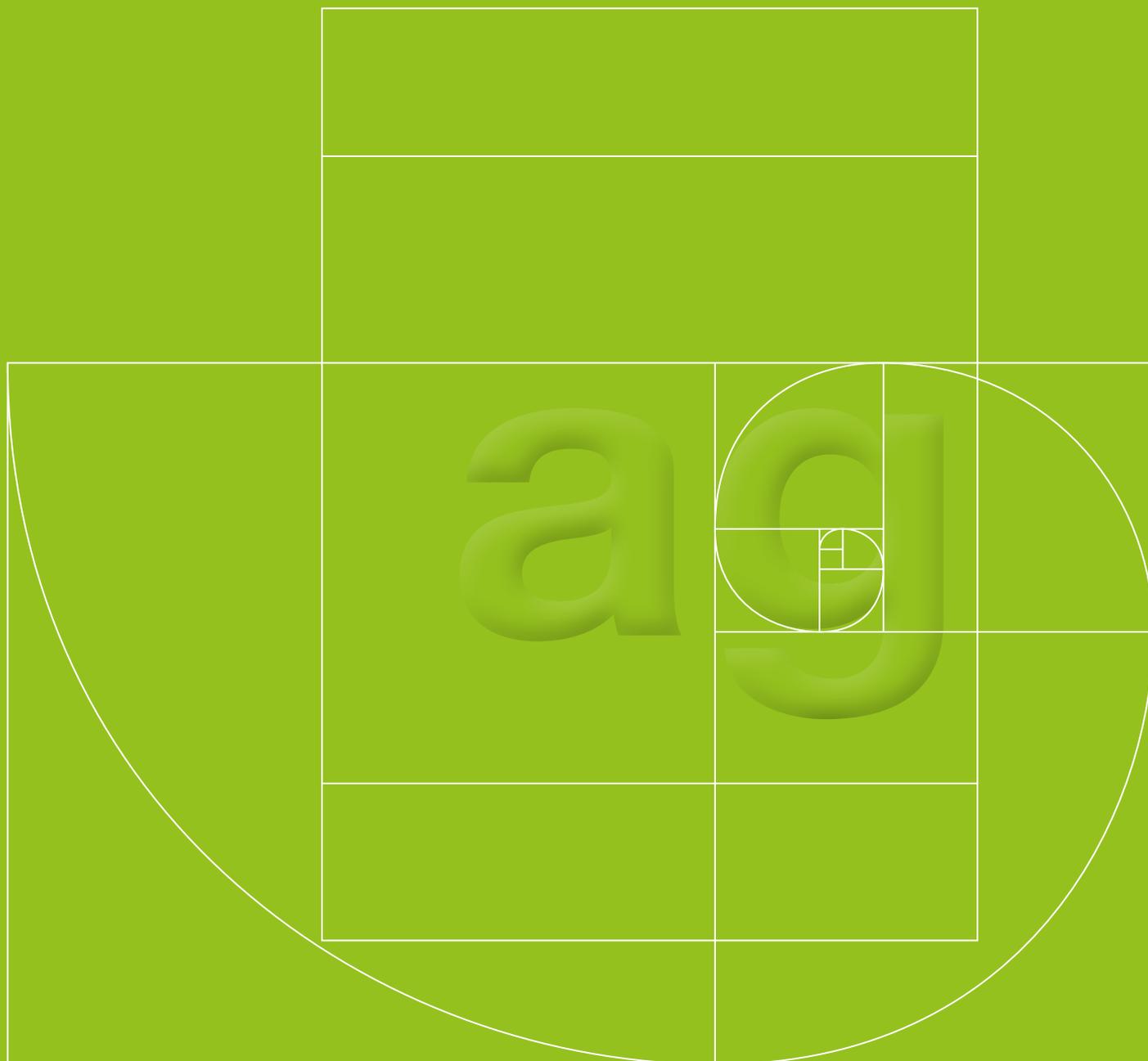


Annual Report

Rīpoata ā-tau

2020



Contents

Rārangī take

About us	02
Chair and Chief Executive's review	04
Responding to COVID-19	08
Our strategy	12
Our strategic direction	14
Alignment with Government priorities	17
Integrated research facilities	18
Our Science Plan	20
Supporting our Science Plan	24
Our research	26
Protected, enhanced and sustained natural resources	28
Prosperous land-based enterprises	32
Added-value foods and bio-based products that meet consumer needs	36
Our stakeholders and partnerships	40
Stakeholder engagement	42
Māori agribusiness	46
Our collaborations	50
National Science Challenges	54
Our international connections	60
Outreach	64
Our people	68
People and culture	70
Celebrating our people	76
Science New Zealand awards	78
Rewarding excellence within AgResearch	80
Corporate governance	82
Our Board	84
Statutory reporting – Board	88
Our Executive Leadership Team	90
Statutory reporting – Company	92
Performance indicators	94
Key performance indicators	96
Financials	100
Financial performance indicators	102
Consolidated statement of comprehensive income	103
Consolidated statement of financial position	104
Consolidated statement of changes in equity	105
Consolidated statement of cash flows	106
Statement of accounting policies	107
Notes to and forming part of the consolidated financial statements	116
Auditor's report	138
Directory	143

About us

Ko wai mātou

AgResearch is one of seven Crown Research Institutes in New Zealand. We are responsible for delivering innovative science and research outcomes specifically for the agricultural sector.

Our approximately 700 staff, spread throughout New Zealand, drive economic and environmental sustainability for New Zealand's food production systems. We meet three overarching goals on behalf of the New Zealand Government: to help

foster and support prosperous land-based enterprises; to produce research that protects and enhances natural resources in a sustainable fashion; and to contribute scientific understanding to added-value foods and bio-based products to meet evolving consumer demands.

We have two national centres of excellence, in Palmerston North and Lincoln, and two regional centres of excellence in Ruakura and Invermay.



■ Research Centres

Ruakura – Hamilton
Grasslands – Palmerston North
Te Ohu Rangahau Kai – Palmerston North
Lincoln – Canterbury
Invermay – Mosgiel

□ Research Farms

Tokanui – Te Awamutu
Ruakura – Hamilton
Aorangi – Palmerston North
Ballantrae – Manawatu Gorge
Kaitoke – Upper Hutt
Woolfords Block – Bulls
Lincoln – Canterbury
Invermay – Mosgiel
Woodlands – Invercargill



Chair and Chief Executive's review

Ngā arotakenga o te Heamana me te Tumuaki Whakahaere

AgResearch is New Zealand's leading agricultural science institute for land-based and food systems research. It has a clear mandate to enhance the value, productivity and profitability of New Zealand's pastoral, agri-food and agri-technology sector value chains to contribute to economic growth and beneficial environmental and social outcomes for New Zealand.

In a time of exceptional change for the agricultural sector as a result of climate change, evolving consumer demands and preferences, fast-moving technological advancements and rapid population growth worldwide, the impact of COVID-19 on international markets and supply chains has brought additional and complex challenges to bear. AgResearch is well placed to make a significant and enduring contribution to the sector's future prosperity through relevant, agile and adaptable science, and thought leadership.

AgResearch ends the 2019/20 financial year ready to support the agricultural sector to successfully tackle the opportunities and challenges of 2020/21 and beyond. Support from the Government in this regard has been crucial. AgResearch was pleased to receive additional government funding for our work through the COVID-19 Response and Recovery Fund and a contribution to the new facility in Lincoln. This funding support, coupled with our emphasis on fiscal responsibility in recent years, has meant that we were able to finish the year in a solid position, well prepared for the year ahead.

This year, in addition to navigating the unprecedented initial impacts of COVID-19 over the last two quarters of 2019/20, we made substantial progress on our strategic position and four-campus model, and delivered a range of exciting science outcomes. Our vision of driving prosperity through transforming agriculture 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. We engaged with Government through the Ministry of Business, Innovation and Employment's (MBIE's) AgResearch science review while Te Pae Kahurangi, MBIE's collective Crown Research Institute (CRI) review, informed our strategic thinking. Subsequently our strategic direction is being reviewed and refreshed, with three pillars identified that will underpin our priorities for the coming year and beyond. Our focus is on doing excellent science while maintaining financial stability to create the AgResearch that New Zealand deserves.

Our four-campus model with national centres of excellence in Palmerston North and Lincoln, and regional centres of excellence at Ruakura and Invermay, was reaffirmed as part of this strategic refresh. Our goal remains to have the right people in the right place, doing the right work at the right time, with the right facilities.

In 2019/20, we completed Te Ohu Rangahau Kai, our joint food science hub with Massey University in Palmerston North. This facility was explicitly designed for collaboration, and is a key part of the Food HQ food science community in Palmerston North. We anticipate Te Ohu Rangahau Kai will significantly increase the visibility and credibility of New Zealand food science nationally and internationally. Our people are operating out of this facility, and we are excited at the prospect of the benefits coming to fruition in years ahead.

We also submitted a single-stage business case for a new world-class facility in Lincoln to shareholding Ministers in October 2019, and received consent to proceed with the project following approval of an implementation business case in June 2020.

Increasing the breadth and depth of stakeholder engagement and building collaborations and new partnerships remained a strong focus during 2019/20.

To enhance our commitment to Te Ao Māori and Mātauranga Māori, we increased our Māori agribusiness capability by adding resource to enhance our strategic partnerships and develop Māori agribusiness research priority areas and strategic research direction. Our Te Ao Māori strategy is being developed. This strategy will guide our activities and priorities in this important area.

We also continued to develop opportunities with international stakeholders, partners and collaborators. This has included conducting workshops in China with key customers to identify areas that have mutual benefit to China and New Zealand and develop research collaboration and long-term partnerships. We were also pleased to sign a new memorandum of understanding with Japanese company Shiratori Pharmaceutical. This partnership will investigate whether an identified probiotic can be commercialised for the food and beverage market.

Once the pandemic began affecting international travel, we worked hard to remain connected with stakeholders and customers virtually.

We celebrated many science successes this year. For example, in a world first, New Zealand sheep farmers now have the ability to breed animals that emit less methane. In partnership with the Pastoral Greenhouse Gas Research Consortium (PGgRc) and the New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC), innovative AgResearch science was able to breed sheep that produce less methane from their grass diets. With this science reaching the industry late in 2019, this 10-year research project has the potential to reduce New Zealand's agricultural methane emissions.

We also completed the first phase of our New Zealand Bioeconomy in the Digital Age platform, which saw us develop a range of proofs of concept, spread across outcome areas. Examples are enabling users to choose the best portfolio of enterprises for their unique circumstances, building consumer confidence and trust in product provenance, enhancing the provenance of products with a unique Māori story, and harnessing and unleashing the power of data to guide decision-making and reveal alternative solutions.

Included in the proofs of concept are some very exciting and innovative projects, such as:

- HyperFarm, a visualisation tool that will help farmers identify new land-use opportunities
- A low-cost sensor for verifying specific milk attributes on-farm
- A new facial expression measure that contributes to the sector's ability to verify animal welfare
- A new algorithm to predict farm profitability and productivity based on farm typology, soil and climate data through FARMAX
- A sensor-based herd test for identifying individual cow urination characteristics to mitigate farm nitrogen loss
- An automated system to integrate sensor and other water quality data collected at remote sites into an information package
- A prototype sensor and algorithms for measuring the rate of an individual animal's feed intake.

Phase 2 of the programme to develop these and other novel and innovative concepts further is now under way. This research platform is a great example of the bold, transformational and impactful science AgResearch is focused on delivering for the future prosperity of the primary sector.

As in past years, financial strength remained a core focus in 2019/20. Our commitment to financial viability saw us through the worst of the initial impacts of the pandemic, when many of our staff could not undertake their research and some stakeholders and partners had to delay or reassess contracted or planned work. Inevitably, this had an adverse impact on our financial position and our projections for the coming year. In addition to implementing cost-saving initiatives in the last quarter of the 2019/20 year, we continued to deliver contracted science and assessed opportunities for savings over the medium term to ensure the financial sustainability of the organisation. As we look to the coming year, it is clear that further impacts will follow as the effect of the response to COVID-19 on our stakeholders becomes more apparent. Our financial forecasts take this into account.

Throughout the year, and particularly the last half of 2019/20 with the onset of COVID-19, the health, safety and wellbeing of our people were front of mind. During the lockdown phases of the pandemic response, AgResearch supported our people to work in different ways. We also supported those of our staff deemed “essential workers”, due to their responsibilities in looking after national collections and animal welfare, throughout the heightened alert level periods.

We look forward to building on the momentum of our achievements this year to support the primary sector, and New Zealand's economy, to successfully meet the challenges that lie ahead.



Dr Paul Reynolds QSO
Chair,
AgResearch

A handwritten signature in black ink, appearing to read 'Paul'.



Tony Hickmott
Acting Chief Executive,
AgResearch

A handwritten signature in black ink, appearing to read 'Tony'.



Dr Sue Bidrose
Chief Executive Officer,
AgResearch

A handwritten signature in black ink, appearing to read 'Sue'.



Responding to COVID-19

Ngā urupare ki te KOWHEORI-19



Above: AgResearch's Dr Gale Brightwell is researching a potential light sterilisation method for COVID-19.

While New Zealand has responded well to the first months of COVID-19, the medium- to long-term effects of the virus on the economy are still emerging. The primary sector, like all industries, has been unavoidably impacted.

Despite this, data is showing that the primary sector is driving much of New Zealand's economic recovery, with primary industries' export revenue tracking higher than the previous year. AgResearch is working hard to support the sector to contribute to the nation's recovery by engaging closely with our stakeholders to understand the impact of the pandemic, particularly on our strategic intent, and by providing thought leadership and innovative science and technologies. We are also contributing our expertise and facilities to the COVID-19 response for New Zealand.

For example, AgResearch and our partners secured funding to develop a unique technology using different forms of light to kill the virus causing COVID-19, and other harmful viruses that can linger in commercial and public places. Scientists from AgResearch will work with Massey University and Christchurch company Energylight Group Ltd to research a combination of different types of light that can be used to sanitise surfaces and circulating air, particularly where industrial-scale use of chemical disinfectants or other sterilisation methods are unsuitable.

Supporting our people

Our pandemic response plan guided our activities during the initial response to the pandemic, and the gradual return to work during Alert Levels 2 and 1. In preparation for Alert Level 4, we developed guidance documents on remote working and online support forums, and then our people leaders regularly checked in with their staff throughout the remote working period. Clear guidance was developed, and support provided, for staff deemed “essential” and who would remain working on our laboratory and field sites throughout Alert Level 4.

Preparation for working at Alert Levels 3 and 2 was undertaken in anticipation of the lifting of Alert Level 4 in late April. The primary focus at that stage was to provide increased on-site access to approximately 191 mostly science-based staff who were identified prior to the lockdown as unable to undertake the majority of their normal duties from home because their work requirements revolved around laboratories, other science facilities, or farm or field work.

AgResearch’s approach to Alert Level 3 was for the majority of our people to continue to work from

home. However, we sought to define and approve priority work related to on-site science activities at our campuses, farms and field sites. This saw increased science-based activity in our laboratories, animal and greenhouse facilities, and travel to regionally constrained AgResearch farms and field-sites. This work was approved only where it could be done in a safe manner. AgResearch ensured access to our campuses, farms and field sites was strictly monitored and enforced.

Thanks to our digital platforms, supported by training, those of our staff who could work from home were able to do so productively. In addition, through our staff wellbeing programme our people were well looked-after, remained connected with their workplace and were kept informed throughout the heightened alert level period. AgResearch showed flexibility, resilience and innovation during what was a testing and often anxious time for many of our people.

Below: AgResearch’s Ancy Thomas working under level 3 COVID-19 restrictions in the lab.



Financial viability and science delivery

Maintaining financial viability for AgResearch was a key priority this year.

For AgResearch, the critical effect of the virus was on our revenue streams. The inability to perform both laboratory- and farm-based science during Alert Level 4 had an immediate and significant impact on AgResearch's ability to deliver projects, and consequently on our revenue. This was mitigated somewhat by a safe and managed return to work for some of our science staff at Alert Levels 3 and 2, and further by the return to Alert Level 1 in June.

