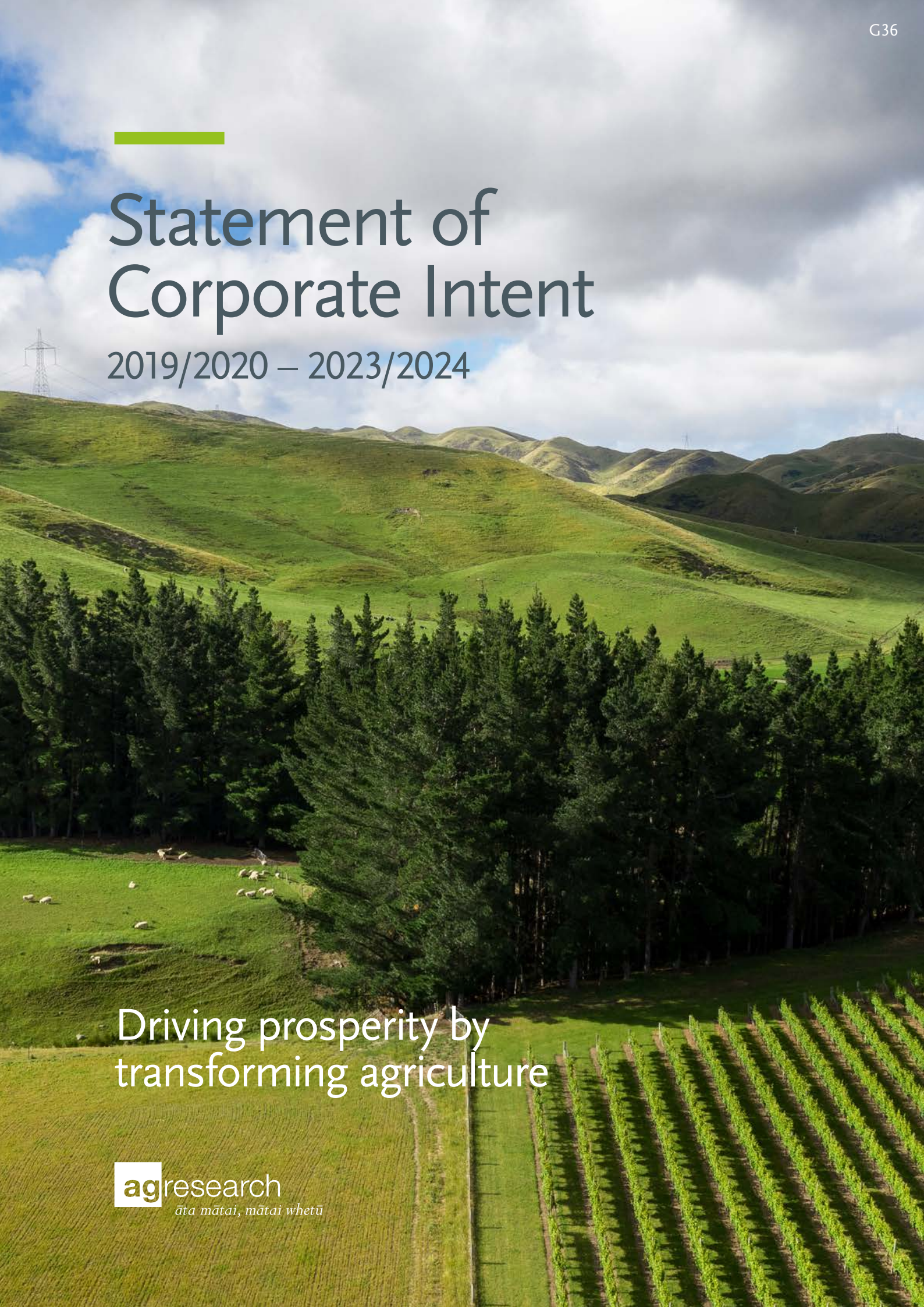
Statement of Corporate Intent

2019/2020 – 2023/2024



Driving prosperity by transforming agriculture

agresearch
āta mātai, mātai whetū

Driving prosperity by transforming agriculture

Chair and Chief Executive overview

AgResearch, through innovative science and research, is leading the way for the future of land-based food production in New Zealand.

Despite primary industry export performance exceeding expectations in the 2018/19 year, the agricultural sector is facing some considerable challenges as it looks to the future. The effects of climate and environmental change, rapid advances in technology and food production systems, and evolving consumer preferences and expectations have meant a significant shift in what is needed for New Zealand's agricultural-based economy to continue to flourish.

Innovative science and thought leadership are essential to support this shift. New Zealand will need to be at the edge of innovation and technology for primary industries to succeed in the future. AgResearch, as the Crown Research Institute (CRI) primarily responsible for engaging pastoral, agri-food, agri-technology, and environmental stakeholders with thought-leading scientific outcomes, is committed to creating new opportunities and providing options to respond successfully to the challenges and opportunities faced by the sector.

This Statement of Corporate Intent (SCI) sets out the framework for the research we will undertake in the coming five-year period 2019/20 - 2023/24. As in past years, this framework has been created through close engagement with our stakeholders and national and international collaborators.

AgResearch is well-placed to support the government's science and innovation priority areas. These areas include transitioning New Zealand's primary industries into higher value products and exports, understanding and mitigating the effects of climate change, and supporting the transition to a low emissions economy. There is a clear role for our science to assist in these areas and in doing so we support thriving and sustainable regions.

To be successful, our science must be bold, agile, and future-focused in nature. The impact sought from our refreshed Science Plan is to increase the value of New Zealand's exports while enhancing our environment and underpinning our regional prosperity. This is supported by the two key overarching and integrated areas of science focus; creating the smartest and most sustainable land use systems, and the most sought-after high value food and bio-based products. The Science Plan was developed with the knowledge that future food production systems will be significantly different from today, and with recognition that we must develop new and smarter collaborations, with disciplines and partners outside of our traditional networks to create effective transdisciplinary teams. Together, the Science Plan and the SCI outline how AgResearch will deliver our strategic goals, and how this leverages domestic and international collaboration.

In amongst the many and varied world-class science programmes across our research areas currently under way, we have recently embarked on a new Ministry of Business, Innovation and Employment (MBIE)-funded platform of research – the New Zealand Bioeconomy in the Digital Age. The platform is an excellent opportunity to put our refreshed Science Plan in action. It is designed to enable the transition to diversified landscapes, to utilise digital technologies and data for land use design and decision-making, and to connect food and bio-based product attributes across the value chain.

A number of use cases are under way to establish a 'proof of concept' that digital technologies can and will transform New Zealand's pastoral land-based sector. These include interdisciplinary approaches for converting data to information at different scales, simulation and visualisation tools to accelerate adoption change, novel methods for linking food and bio-based product attributes across the value chain, Māori agribusiness land

information, and new business and governance models for increasing trust and value equity in digitised value chains.

Our vision for this work is that the power of digital technologies is harnessed to enable the transformation of New Zealand agriculture and food production systems. We are excited about the scientific outcomes this platform will demonstrate, and the resulting advancements for the sector in the years ahead.

Our capital investment programme supports the embedding of our Science Plan, and the new ways of working this requires. This programme will see new fit-for-purpose, technologically advanced facilities in Palmerston North and Lincoln that will enable greater collaboration with our partners, collaborators, and the wider industry. The Food Science Facility in Palmerston North is scheduled for completion in early 2020. We are excited about realising the benefits of the joint approach with Massey University and the Riddet Institute, and look forward to reporting on this in the coming years. In Lincoln, the focus for 2019/20 and beyond is the design and construction of an AgResearch-led facility, which will be the first stage of a wider education, research, and innovation precinct in the area.

Whilst significant progress is being made with key strategic initiatives, AgResearch continues to operate in a capital constrained environment. As a result fiscal responsibility remains a critical focus and AgResearch will continue to seek innovative approaches to delivering the best possible facilities and environments to underpin our enduring future value for New Zealand.

The next five years are critical for AgResearch as we support the sector through major change. We are excited about the role we have to play, and the significant impact our work will have on transforming agriculture in New Zealand and further afield. Given the transformation processes being progressed within AgResearch, we also look forward to engaging further during the upcoming science review process.

Dr Paul Reynolds
Acting Chair,
AgResearch

Tom Richardson
Chief Executive,
AgResearch

Our strategic direction

AgResearch's vision remains unchanged — to drive New Zealand's prosperity by transforming agriculture.

Over the past year AgResearch has continued to refresh its strategic position. We have refined our overarching strategy and developed the next tier of detail around our Strategic Initiatives in our refreshed Science Plan, a process that included extensive engagement with both internal and external stakeholders.

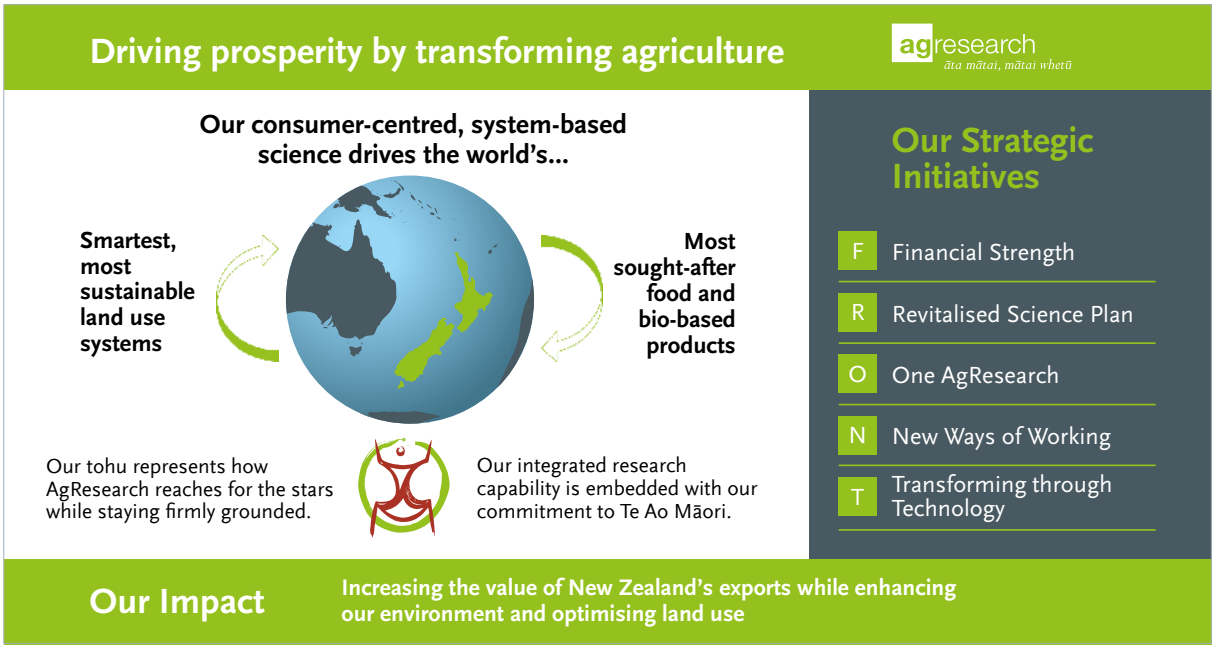
This vision is supported by a focus on the two broad areas of aspiration; developing the world's smartest and most sustainable land use systems and developing the most sought-after, high value food and bio-based products. Applied consistently to these aspirations are the twin lenses of consumer focus and a systems based, integrated approach to science seeking to bring the best possible teams together to tackle both issues and opportunities, leveraging both the breadth of AgResearch capability and an extensive and developing network of external collaborators.