AgResearch implemented initiatives early in the 2020 calendar year to more closely monitor progress on each of our projects, particularly those most clearly at risk from COVID-19 effects. We took a proactive approach by determining what science programmes and projects we could deliver and should prioritise in the last quarter of the 2019/20 year. We also worked hard to maintain constructive discussions with our stakeholders around reprioritising contract milestones to match our ability to deliver under the operating constraints.

Some projects will inevitably be permanent losses rather than a revenue shift to future years. Others may continue but require some change, such as adding in a full season or year so they can re-engage at the correct time in the production cycle or taking a different approach to deliver the outcomes intended.

Our efforts are now concentrated on building an understanding of the longer-term potential impacts of COVID-19 on the research and development plans of our stakeholders. Our focus over the last 12 months has been on enhancing engagement with existing stakeholders and business development to build diversity and resilience into our stakeholder base.

AgResearch appreciates it will take some time to develop insight into the longer-term impact of the virus, as many of our commercial stakeholders are grappling to understand the impact of COVID-19 on the operating environments within key export markets. The longer-term impact is somewhat dependent on how consumers and supply chains respond in a post-pandemic world.

Once this becomes clearer, opportunities for AgResearch and the primary sector to meet and leverage the changes in consumer demand will be more apparent. We are ready to act when they do.

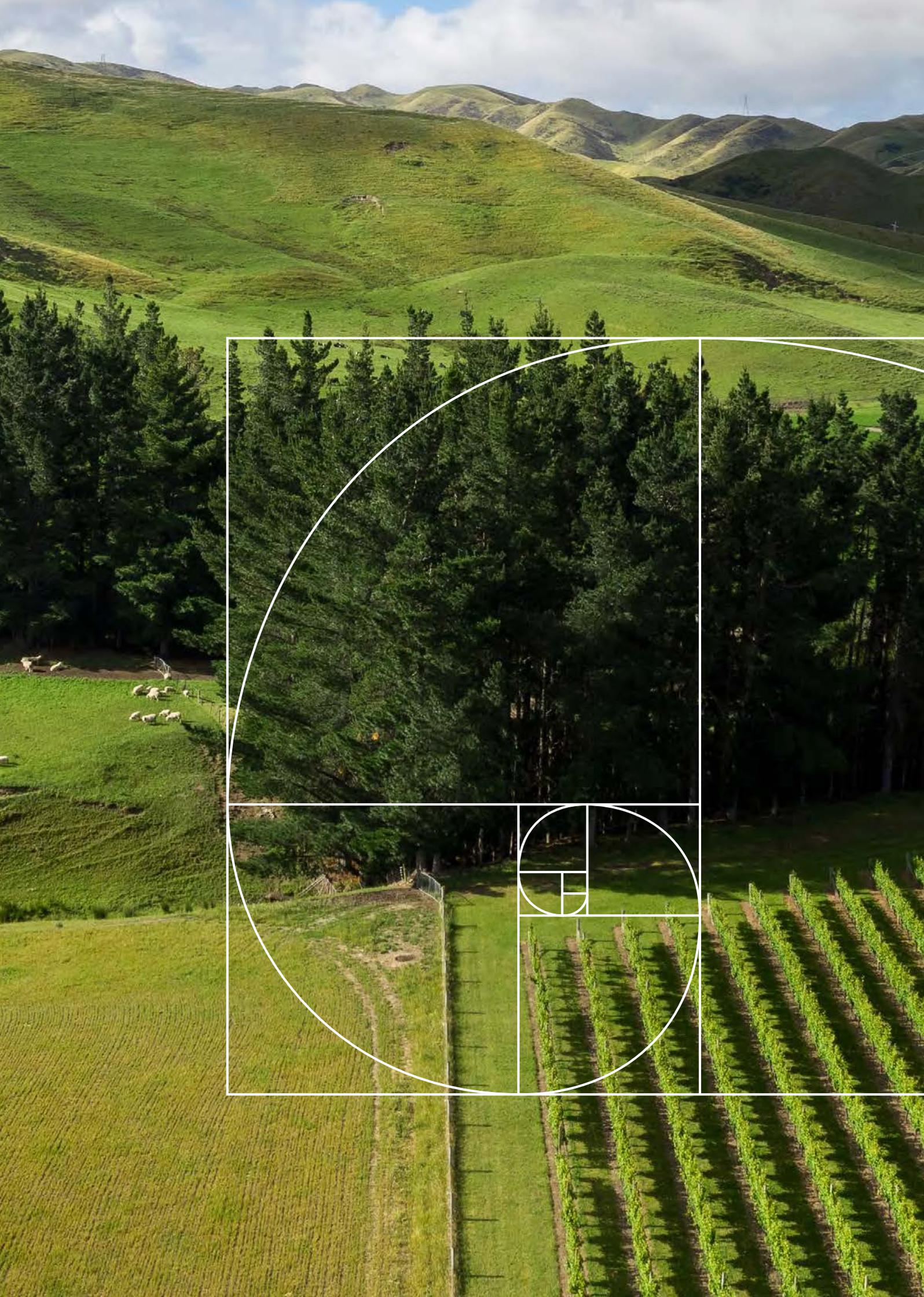
Despite the COVID-19 crisis, New Zealand and AgResearch are well placed to attract international investment. A number of our international projects are conducted in New Zealand; the key for AgResearch is to connect with potential investors and then to develop and maintain those relationships. In 2020/21 we will grow investment in research and development by connecting in new ways with our existing and potential new clients. Our international strategy focuses on four often interconnected goals:

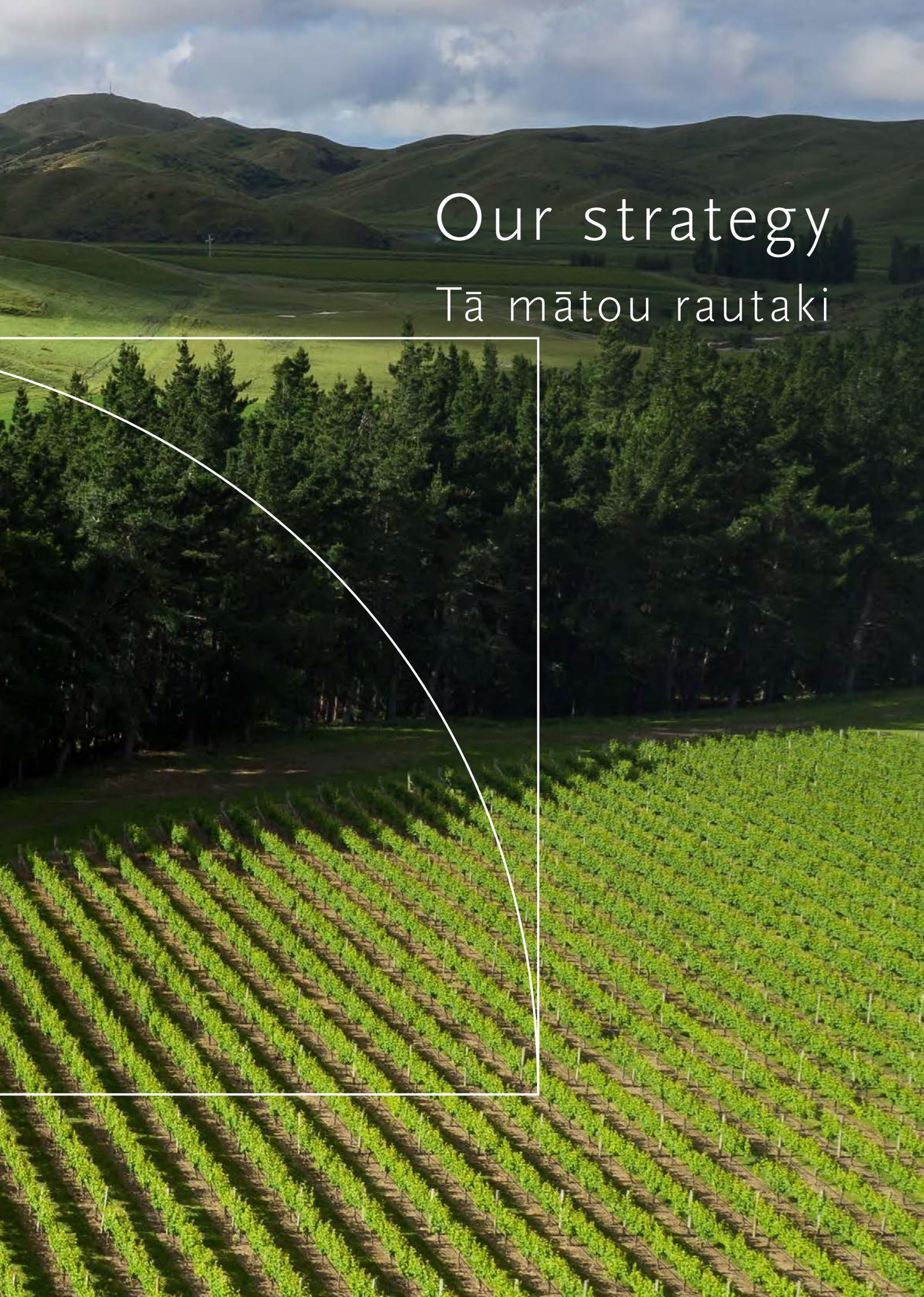
- Build global science collaboration and reputation, including people development
- Support for New Zealand stakeholders abroad (direct and indirect)
- Science diplomacy: support New Zealand Government trade and policy goals
- Work with international companies to support world-class capability development.

Given the impact of COVID-19 on borders, AgResearch will execute and implement our international strategy through continuing to leverage our professional networks and virtual connections. We will also leverage our key government connections to support us with market access and other international business opportunities.



AgResearch's Dr Caroline Thum using the new laboratory facilities at Te Ohu Rangahau Kai.





Our strategy

Tā mātou rautaki

Our strategic direction

Tā mātou aronga rautaki

The impact of our work will grow the value of New Zealand's exports while enhancing our environment and optimising land use.

Our vision is focused on two broad areas of aspiration:

- Developing the world's smartest and most sustainable land-use systems
- Developing the most sought-after, high-value food and bio-based products.

Aramoana

The Aramoana tohu speaks of ocean currents, journeying, bringing people together and seeking new horizons.

Our vision is to drive New Zealand's prosperity by transforming agriculture

agresearch
āta mātai, mātai whetū

Driving prosperity by transforming agriculture

Our Strategic Initiatives

- F Financial Strength
- R Revitalised Science Plan
- O One AgResearch
- N New Ways of Working
- T Transforming through Technology

Our Impact

Increasing the value of New Zealand's exports while enhancing our environment and optimising land use

Our consumer-centred, system-based science drives the world's...

Smartest, most sustainable land use systems



Most sought-after food and bio-based products

Our *tohu* represents how AgResearch reaches for the stars while staying firmly grounded.



Our integrated research capability is embedded with our commitment to Te Ao Māori.

Our FRONT framework, developed in 2018, has been the strategy that geared us toward achieving this vision through five strategic initiatives:

F Financial Strength – Ensuring stability and sustainability, which creates opportunities for strategic growth and direct reinvestment into science capability and capacity.

R Revitalised Science Plan – Creating value through integrated research that is focused on consumer needs and responds to the five interconnected, global mega-trends that are driving the future economic and environmental sustainability of our food production systems.

O One AgResearch – An aligned culture that is innovative, energised, vibrant and collaborative, attracting people who are the best at what they do and who strengthen our team's collective expertise.

N New Ways of Working (He Ara Hou) – Creating a people-focused environment with vibrant, collaborative campus facilities and research hubs. This means investing in people and processes to support the transformation process.

T Transforming through Technology – Embracing technology to change the way we deliver science, to enable industry to transform agriculture and to improve our systems and processes.



Above: An AgResearch strategy planning session with our people from across the organisation.

Strategic refresh

In the second half of the 2019/20 year, AgResearch commenced a strategic refresh.

The strategic refresh was in response to advice from our Science Advisory Panel, and the recommendations of a science review of AgResearch by MBIE in 2019. The review concluded with a range of recommendations for AgResearch on capability planning, strategic planning, funding and stakeholder engagement.

During the 2019/20 year, AgResearch also engaged with the Government's Te Pae Kahurangi review, which evaluated how well Crown Research Institutes are collectively and respectively positioned to meet New Zealand's current and future needs.

The discussions we had with these review panels helped to us to identify three pillars that will underpin our strategic direction going forward. We will use these three pillars to maximise our strengths and prepare us for the future.

The pillars are:

- FUSE** what is uniquely Aotearoa Mātauranga Māori with our science
- FOCUS** on high value, high uptake of our science
- OPTIMISE** how we work.

The pillars respond to three distinct challenges facing AgResearch:

- Continuing to build on science engagement with Māori
- Refreshing our focus on the unique science contribution AgResearch makes
- Financial strength and improving engagement with our people.

The refresh was undertaken in tandem with a review of our operating model, to ensure AgResearch is efficient and well positioned to achieve our strategy. The outcome of these processes will guide our activities and areas of focus in the year ahead.

Alignment with Government priorities

Kia tīaroaro ki ngā whakaarotau o te Kāwanatanga

AgResearch's science is well aligned to Government priorities. It supports accelerating the shift from volume to higher-value agricultural production, enabling the transition to a productive, sustainable and low-emissions economy. It also directly promotes regional economic development by supporting prosperous and sustainable agriculture. The section on 'Our research' that follows gives examples of our science that clearly illustrate how our work programmes contribute to the Government's goals for the research, science and innovation sector.

AgResearch welcomed the opportunity to participate in two important government-led science reviews this year – the MBIE review of our science capability, and the pan-CRI Te Pae Kahurangi review.

The MBIE AgResearch science review assessed our ability to respond effectively to rapidly emerging changes in food and farming technologies, science, markets and environmental constraints. The review found that a strong and strategic AgResearch is vital to the success of our nation's primary sector and science system, particularly considering the challenges facing the pastoral sector. It concluded AgResearch is heading in the right direction, but that more focus is needed on our role in delivering relevant and excellent science. The report made a range of recommendations, largely in the areas of capability planning, strategic horizon scanning, funding, and engaging with our stakeholders. We responded to the review by using part of our Strategic Science Investment Fund (SSIF) funding to establish a new Science Plan Accelerator Fund in November 2019.

The fund aims to help embed our new Science Plan by enabling us to: improve our strategic planning ability (for example, white papers and horizon scanning work); rapidly develop proofs of concept; and respond rapidly to new opportunities by scoping out enabling platforms and integrative initiatives, and fast-tracking initiatives such as new collaborations. Some current projects that have received funding are:

- A White Paper on international opportunities for diversifying New Zealand's sheep breeds to ensure the future sustainability and profitability of the New Zealand sheep industry
- A study into the capability of artificial intelligence for early detection of systemic risks that threaten the viability of production networks, sectors or economies
- AgResearch collaborations with the Chinese Academy of Agricultural Science in areas of mutual benefit
- A "greenprint" for a New Zealand Pastoral Biorefinery.

AgResearch welcomed Te Pae Kahurangi Review Panel's report and recommendations as closer collaboration between CRIs has been an ongoing area of importance to us. The report provides a roadmap to collectively and respectively work towards and the CRIs will continue to build on the closer ties developed during the COVID-19 response under the Science New Zealand umbrella.

Integrated research facilities

Ngā wāhi rangahau pāhekoheko



Above: Concept drawing of AgResearch's new facility to be built in Lincoln.

Our strategic framework and the Science Plan acknowledge the four-campus model is critical to enabling collaboration and partnership and transitioning to systems-based research.

The four-campus model endorses the Lincoln Campus as AgResearch's corporate headquarters; it is also one of our two national centres of excellence, along with the joint Te Ohu Rangahau Kai food science facility in Palmerston North. Both locations were chosen as national centres of excellence because they are close to Lincoln and Massey universities respectively, as well as to CRIs, other partners and stakeholders. The model also highlights the importance of two vibrant regional centres of excellence, at Ruakura and Invermay. This model ensures we will have one or more centres of excellence with proximity to our range of stakeholders and partners for improved collaboration and innovation.

Regional centres of excellence

The growth of vibrant innovation hubs at our regional centres of excellence in Ruakura and Invermay continued to gain momentum in the last 12 months. With the four-campus model now reaffirmed, genomics resources will remain at Invermay, and animal science at Ruakura. Both our Ruakura and Invermay campuses continued to attract interest from tenants, and we have actively pursued opportunities for collaboration with other science organisations. In Ruakura, we are key collaborators with Innovation Waikato, Waikato-Tainui, Plant & Food Research, PGG Wrightson Seeds and BCC Limited. In Invermay, we will continue to explore opportunities for collaboration with the University of Otago and Otago Energy Research Centre, and will advance collaborations with current partners.



Above: Images of the recently opened joint food science facility, Te Ohu Rangahau Kai.

Te Ohu Rangahau Kai

We are excited to have opened Te Ohu Rangahau Kai, the world-class joint food science hub in Palmerston North, developed alongside Massey University and other research and commercial partners. It was due to open on time in April 2020, but after a necessary delay due to the pandemic, it instead opened in early June. It is already attracting global talent to work on grand food-based challenges.

The building provides a collaborative, modern and open working, teaching and research environment for AgResearch and our co-located colleagues from Massey University and the Riddet Institute. These new, state-of-the-art workspaces and ways of working are a significant change for the staff and students who will work in them. In preparation for staff relocations to the new facility, we developed a robust change programme to help staff make a successful transition to the new working environment. Change initiatives include familiarisation visits to the site, change management and resilience workshops and seminars, a capability strategy, and continued relocation and transition support for those employees impacted by the move to the new facility.

New Lincoln facility

AgResearch's Lincoln Campus, as the other national centre of excellence and our corporate headquarters, is currently situated within the Lincoln education, science and innovation precinct (Lincoln Precinct) and provides office and laboratory facilities for 290 employees. Among the numerous other organisations in the precinct are Lincoln University, Plant & Food Research, Manaaki Whenua and PGG Wrightson Seeds.

We made significant progress on the new facility planned to replace AgResearch's ageing, earthquake-damaged infrastructure in Lincoln this year. AgResearch completed our Single-stage and Implementation Business Cases and received Ministerial approval for both of them during the last 12 months. The approval of the Implementation Business Case in June means that we can now proceed to the construction contract stage with our preferred supplier. Due to begin construction in the second half of the 2021 calendar year on a site within the Lincoln University campus, this building will be the primary focus of our infrastructure portfolio in the coming three years.

Our Science Plan

Tā mātou Mahere Pūtaiao

The AgResearch Science Plan aims to be the cornerstone of our organisation's strategic and operational thinking and activities across the science and science support space.

In September 2019 AgResearch published a revitalised Science Plan. The Science Plan maps out our strategy for transforming New Zealand's food production systems to strongly contribute to the Government's priorities for the wellbeing of New Zealand and its people. It links our actions in the laboratory, our efforts out on the land and our collaboration with partners through to the outcomes that Government has agreed we should deliver.

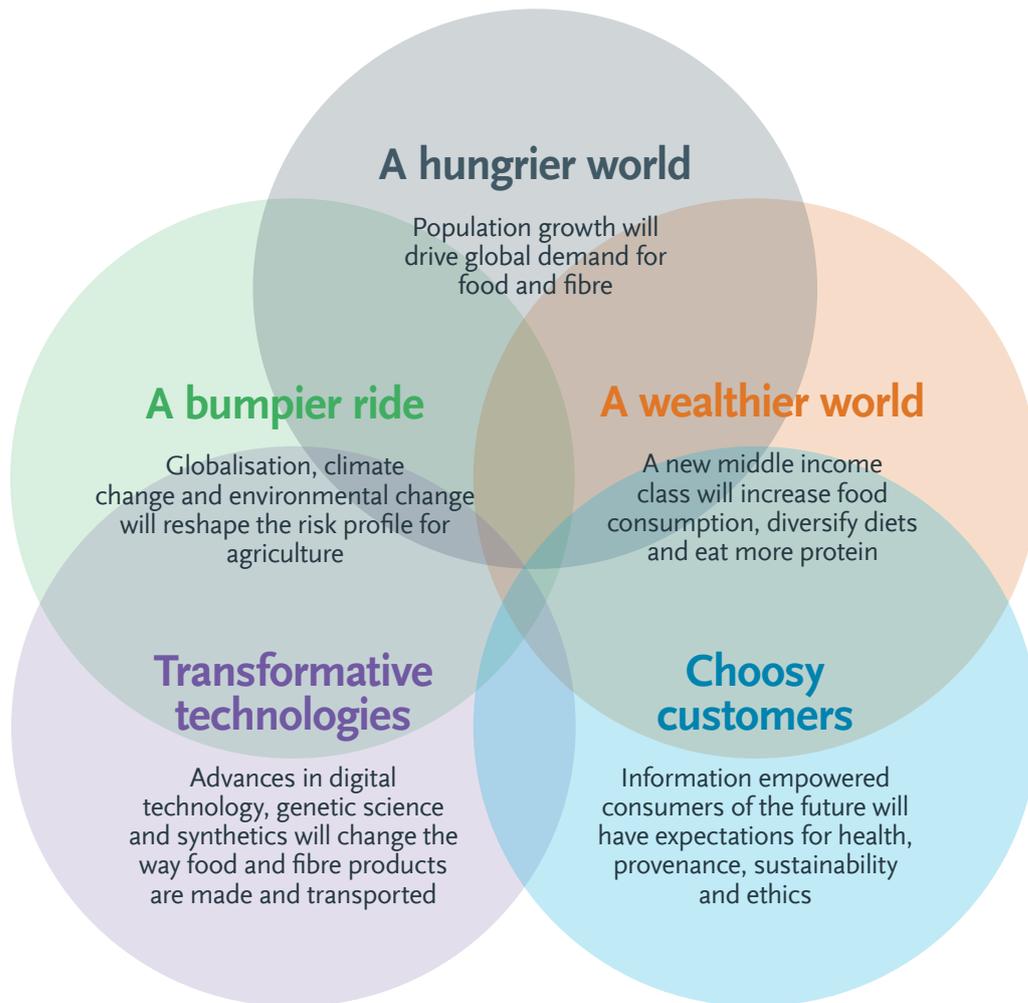
The Science Plan is a key part of our FRONT strategic framework and now guides all our science and research activities.

Niho Taniwha

The Niho Taniwha tohu is symbolic of the whenua (land) and many moutere (islands) within Aotearoa.

The Science Plan revolves around consumer-centred, system-based science that drives the world's smartest and most sustainable land-use systems, and the most sought-after food and bioproducts.

It responds to the following five identified mega-trends:



These mega-trends have direct consequences for the innovation ecosystem we inhabit:

- The environmental costs of food production are inconsistent with what our global customers and local society value. We must improve water quality, act on climate change, reduce soil erosion and better support our iconic biodiversity for the benefit of future generations. Essentially, we must adopt the philosophy of kaitiakitanga.
- New technologies and production systems are entering the global food business society and science with disruptive technologies and products like synthetic foods and plant-based 'meats and milks'.
- Changing consumer views of and preferences for food include shifting preferences around meat consumption, the desire for full traceability of food from pasture to plate, animal welfare, transparency of environmental footprint, as well as growing expectations about the personalisation of nutrition and well-being.

Our Science Plan has been designed to drive prosperity by transforming agriculture within this context.

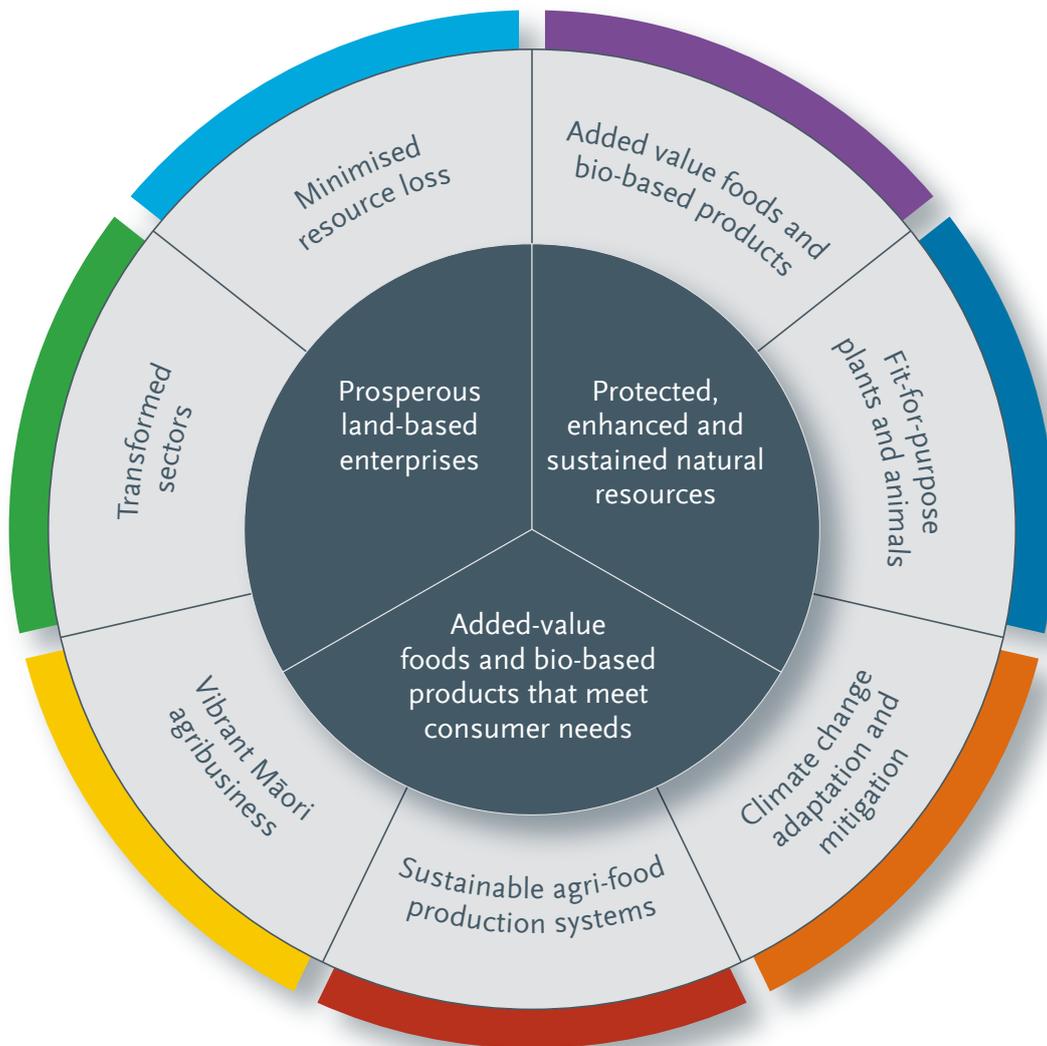
The Plan reflects a ‘whole of value chain’ approach, which acknowledges the complexity of the challenges and opportunities across global, national, regional and local scales; the diversity of existing and new actors in the agricultural innovation system; the availability of new scientific tools; and the focus on contributing to positive impacts.

The following overarching principles summarise the strategic goals inherent in the Science Plan:

Protected, enhanced and sustained natural resources – our land use must operate within natural resource boundaries at the global and local scale.

Prosperous land-based enterprises – New Zealand’s regions still depend on primary production to deliver inclusive and equitable wellbeing that flows on to national benefit.

Added-value foods and bio-based products that meet consumer needs – transform volume-based production systems into value-based systems where producers share in the generated economic benefits.



Above: Overarching principles (inner) and highly interconnected science objectives (outer).



AgResearch PhD students taking grass samples at our facilities in Ruakura.

Supporting our Science Plan

Tautokohia tā mātou Mahere Pūtaiao

Realigning our science groups

Following the implementation of the Science Plan, AgResearch reassessed the structure of our Research business unit to ensure it enabled successful delivery of the Plan's outcomes and was aligned to achieving our organisational strategy.

We announced our proposed structure early in the 2020 calendar year. Following consultation, we confirmed the new structure, in which key aspects were to:

- Establish Associate Research Director (ARD) roles focused on specific elements of our science – strategy, investments, delivery, capability and enablers
- More clearly define accountabilities in mid-tier science leadership through a series of senior operational roles across the five elements
- Dedicate resources to strategic and operational integration of Te Ao Māori.

Recruitment for the ARD roles began in June 2020. We intend to have the full new structure in place in the coming months.

The Research structure was also realigned to enhance Te Ao Māori capability. A new role of Pou Rangahau / Science Objective Leader – Vibrant Māori Agribusiness was created and recruited in the 2019/20 year. The Pou Rangahau will direct a research portfolio based on Te Ao Māori and Mātauranga Māori, providing thought leadership and strategic direction in line with the priority areas of the Mātai Ahuwhenua (Māori Agribusiness) portfolio. It will also identify opportunities for research and development and convert them into successful proposals and outcomes. A team to support the Pou Rangahau was also established. This team will:

- Carry out research based on Te Ao Māori and Mātauranga Maori
- Enable vibrant Māori agribusinesses as set out in the Science Plan
- Support other scientists and help them to consider and implement the Te Ao Māori strategy in their work. A key goal is growth in Māori projects across all science groups
- Foster collaborations with external research teams.

Enabling technologies

The successful delivery of our revitalised Science Plan will be underpinned by enabling technologies. In 2019/20 we confirmed a digital strategy and the enabling platforms that would be needed to drive the success of the Plan. The digital strategy focuses on the following outcomes:

- Developing computational and data science capability via the eResearch enabling platform
- Creating impact for New Zealand landowners via inter-operable decision support tools
- Enabling innovation and improved organisational performance through knowledge and information management
- Delivering operational efficiency through investment in modern transactional systems
- Analysing future operating models to transform efficiency and profitability
- Developing cyber security capability to protect assets and intellectual property.

Below we summarise two initiatives that are central to the digital strategy: the eResearch platform and decision support tools. Both received some funding through the Science Plan Accelerator Fund, which we set up to make strategic investments in critical projects that can rapidly embed the approaches outlined in our Science Plan into our innovation culture.

eResearch platform

The eResearch platform primarily focuses on developing AgResearch's capability to use modern data science technologies. It will enable our scientists to overcome research challenges by applying modern data science tools and techniques, including artificial intelligence and machine learning.

The eResearch platform will accelerate the pace of both existing and new forms of research with the support of digital technologies and analytics. The platform enables innovation through the informed use and integration of emerging digital technologies. Additionally, it will equip our people with the knowledge and skills to recognise their eResearch needs and when and how to engage services the platform offers.

Decision support tools

A project that has received significant attention through the New Zealand Bioeconomy in the Digital Age programme is the visualisation tool concept HyperFarm, which we co-designed with Animation Research Limited in the 2019/20 year. HyperFarm is a computer-based tool that allows landowners to visualise the different ways in which they might use their land, and to understand how those changes would affect key aspects such as water quality, finances, carbon sequestration and biodiversity.

With this tool, farmers and consultants will be able to identify the range of activities that are suited to their unique circumstances. An animation interface will allow the user to interact with underpinning models and spatial layers via a visual image interface of their farm, and to rapidly understand multiple economic and environmental impacts and trade-offs at different spatial and temporal scales. Design approaches will address how to future-proof the tool's architecture and allow integration of new data from related projects. With proof of concept now complete, AgResearch and our partners propose to develop a minimum viable product within the next two years for release to targeted users in the form of either a fully commercial product or a public good provision.

Innovation and impact

In the next section, we include a selection of science impact and innovation stories that exemplify our Science Plan. These stories are laid out in line with the overarching principles (outcomes) and highlight the science objectives.

Please note, the following stories are a snapshot of our innovations across the business from all areas of funding. Contracted funding from the Government (for example, SSIF) has separate reporting arrangements.



A close-up photograph of sheep wool, showing the texture and color variations from light beige to dark brown. A white curved line separates the text from the wool. The text is in a clean, white, sans-serif font.