The breadth of AgResearch science capability, spanning the agricultural value chain, continues to underpin the organisation's differentiated value proposition whilst ensuring a focused approach to delivering the stated impact of increasing the value of New Zealand's exports. All the while enhancing our environment and optimising land use outcomes.

The AgResearch strategy is well aligned to government priorities and will support accelerating the shift from volume to value agricultural production, enabling the transition to a productive, sustainable and low emissions economy, and directly support thriving sustainable regions.

Five critical strategic initiates have been identified to underpin, direct, and facilitate organisational performance:

1. Financial Strength – Financial sustainability allowing reinvestment into science capability and capacity over time.
2. Revitalised Science Plan – Creating enduring value via integrated and focused areas of research that capitalise upon emerging opportunities from rapid changes in food and farming technology, science, consumer drivers, and environmental constraints.
3. One AgResearch – Investing in an aligned organisational culture that is innovative, energised, vibrant, and collaborative.
4. New Ways of Working – Implementing the four campus model, including new facilities, and developing research, innovation and education centres facilitating collaboration. This means investing in people and processes to support the transformation process.
5. Transforming Through Technology – Embracing technology to change the way we deliver science and to improve enabling systems and processes to enhance impact.



The AgResearch Science Plan

Putting our strategies into action.

Our Science Plan has been refreshed and revitalised and places a greater emphasis on an outcome and objective-focused strategic framework. The changes demonstrate AgResearch's adaptability and agility against a rapidly evolving science sector and changing community and government priorities.

Our expected outcomes will achieve the following:

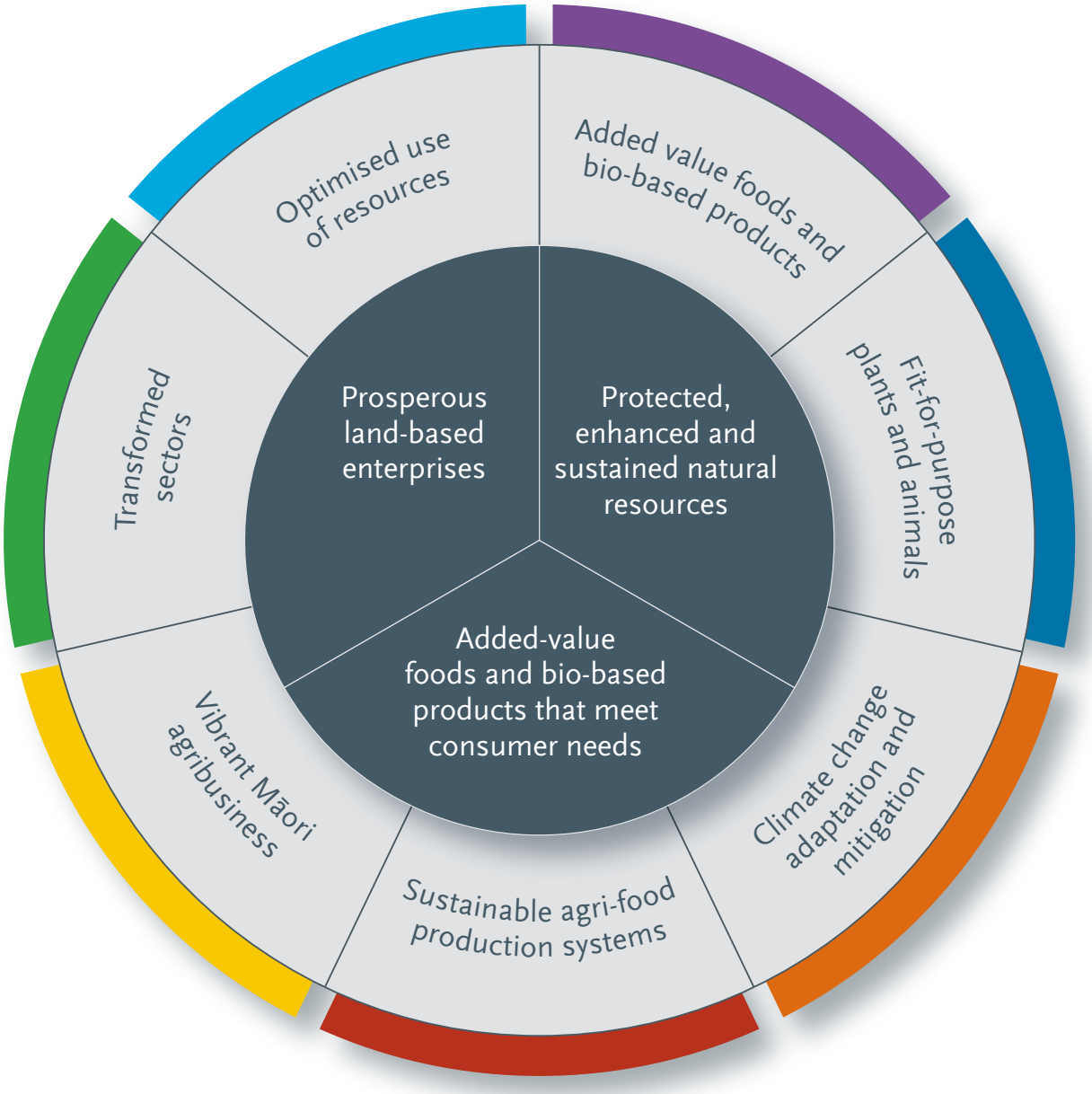
- Protected, enhanced, and sustained natural resources
- Prosperous land-based enterprises
- Added-value foods and bio-based products that meet consumer needs.

We know New Zealand because of our size, scale, and capability is uniquely placed to transform current food production systems to meet these needs. It falls to AgResearch and our collaborators to enable this transformation by providing the scientific advances that will support these new systems. These scientific advances take time, and therefore, our Science Plan must meet New Zealand's short, medium and long term needs.

These objectives cut across diversified pastoral landscapes and new land-based enterprises that deliver to local and international values.

Our climate change research objectives will range from the reduction of methane and nitrous oxide emissions of grazing systems, to the resilience to adverse weather events and the prevention and management of biosecurity risks. We want to foster a vibrant Māori agribusiness sector with our research focus on product attributes reflecting Te Ao Māori.

We will develop fit for purpose forage and animal diversity systems and tools that promote world-class animal health and welfare. We will drive scientific discovery



pertaining to added-value foods and bio-based products, including food and ingredient verification and reduced waste. We will support business models and policies that enable this transformation.

Our Science Plan objectives take into account the complex value webs that connect on-farm practices to consumer demands and address the critical questions such as: where is the end product going, where has the product come from, and what is the impact of the production system?

Animals and forages are not the only drivers to boosting New Zealand's prosperity, but they have input. Understanding that and knowing how AgResearch science can play its part is how we will succeed. From soil scientists to food safety researchers, AgResearch has the science capability to apply critical thinking right across the value chain.

Our refreshed Science Plan will guide the science that we will conduct, our internal investment, and reinforce the behaviours we will need to deliver our vision. It will be embedded with the principles of kaitiakitanga, which reflects our focus on Vision Mātauranga.

The objectives outlined here will form the framework of measurements for our programme of work.

New Zealand Bioeconomy in the Digital Age

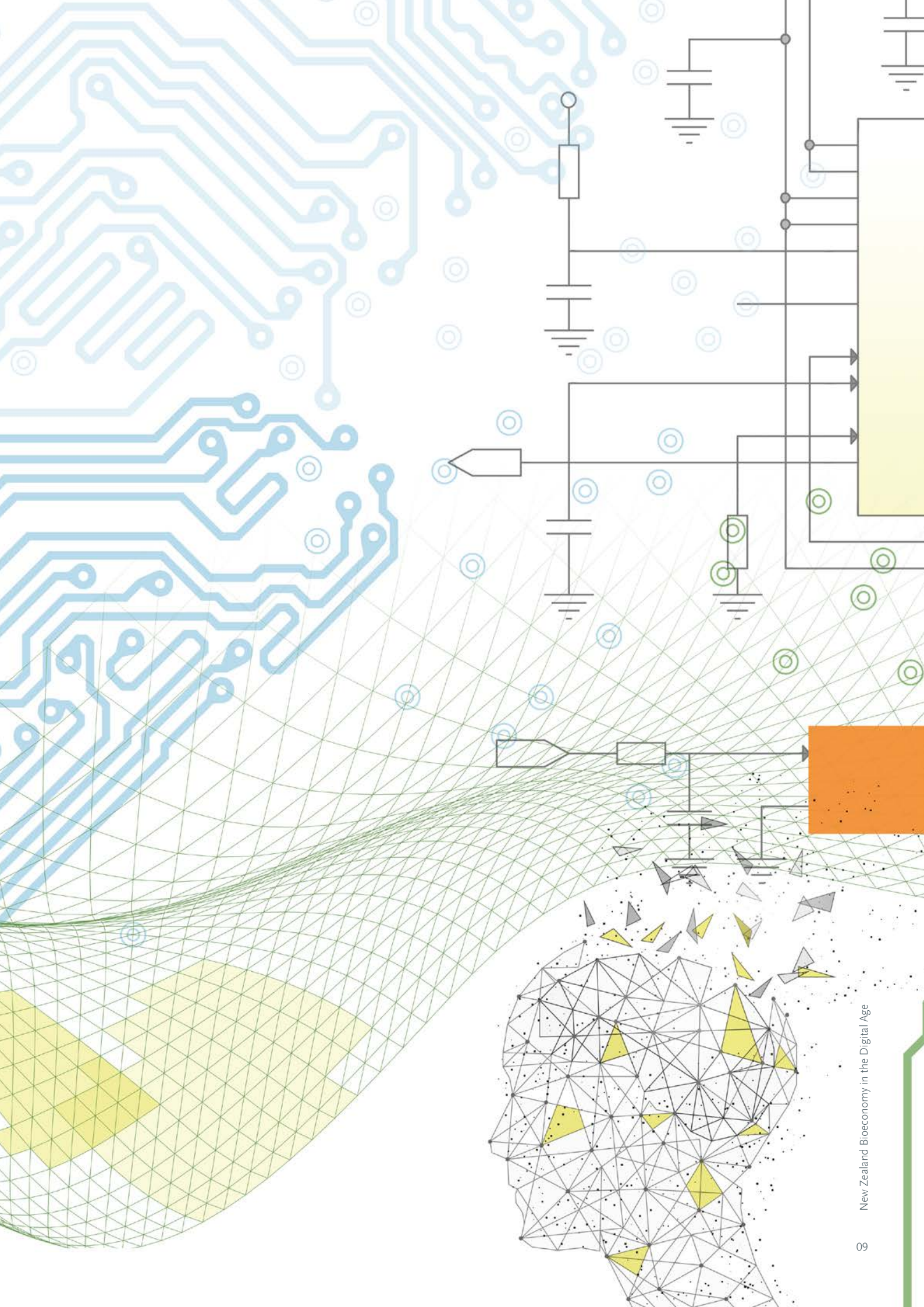
AgResearch has launched a new research programme called the New Zealand Bioeconomy in the Digital Age (NZBIDA).

The programme is a MBIE funded $10m project to deliver a 'proof of concept' that digital technologies can transform New Zealand land-based food production. AgResearch and a broad range of collaborators will do the science of today that will enable the pastoral sector to transition to a more adaptive and sustainable 'bioeconomy' of tomorrow. AgResearch is uniquely placed to deliver on this ambitious project. It is designed to enable the transition to diversified landscapes, utilise digital technologies and data for land use design and decision-making to connect food and bio-based product attributes across the value chain.

We have long-lasting and deep relationships within the pastoral sector and we're a research focused organisation that has embraced the digital revolution that is allowing intellectual endeavour on a scale never seen before. The broader agricultural sector has been relatively slow in its uptake of digital technology, therefore, AgResearch's job is to add impetus to the transformational change required.

We've identified and designed 12 case studies that will demonstrate 'proof of concept' to stakeholders and researchers. They will expose scientists and stakeholders to global thinking about non-traditional and disruptive technology options. And they will be integrated vertically and horizontally to contribute to a 'joined up' programme that creates added economic, environmental, cultural and social value by producing, converting, and using knowledge with biological raw material.

The case studies all use the tools of a successful bioeconomy: advanced engineering, nanotechnology, sensor technology, precision measurement, communications, genetics, automation, robotics, analytics, and decision support tools that can transform production systems and ensure a safe and traceable product supply. We will also work with partners who are heavily focused on developing niche value chains that incorporate Mātauranga Māori.



Strategic science investment funding

AgResearch uses its assigned contribution from the Strategic Science Investment Fund (SSIF) to explore and innovate new systems, practices, processes and products right across the agricultural value chain.

Our research priorities enable us to deliver integrated solutions; we can target consumer and market needs by developing food productions systems that generate foods that are high quality, ethically and sustainably produced, nutritious and support health and well-being.

In FY20 we will receive $43.4m SSIF funding through two defined platforms – AgriFood Production ($31.4m) and Premium Agri-Foods, Products and Services ($12m). This funding is allocated to projects that contribute to the seven objectives of our Science Plan. This funding includes a $5m pa investment in a two-year digital agriculture initiative New Zealand's Bioeconomy in the Digital Age that contributes to both platforms. Separately we receive $470,000 pa to host and manage the Margot Forde Germplasm Centre as a Nationally Significant Database and Collection.

Our consumer-centric research is aligned to our two, interconnected strategic drivers – to develop the smartest and most sustainable land use systems, through developing the most sought-after food and bioproducts. Our scientists are focused on delivering to these two strategic drivers by excelling in their specialist fields, while working closely with their colleagues and peers across the organisation, the sector, and with other collaborators. The ability to excel in specialist research that is connected along the value chain is our point of difference, and ensures our research is internationally respected. Across the next five financial years, the projects outlined will enable AgResearch to deliver on its Statement of Core Purpose.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Protected, enhanced, and sustained natural resources

Science Plan Outcome

Aramoana

Project summaries FY20

Project

Animal welfare for market success

Scope
This research programme will advance animal welfare science and New Zealand's reputation internationally, and protect the market success of New Zealand animal-based products within three broad goals: 1) Accentuate the positive aspects of New Zealand production systems in ways that resonate with consumers, 2) Advance animal welfare science through developing innovative welfare measures that meet evolving definitions of welfare (e.g. sentience), and 3) Deliver animal behaviour and welfare expertise to support the sustainable development of other programs within AgResearch. The programme comprises fundamental research to maintain our world-leading understanding of animal welfare and builds capability and delivers shorter term research outcomes to address industry issues as they arise. Research outcomes will have a long-term impact, supporting consumer confidence in New Zealand products, and providing guidance, management, and legislative recommendations for stakeholders and Ministry of Primary Industries to maintain freedom to operate and provide social license. Program delivery is designed in a way to generate significant capability-building in animal welfare.

SSIF Platform:
Agri-Food Production

Key stakeholders and partners:
Ministry for Primary Industries, Dairy NZ, Fonterra

FY20 funding:
$1,232,000

Project timeline:
2012 – 2021

Project

Pasture weeds

Scope
The overarching objective is to provide the science that will enable the New Zealand pastoral sector to achieve long-term cost-effective management of weeds under a changing climate. It will achieve this through new strategies and tools for greatly improved internal biosecurity and through next-generation alternatives to synthetic herbicides.

Our research on alternatives to herbicides will help realise the potential benefits of biological control of weeds through understanding relevant biological processes and the associated risks; and by developing, testing, and promoting (through stakeholder engagement) disruptive farming cultural practices that reduce weed control costs and environmental impacts of weed control.

Our research on internal biosecurity will develop risk assessment and decision-making tools useful for engaged stakeholders at farm, regional, and national levels for species already present in New Zealand but with a limited distribution and for new incursions; identify best management practices for selected priority species (e.g. high-threat low-incident pests); account for global-change (e.g. climate and land-use changes); and support evidence-based pathway management.

SSIF Platform:
Agri-Food Production

Key stakeholders and partners:
Foundation for Arable Research, Regional councils, Dairy NZ, Crown Research Institutes, Ministry for Primary Industries, Agrichemical companies

FY20 funding:
$1,222,000

Project timeline:
2017 – 2022

Project

Better Border Biosecurity (B3)

Scope
The objective of the Better Border Biosecurity (B3) research collaboration is to be a world-leading source of science-based solutions for border biosecurity challenges by 2022, supporting and protecting the competitiveness of export industries and unique terrestrial ecosystems.

The goal of B3 is to develop new knowledge, tools, and approaches to ensure that harmful organisms are excluded before, at, and immediately after New Zealand's national border and that these will be available to, and implemented by, key end users and stakeholders. By 2022, the major disease, weed and pest species of threat to New Zealand will be better known, their risk quantified and optimal points for intervention defined both off-shore and at the New Zealand border. Novel analytical and modelling systems will be available for defining levels of risk posed by the various threats and models will be available for assessing their likely impacts should they establish.

SSIF Platform:
Agri-Food Production

Key stakeholders and partners:
Ministry for Primary Industries, Environmental Protection Authority, Dairy NZ, Department of Conservation, Forest Owners Association, Crown Research Institutes, Lincoln University

FY20 funding:
$1,977,000

Project timeline:
2015 – 2022

Project

Margot Forde Germplasm Centre

Scope
The Margot Forde Germplasm Centre (MFGC) is a Nationally Significant Collection and Database (NSCD) funded through SSIF Infrastructure that has been established to collect and provide forage germplasm (seed), and therefore genetic diversity, to all forage breeders and breeding programmes in New Zealand. It provides these genetic resources to the users to help them accomplish breeding targets in New Zealand and also provides data and information to New Zealand and international researchers for their research. MFGC's mission is to provide a world-class operation of basic and applied seed banking and utilisation to benefit New Zealand's bioeconomy and the world's bio- and agro-diversity.

SSIF Platform:
N/A

Key stakeholders and partners:
DairyNZ, Grasslanz Technology Ltd, GRDC, Grasslands Innovation Ltd and PGG Wrightson Seeds

FY20 funding:
$470,000

Project timeline:
2012 – 2020

Project

Climate change and the pastoral sector – impacts and adaption

Scope
This programme of work will see us provide forewarning of the impacts of climate change on soil, plant, and animal interactions in pastoral agriculture and to develop adaptations that will enable agriculture to ameliorate or take advantage of the changing environment.

This activity includes future-proofing key technologies (e.g. nitrogen fixation and biological control systems) so they remain effective under climate change.

Furthermore, the work aims to provide the information necessary for decision makers (farm, regional, national scales) to make informed choices in areas where the timescale and the nature of the activity mean they may be influenced by climate change.

SSIF Platform:
Agri-Food Production

Key stakeholders and partners:
Ministry for Primary Industries, Ministry for the Environment

FY20 funding:
$1,240,000

Project timeline:
2015 – 2022

Project

Agricultural system modelling

Scope

Agricultural system models are a crucial element in supporting good environmental practice in New Zealand farming systems. Increasingly, regional councils and other regulatory bodies are relying on models to help understand and manage environmental losses from our farms. It is therefore important that models that AgResearch support are provided with the most up-to-date research data and clear and transparent model development. Additionally, data for models is available from many disparate data sources. Constructing representations of farm systems in models or undertaking analytics requires accessing these disparate datasets, which is time consuming, prone to error, and complicated by freedom of data access and poor data interoperability. We propose to devise a new approach whereby data from those systems and technologies can be accessed into a logical, more open data model to create a full picture of the farm enterprises to speed up modelling and analytics initiatives. Lastly the project will compose a thought piece on next generation modelling tools based on work undertaken in the SSIF project New Zealand Bioeconomy in the Digital Age. This is a critical piece of work, ensuring that AgResearch is well-positioned for the future development of models in New Zealand.

SSIF Platform:

Agri-Food Production

Key stakeholders and partners:

Fertiliser Association of New Zealand, Ministry for Primary Industries, Overseer Ltd, Chinese Academy of Sciences

FY20 funding:

$750,000

Project timeline:

2012 – 2020

Prosperous land-based enterprises

Science Plan Outcome

Niho Taniwha

Project summaries FY20

Project

Nutritional approaches to enhancing ruminant lifetime performance and reducing wastage and environmental footprint

Scope

By exploiting a mechanistic understanding of the nexus between feed inputs and physiology of the animal we will deliver knowledge and evidence-based recommendations and develop beta-test novel nutrition-based intervention technologies for the pastoral sector. This will be achieved through a multi-disciplinary approach to key issues highlighted by the red meat and dairy industries with implementation of outcomes through projects co-developed with stakeholders.

We will do this by modifying rumen function, developing strategic supplementation strategies to enhance nutrient utilisation, and reducing wastage of animals and feed. By meeting the nutritional requirements of animals we will improve animal welfare and consumer concerns about farming intensification. This in turn will improve per animal performance, reduce animal and feed wastage, environmental footprint, and improve animal health.

SSIF Platform:
Agri-Food Production

Key stakeholders and partners:
Scotland's Rural College, INIA, Ballance Agri-Nutrients, Fonterra

FY20 funding:
$1,100,000

Project timeline:
2017 – 2022

Project

Strategies to improve reproductive performance in dairy cattle

Scope
Milk and milk products remain New Zealand's largest food export. However, as milk production has steadily increased over the last 40 years, fertility of the lactating cow has decreased. The overarching goal of this work is to improve the efficiency of the dairy sector through a greater understanding of reproductive processes and how they can be manipulated to provide management solutions to meet the industry's target 6-weeks (from planned start of mating) in-calf rate of 78%. This includes investigating the use of non-steroidal anti-inflammatory drugs (NSAIDs) to reduce inflammation in the early postpartum period, the search for biomarkers to identify cows with improved fertility, identifying functional pathways and molecules originating from the oocyte and related embryo survival, and understanding the role of the local immune system in conception loss.