Our research

Tā mātou
rangahau

Protected, enhanced and sustained natural resources

He haumarū, he whakapai,
he tautīnei ngā rawa taiao

Our land use must operate within
natural resource boundaries at the
global and local scale.

Turuturu

The Turuturu symbolises the
cultural significance of water
and how it is essential to life.



Above: AgResearch's Dr Suzanne Rowe with a Portable Accumulation Chamber trailer.

Lower-methane sheep to drive emissions reductions



Farmers are looking to science to help them to reduce their greenhouse gas emissions, and research into breeding sheep that emit lower levels of methane is now coming to fruition.

Work by AgResearch scientists over the last decade, supported by the NZAGRC, the PGgRc and the Global Research Alliance, has demonstrated that sheep can be bred for the trait of producing less methane from their digestive process.

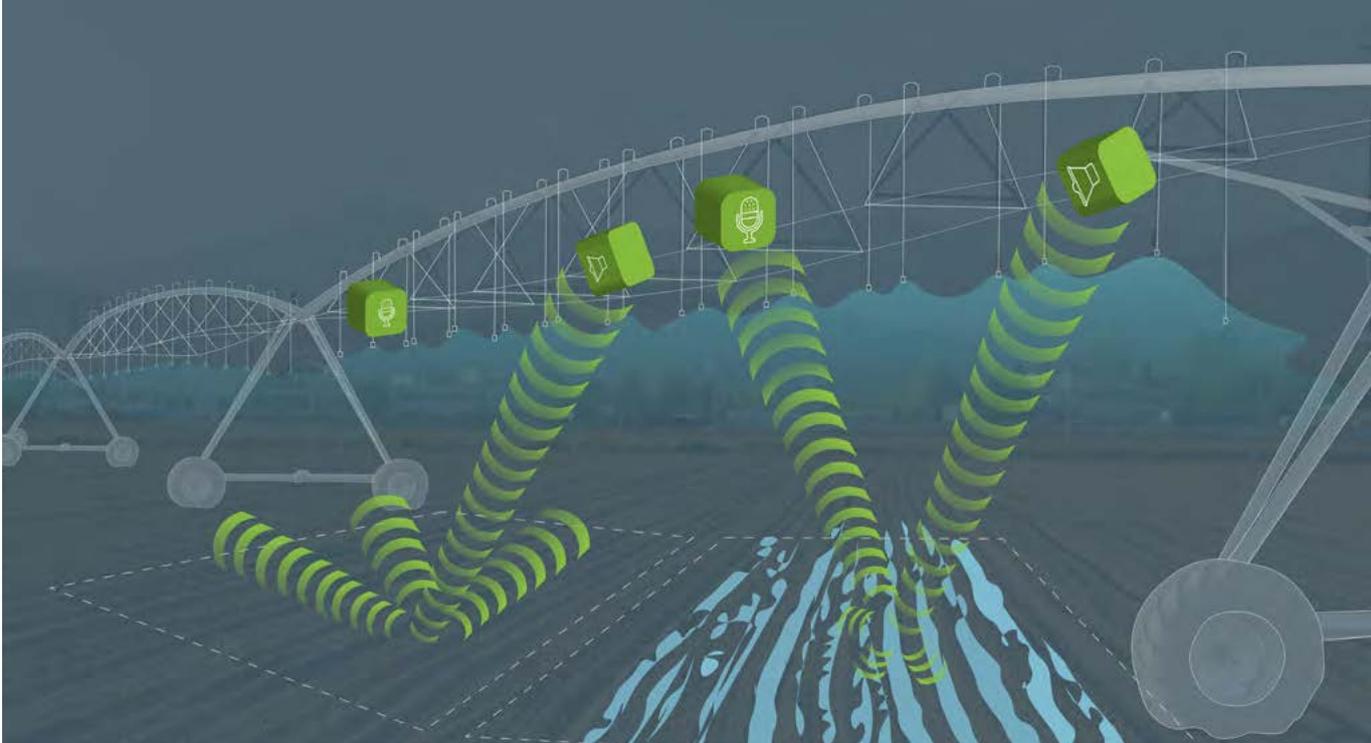
Methane is a potent greenhouse gas that is produced by all ruminants – including sheep, cows and goats. While it breaks down to carbon dioxide in the atmosphere, it contributes to global warming and climate change.

Our scientists have successfully bred sheep for the purpose of lower methane emissions and measured the emissions from the sheep in specially designed chambers. The sheep also passed on this trait to successive generations. After three generations, the lower-emitting animals were producing 11% less methane per

kilogram of feed eaten. The potential effect across New Zealand is a cumulative 1% reduction in methane emissions each year.

As well as benefiting the environment, the sheep bred for lower methane emissions have proven to have other advantages such as faster growth, leaner meat, better parasite resistance and better wool growth.

The process of rolling out the results of the research to farmers and applying them to the national sheep flock is now under way. In addition, the scientists are taking their emissions measurement technology on the road to farms. This work will also help inform research into reducing methane emissions from cattle.



Above: Illustration of the transformative new concept for assessing surface water from irrigation.

New technology to improve environmental performance



Irrigation provides significant economic benefit to farmers and New Zealand as a whole, but it also comes with challenges.

The area of irrigated agriculture across New Zealand has doubled in the past 15 years, and now produces nearly 20% of New Zealand's agricultural gross domestic product. However, farmers are under increasing pressure about how they manage the freshwater resource and to lessen their environmental impact.

With this in mind, AgResearch scientists have developed a potentially transformative new concept called Surface Water Assessment and Mitigation for Irrigation (SWAMI). It is an MBIE Smart Idea that could help farmers reduce the risk of contaminants such as phosphorus, microbes and sediment being carried into lakes, rivers and streams.

Our scientists, working with the University of Auckland, have shown that by bouncing acoustic signals off the soil surface, they can detect ponding

where the water application is greater than the capacity of the soil to absorb irrigation water. The aim is to feed back the information to the irrigation system in real time so that it can adjust for those areas to avoid causing excess surface water that carries the contaminants into lakes, rivers and streams.

Another potential application of the concept is where farmers are spreading effluent on their land to increase pasture production and reduce fertiliser costs. As with the irrigation, an effluent spreader could be fed information in real time to adjust for effluent ponding on the soil surface that can cause damage.

The research has a full patent application. The next step is a commercial partnership to develop the concept into a technology that can be incorporated with existing irrigation systems that farmers can use.

Research underscores the environmental advantages of wool



The accumulation of plastics in the oceans is a major global environmental concern. It is also stimulating a growing interest in products with strong environmental credentials.

Wool is already known to have multiple benefits as a fibre used for clothing, furnishings and other everyday products. AgResearch teamed up with Scion (funded by SSIF and Australian Wool Innovation) to help inform a global audience of consumers about the advantage wool has over synthetic alternatives when it comes to the marine environment.

A known source of microplastics entering the sea and freshwater systems is through shedding from synthetic fabrics in the process of washing clothes and laundering other products. This is also generating concern about the microplastics being captured in global seafood products.

A substantial body of research has established how wool biodegrades on land, but far less was understood about its behaviour in the aquatic

environment until recently. As the International Wool Textile Organisation publicised in March 2020, our scientists conducted a study to compare fabrics for how much they biodegraded in water. The fabrics were washed repeatedly before testing to simulate a partial garment lifetime.

The study found that both untreated and machine-washable wool readily broke down in the water, as did cellulose-based viscose rayon. In contrast, synthetic fibres that were tested – polyester, nylon and polypropylene – showed little or no biodegradation in an aquatic environment. The treatment that makes wool machine-washable, preventing felting by applying a thin film to the fibre surfaces, actually caused the wool to biodegrade more rapidly than untreated wool.

Work to further establish the environmental credentials of wool is continuing at AgResearch with further funding from Australian Wool Innovation.



Prosperous land-based enterprises

Taurikura ai ngā pakihi ā whenua

New Zealand's regions still depend on primary production to deliver inclusive and equitable wellbeing that flows on to national benefit.

Niho Taniwha

The Niho Taniwha tohu is symbolic of the whenua (land) and many moutere (islands) within Aotearoa.



Above: AgResearch's HyperFarm tool being showcased at National Fieldays.

New Zealand Bioeconomy in the Digital Age programme



Rapid advances in digital technologies and data availability are changing the way agriculture is done around the world. We are now positioning ourselves to be at the cutting edge of this change.

In December 2018, MBIE approved a new SSIF platform for AgResearch called the New Zealand Bioeconomy in the Digital Age (NZBIDA). As part of this programme, we have developed a series of proofs of concept, each derived from an experiment or pilot project, to demonstrate how digital technologies can support the transformation of New Zealand's pastoral sector.

Among the areas explored by NZBIDA is HyperFarm, a digital tool developed by AgResearch scientists working with leading digital firm Animation Research Limited. The tool helps farmers visualise land-use opportunities and future scenarios for their land, while also getting an insight into implications of any change on issues like nutrient loss and biodiversity.

Another proof of concept is focused on virtual fencing technology, where our scientists have worked with Australian company Agersens and New Zealand's Gallagher Group in the very first New Zealand testing of the eShepherd system and collars on cattle. The system allows the operator to set virtual fences for cattle on a computer instead of physical fences. The cattle are guided as to where the virtual fences are with an audible alarm, which is backed up by a mild electrical stimulus from the collar when required.

Recent testing of the collar in a trial on a Pāmu farm in Otago showed that, after an initial training period, the animals stayed within the virtually fenced areas. The technology also enables remote monitoring of animal behaviours and the trial showed that the cattle were unaffected by having the collars fitted.



Above: Tangihanga Station in Gisborne.

Engaging with Māori agribusiness and research



Managing approximately 450,000 hectares of land and \$50 billion in assets, Māori agribusiness plays an important role in the New Zealand economy. The sector also brings its unique holistic view of balancing environmental, cultural, social and economic outcomes for its communities.

In recognising Māori as important partners in science and innovation, the New Zealand Government has embedded Vision Mātauranga policy across all priority investment areas.

With funding through the SSIF, AgResearch have joined with 12 Māori agribusiness partners across five regions in New Zealand in a collaboration focused on diversifying land use and other research opportunities. Research undertaken within this programme ranges from plant genetics, weed and pest management, farm systems and land-use planning, to food additives and pharmaceuticals. The programme's long-term collaboration with Ravensdown and the Wi Pere Trust (a large Māori

family operation, on freehold Māori land in the hill country of Gisborne) has demonstrated the potential to improve pasture quality, weed management, animal performance and financial performance on Māori farms.

This programme builds on successful research completed under the Vision Mātauranga Capability Fund.

Building on the Land Environment Plan previously developed for Tangihanga Station, the programme aims to quantify the impact of thistles and legumes on profitability. Field studies on the station's typical low-fertility, diverse-species hill country pasture showed that the introduction of white clover can increase spring and summer forage supply by 12%. With this increase, the station could include an additional six-month bull finishing enterprise, which increased carcass weight production by 25% and led to a 39% improvement in farm profitability.

Future-facing experiment helping to combat climate change



A prescient experiment is providing enduring benefits for scientists to study and manage the effects of climate change on pastoral agriculture. AgResearch set up an experiment in the late 1990s that uses purpose-built technology to control elevated atmospheric carbon dioxide on pastures.

The programme and field facility based at a research farm in the lower North Island are known as Free Air Carbon Dioxide Enrichment (FACE). Atmospheric carbon dioxide levels are artificially elevated to 500 parts per million (levels expected by the year 2050) across plots of pasture measuring 12 metres in diameter. The pasture within these rings is commonly found on many New Zealand farms.

The experiment is unique in that it includes grazing animals and has been running for so long. Now 22 years old, FACE has produced data sets that scientists from all over the world are still finding new and innovative applications for as well as becoming the established and key plank of our “Climate change and the pastoral sector: Impacts and adaptation” programme funded by MBIE’s SSIF.

FACE experiment’s data sets are used to verify models and contribute to meta-analyses, as well as to improve climate change impact studies and adaptation testing. Adapted technologies (such as climate proof plants) can also be directly tested in the FACE to see if they are going to work as expected under climate change. Data and key outputs of the FACE experiment have also been integrated into an international model: the Agricultural Production Systems sIMulator (APSIM).

Scientists can use APSIM to simulate agricultural systems that cover a range of plant, animal, soil, climate and management interactions and visualise potential future scenarios, allowing them to explore potential impacts and plan adaptation strategies. APSIM’s AgPasture module can accurately simulate pasture systems in New Zealand, across a wide range of soil types and climates.

The data sets from the FACE experiments are used to check that the output from APSIM gives a valid projection of the future. This provides confidence that impact and adaptation studies for the pastoral sector give a realistic assessment of a future under climate change.

Below: Free Air Carbon Dioxide Enrichment trial.



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

Kia pai ake ngā kai, me ngā hua kia aro ki ngā wawata o te hunga hoko

Transform volume-based production systems into value-based systems where producers share in the generated economic benefits.

Aramoana

The Aramoana tohu speaks of ocean currents, journeying, bringing people together and seeking new horizons.



Above: AgResearch's Dr Gale Brightwell (right) and Shuyan Wu are researching a potential light sterilisation method for COVID-19.

Light sterilisation technology to help tackle COVID-19 spread



Amid the COVID-19 pandemic, a major concern continues to be the potential for the virus to spread in public places and workplaces.

In response, AgResearch scientists – using our expertise in food safety and sterilisation technologies – are working with colleagues from Massey University and Christchurch firm Energylight Group Ltd on developing a new technology that would combine ultraviolet (UV) light and blue light to kill the virus causing COVID-19 and other viruses that linger on surfaces or in circulating air.

This project has been funded by the COVID-19 Innovation Acceleration Fund. The aim of the Fund is to get innovative solutions into use more quickly, as a way of supporting responses to COVID-19 and alleviating the direct impacts of the virus threat.

Globally, scientists have been looking at the use of a form of UV light to sanitise against viruses, but experience has shown that high-intensity treatments and long exposure times are needed to kill the viruses.

The novelty of the approach that AgResearch and our partners are using is that it combines the UV light with blue light – and applies it through light-emitting diodes (LEDs) – to significantly improve the speed and efficiency of the light treatment. It is expected to generate much less heat and make any product delivering the light treatment significantly smaller and cheaper.

Once the light combination is tested, and a prototype developed, our scientists expect that it could be delivered through commercial light fittings to sterilise surfaces, disinfect circulating air, and treat parcels, baggage and freight – all with minimal management day to day. Examples of places that might use it include airports, shopping malls and public toilets.

Development of new test to detect COVID-19 infections earlier



Early detection of new cases of COVID-19 is an important part of a country's pandemic response.

Our scientists have taken their knowledge of detecting infectious disease in livestock to work towards a new test that would indicate the presence COVID-19 within just hours. This would represent a significant advance on current testing where the virus typically needs to grow for at least a few days in the body before detection and would allow early detection of COVID-19 in asymptomatic people.

The project has been funded from the COVID-19 Innovation Acceleration Fund. We are working on it in partnership with ESR and the University of Otago.

The current testing method for COVID-19 focuses on viral RNA, but the AgResearch scientists and partners want to develop a test that measures a specific pattern of what is known as microRNA (miRNAs).

Once identified, this pattern of miRNAs specific to the virus causing COVID-19 would indicate a body's response to the infection.

Our scientists expect that a new test would provide a significant advantage in border testing and quarantine measures, and would make targeted contact tracing more effective.

The aim is first to develop this diagnostic method in the laboratory and then to validate with samples from COVID-19 patients. Finally, if the test is proven effective, the researchers would trial it and potentially have it available in a year to 18 months from the start of the research.

While AgResearch typically focuses on agricultural science, we have experience and expertise in detection of infectious diseases. Our scientists have successfully used this method of detecting microRNA patterns to diagnose cattle infected with Johne's disease.

Magic number for intramuscular fat



Scientists at AgResearch have scientifically proven a "magic number" for intramuscular fat (IMF), otherwise known as marbling, in lamb loins for the ultimate taste. The "magic number" is 3%.

The finding was a result of an experiment using 530 ewe lambs from a Taumarunui farm, all of the same age and genetic background, and all fed the same pasture diet. Loin cuts from these lambs were tested by a tasting panel of 165 consumers.

The 3% finding corresponds with similar international studies for sheep meat products.

It also has significant ramifications for New Zealand's sheep meat industry given its biological focus is geared towards increasing productivity – breeding more muscular lambs, with faster growth rates – which has been achieved at the expense of IMF. The current New Zealand IMF average is 2.7%.

The research was funded by MBIE through the Endeavour "Capturing the Value of New Zealand Red Meat" research programme and SSIF. We are now investigating how the findings can be applied along the New Zealand supply chain

(including near infrared spectroscopy technology that can measure IMF at meat processing plants) to differentiate among products based on meat quality. That information could then be provided to

farmers or producers so they can make informed breeding and management decisions based on taste to further New Zealand lamb's credentials as a premium protein.

Science that helps meet consumer needs



AgResearch scientists are using cutting-edge mass spectrometer technology to gain new insights into the make-up of food, its provenance and purity.

The rapid evaporative ionisation mass spectrometer (REIMS) can, in a few seconds, analyse an animal tissue sample, reveal what it has been eating, including what sort of grass varieties it may have been fed, and also identify what region that animal originates from.

Consumers are increasingly demanding information about the composition of the food they are buying and how and where it was raised. The REIMS instrument located at our Lincoln Research Centre is demonstrating that scientifically robust data to meet that demand can be obtained quickly, bridging the gap between high-tech lab-based science and the needs of industry.

REIMS machines are extremely versatile. For example, they can differentiate between premium

and inexpensive cuts of meat, which could be invaluable during a food origin crisis and deter future supply-chain fraud. REIMS can also be used to assess meat quality and processing.

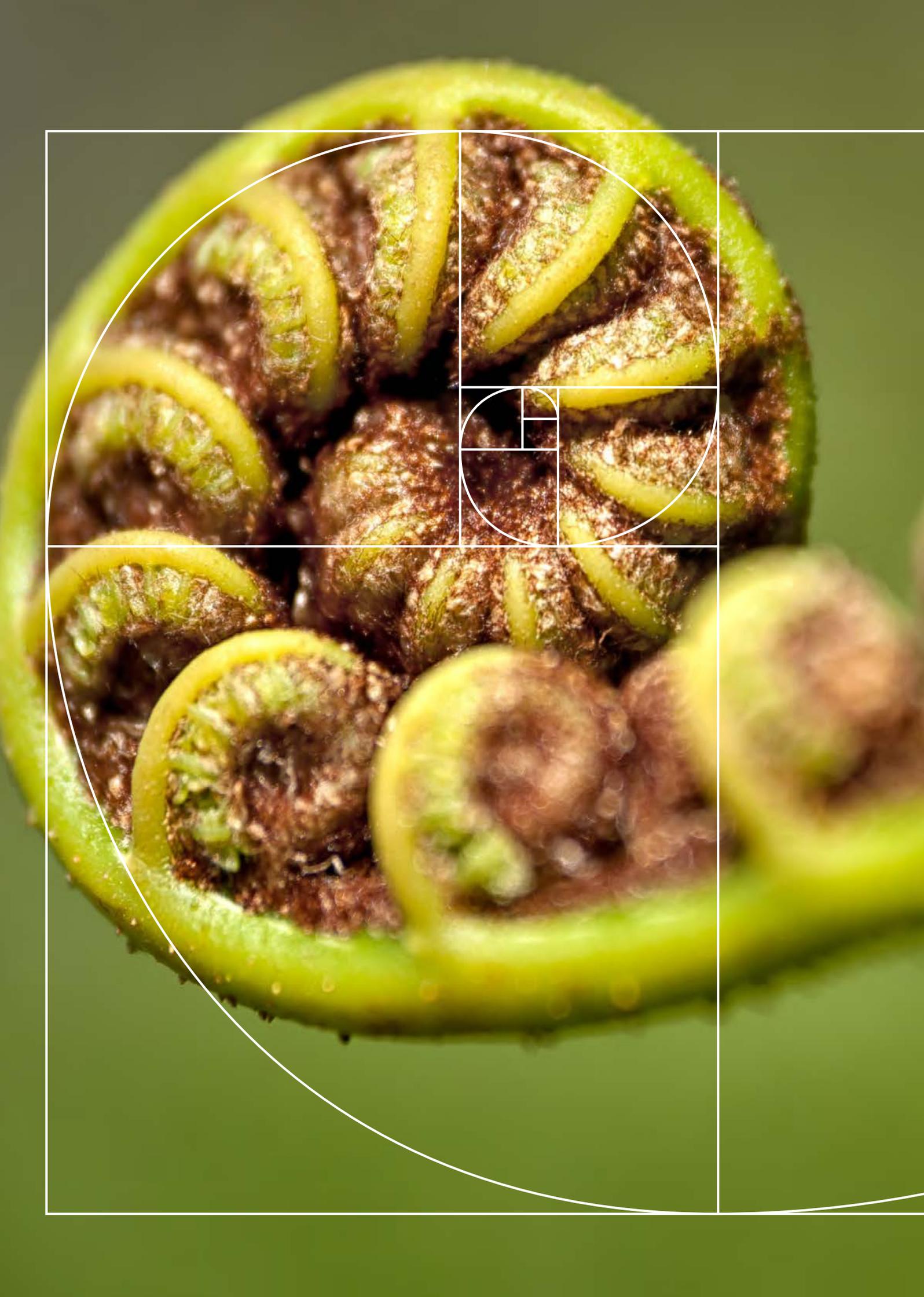
AgResearch using REIMS, was able to measure and identify distinct differences between Welsh, British and New Zealand lamb samples in only a few hours – a process that formerly would have taken weeks.

The technology has been used to distinguish wines by region and variety, and different characteristics of a range of foods, including sheep and bovine milk.

REIMS technology can also provide insights into how diet and feed can change the final product's taste and palatability.

Below: AgResearch's Dr Alastair Ross using a mass spectrometer to analyse a meat sample.





Our stakeholders and partnerships

Ō mātou hunga whaipānga
me ngā rangapū

Stakeholder engagement

Ō mātou mahi ki te hunga whaipānga

AgResearch leverages our world-leading capability and reputation to grow and maintain a strong national and international network of research partners and collaborations.

Aramoana

The Aramoana tohu speaks of ocean currents, journeying, bringing people together and seeking new horizons.



Above: AgResearch staff taking part in the Food Service Innovation Workshop.

During the 2019/20 year, we refreshed our approach to collaboration as part of implementing our refreshed strategy and Science Plan. In doing so, our aim was to leverage the best available science and technology and avoid unnecessary duplication of resources. When engaging with partners, we actively consider:

- Establishing shared values and a common vision that builds engagement, trust, clarity of expectations and understanding of each partner's key strengths
- Adopting principles of co-design and co-innovation, shared risks and responsibilities, and building interdependence
- Defining success beyond financial gain to embrace sustained economic, environmental, social and cultural outcomes.

This framework aligns with associated principles that will guide the development of our research-to-research collaborations with actions including sourcing non-traditional investments, increasing science vitality through postdoctoral and graduate students, and increasing our generation and recognition of science excellence.

As discussed in the 'Responding to COVID-19' section, we have worked hard to support stakeholders, partners and customers as they navigated the effects the pandemic on their business. We will continue to focus on this work in the coming year.

On the international front, AgResearch will execute and implement our international strategy through continuing to leverage our professional networks and virtual connections. We will also leverage our key government connections to gain support for market access and other international business opportunities.

In this section, we provide updates on our collaborations with our wide stakeholder base and highlight key projects across the 2019/20 financial year.

Coconut rhinoceros beetle in the Pacific



AgResearch plays a major part in the response to the devastating outbreak of the coconut rhinoceros beetle in the Pacific, through a Pacific region multi-country programme supported by the Ministry of Foreign Affairs and Trade's Strategic International Development Fund.

This five-year programme of work, with \$11.5m in funding, aims to significantly increase support in response to the invasion of a new strain of coconut rhinoceros beetle (CRB-G beetle) that threatens economic resilience and food security across the Pacific.

Working with Pacific partners, AgResearch concentrates our research efforts on developing a biocontrol capable of targeting the CRB-G beetle. Once our team has identified a biocontrol, it will establish its release and management through an integrated pest management programme.

This investment will continue to build the Pacific region's capacity in incursion response to invasive species. Through our role, we are establishing AgResearch as a leader in providing biological solutions to reduce the impact of invasive species on native biodiversity and crop production.



New research into facial eczema tolerance testing



We have joined forces with Beef + Lamb New Zealand to launch a pilot study of the feasibility of laboratory-based testing for an animal's intolerance to the toxin associated with facial eczema.

Facial eczema has been a problematic disease in New Zealand for over 100 years, causing major production losses and significantly impacting the welfare of the affected animals.

Little research on facial eczema has been conducted. Likewise, only limited management tools are available despite the significant impact of the disease and its long history among livestock in New Zealand.

With new science approaches and technologies, we have an opportunity to find a solution to this ongoing serious issue for New Zealand farmers.

The investment from Beef + Lamb is a great example of industry and research partnering to find solutions.

Initial results are expected by March 2021. If the pilot study is successful and further funding can be secured, we expect to complete validation and implementation of the test by late 2022.

He Waka Eke Noa – action on agricultural emissions

AgResearch is part of a group of primary sector partners and government organisations working together to deliver on the primary sector’s climate change commitment through a five-year Joint Action Plan called “He Waka Eke Noa”.

The plan, initiated by industry and adopted by the Ministry for the Environment (MfE), outlines the sector’s collective commitment to respond to the challenges posed by climate change and to contribute to the global effort under the Paris Agreement. The plan will provide overarching direction and vision for a range of existing initiatives already under way within the contributing sectors.

The initiative is aiming for practical and cost-effective systems that support farmers and growers to develop farm business and environmental plans that address mitigating greenhouse gas emissions and adapting to climate change. The partners hope that these systems will enable people to calculate greenhouse gas emission sources and incentivise them to take action on climate change.

AgResearch has formally committed a \$100,000 in-kind contribution by involving our leading researchers in the relevant workstreams to promote thought leadership and provide science expertise and science system connections. Early in the 2020 calendar year, we contributed to early workshops on emissions reporting, on-farm sequestration and emission pricing, where participants developed draft project charters to ensure the workstreams are directed and effective.

Primary sector partners include: Apiculture New Zealand, Beef + Lamb New Zealand, DairyNZ, Dairy Company Association of New Zealand, Deer Industry New Zealand, Federation of Māori Authorities, Foundation for Arable Research, Federated Farmers, Horticulture New Zealand, Irrigation New Zealand and Meat Industry Association.



Māori agribusiness

Pakihi Ahuwhenua Māori

Whenua-based partners

AgResearch celebrates the significant roles that our whenua-based partners hold as kaitiaki and mana whenua.

We recognise the indigenous value systems of whakapapa, rangatiratanga, kaitiakitanga, whanaungatanga and manaakitanga mean that our whenua-based partners move beyond business as usual, in providing for communities, reaffirming their culture and honouring their obligations as kaitiaki. These ways of valuing the world we live in create a pathway of opportunity for all of New Zealand.

Unique to Māori agribusinesses are the aims to produce food and connect with the whenua in a way that honours responsibilities and values, and maintains and restores the mana and mauri of the land and waters. AgResearch acknowledges the value of Mātauranga Māori and, in agreement with our

whenua-based partners, we establish a shared space in research for Māori knowledge that is informed by AgResearch's science skills and knowledge.

AgResearch is working closely with whenua-based partners to co-design a Te Ao Māori approach to our long-term partnerships. This approach will ensure our research is relevant to Māori and whenua-based agribusinesses.

This is a transformational phase for AgResearch as we make an intentional commitment to honour our Treaty of Waitangi partners, address inequities, make a greater contribution to community wellbeing and improve outcomes for New Zealanders.

Unlocking the secrets of Aotearoa's native tree fern mamaku

AgResearch and Ora Innovation Group Limited teamed up to gain a greater understanding of the science behind the versatile New Zealand native black tree fern, mamaku, with research funding through KiwiNet and MBIE's Te Pūnaha Hihiko: Vision Mātauranga Capability Fund. Lead scientist Dr Paul Harris presented initial findings at a wānanga at Taupiri Marae in October. Because the event was a two-way exchange, the wānanga was also an opportunity for the AgResearch team to learn about how to integrate tikanga rongoā (correct protocols for traditional medicine) into research activities.

Ora Innovation Group Limited, a proudly Māori company, uses mamaku extract, harvested from the tree fern, as a base ingredient in its product range. Our scientists have further developed new extracts in various forms to test its active ingredients.

Mamaku has been used for centuries as a healing extract to soothe a myriad of ailments. We plan to delve deeper into its skincare benefits, looking at its

biochemical properties, such as controlling melanin production, and its anti-oxidant value. Ora is also interested in finding new uses for the by-product of mamaku extraction, so that the whole of the taonga (a highly prized object) can be used.

The collaboration has enabled us to add to the breadth of existing traditional knowledge about mamaku.

Following the completion of this project, Ora has gained funding for a second-stage proposal, titled "Building Science Capability in Mamaku Skincare Business", under Te Pūnaha Hihiko: Vision Mātauranga Capability Fund. AgResearch is again involved as the research partner.

Below: Dr Paul Harris (left) is welcomed onto Taupiri Marae by kaumatua Hone Nuku Tarawhiti.



Te Ao Māori approach to transforming agriculture in New Zealand

During the COVID-19 lockdown, AgResearch's Mātai Ahuwhenua team (Whenua-based Partnerships team) held a series of virtual wānanga with a wide representation of Māori agribusiness partners spanning iwi, farm and commercial entities.

The purpose of the wānanga was to co-develop a vision of 'what transformation in agriculture means for Māori agribusinesses'. This vision would then inform the research direction and strategic positioning of our Science Plan and key integrative initiatives, including Digital Bioeconomy and Circular Bioeconomy.

As these virtual wānanga developed, AgResearch acknowledged the need to take a more holistic approach towards not only agriculture and the way we design research programmes but also the way we engage and build relationships with, and bring value to, Māori and Māori agribusinesses.

These wānanga were a catalyst to our partners, spurring them to collectivise and take active leadership of our ongoing relationship. They agree the series involved genuine and meaningful engagement, and has started a valuable conversation to continue in person.

Microprocessing capability to respond to Māori business need

AgResearch is partnering with a collective of Māori agribusinesses across the North Island and the Hokotehi Moriori Trust of Rēkohu (Chatham Islands) to design and implement a mobile micro abattoir.

With access to a mobile micro abattoir, Māori agribusinesses and niche red meat food producers could produce their own high-quality meat products. Connecting with local and international consumers directly, the producers can then highlight their unique provenance story.

The abattoir would also provide year-round access to meat processing, allowing consumers to purchase locally sourced red meat products from farms that demonstrate strong ethical and social values. Further, the economic benefit would flow back into their own communities.

The initial stage of the project involved establishing a collective of Māori agribusinesses to pursue the development of mobile micro abattoir capability in New Zealand with funding from MPI's Māori Agribusiness Extension Programme.

Several wānanga were then held with the collective as a way of gaining its direct input into the project and the design of the abattoir produced by AgResearch. Over the next 12–18 months as the project advances, further wānanga with the cluster will ensure that the abattoir fits the collective's needs.

Following this, a prototype will be built and piloted on farm, at which stage we will invite other interested groups to view it in action.



Above: AgResearch's Dr Jane Mullaney pictured with a banana plant grown from a tissue culture.

Research that is bearing fruit

A new research programme is helping AgResearch forge new connections with Māori communities. In 2018, we were granted \$93,455 from Te Pūnaha Hihiko: Vision Mātauranga Capability Fund to nurture the growth of a banana industry through the rapid expansion of commercial banana growing in Te Tairāwhiti, in partnership with Tai Pukenga Limited.