SSIF Platform:
Agri-Food Production

Key stakeholders and partners:
Dairy NZ, Ministry for Business, Innovation and Employment

FY20 funding:
$1,275,207

Project timeline:
2015 – 2020

Project

Animal health and welfare as the foundation for sustainable high-value global markets

Scope
This programme of work is designed to deliver farmers the knowledge and tools to meet future market demands for safe, ethically-produced, food, specifically by producing resilient farms with low chemical inputs and superior animal health and welfare. The programme aims to generate disruptive technologies (e.g. parasite vaccines) that will change future farm systems. The approaches are designed to enhance animal performance and lead to significant gains in on-farm efficiencies (e.g. through requiring fewer treatments and less mustering) through the creation of new animal health and welfare management practices. In the long-term we will help to build resilient farm systems that are able to adapt to changing expectations of society of the interplay on farms between environment (including climate change), welfare and food production. In addition, this programme provides critical support to the Premium Agri-Foods platform by ensuring that the value added during processing is accessible by first capturing consumer preference for New Zealand's way of farming.

SSIF Platform:
Agri-Food Production

Key stakeholders and partners:
Beef and Lamb NZ, OSPRI

FY20 funding:
$2,176,335

Project timeline:
2018 – 2023

Project

The way forward: utilising a globally unique ruminant resource for consumer-focused, technology-driven science for sustainable farming

Scope
This Animal Genomics core research project develops science leadership, key capability, and novel technology to ensure sustainable and profitable farming in a rapidly changing environment. We will continue to drive genetic gain in New Zealand's national flocks by discovery and demonstration within the AgResearch resource flocks. We will develop novel genomic and phenotyping approaches to deliver new traits (e.g. methylation, adaptation) and advanced measures for existing traits (e.g. live measures of pneumonia). Ultimately the programme aims to breed product that has been farmed with social licence (nutritious, high-value food, from healthy animals with reduced environmental impact). Maintaining and developing our globally unique resource flocks is critical to enable research to be carried out that is linked to the New Zealand industry ensuring direct implementation and uptake of science to achieve maximum impact.

SSIF Platform:
Agri-Food Production

Key stakeholders and partners:
Beef + Lamb NZ, Focus Genetics, Pastoral Greenhouse Gas Research Consortium, NZ Agricultural Gas Research Centre, Pāmu Farms of New Zealand, Spring Sheep, Southern Cross Dairies

FY20 funding:
$500,000

Project timeline:
2013 – 2020

Project

Forage value

Scope
This project provides the basic research that underpins the development and future expansion of the Forage Value Index (FVI). The FVI, led by DairyNZ and NZ Plant Breeders and Research Association, is providing dairy farmers with a facts-based online cultivar selection tool to identify the best ryegrass cultivars for their system. Beneficial environmental mitigation traits have been identified as critical for future development of the FVI and we will continue research on this topic. A new initiative is investigating the potential for climate change to transform "sleeper pests" into active threats to pasture performance. We will identify the key plant traits required to achieve high rankings across a range of FVI indices thereby providing breeders with specific traits to build into cultivars with the incentive that a high FVI ranking will stimulate seed sales. The programme will inform farmers about choosing cultivars that deliver the balance of production and environmental outcomes that they want, and optimum sward management to realise expression of the desirable traits.

SSIF Platform:
Agri-Food Production

Key stakeholders and partners:
DairyNZ, NZ Plant Breeders and Research Association, Forage Value Technical Working Group

FY20 funding:
$1,340,000

Project timeline:
2013 – 2020

Project

Application of plant biotechnology in agriculture

Scope
AgResearch currently has two parallel and closely interrelated programmes working on High Metabolisable Energy (HME) forages. One, which is funded through MBIE's Endeavour Fund with significant industry co-funding, will progress four lines of HME ryegrass to US-based field trials and animal nutrition trials. These trials will assist the industry to determine if New Zealand-based field and animal nutrition trials will occur from 2021 by building a data package of information to help define the value proposition for New Zealand. This SSIF supported programme will prepare commercial-ready HME forages for New Zealand-based field and animal nutrition trials scheduled for the spring of 2021.

The SSIF programme will also progress a second technology that enables the enhancement of plant root systems. This has been designed to be dovetailed with the HME technology and act synergistically to improve overall plant performance. Packaging this new technology with HME will extend patent life to 2035, adding an additional six years onto the potential licensing revenues (and increasing the opportunity for industry to gain a return on investment).

SSIF Platform:
Agri-Food Production

Key stakeholders and partners:
Dairy NZ, PGG Wrightson, Grasslands Technology Ltd, Ministry for Business, Innovation and Employment

FY20 funding:
$1,900,000

Project timeline:
2017 – 2022

Project

Epichloë endophytes for the future farm

Scope
This project aims to improve pasture productivity and resilience by both reducing insect predation and improving plant access to water and nutrients through healthier root systems. This project has a number of focus areas including the discovery of new Epichloë endophytes. We will also develop a gene editing platform for Epichloë endophytes using CRISPR-Cas9 technology to ensure that mammalian-toxic compounds are eliminated and useful bioactives are present. We will continue our research to identify novel bioactive compounds that may be active against a broader range of insect pests and additionally confer improved drought resistance. Lastly this project will develop a deeper understanding of the barriers to production of efficacious concentrations of bioactive metabolites, and efficient transmission and longevity of the endophyte in seed.

SSIF Platform:
Agri-Food Production

Key stakeholders and partners:
Endophyte Innovation, Grasslanz Technology Ltd., PGG Wrightson Seeds

FY20 funding:
$2,000,000

Project timeline:
2017 – 2022

Project

Microbiomes: from soils to plate

Scope
The aim of this project is to bring together Soil-Plant-Animal Microbiome research to test the hypothesis that the microbiomes in soil, plants, animals, and humans may be interlinked, and further, that they may be able to be managed across the value chain for environmental, productive or other benefits.

This project will bring together existing and new strands of microbiome work into a more unified whole that will uncover synergies in thinking, experimental approaches, methods, and analyses that will allow us to investigate microbiome interactions in areas as diverse as soil functioning, plant breeding, animal health, and human functional foods.

The long term goal of this project is to link and describe the impact of microbiomes throughout the value chain in each of our major areas of interest, including environmental impacts of farming, plant and animal health and sustainability, through to the attributes of food and bio-based products.

SSIF Platform:
Agri-Food Production, Premium Agri-Foods

Key stakeholders and partners:
Our Land & Water

FY20 funding:
$2,600,000

Project timeline:
2018 – 2020

Project

Hitting targets for deer industry profitability

Scope
This project assists the New Zealand deer industry to achieve its aspirational targets for improvements in animal performance and on-farm profitability, as espoused in its Productivity Improvement Programme (now embedded in the Passion- 2-Profit PGP project), over the next 10-year period, by providing science-based outputs to improve profitability and environmental outcomes. The research focus areas are driven by the Science Strategy of DEEResearch (a joint venture between AgResearch and Deer Industry New Zealand) These include: improving the profitability of deer farming systems through optimising genetics, nutrition and reproduction to produce products desired by customers, protecting deer from pests and diseases, maintaining the 'five freedoms' of animal welfare, and maintaining the quality of soil, water, and atmosphere of deer farms).

SSIF Platform:
Agri-Food Production

Key stakeholders and partners:
DEEResearch, Landcorp, Deer Industry NZ, Alliance Group, Passion to Profit Programme

FY20 funding:
$1,333,000

Project timeline:
2015 – 2022

Project

Research for innovation and impact

Scope
The aim of this project is to provide the knowledge and the practice that will enable researchers, within AgResearch and the national and international innovation system, to take a more systemic approach in order to address complex research issues. It will enhance the delivery of impact from research on complex societal issues, and the communication of that impact. Through previous SSIF investment AgResearch has already developed research and practice that uses agricultural innovation systems approaches to plan for research impact. This project will take the research and practice to the next level to embed a cultural change within AgResearch, and to influence that national and international science system. It will expand on the underpinning knowledge around interdisciplinary science and innovation systems and apply this to organisational change.

SSIF Platform:
Agri-Food Production, Premium Agri-Foods

Key stakeholders and partners:
Crown Research Institutes, CSIRO, MPI, MBIE

FY20 funding:
$450,000

Project timeline:
2013 – 2020

Project

Māori Agribusiness research and engagement

Scope
This project aims to support collaboration between Māori partners, AgResearch, and research collaborators through on-farm (e.g. integrating a kaitiakitanga framework and quadruple bottom line approach to land use inventory) and off-farm projects (e.g. assessing the uniqueness and significance of a Māori value chain that addresses particular needs of those businesses). The project will both demonstrate and develop AgResearch's capabilities.

Research collaborations between Māori partners, AgResearch and research collaborators will primarily focus on strengthening capability, capacity, skills, and networks to increase understanding of how science can enable the aspirations of Māori partners. We will do this by co-developing our research with our Māori partners and research collaborators.Through this co-development process there will be an exchange and integration of traditional knowledge (Mātauranga Māori) with our science capabilities leading to a shared increase in capabilities and understanding.

SSIF Platform:
Agri-Food Production, Premium Agri-Foods

Key stakeholders and partners:
Te Aranga, Ngāti Pahauwera, Prime Holdings, Wi Pere Trust, Pakihiora Farms Ltd

FY20 funding:
$650,000

Project timeline:
2018 – 2020

Added-value foods and bio-based products that meet consumer needs

Science Plan Outcome

Ngā Tāngata

Project summaries FY20

Project

Smart and sustainable bio-based products

Scope

This programme delivers a balanced portfolio of research aimed at delivering medium to long term outputs of strategic importance within the established fibre industries and emerging bioproduct sectors. The programme seeks new high value uses from highly functional combinations of natural fibres, their components and protein sources from other primary sector values streams. Research objectives will deliver science outcomes from longer term, potentially transformational, fundamental science through to shorter term agile and responsive science on issues of strategic importance to industry. We continue to benchmark our research strategy against the needs of industry through ongoing communications with our stakeholders and external contacts.

The objectives align to recommendations within the Textiles and Bio-based Products (TBBP) Roadmap to ensure New Zealand wool is competitive in the areas of sustainability, fitness for market, new products and process, personal and health care, and intrinsic benefits. Elements are linked financially to the National Science Challenge, Science for Technological Innovation.

SSIF Platform:
Premium Agri-Foods

Key stakeholders and partners:
Science for Technological Innovation National Science challenge

FY20 funding:
$2,000,000

Project timeline:
2013 – 2022

Project

Food integrity: doing the right things in a way that builds trust

Scope
For decades, big meant better; consumers trusted brands they knew. Today, consumers are seeking authenticity and regulators demand more stringent compliance. People demand better information on how their food was made. They are looking for foods from companies who can demonstrate how they grow or raise their food – from environmental practices to food safety, quality, and animal welfare. Consumers and government are looking for sustainable practices around power usage, water quality, and reducing food wastage. These consumer and regulatory drivers provide a definition of food integrity that focuses on four common themes; transparency (how foods are produced), provenance (where foods come from), assurance (food safety), and sustainability (reducing environmental impact and waste). Food Integrity SSIF will deliver science outcomes that underpin the authenticity of these themes; to ensure that New Zealand's exports are safe, have defendable provenance, and produced in ways that fit consumers' values.

SSIF Platform:
Premium Agri-Foods

Key stakeholders and partners:
Meat Industry Association Innovation, New Zealand Food Safety Science & Research Centre, Ministry of Primary Industry, NZ Food industries (DairyNZ, Oceania Dairy Ltd, Spring Sheep Milk Co.)

FY20 funding:
$2,142,000

Project timeline:
2015 – 2022

Project

New values in pastoral ingredients

Scope
This project contributes research and innovation along the supply chain. We work with the agri-food industry, taking a whole-of-lifecycle approach so every aspect of farmed livestock finds purpose. We aim to create new paths to next-users for pastoral products that are currently underutilised and employ meat and milk as ingredients in complex foods, exploiting their interactions at micro- and macro-scales.

This research is relevant: at the point of origin to characterise the diversity and composition of raw materials, during processing to deliver technology for differentiation leading to new foods and biomaterials, and for consumers looking for novel enticing foods, especially in prepared-meal formats.

This project complements other SSIF investments into the quality, performance, and integrity of meat and milk, the sensory experiences that consumers desire, and the wellbeing benefits that add value. It focusses on the precompetitive space, to identify points of New Zealand difference and develop technologies and measurements supporting agri-foods with functional benefits.

SSIF Platform:
Premium Agri-Foods

Key stakeholders and partners:
Meat and Livestock Australia Donor Company, Meat Industry Association Innovation University of British Columbia, Vancouver

FY20 funding:
$1,542,000

Project timeline:
2013 – 2021

Project

Consumer experience: delivering customised meat attributes

Scope

The economic sustainability of the meat and dairy value webs that support the New Zealand economy depends on consolidated and increased shares in the global food market. The ways consumers are interacting with food are changing and their demands are becoming more complex and dynamic, creating a more challenging landscape for the interrelated meat and dairy sectors. Adding value to meat and meat products from New Zealand's natural resources and creating new offerings that meet consumer needs are critical for the future success of these sectors.

Consumer experience aims to develop meat attributes and presentations that resonate with consumer preferences working on a consumer-centric framework of five interconnected themes and a pan-sector objective. Consumer-Product Interaction (Theme 1) and Transformative Technologies & Applications (Theme 5) will enable information and tools to deliver optimised sensory attributes from Whole Muscle (Theme 2), Minimally Processed Ground Muscle (Theme 3), and Meat Extracts (Theme 4) that meet or exceed consumer expectations. The pan-sector objective maximises the interaction with other internal and external research programmes across disciplines and enhances the engagement with stakeholders.

SSIF Platform:
Premium Agri-Foods

Key stakeholders and partners:
Beef + Lamb NZ, Meat Industry Association, Meat & Livestock Australia

FY20 funding:
$1,161,000

Project timeline:
2014 – 2020

Project

Systems nutrition for consumer well-being

Scope

This project aims to determine the cause and effect of food-health relationships by defining underlying biomarkers and mechanisms of action relating to gastrointestinal and microbial interactions. The human microbiome profoundly affects food digestion and nutrient absorption and is increasingly seen as providing signalling molecules critical for gut-brain responses. Given the vast amounts of human microbiome sequencing data available, surprisingly little is known about the precise mechanisms by which these microbes interact with each other and the human host, and how food structures influence microbial signalling and biology. The proposed research will address this knowledge gap, ultimately providing evidence for foods targeted at so-called 'Worried Well' emerging middle- and upper-class consumers in Asia. To excel at their careers and contend with advancing age, these consumers will pay a premium for food and beverage products that help them feel physically fit and mentally sharp.

SSIF Platform:
Premium Agri-Foods

Key stakeholders and partners:
High value Nutrition National Science Challenge, The Riddet Institute, Massey University, Comvita, Glaxo-Smith-Kline

FY20 funding:
$1,895,000

Project timeline:
2014 – 2022

Project

The future of food

Scope

Sustainable processing and "food for life" will be the driving issues for the future of food processing and consumption. Development of emerging low-stringency technologies to process low-value food by-products will be used to produce new food ingredients and products with added value, and with less impact upon the environment and less resource-usage. People are concerned with mitigating the effects of ageing through targeted food consumption throughout their whole life. The structure of food ingredients and products can be re-designed using novel and minimal food processing technologies to maximise the delivery of health-conferring components that will enhance our quality of life. Research themes to be addressed include: (1) Sustainability issues when processing milk into dairy products, such as greenhouse gas emissions, resource usage, and co-product transformations with added value. Issues surrounding the sustainability of plant- versus animal-based ingredient processing will be explored. (2) Novel food ingredients and products targeting human senescence (anti-ageing strategies), taking a human cell energy approach. (3) Leverage of the protein functionality in dairy protein-based food products with plant proteins. (4) Impact of processing on altering food structures and delivery of nutritional benefits under in vitro digestive conditions. (5) Flavour development from the fat phase in food products. (6) New uses for historically low-value by-products in food manufacture and extraction of maximum value from these components. (7) Development of the underpinning science to create non-dairy milk products by cellular expression of bovine proteins in yeast or bacterial cells and construction of the natural milk protein structures that are important when processing milk into dairy products. (8) Changing on-farm practices to increase the health and nutritional properties of milk. This on-farm connection has the additional aspect of animal welfare by changing the weaning practices of calves from their mother.

SSIF Platform:
Premium Agri-Foods

Key stakeholders and partners:
Riddet Institute, Teagasc, Institute of Materials Research and Engineering (IMRE) of the Agency for Science, Technology and Research (A*STAR), Dairy food processing companies

FY20 funding:
$2,000,000

Project timeline:
2019 – 2020

Project

Towards a circular bioeconomy

Scope

This project will bring together knowledge and capability from the whole of AgResearch to tackle some of the most pressing issues facing this country. Research will focus on the following national and global challenges related to sustainable future food and bio-based production systems: a) halving food-system waste, b) transitioning to carbon sink farming, and c) extracting maximum value from resources. This new project will investigate novel technologies and strategies to increase resource efficiency, reduce pollution to air and water, and produce more food and other bio-based products with minimised inputs, environmental impact, and emissions.

Outcomes from this project will contribute to the rejuvenation of our primary sector to meet national goals and international obligations.

SSIF Platform:
Agri-Food Production, Premium Agri-Foods

Key stakeholders and partners:
TBC

FY20 funding:
$2,000,000

Project timeline:
2019 – 2020

Integrated facilities for research excellence

An important part of the AgResearch strategic review has been the reaffirmation of the criticality of the four campus model in delivering to strategy and balancing national and regional priorities.

In transforming AgResearch to deliver enduring and relevant future value, co-location of people and science across research areas to support transdisciplinary collaboration is critical to enabling enhanced research delivery and optimising resource utilisation including the facilities and farms portfolios.

The four campus model relies on each campus being a vibrant attractor for science talent and partner co-location.

Two major investment streams are progressing to create national research, science, education, and innovation centres at Palmerston North and Lincoln, aligned to the delivery of the two pillars of the refreshed strategy.

Palmerston North Food Science Hub
The development of our national research, science, education, and innovation centre for food science, aligned to the delivery of the world's most sought-after, high-value food and bio-based products is well advanced on the Massey University campus, supporting the largest concentration of New Zealand's food scientists, academics, researchers, and students.

The development will support the following;
- Centre of excellence for food science and safety in collaboration with primary partners Massey University, Plant & Food Research and Fonterra
- New Zealand Food Safety Science & Research Centre
- National centre for agricultural greenhouse gas research and collaboration
- National centre for animal welfare research
- Regionally important research into land use and environmental issues in the central North island, including focus upon the Manawatu River water quality.

The construction of the AgResearch - Massey University Joint Food Science Centre is due for completion in early 2020, with significant work underway to facilitate the expected new ways of working and enhanced business systems and processes.

Lincoln Precinct - Canterbury
The development of our national research, science, education, and innovation centre for land-based food production systems research, aligned to the delivery of the world's smartest and most sustainable land use systems is being planned for Lincoln. This development recognises the fact that the Lincoln precinct is the intersection of a critical mass of relevant education, research, and science resources belonging to AgResearch, Lincoln University, Manaaki Whenua and Plant & Food Research.
It is also expected that the University of Canterbury will increasingly contribute complimentary capability.

In addition, Canterbury, long regarded as New Zealand's breadbasket, is where many of the country's food production challenges are most acute, including fresh and estuarine water quality degradation, land use change and intensification, catchment management,

irrigation, water and nutrient allocation. This is recognised by many of New Zealand's largest agribusiness enterprises and their international partners establishing increasing presence in the region.

These factors provide the opportunity for our farms system research capability to be leveraged in more effective and impactful collaborations than in any other location.

The development will support the following;

- The Lincoln precinct becoming the national centre for land-based systems research bringing together the largest concentration of focussed researchers and academics in the Southern Hemisphere
- The national Bio-Protection Centre – in collaboration with Lincoln University, Manaaki Whenua, and Plant & Food Research
- Our Land and Water National Science Challenge – hosted by AgResearch
- Data Science, systems biology and precision agriculture
- Forage seed production
- Regionally important research into land use and environmental issues in Canterbury and the upper South island
- Collaboration with Ngāi Tahu.

The two major developments will be supported by two critical regional campuses, in which AgResearch will continue to invest to support specific research focus areas.

Ruakura – Hamilton, Waikato

- Regionally important research into land use and environmental issues in the upper North Island
- Environmental research focussed on water quality centred on the Waikato River, Rotorua Lakes, and Lake Taupō
- Biosecurity (Ports of Tauranga and Auckland, and the impending Ruakura inland port)
- Collaboration with existing co-located entities and Innovation Waikato
- Collaboration with Waikato Tainui

Invermay – Mosgiel, Otago

- Regionally important research into land use and environmental issues in Otago and Southland, specifically focused upon water quality and dairy intensification
- Supporting the Southern Dairy Hub (a partnership between AgResearch, DairyNZ and the broader sector) to develop and demonstrate more sustainable production systems
- Specific research to support hill country sheep and beef production systems
- The national centre for deer research
- Collaboration with existing and the expansion of co-located entities
- Closer collaboration with the University of Otago, focused upon environmental and sustainability research, and including the Otago Centre for Sustainability and the Otago Energy Research Centre.

Māori Agribusiness

At AgResearch we recognise that our partners are distinctive because their whakapapa, values, and obligations to the people. The whenua propels Māori businesses towards something different – a supply chain based on Whakapapa, Rangatiratanga, Kaitiakitanga, Whanaungatanga and Manaakitanga.

This is a uniquely Māori business ethos reflecting indigenous value systems that aims to move Māori Agribusinesses beyond business as usual, while providing for communities, reaffirming their culture and honouring their obligations as kaitiaki. This pathway builds opportunity for New Zealand at large. As AgResearch innovates alongside Māori partners developing new indigenous fibre and meat values-based supply chains, we have formed three key Māori Agribusiness research themes to underpin R&D needs.

Māori Agribusiness Research Themes:

- decision-making
- land use diversification
- value chain.