From the initial partnership with Tai Pukenga, our scientists have gone on to sequence the DNA of New Zealand-grown bananas. With this information, they can learn more about the origins of the bananas, predict how they have adapted to their environment and provide guidance as to how they may tolerate different temperatures.

The scientists also used existing technologies in the lab to generate plants from tissue cultures, a method that allows them to generate thousands of new plants from a single stem.

Beyond this, as part of our collaborative approach, we have been training Tai Pukenga and its

associates so that ultimately they can undertake this process themselves. With this ability they will be well placed to do their own research into technology and processes for growing bananas in New Zealand that offer greater nutritional benefits.

With a healthy supply of plants generated, people around New Zealand have become aware of the growing trials in their own communities and the potential health benefits of New Zealand-grown bananas. Many are also now participating in their local trials.

The programme gives a clear demonstration of how, by listening to the stakeholder and understanding their aspirations and needs, AgResearch scientists can use their scientific knowledge to come up with a practical way of implementing a business idea. With trust building over time, we continue to strengthen our relationship with our partner through our shared knowledge and integration of Mātauranga Māori into this work.

Our collaborations

Ō mātou rangapū

Collaboration is one of AgResearch's six organisational values. This value is demonstrated both internally and externally.

Collaboration with other agencies and industry bodies delivers wide benefits – researchers learn from their peers, funding constraints are eased and the end-user of the research benefits from the broad application of knowledge and thought leadership.

In this section we give a snapshot of how our relationships across a wide range of disciplines have led to innovative developments that are invaluable for New Zealand.

Aramoana

The Aramoana tohu speaks of ocean currents, journeying, bringing people together and seeking new horizons.



Above: Signing of collaborative agreement between Farmlands CEO Peter Reidie (middle), Manaaki Whenua CEO Richard Gordon (left) and AgResearch's Tony Hickmott (right).

Partnership to support science-led solutions

In June, we signed a landmark partnership with Farmlands Co-operative and Manaaki Whenua. This partnership seeks to effect change within the food and fibre sector through the partners' combined strengths across a series of projects.

Farmlands, as the largest farmer-owned rural supplies cooperative in New Zealand, has a focus on providing shareholders with expertise to efficiently meet challenges and accelerate opportunities. The collaboration with two leading researchers in agricultural science, innovation and land management creates an even stronger

base for understanding the present and future concerns and needs of farmers and growers on a national scale.

The partnership will help connect the science with farmers and help to keep AgResearch and Manaaki Whenua on track so that they are conducting the right science to support farmers to be prosperous and sustainable. With support from Our Land and Water National Science Challenge, the first collaboration will be the "How to Enact Environmental Change" research project, which will start later in the 2020 calendar year.



Better border biosecurity for New Zealand



AgResearch is a science partner in the Better Border Biosecurity (B3) collaboration along with Plant & Food Research, Scion, Manaaki Whenua and the Bio-Protection Research Centre. The end-user organisations are MPI, the Department of Conservation (DOC), the Environmental Protection Agency and the horticultural, cropping, forestry and pastoral sectors.

Through a collaboration of research, industry and government, B3 delivers world-leading science and

technology development, enabling stakeholders to implement results for valued plant systems for better border biosecurity.

AgResearch contributes to the different projects within the joint venture. This section presents some highlights from a selection of B3 projects currently under way.

Identifying invasive agricultural pests in China

AgResearch, as the lead research partner, embarked on a five-year project in July 2019 to develop a database of potential pasture insect pests that could come into New Zealand from China. Alongside this, we are progressing a proof-of-concept Sentinel Plant Habitats risk assessment tool for insect pests that can be used to test grassland plant communities rather than single plant species.

The tool will be trialled in China before potentially being deployed to other countries.

The database of potential insect pests, which will include information on their possible pathways and economic impact should they establish in New Zealand, will be made available to end-users as part of this project.

Supporting pest risk assessments in natural ecosystems

AgResearch is leading a three-year joint project with Manaaki Whenua and Plant & Food Research, which will develop a framework to improve biosecurity risk assessments for invasive organisms in natural ecosystems. The framework will provide a comparative analysis of the characteristics of invasive organisms established in natural and productive plant systems.

During the project's first year the team worked on three areas:

- Workshopping with end-users to select focus herbivore taxa and establishing the first group to work on

- Identifying fields for traits to score for exotic insect herbivores
- Defining and selecting appropriate data sets and databases to source material from.

Ultimately DOC and MPI will be able to use the completed framework as part of their risk assessment process to identify biosecurity threats to New Zealand's natural systems.

Tourism, biosecurity and pathways into New Zealand

Gaining a greater understanding of the biosecurity and tourism landscape in New Zealand will help MPI allocate surveillance resources to predict direct and indirect risks from tourist flows. AgResearch's Senior Social Scientist, Mike MacKay, has been leading a team to develop a greater understanding of the biosecurity and tourism landscape for agencies working in this space.

To this end, the team has been assessing the awareness of biosecurity issues among international tourists, learning more about the role of tourism providers in identifying and mitigating biosecurity risks in different tourism settings, and enhancing biosecurity awareness among different tourist activity groups.

The results of an awareness survey targeting international tourists have given valuable insights into tourist awareness of New Zealand's concern for biosecurity, how tourists view biosecurity, their reporting behaviours and differences between tourist groups.



National Science Challenges

Ngā Mahi Tūkaha Pūtaiao ā-motu

AgResearch is proudly involved in a number of National Science Challenges, offering expertise in agricultural-based research.

The Challenges were established to bring together the country's top scientists so they can work collaboratively across disciplines and institutions to tackle the biggest science-based issues and opportunities facing New Zealand.

National
SCIENCE
Challenges



OUR LAND AND WATER

Toitū te Whenua,
Toiora te Wai

Objective

To enhance primary sector production and productivity while maintaining and improving our land and water quality for future generations.

Challenge launched

26/1/2016

Host

AgResearch

Collaboration partners

Institute of Environmental Science and Research (ESR), Geological and Nuclear Science (GNS); Manaaki Whenua – Landcare Research; NIWA; Plant & Food Research (PFR), Scion; University of Auckland, Massey University, Lincoln University, Waikato University, University of Otago, Lincoln Agritech, Cawthron Institute

Preserving the fundamental treasures of our country

AgResearch is proud to host Our Land and Water, one of 11 National Science Challenges. The Challenge is funded by MBIE with research partners, including CRIs and the majority of the country's universities.

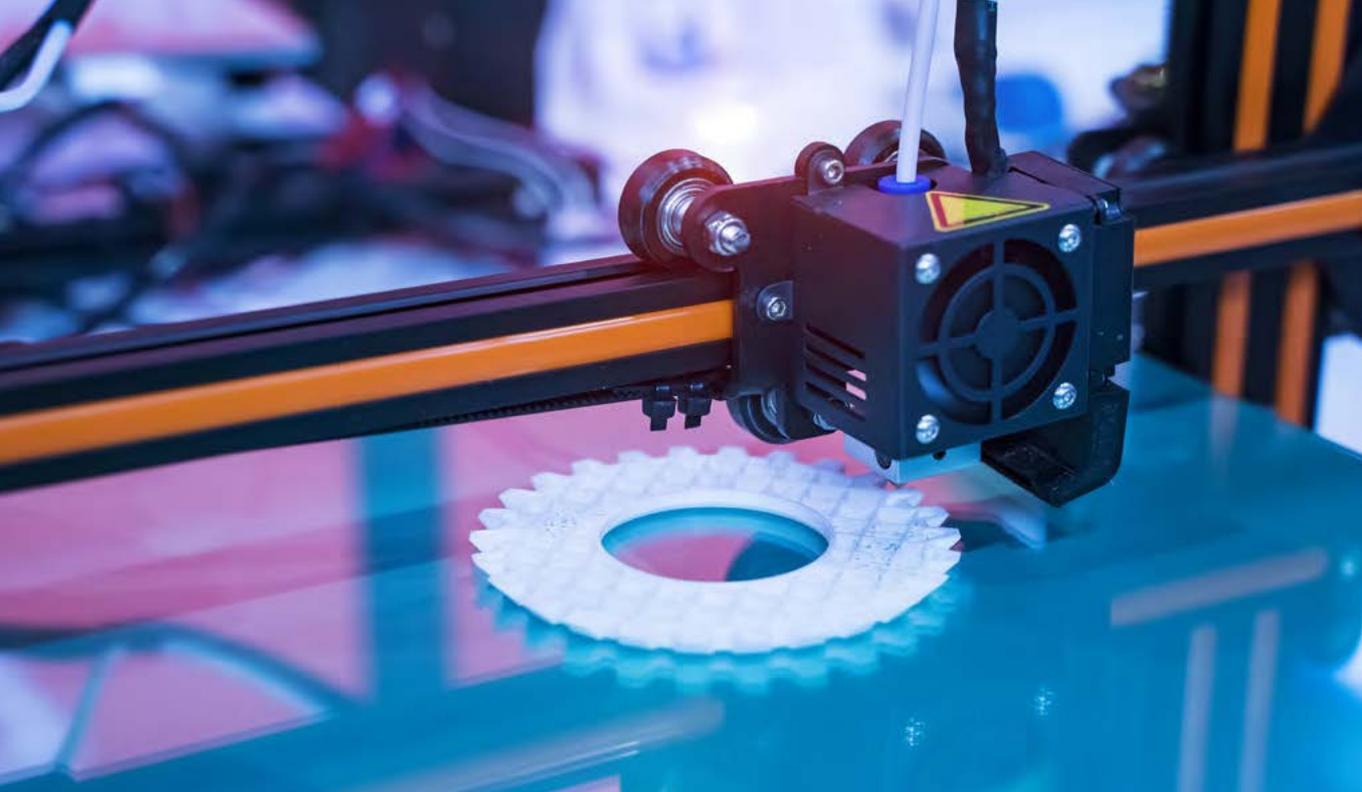
The Our Land and Water Challenge aims to preserve the most fundamental taonga ecosystems, our land, water and associated ecosystems, while producing value from those same taonga.

Placing Te Ao Māori at the heart of the Challenge has been a strong focus this year, helped by the appointment of Naomi Aporo to the new role of Kaihāpai Māori and the merging of the Board with Kāhui members into a single governance body.

In implementing AgResearch's commitment as one of Our Land and Water's research partners, our scientists continue to play a role in science leadership within the Challenge as well as leading or contributing to collaborative projects such as Whitiwhiti Ora (Land Use Opportunities) and Pohewa Pae Tawhiti (Visualising Horizons).

In addition, through a partnership with the Farmlands Co-operative we are exploring the best ways to support farmers to navigate issues in freshwater and climate policy.

In the past year Our Land and Water launched the Rural Professionals fund, to enable food and fibre producers and businesses to test exciting and innovative ideas. It also worked with the MfE and MPI to identify critical knowledge gaps in the design of environmental monitoring and in defining the most appropriate technologies to verify the impact of action on the ground.



Above: 3D printing technology in action.

SCIENCE FOR TECHNOLOGICAL INNOVATION

Kia kotahi mai –
Te Ao Pūtaiao me
Te Ao Hangarau

Objective

To enhance the capacity of New Zealand to use physical and engineering sciences for economic growth.

Challenge launched

16/9/2015

Host

Callaghan Innovation

Collaboration partners

AgResearch, GNS, Scion, Auckland University of Technology, Lincoln University, Massey University, University of Auckland, University of Canterbury, University of Otago, University of Waikato, Victoria University of Wellington, Lincoln Agritech

Tackling high-tech challenges to grow our economy

AgResearch is part of the project team, led by Scion, taking a novel, design-led approach to the Additive Manufacturing spearhead project in the Science for Technological Innovation National Science Challenge. Our staff, working alongside scientists, engineers and designers from other New Zealand CRIs and universities, are using biopolymers that originate in New Zealand, such as lignin, cellulose and protein, to create new engineered materials suitable for application in 3D printing of manufactured parts or products.

In this collaboration we are leading the development of new keratin-based substrates. The team has shown that these substrates have promise in various methods of 3D printing, including gel printing and

powder printing. It is also investigating how these materials can be connected to the environment to provide a 4D function. For example, findings so far indicate that some of the lignin materials change shape when exposed to high levels of humidity. The biomimetic aspect (learning from nature) is an important stretch goal of this project. As part of this project, AgResearch engineers and physicists have adapted existing 3D printing technologies and developed apparatus that can be used to evaluate the 3D-printability of these bio-based materials and to produce samples that can be characterised using scanning electron microscopy, mechanical strength testing and thermodynamic analysis.



Above: AgResearch's Dr Amber Milan conducting tests as part of a clinical trial into gut comfort.
Photo by Liggins Institute.

HIGH-VALUE NUTRITION

Ko Ngā Kai
Whai Painga

Objective

To develop high-value foods with validated health benefits to drive economic growth.

Challenge launched

1/4/2014

Host

University of Auckland

Collaboration partners

AgResearch, PFR, Massey University, University of Otago

New Zealand foods with proven health benefits

This Challenge is focused around four priority research areas: gut health, metabolic health, immune function and complementary feeding. AgResearch is a key collaborator across all priority areas.

The food and beverage sector generates the largest volume and value of New Zealand's merchandise exports. New Zealand aims to grow the overall ratio of exports to gross domestic product to 40% (from under 30% currently). Much of this growth will need to come from the expanding food export markets across Asia and especially in China. This level of growth cannot be achieved by productivity gains alone. Instead, the sector will need to derive greater value from the products it exports.

One of the strongest and most enduring value-add strategies comes from the relationship consumers perceive between foods and their health

and wellbeing. High-Value Nutrition therefore has a simple and clear mission: to develop high-value foods with scientifically validated health benefits as a way of driving economic growth.

We have aligned SSIF activities working in support of the Challenge vision, which also strongly aligns to our refreshed Science Plan goals.

An example is the "Systems Nutrition for Consumer Wellbeing" project. This project includes clinical research (conducted in collaboration with High Value Nutrition) investigating the complex relationships between food and the micro-organisms within the intestine. This research is important to identify which foods can influence gut comfort, and even brain health. It will enable food and beverage businesses to demonstrate the health benefits of New Zealand foods to key export markets.



Above: North Otago is one of the areas studied in the Thriving Regions programme.

BUILDING BETTER HOMES, TOWNS AND CITIES

Ko ngā wā kāinga hei whakamāhorahora

Objective

To improve the quality and supply of housing and create smart and attractive environments.

Challenge launched
5/5/2016

Host
BRANZ

Collaboration partners

Auckland Council, Auckland University of Technology, Centre for Research, Evaluation and Social Assessment, GNS, Lincoln University, Massey University, Opus, University of Otago, Prefabnz Incorporated, Scion, Limited, University of Auckland, University of Canterbury, Victoria University of Wellington, University of Waikato

Supporting success in regional settlements

We are proud to host the programme “Thriving Regions – South Island” as one of the four core strategic themes of the Building Better Homes, Towns and Cities National Science Challenge: Ko ngā wā kāinga hei whakamāhorahora.

The programme comprises a set of integrated case studies of South Island regions, settlements and communities. In the studies already under way in North Otago, South Canterbury, Horomaka Banks Peninsula, Cromwell and Marlborough, the researchers are working directly with community stakeholders as they navigate change, determine their own aspirations, confront impediments to wellbeing and search for solutions to local problems.

The central research questions of the Thriving Regions programme are:

- How are regional futures being defined, what strategies are being adopted to create them, and how are related plans, programmes and activities resourced and supported?
- What do community leaders, councils, organisations and agencies, mana whenua groups and Māori organisations need in order to develop strategies that support the capacity and capability of their communities to adapt to future challenges and thrive?

The programme builds on AgResearch’s previous SSIF-funded platforms: Resilient Rural Communities and, more recently, the Transforming Rural Communities project.



Above: Tāne Mahuta, the oldest Kauri tree in the world, located in Waipoua forest.



Objective

To protect and manage New Zealand's biodiversity, improve our biosecurity and enhance our resilience to harmful organisms.