Increasing numbers of our Māori Agribusiness partners are asking AgResearch to co-develop research and development projects that will help extend business operations and interests beyond production into processing and marketing.

This will enable the indigenous story to be taken to the global market place, underpinned by authenticity and the ethic of kaitiaki. Not unlike many New Zealand farmers, our partners have identified that they want ownership of the product from the paddock to the plate, to have a direct relationship with their national and international customers, and to increase the transparency within the supply chain, therefore spreading the risk and returning the wealth to their people.

But where we at AgResearch add value is recognising that unique to Māori Agribusinesses are the aims to produce food and engage with the whenua in a way that honours Māori values, that maintains and restores mauri, and the health of land and waters.

This is an exciting area of development and we look forward to growing our partnerships and connection with the Māori Agribusiness sector.

Māori Agribusiness Project summary
Project summary FY20

Project

Kaitiaki Farm Plan

Scope

The project focuses on training of two senior science cohorts in concepts of kaitiaki as it relates across multiple outcomes of Māori communities, nga uri whakaheke (future generations), marae and kainga, whenua (land and environment), and new target markets. Utilising these concepts, the researchers are working with Māori stakeholders to develop kaitiaki based farm plans that respond to the broader cultural and economic needs of Māori land owners.

The goal is to make significant and lasting impacts for Māori through building the capacity of landowners and trustees to enhance resource stewardship and unlock the potential of their whenua-based assets. Particularly important is taking a whole systems approach that considers multiple values and can explore novel enterprises suited to small land units.

For AgResearch researchers to meaningfully assist with these goals, it is critical to build capability with a deep understanding of, and appreciation for, a unique Te Ao Māori. This project is enabling the researchers and Māori partners to co-develop new tools and apply the knowledge to their individual needs.

Investment area:
MBIE Vision Mātauranga Capability Fund/ AgResearch SSIF

Key stakeholders and partners:
Nga Uri o Te Ngahere Trust, Prime Holdings Ltd, MBIE

FY20 funding:
$120,000

Project timeline:
2017 – 2019

Vision Mātauranga

"To unlock the innovation potential of Māori knowledge, resources, and people to assist New Zealanders to create a better future."

He nui whakaharahara te mahi a AgResearch ki te whakatutuki i ngā whakakitenga mātauranga ki te motu nei, ko te matua kia tautoko ai i ngā huatau tiketike, i te oranga whenua me ngā whāinga taumata angitu o te mātauranga iwi tiketike.

Ki te whakatutukitia, kia toru ngā kaupapa mātua hei pou whirinaki kia taea ai ngā kōwhiringa auaha te whakataki:

- tāria te raukaha kia whakatutukitia te whakawhiti whakaaro, te whakawhiti rangahau me Ngāi Māori
- whakawhanaketia ngā tātai hononga ki a Ngāi Māori
- whakawhanaketia ngā rautaki rangahau kia whai i ngā hiahia nō Ngāi Māori.

Ko tō mātou wero kia kāpia te anga kōrerorero nō te rāngai ahuwhenua nei ki a Ngāi Māori, kia whakawhanaketia hoki ngā hononga motuhake.

Kia tika ai ngā hononga ki a Ngāi Māori, mā mātou anō ngā whāinga o Ngāi Māori e whai. E mate kāinga tahi, e kāinga rua.

Ka whai a AgResearch i te mātauranga me ngā pūkenga o te ahuwhenua Māori ki te whakapuakihia nā te mahi whakaako, nā te whaiaro whanaketanga.

E ai ki te whakataukī, Mā ngā pakiaka tū ai te Kāhikatea i te uru", ki te tākaia ngā kōeke katoa o tō tātou whakahaerenga e ngā tautokotanga tika, ka kitea ngā hua papai nō tātou.

AgResearch has a significant part to play in the delivery of Vision Mātauranga to New Zealand, particularly in the support of its indigenous innovation, environmental sustainability, and indigenous knowledge growth goals.

To achieve this, three priorities have been identified to better enable the delivery of opportunities for innovation;

- build capacity to engage with and deliver research outputs to Māori
- develop meaningful relationships with Māori
- develop research programmes that meet the needs of Māori.

Our challenge is to bridge a communication gap between Māori and the sector and to develop long-term relationships.

It means a re-focusing of the way we partner with Māori entities – ways that are more in tune with the way Māori make decisions. Two strategies are better than one.

We are ensuring that AgResearch has the knowledge and skills to deliver on AgResearch's Māori specific impacts through learning and development initiatives.

As the Māori proverb, 'With the right roots, the Kāhikatea can withstand the storm' explains, if we wrap ourselves with the right support at every level of the organisation we will have impact and visibility.

Our people

The successful delivery of our new Science Plan will only be achieved by ensuring that we have the right people doing the right work, in the right place, at the right time.

AgResearch has a new Science Plan and we must ensure that we have the right people, with the right capability to deliver on that plan. We are supporting this objective through the work we are undertaking on;

- attraction, recruitment, and retention strategies
- leadership development
- developing a diversity and equity programme
- change management framework
- workforce planning
- talent / succession management
- the implementation of a Human Resources Information System (HRIS)
- enhancing our employee experience
- research capability mapping to ensure that our future science knowledge and experience will continue to meet emerging science priorities
- mentoring programme
- Mātauranga Māori (MM).

Our new facilities at Massey and Lincoln Universities present an exciting opportunity for our people to work in modern lab and work environments but more importantly these buildings will be the catalyst for us to fully realise our New Ways of Working (NWOW). Our NWOW philosophy encompasses enabling technology, enhanced collaboration practices and spaces, increased efficiency, streamlined processes, a greater integration of Mātauranga Māori into our 'every day' and enhanced well-being for our people.

Ngā Tāngata

AgResearch staff:

374 Female | **324** Male

AgResearch has a key focus on our culture and the engagement of our people. We are working closely with our science teams on strategies and initiatives that will engage a research population. A critical focus remains the bringing to life of Our Values across the organisation.

This culture work is further supported by a comprehensive learning and development programme which is fully aligned to organisational strategy and includes a leadership development programme which is intended to develop a range of stakeholders, from our emerging leaders to our Executive Team. We are currently developing a 'whole person' leadership initiative which, when launched, will cascade into our supporting systems and processes like Science Career Descriptors, our Promotions process, our Remuneration Framework etc.

Our employees value and celebrate our workforce diversity and appreciate the flexibility that working for AgResearch offers them. Our employee support programme is extensive and is aimed at providing counselling and other services to help our employees through those difficult times in life. This goal is also supported by the income protection and life insurance benefits that AgResearch extends to our full-time employees which offer the ultimate peace of mind - when times get tough.

The implementation of HRIS will allow line managers to have a single source of truth and a comprehensive array of employee data at their fingertips. The system functionality will automate many current manual processes and is intended to support increased efficiency and a higher level of productivity in the people management space.

Our Values

Our Values represent the attributes that are innate to those who will drive the success of our organisation.

Aligned to government priorities

Our science investments run in parallel to the framework and expectations set by government. We pursue activities that can sustainably transform New Zealand's agricultural systems, including addressing production, land management, and biosecurity.

The elements considered in our approach to the challenges of sustainable farm systems and primary production that is based on science and informed research include environmental impact, social acceptability, ethical and cultural responsibility, regional prosperity, as well as the improved economic return to New Zealand and New Zealanders.

AgResearch's focus and direction within this framework is informed by regional, national and global collaborators, by our Science Advisory Panel, and government, ensuring these priorities remain at the heart of our Core Purpose. Our research focuses on delivering impact and enhancing the well-being of all New Zealanders through innovative and sustainable science that is solutions-driven and meets the demand of the global marketplace. Changes in the rapidly evolving science sector and accompanying societal expectations requires the support of agile, high-quality research. AgResearch has a broad and multi-disciplinary capability that focuses on agri-technology, bio-based food products, premium products, social science meeting the complex challenges of communities, and meeting and identifying research opportunities for commercial and public good.

Current and emerging trends are driving agri-products, economic, social and consumer tastes, influencing land-based research priorities and capability requirements. We are actively involved in catalysing new collaborative arrangements to meet these current and future trends to support our agri industry partners to meet market demands. This is demonstrated through our collaboration with regional, national and global organisations, the National Science Challenges, initiatives such as the NZ Food Safety Research & Science Centre,

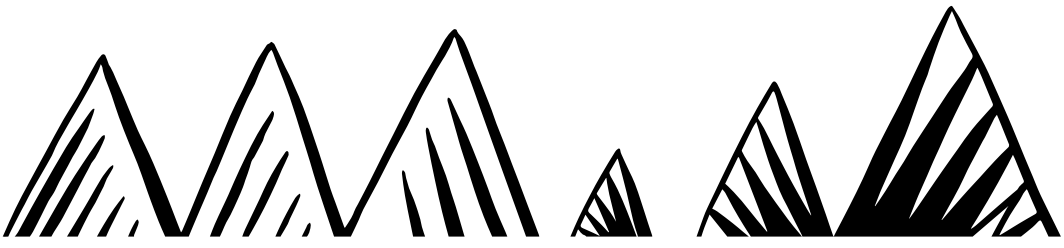
collaborating with innovation brokers Callaghan Innovation, MBIE's Innovative Partnerships team, along with commercialisation with partners from the private sector. Our focus includes transitioning New Zealand's primary industries to higher value products and exports and delivering impact in terms of export revenue returned to New Zealand.

Our high-quality science informs decision-making in regional and national policy in the areas of primary production, climate change, and environmental sustainability. Our industry-focused engagement and our provision of research capability and expertise enables our industry partners to satisfy global consumer demand for premium products and innovative foods.

Our research is aligned to the government's three fundamental objectives for climate change policy and New Zealand's transition to a net zero emissions economy in support of New Zealand's commitment to the Paris Agreement on climate change, and include the outcomes of the government's proposed Zero Carbon Bill (ZCB) to be taken into account.

In line with the government's direction to lower emissions AgResearch's collaboration with leading international and New Zealand based researchers includes research in vaccines and inhibitors, nitrogen fixing, and carbon storage in soil and pasture. Our collaboration with other researchers supports the Government Research Alliance (GRA) and enables our participation in the Global Partnerships in Livestock Emissions Research (GPLER), helping frame international understanding on emissions. Our Science Plan is focused on sustainably transforming agricultural for profitable premium production, supporting new land-based enterprises and practices that enable and support the diversification of our export base, progressing from commodity driven exports to value added premium products, and capturing value along the value chain. Our research investment is cognisant of consumer demands and the need to diversify our economy supporting landscapes and introducing novel methods and products, such as sheep and goat dairy milk.

AgResearch understands the research needs in revolutionising the primary sector and this includes undertaking activities such as building expertise, capability, and capacity for New Zealand's research sector. This includes planning for impact and management systems for the improvement in performance through professional project management systems, risk management, and monitoring and evaluation of projects and programs.



Niho Taniwha

Sustainable future roadmap

The Climate Change Response (Zero Carbon) Amendment Bill sets out the government's plan for the next 30 years, including new emissions reduction targets for all greenhouse gases in line with New Zealand's commitments under the Paris Agreement.

As a Crown Research Institute, AgResearch fuels innovation and new market creation in the field of land-based research and is a key contributor and sponsor of research that will reduce emissions from agriculture and provide forewarning of the impacts of climate change in pastoral agriculture.