Challenge launched

29/8/2014

Host

Manaaki Whenua – Landcare Research

Collaboration partners

AgResearch, ESR, GNS, NIWA, PFR, Scion, Auckland University of Technology, Lincoln University, Massey University, University of Auckland, University of Canterbury, University of Otago, University of Waikato, Victoria University of Wellington, MPI, DOC

Helping New Zealanders protect our precious environment

The Biological Heritage National Science Challenge is working to protect Aotearoa's biodiversity, improve biosecurity and enhance resilience to harmful pests, weeds and diseases. Over the past year our researchers were part of Biological Heritage's Science Leadership team – co-leading Ngā Pt Ka Rere (Early Career Researcher Group) and Ngā Rākau Taketake (Saving our iconic trees from kauri dieback and myrtle rust).

It was a great opportunity for staff to work collaboratively with researchers, stakeholders and Māori. We are pleased that some of our researchers remain involved in the Investment teams within Biological Heritage supported by our ongoing SSIF investment in Better Border Biosecurity, which continues to contribute significantly to the goals of this Challenge.

Other AgResearch researchers co-led or contributed to Biological Heritage's Strategic Outcome scoping groups including:

- Biological heritage scorecard for Aotearoa
- Environmental stewardship
- Emerging biosecurity risks
- State-of-the-art biosecurity surveillance tool, technologies and strategies.

Our international connections

Ō mātou hononga ā-tāwāhi

AgResearch partners globally to carry out a wide range of research programmes. These programmes span the breadth of our scientific capability and reinforce the success of global relationships.

AgResearch has worldwide connections with a range of researchers and scientific research entities. We also use our skills and capabilities to leverage international business opportunities with commercial companies.

Earlier this year, our Partnerships and Programmes team produced an international research and development collaboration strategy to attract research investment from global companies and foreign governments into New Zealand to support the growth of our science capability and international reputation.

International connections are increasingly important as we implement our refreshed Science Plan with a view to strengthening consumer-centric thinking and 'whole of value chain' approaches. Despite the recent challenge of COVID-19, AgResearch is well placed to attract international research and development investment into New Zealand, and we are still aiming to deliver our international strategy to grow investment by adapting ways of connecting with existing and potential clients.

62

Countries
and regions

412

Collaborations

86

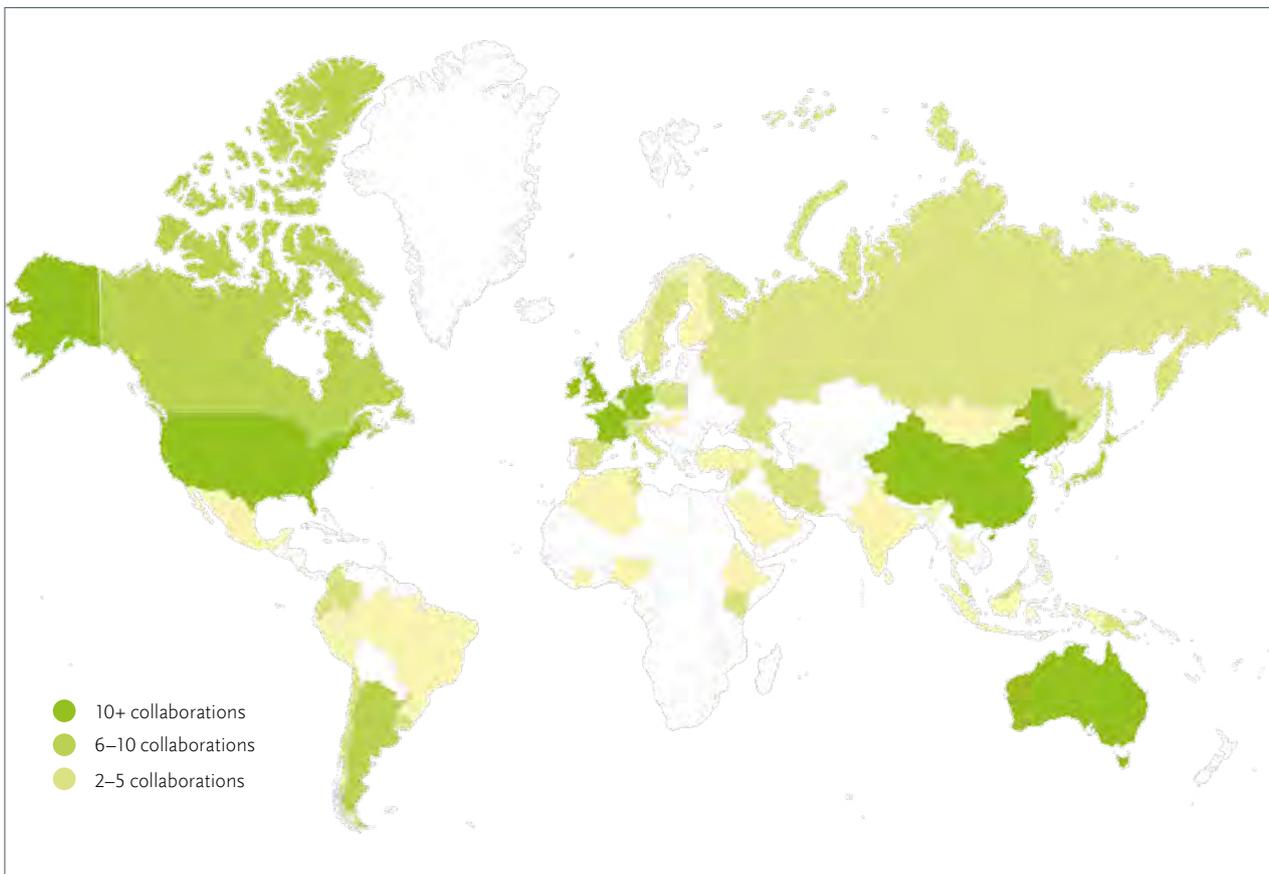
Collaborations
with USA

41

Collaborations
with China

81

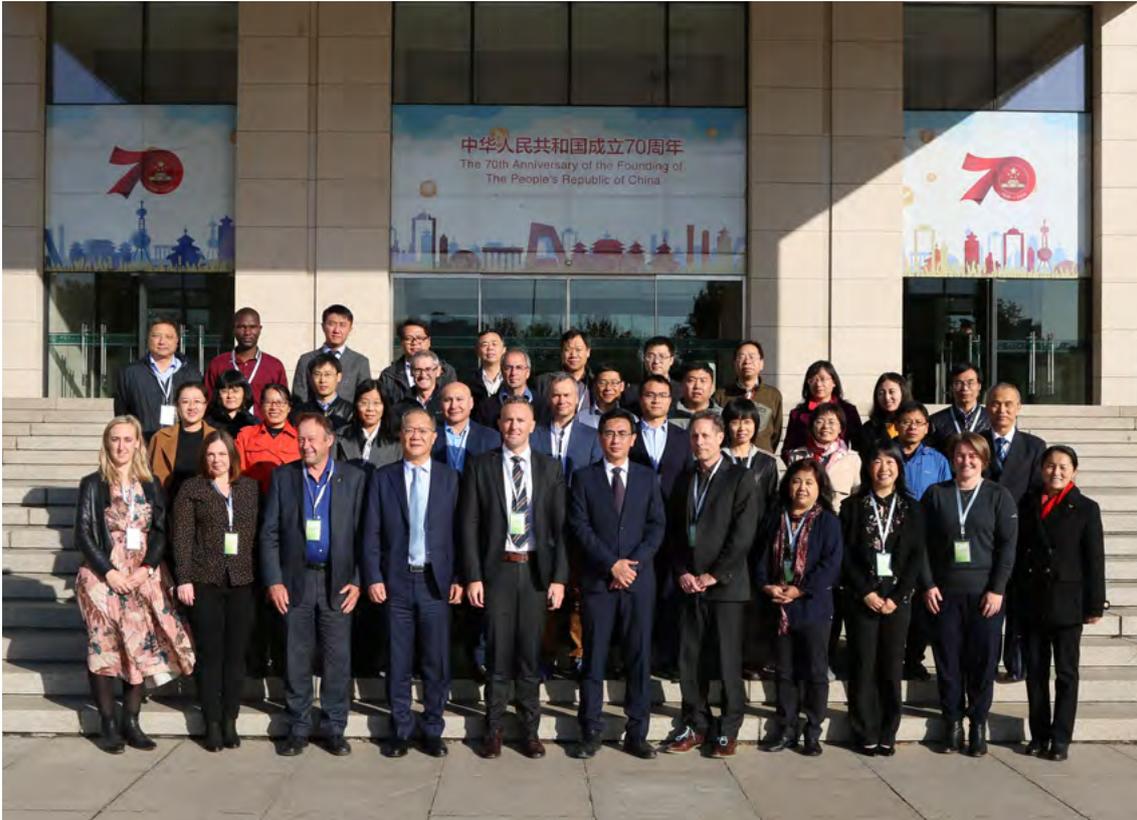
Collaborations
with Australia



We collaborate with:

Argentina, Armenia, Australia, Austria, Bangladesh, Belgium, Brazil, Canada, Chile, China, Colombia, Czech Republic, Denmark, Ecuador, Egypt, Ethiopia, Fiji, Finland, France, Georgia, Germany, Ghana, Greece, Hungary, Iceland, India, Indonesia, Iran, Ireland, Italy, Japan, Kazakhstan, Kenya, Latvia, Malaysia, Mexico, Morocco, Netherlands, Norway,

Papua New Guinea, Poland, Portugal, Russia, Samoa, Singapore, Slovakia, Solomon Islands, South Africa, South Korea, Spain, Sri Lanka, Svalbard, Sweden, Switzerland, Taiwan, Thailand, Tunisia, Turkmenistan, USA, United Kingdom, Uruguay, Vanuatu.



Above: Workshop attendees from AgResearch and both Chinese institutes.

Successful workshops in China

In November, an AgResearch delegation travelled to China, where it conducted two workshops with the Chinese Academy of Sciences and the Chinese Academy of Agricultural Sciences (CAAS) to identify key areas of mutual benefit to China and New Zealand.

The workshops covered a wide range of agricultural science areas and opportunities for research collaboration and long-term partnerships.

As a result of the workshops, CAAS and AgResearch have agreed to establish three collaboration projects in the following areas:

- Rumen microbial nitrogen metabolism (animal science)
- Sustainable management of lucerne for future climates (forage science)
- Review of active packaging for maintaining meat quality (food and bio-based products).

Developing an agricultural framework for a circular bioeconomy

Early in 2020, AgResearch shared research findings with Australia's national science agency, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), on a circular bioeconomy project. The research outcomes, based on a New Zealand dairy farm case study, included an initial framework to identify priorities to design out waste on farm, increase the overall value of the system, and track progress over time.

Although the project has been affected by COVID-19, a virtual workshop held with CSIRO in April resulted in revisions to the framework. The next stage of the project will be to apply the framework to an Australian dairy farm.



Right: Prime Minister Rt Hon Jacinda Ardern presided over the signing of an MoU between AgResearch and Shiratori Pharmaceutical.

Partnership with Shiratori Pharmaceutical

In September, AgResearch signed a new memorandum of understanding with Japanese company Shiratori Pharmaceutical. The ceremony was presided over by Prime Minister the Rt Hon Jacinda Ardern at the New Zealand Embassy in Tokyo.

The partnership will investigate whether an AgResearch-identified probiotic can be commercialised for the food and beverage market.

In February 2020 representatives from Shiratori visited AgResearch Grasslands to develop the project plans.

A second planned visit by Shiratori to New Zealand has been put on hold due to COVID-19; however, we have continued to connect virtually. The project should be completed in early 2021, and, if it indicates the probiotic has market potential, commercialisation will start soon after.

Outreach

Toro atu

To share the stories of our research, we use channels ranging from mainstream media and social media, to stakeholder-specific gatherings and meetings, to large public-facing events.

Aramoana

The Aramoana tohu speaks of ocean currents, journeying, bringing people together and seeking new horizons.





Visit from the Prime Minister

In November, AgResearch hosted Prime Minister the Rt Hon Jacinda Ardern at our Grasslands campus. The visit included a tour around the campus, including our new PC (Physical Containment) 2 facilities and the New Zealand Methane Measurement Centre. The Prime Minister also visited our labs to learn more about our endophyte research.

Among the scientist who greeted the Prime Minister was Dr Linda Johnson (pictured above).

The visit was featured on both primetime news bulletins, among other media outlets, demonstrating AgResearch's role as a leader in climate change research.



Welcoming Otago University students

Scientists at AgResearch's Invermay campus hosted botany students from Otago University in December to provide a snapshot of how CRIs, and AgResearch in particular, operate.

The three-day event provided students with a mix of practical and lecture-based opportunities. Day one was around the plantain trial at Invermay and gaining practical experience on pasture sampling, dissections, and assessment of pasture composition.

The next day focused on soil and fieldwork to measure key soil parameters and a lecture on the depths of soils and soil-water dynamics.

On the final day, the students collaborated and analysed the results. After that, they attended a lecture on the use of remote and proximal sensing technologies, which offer unique opportunities of non-invasive, non-destructive and very reliable measurements.



Rural Innovation Muster

AgResearch sponsored the Rural Innovation Muster in November – an event celebrating a year of future thinking and colliding ideas on technology and innovation in the rural sector. Two AgResearch projects featured as keynote addresses:

- Land-use visualisation tool by Remy Lasseur (pictured left)
- Real-time forage yield machines by Dr Kioumars Ghamkhar.

The event was attended by farmers, key stakeholders and innovative thinkers in the Manawatu region.

Dairy Industry Workshop

AgResearch, in conjunction with the Riddet Institute, hosted the annual Dairy Industry Workshop in Palmerston North in August 2019. The workshop provided a forum to showcase and promote our science contributing to the dairy industry, and equally provides an opportunity for different industry players to come together, network and discuss challenges and ideas.

The workshop was well attended by academia, government agencies and industry stakeholders.



Soil your Undies Otago

In June, AgResearch teamed up with Beef + Lamb New Zealand and a number of Otago-based schools and industry partners in the “Soil your Undies Otago” research programme. The research aims to understand and measure the health of rural soils using simple biological indicators to build a map of soil health for the area. The project involved local schools burying a pair of cotton undies, leaving it for two months and digging it up again. When they get dug back up, the worse the deterioration (from micro-organisms, worms and dung beetles), the better the soil.

The data gathered will help build a comprehensive picture of the state of soil health across the area. This partnership has received coverage by a range of media outlets.



Food service innovation workshop

AgResearch partnered with Shepherd Restaurant, Four Good Foods Ltd and Beef + Lamb New Zealand board member Melissa Clark-Reynolds in November, holding an immersive food experience in Wellington. The workshop gave participants an opportunity to watch, learn from and engage with top chefs to gain deeper insight into the sector and find areas where AgResearch science could play a role.

The second day focused on food service foresights and the development of a White Paper.

The workshop was attended by AgResearch food scientists, other staff, government agencies and food service experts.