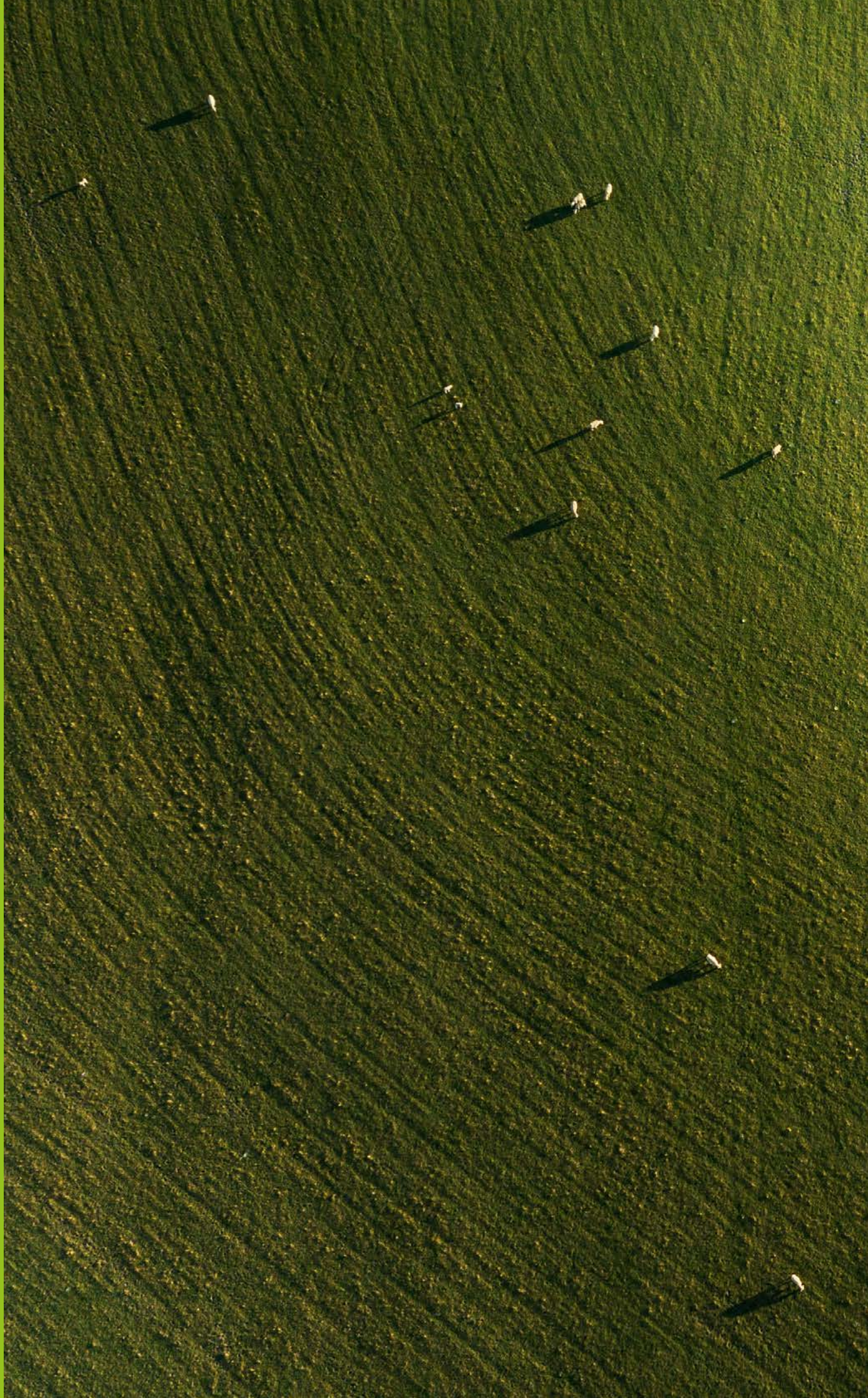
But we acknowledge that aspects of our business can have both positive and negative impacts on the environment. Our vision is that our management of the environment is consistent with our level of innovation and improvement in science research and that we are directors and influencers of positive environmental change.

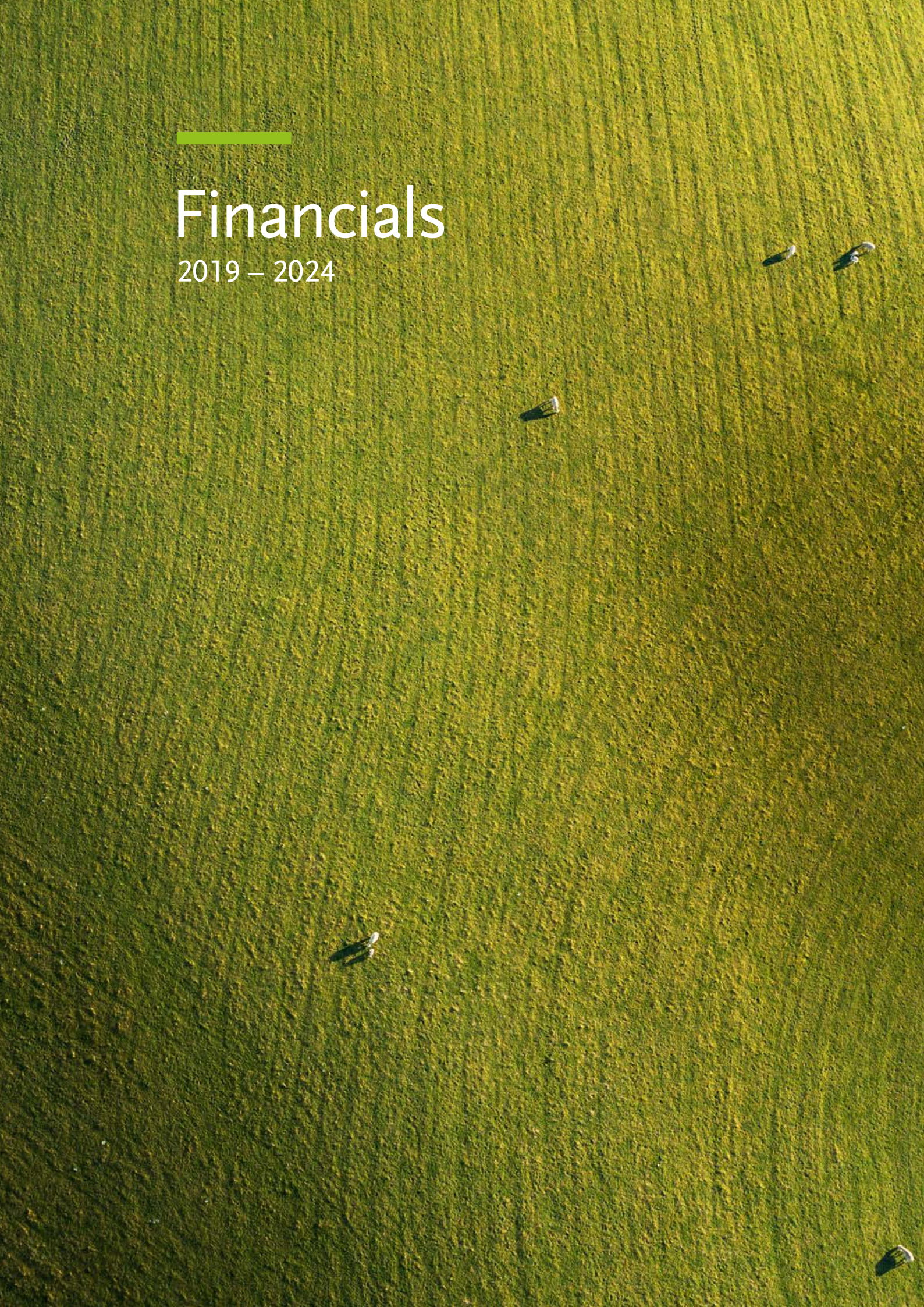
In turning a critical eye to our own environmental performance AgResearch has engaged Enviro-Mark Solutions CEMARS, a world-leading independent carbon emission management and reduction scheme, to ensure that our Sustainability Strategy and emissions reduction targets are both science-based and business tested.

To implement innovative long-term solutions, and embed sustainability within our business, we are focused on transitioning to strategic, systematic, and integrated core business processes that are deeply aligned to our sustainability vision and organisational values.

With the government's zero carbon aspirations at front of mind, AgResearch will be using science-based target setting methods to develop carbon reduction targets to ensure the transformational action we take going forward is aligned with current climate science.

By moving environmental sustainability from a peripheral concern to one that is at the core of our business, we are uniting our desire to improve economic performance with our ability to make a difference to climate resilience right now.





Financials

2019 – 2024

Financial results 2019 – 2024

The financial results show modest growth throughout the forecast period.The following table shows the operating revenue from FY2019 through to FY2024, showing a normalised position from FY2021.

At a surplus before tax level the group is forecasting losses through to FY2021 as it completes some campus developments, further development is budgeted through to FY2024 returning projected nominal surpluses.

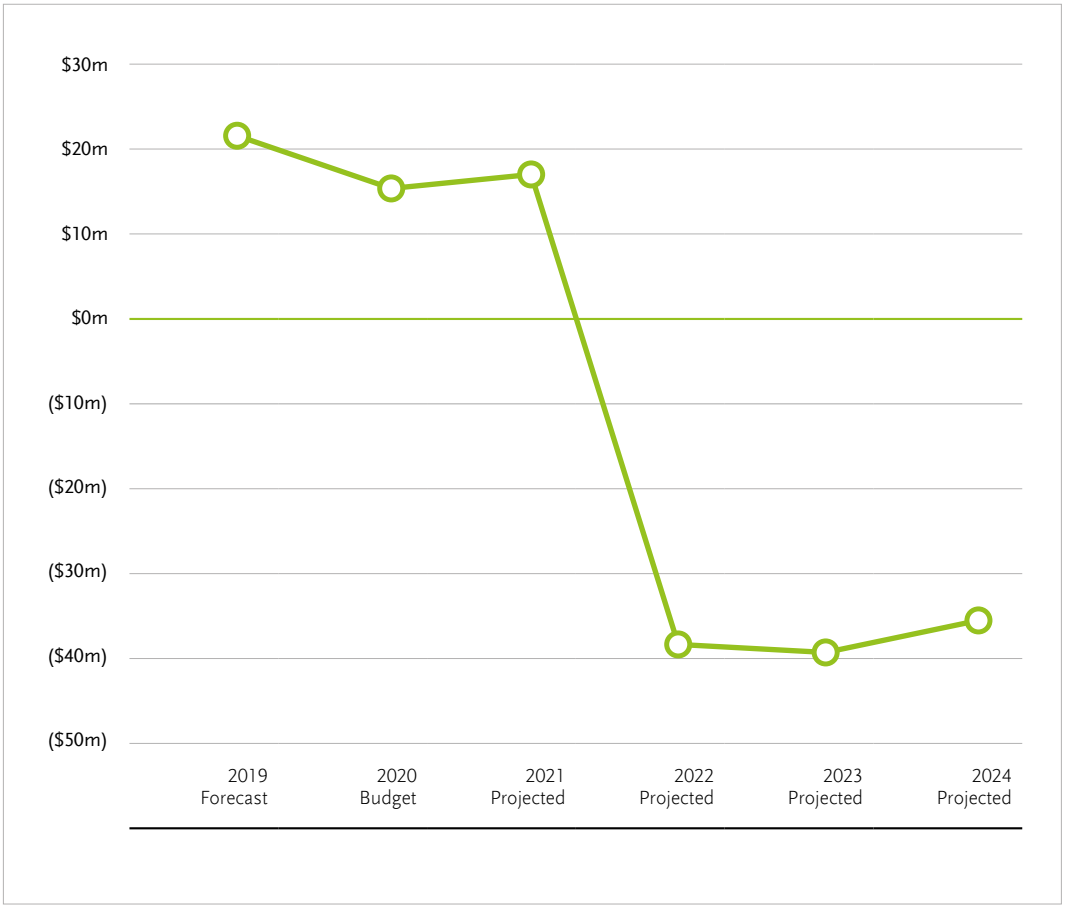
Overview of projected financial performance for the 6 years ended 30 June 2024

Financial year Type	2019 Forecast $000's	2020 Budget $000's	2021 Projected $000's	2022 Projected $000's	2023 Projected $000's	2024 Projected $000's
Operating revenue	157,037	155,182	156,632	157,869	162,760	166,079
EBITDA	11,218	10,080	13,420	13,859	16,253	15,692
Surplus (deficit) before tax	(8,282)	(4,484)	2,901	2,581	1,661	263
Total Equity	240,526	237,297	239,386	241,244	242,440	242,629

Financial Performance Indicators

Financial year Type	2019 Forecast	2020 Budget	2021 Projected	2022 Projected	2023 Projected	2024 Projected
Cashflow						
Net cash flow from operating activities	(4,867)	9,476	26,247	13,752	14,158	15,007
Net cash flow from investing activities	(19,453)	(16,860)	(24,014)	(69,140)	(15,006)	(11,522)
Net cash flow from financing activities	(200)	-	-	39,243	849	(3,485)
Effect of exchange rate changes						
Total net cash flow	**(24,520)**	**(7,384)**	**2,234**	**(16,145)**	**(0)**	**0**
Cash at the beginning of the year	46,315	21,795	14,412	16,645	500	500
Cash at the end of the year	**21,795**	**14,412**	**16,645**	**500**	**500**	**500**
Ratios						
Operating Margin	0.5%	(1.3%)	1.4%	1.7%	2.0%	1.1%
Operating Margin per FTE	1.2	(3.0)	3.4	4.0	5.0	2.7
Revenue Growth	9.0%	(1.2%)	0.9%	0.8%	3.1%	2.0%
Quick Ratio	1.5	1.5	1.1	0.7	0.8	0.8
Interest Coverage	(0.8)	7.7	(2.9)	38.5	2.0	1.2
Operating Margin Volatility (FC/TC)	23.9%	25.2%	26.7%	26.7%	26.9%	29.8%
Forecasting Risk %						
Adjusted Return on Equity	(5.8%)	(2.4%)	1.5%	1.3%	0.9%	0.1%
Capital Renewal						
Equity Ratio	81.8%	82.7%	79.0%	70.1%	70.0%	70.7%

Net Cash/(Debt) Position



Note: It should be noted that the financial projections utilise a base case assumption around the ownership and funding model for the Lincoln facility development.
As part of the single stage business case development for the project, alternative ownership and funding models for the Lincoln development are continuing to be assessed with the objective of delivering the best fit for purpose facilities in the most fiscally responsible manner.

Non-financial targets 2019 – 2024

Core Operating Indicators

ID	Indicator	Definition	FY20 target	FY18 actual
G.1	End user collaboration	Revenue per FTE from commercial sources.	$115.9k	$121.8k
G.2	Research collaboration	Publications with collaborators (Percentage of publications with a) only AgResearch authors, b) with other New Zealand authors, c) with international authors or d) with a combination of New Zealand and international authors).	a) 14% b) 39% c) 26% d) 21%	10% 36% 32% 22%
G.3	Technology & knowledge transfer	Commercial reports per scientist FTE.	1	1.25
G.4	Science quality	Impact of scientific publications. (The average value of 2-year citations per document for scientific journals assessed by SCImago in which AgResearch staff published during the year, weighted by the number of AgResearch publications in each journal. The reference figure is for the 2014 calendar year).	2.7	2.99
G.5	Financial indicator	Revenue per FTE, based on average FTEs over the year.	$225.4k	$229.6k

AgResearch-specific indicators of End-User Engagement and Science Relevance

ID	Indicator	Definition	FY20 target	FY18 result
1.1	External Stakeholder Engagement	Consistent implementation of agreed Stakeholder Services Plans.	Achieved	Achieved
1.2		Stakeholder Relationship measure – "Very Good" or "Better" satisfaction rating.	>60%	58%
1.3		Satisfaction with our Service – "Very Good" or "Better" satisfaction rating.	>70%	64%
1.4		Dealing with Us – "Preference to Work" rating.	>60%	68%
1.5		Familiarity with our Capability – "Very Familiar" rating.	>40%	32%
1.6		Contribution to Stakeholder Strategy – "Good or "Better" rating.	>90%	83%
1.7	Internal Stakeholder Engagement	Consistent implementation of agreed Science Service / Interaction Plan.	Achieved	Achieved
1.8	Revenue from stakeholders	a) total revenue; b) total net science revenue; c) commercial revenue; d) IP revenue; e) international revenue; f) Māori revenue.	a) $155.4m b) $114.6m c) $54.7m d) $10.9m e) $4.07m f) $0.335m	a) $145.8m b) $105.2m c) $48.6m d) $11.03m e) $3.2m f) $0.279m

AgResearch-specific Operating Indicator of Delivery to Vision Mātauranga

ID	Indicator	Definition	FY20 target	FY18 result
2.1	Collaboration with Māori	Cultivate collaboration to support Māori agribusiness by co-developing funding proposals with stakeholders.	6	6

AgResearch-specific workforce indicators

ID	Indicator	Definition	FY20 target	FY18 result
3.1	Staff engagement	Increase Engagement Index (EI) by 5 points.	70%	65%
3.2	Health & Safety	No notifiable injuries and <2 notifiable events.	<2%	0%
3.3	Employee engagement with Health and Safety	Employee engagement index of Health & Safety within AgResearch increases with >75% score.	>75%	75%

AgResearch-specific financial performance

ID	Indicator	Definition	FY20 target	FY18 result
4.1	Financial Target	Operating Profit budget achieved.	Achieved	Achieved

Miscellaneous items

AgResearch's accounting policies

AgResearch's financial statements are prepared in accordance with the requirements of the Companies Act 1993, the Financial Reporting Act 2013, the Crown Research Institutes Act 1992, the Public Finance Act 1989, and Generally Accepted Accounting Practice in New Zealand (NZ GAAP). The financial statements, including the financial information presented in this Statement of Corporate Intent, comply with the New Zealand Equivalents to International Financial Reporting Standards (NZ IFRS) and other applicable financial reporting standards as appropriate. A full Statement of Accounting Policies is provided on AgResearch's website at www.agresearch.co.nz. There have been no material changes in accounting policies since the 2017 Annual Report.

Principles in determining the annual dividend, if any

The Company's policy is that it will return surplus cash to shareholders in the form of a dividend when no sound investment opportunities (including reinvestment, commercialisation, capital expenditure and the retention of important capabilities) exist.

It is forecast that no dividends will be paid in the year ending 30 June 2019.

Information to be provided to the Shareholding Ministers during the financial year

AgResearch provides Shareholding Ministers with the following documents and information throughout the year:

Quarterly Reports

These include:

- Financial statements
- Comparisons with budgets and comments on financial activities for the quarter
- Comment on research achievements and comparisons of such achievements with business plans.

Half-Year Report

This includes:

- Unaudited financial statements and notes (including accounting policies) for the half year, within two months of the half year
- Comparative figures for the corresponding period of the previous financial year
- Commentary on operations and overall performance for the period
- A statement of responsibility
- A statement that the CRI has operated during the period in accordance with the principles set out in Section 5 of the Crown Research Institutes Act 1992 and the Companies Act 1993
- Commentary on progress towards achieving annual performance targets (financial and non-financial).

Annual Report

An Annual Report of the operations of AgResearch is delivered to the Shareholding Ministers within three months of the end of each financial year. In it, the Board sets out:

- Audited consolidated financial statements for the financial year, consisting of:
  - A report of the operations of AgResearch and its subsidiaries
  - Statements of financial position, comprehensive income and cashflows, including budget (as established at the beginning of the year in the SCI); and
  - Statements of commitments, contingent liabilities, accounting policies and such other statements as may be necessary to show the financial results of the operations of AgResearch and its subsidiaries during the financial year and their financial position at the end of the period
- Comparative information for the previous financial period
- The auditors' report on these financial statements
- A statement of responsibility
- A report on AgResearch's performance as a good employer

- A corporate social responsibility report
- A report against financial and non-financial performance indicator targets set in the SCI
- A response to any direction given by the Shareholding Ministers.

The Annual Report will comply with the annual reporting provisions in Part V of the Public Finance Act 1989, Section 17 of the Crown Research Institutes Act 1992 and the Companies Act 1993.

Procedures to be followed before any member of the group subscribes for, purchases, or otherwise acquires shares in any company or other organisation

As required by section 13(1)(d) of the Crown Research Institutes Act 1992, AgResearch will not acquire:

- Shares that give it substantial influence in or over a company
- An interest in any partnership, joint venture, or other association of persons, or
- An interest in a company other than in its shares, except after written notice to the shareholding Ministers.

The Board will obtain prior written consent from Shareholding Ministers for any transaction or series of transactions involving a full or partial acquisition, disposal or modification of property (buildings, land, and capital equipment) and other assets with a value equivalent to or greater than $10m. The Board will obtain prior written consent for any transaction or series of transactions with a value equivalent to or greater than $5m involving:

- The acquisition or disposal, in full or in part, of shares or interests in a subsidiary, external company or business unit
- Transactions that affect a company's ownership of a subsidiary or a subsidiary's ownership of another entity (provided that transactions which include "drag-along" clauses that compel AgResearch to sell interests at a future date at the direction of the investors shall be valued at the time of the investment transaction), and
- Other transactions that fall outside the scope of the definition of the company's core business or that may have a material effect on the company's science capabilities.

The Board will advise Shareholding Ministers in writing before entering into any transaction related to property and commercialisation activities below this threshold in accordance with notice requirements agreed between the Ministers and AgResearch from time to time.

Activities for which the board seeks compensation from the Crown

At the date of this SCI, no compensation has been sought from the government.

Current commercial value of AgResearch

The Board's estimate of the current commercial value of the Group is approximately $230m. This value is based solely on the forecasted Group equity positon determined under NZ GAAP which the Board considers is a reasonable approximation of the commercial value. The Board note that the Group revalues its land, land improvements, and buildings every three years, or more frequently where market and other factors indicate their stated book value may not reflect their current fair value. AgResearch does not revalue its intangible property rights.

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