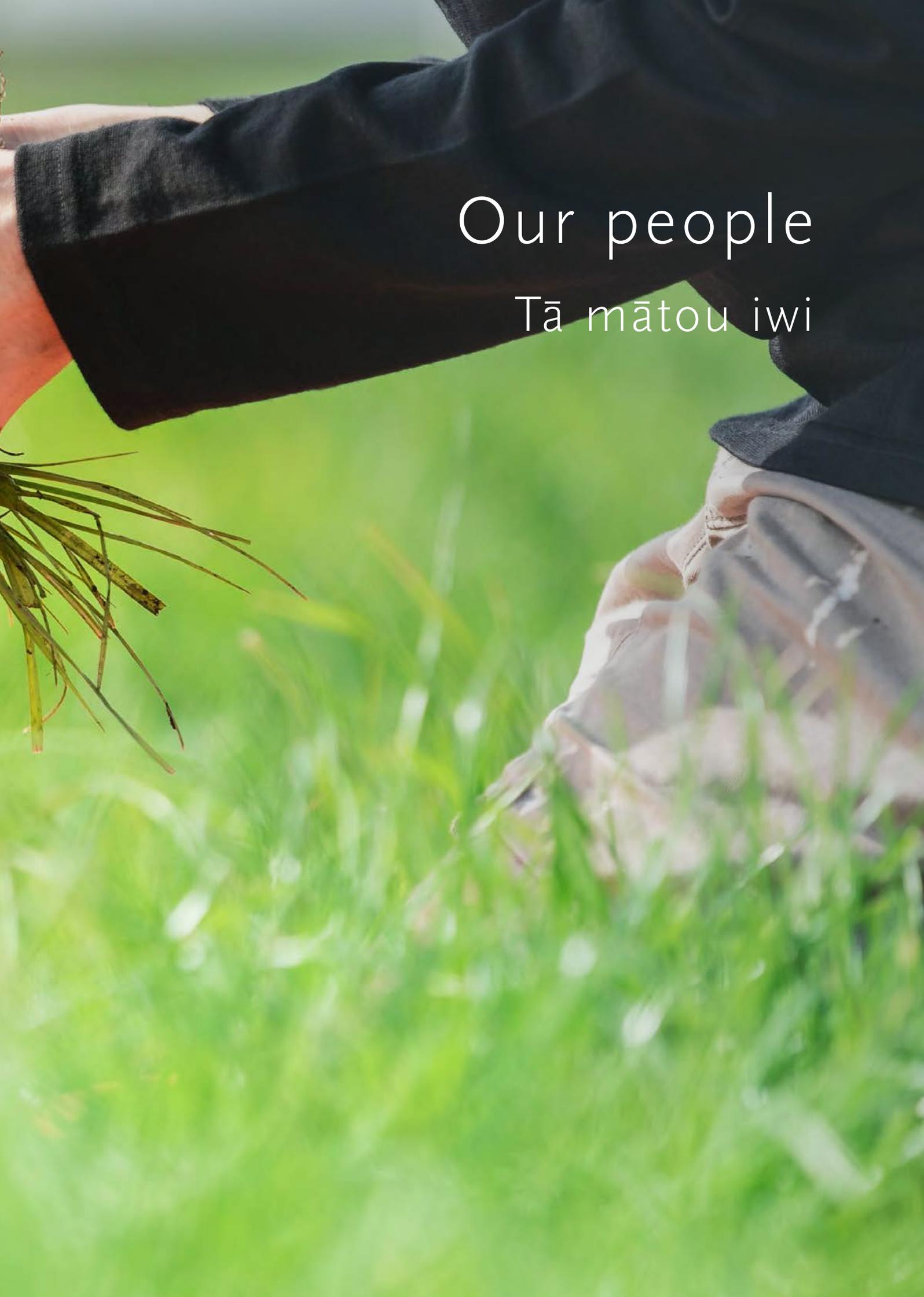
Social media

This year we used social media, in conjunction with a third party, to socialise a series of podcasts based on the *Heartland Strong* book.

The podcasts received over 1,000 downloads on the main hosting site.





A close-up photograph of a person's hands holding a bundle of dried, brown grasses. The person is wearing a black jacket. The background is a vast field of vibrant green grass, slightly out of focus. The lighting is bright and natural, suggesting an outdoor setting.

Our people

Tā mātou iwi

People and culture

Tāngata me te ahurea

Building a constructive culture of innovation excellence was a key area of strategic focus this year.

Aramoana

The Aramoana tohu speaks of ocean currents, journeying, bringing people together and seeking new horizons.

Culture of innovation excellence

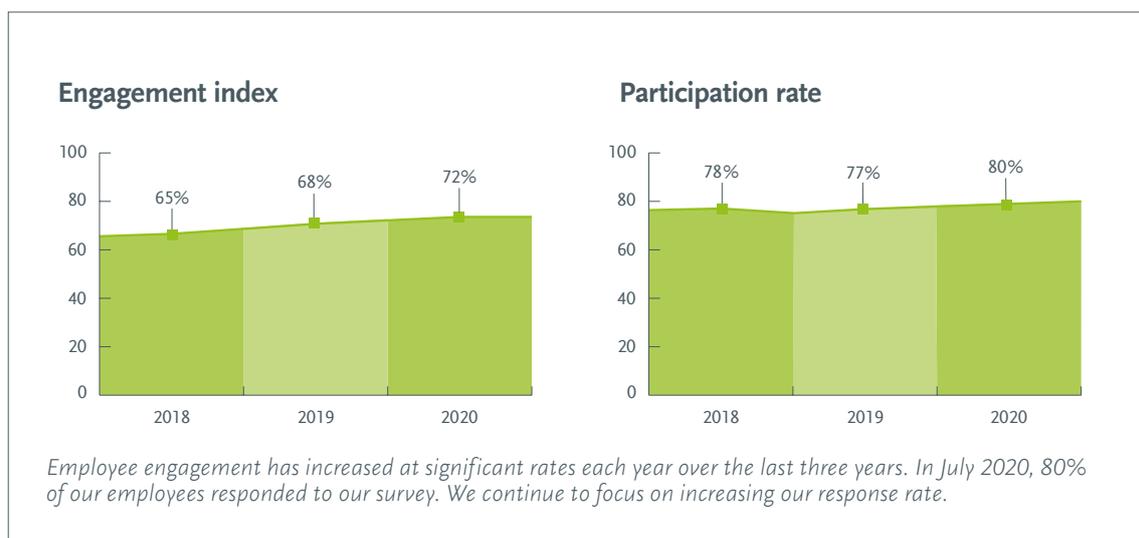
Our culture will help us attract and retain the right people who are the best at what they do, strengthen our collective expertise and position us to meet the challenges of the future. Our team of around 700 people across four vibrant campuses includes people in both science and support roles who are specialists in their disciplines.

This year we established a Culture Group, which is made up of a cohort of our people from across all campuses, all levels in the organisation and a range of roles. Supported by our People and Culture team, this group has been critical in identifying the culture levers we need to concentrate on to build our desired culture and foster a 'growth mindset'. We know building a culture of innovation excellence requires sustained effort and commitment to several organisational practices that impact our people, our environment and our practices.

Through the Employee Experience Programme, we receive feedback on how our people experience working at AgResearch so that we can better connect our people to our purpose and strategic direction, improve employee engagement, build stronger teams, develop and empower our people, reduce attrition and build our employment brand. While an overall engagement index score is still important for tracking changes in engagement over time, our Employee Experience Programme

has a strong focus on continuously improving what our people experience at work. Our Employee Experience Stakeholder Group was formed in 2019 to work alongside People and Culture to improve the employee experience. This approach has been well received by our people as we work towards One AgResearch.

Our Values describe the core behaviours and principles that our organisation abides by. They inspire our people's best efforts and continue to be the impetus for how we interact with our people, stakeholders and shareholders.



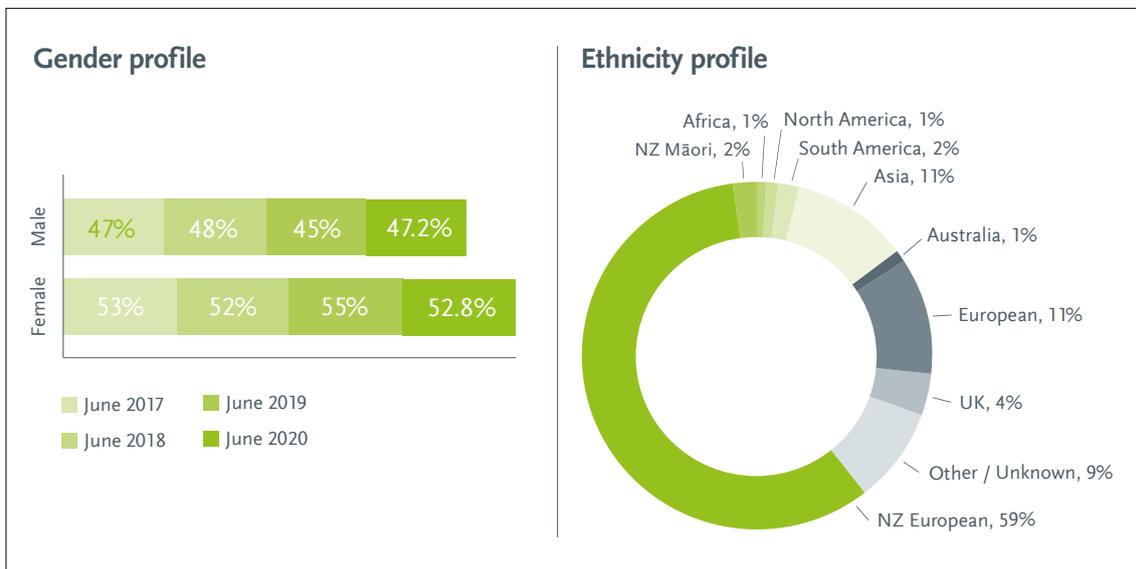
Whole Person Leadership

We are committed to supporting our leaders across all levels of the organisation to increase their self-awareness and effectiveness, so that they can build trust and empower their people to deliver their work with impact. The Whole Person Leadership programme sets out the competencies and associated behaviours that will drive change to our constructive and collaborative culture of innovation excellence. We have introduced the Human Synergistics Life Styles Inventory coupled with the Hogan competencies into our talent and leadership development programmes to encourage leaders to focus on, and develop, constructive and collaborative thinking and behaviour styles. The framework aligns with our approach to learning and

development by focusing on building the critical skills and core capabilities needed to deliver on our Science Plan and strategy.

Our learning and development strategy focuses on building critical skills and core capabilities required to deliver on the outcomes of the Science Plan. Its framework outlines the offerings available to our people and is refreshed annually to ensure it aligns with strategic initiatives and the needs of our people. This year we emphasised growing capability in Mātauranga Māori, developing people's thinking through design thinking and helping our people build commercial acumen across AgResearch.

Equity, diversity and inclusion strategy



We are committed to embracing equity and diversity, and we strive to be an inclusive organisation where all of our people feel valued for their contribution. Our diverse workforce is one of our greatest strengths. Our equity, diversity and inclusion strategy provides the platform to embed best practices within our actions, systems and processes. We are committed to continuously

educating our leaders around unconscious biases in the workplace and how to mitigate their impact. We have put in a place a strategy to proactively close pay equity gaps. We are an accredited employer with Immigration New Zealand and we continue to attract and welcome international talent. We have become a member of Diversity Works New Zealand – the national body that

supports workplaces to do diversity and inclusion well. We are working towards becoming a Living Wage Employer.

Offering flexible working arrangements is one way we can support the diverse needs of our employees and is one of the many initiatives that enable new ways of working.

Flexible working at AgResearch involves effectively managing work and personal priorities while meeting stakeholder expectations. When they are able to balance the many different aspects of their lives – including family, personal and social commitments, in addition to careers – our people can support each other to reach their full potential.

He Ara Hou (New Ways of Working)

As part of our culture of continuous improvement, we encourage and support our people to embrace, adopt and use change quickly and proficiently. We are committed to accelerating changes into AgResearch while minimising their impact on day-to-day business. Our Change Management Framework and toolkit provide a best-practice, consistent and comprehensive approach to change management at AgResearch.

We developed and executed a robust change programme focused on new ways of working to ensure our people had a successful transition to their new working environment in Te Ohu Rangahau Kai. The name translates as a cooperative community of food researchers, and this sense of community and collaboration is embodied in the facility, an exemplar of new shared ways of working. Modern workspaces designed to have activity-based working and shared areas throughout the

facility maximise the benefits of the co-location of food scientists and infrastructure to create a 'living laboratory' in cross-organisational collaboration.

We are now tailoring this new way of working for our new education, science and innovation precinct that will be built at our Lincoln Campus, including by developing change management guidance and lessons learnt. A proposed new science structure will be confirmed early in the 2021 calendar year to reflect the structure and language of our revitalised Science Plan and support a culture of accountability, innovation and transdisciplinary collaboration. We will continue to focus on building our capability and approach to supporting change management across AgResearch.

Technology driving people information

People and information are our most valued assets. For this reason, improving the way we manage our employee experience, processes and information has been a key strategic initiative for 2019/20 and will continue to be into 2020/21.

We are in the middle of implementing an integrated Human Resources Information System (HRIS), and payroll system, for all people-related activities. From their first touch through our careers website to when they leave (and everything in between), all of our leaders, and employees, will be able to use our new technology to manage and interact with information easily and with mobility.

Our HRIS will provide us with a single source of truth for all our people information. It will automate and streamline people-related processes from time-sheeting to succession planning, and deliver a higher level of accuracy, security, integrity and access for our people data. The solution will be fully mobile and our people will be able to manage their personal information, leave requests and undertake other employee-related transactions while out on the farm or visiting a partner offsite. We are looking forward to its launch early in the 2021 calendar year.

The following provides a snapshot of our people at AgResearch, as at June 2020:



Our Values

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

Professionalism
- WHAKARANGATIRA -
We do what's right.

Collaboration
- MAHITAHĪ -
We leverage collective expertise.

Quality
- MĀTAI WHETŪ -
We commit to excellence.

Innovation
- ĀTA MĀTAI -
We stimulate curiosity.

Customer Focus
- MĀTAI -
We deliver responsive, impactful solutions.

Thought Leadership
- ĀTA -
We inspire transformational change.



Celebrating our people

Whakanui i ō mātou iwi



Ronaldo Vibart

Ronaldo Vibart has been appointed to the Editorial Board of *Agricultural Systems*, an international journal with a high impact factor (of 4.131). It deals with interactions – among the components of agricultural systems, among hierarchical levels of agricultural systems, between agricultural and other land-use systems, and between agricultural systems and their natural, social and economic environments.



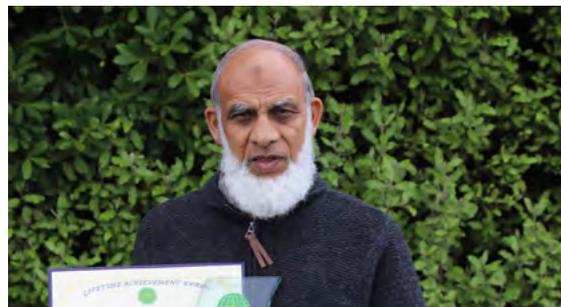
Val Snow

Senior Scientist Val Snow was made a Fellow of the Modelling and Simulation Society of Australia and New Zealand Inc. Furthermore, she was appointed as the inaugural Editor-in-Chief of the Elsevier journal *Agricultural Systems*.



Hannah McKerchar

PhD student Hannah McKerchar, from our Protein and Metabolites team, was the recipient of the Riddet Institute's Overseas Placement Award, which allowed her to visit the Wilson Lab at York University in Toronto. The visit gave her more information about the dynamics of cow and goat milk proteins, which will help her in engineering them.



Anis Rahman

Anis Rahman, an Honorary Researcher in our Plant Functional Biology Team, was presented the Life Achievement Award 2019 by the Asian-Pacific Weed Science Society at the Society's 27th conference in Kuching, Malaysia.

He is the author or co-author of 297 refereed publications (1 book, 6 book chapters, 84 science journals and 206 papers for international and national scientific conferences). These are augmented by 94 other conference and farming publications.



Harry Clark

Harry Clark, the Director of the NZAGRC, was appointed as one of seven Government-appointed Climate Change Commissioners.

The Climate Change Commission provides governments with independent advice on how to meet the emissions reduction targets required by law, with regular “emissions budgets” set for governments to follow if they wish.

The independent commission, which takes over from the Interim Climate Change Committee, is tasked with monitoring and reviewing governments’ progress towards emissions reduction and adaptation goals.



Sam Hitchman

Sam Hitchman, a postdoctoral scientist in the Food & Bio-based Products team, was awarded the International Meat Secretariat Prize for Young Talent in Meat Science and Technology at the International Congress of Meat Science and Technology.

Sam presented two posters and gave an oral presentation at the congress on behalf of the wider MBIE “Capturing the value of New Zealand red meat” research programme team, which includes AgResearch, Callaghan Innovation, the Dodd-Walls Centre and Scott Technologies Limited.



Jim Webster

Jim Webster, the Science Team Leader for our Animal Welfare team, was elected to the board of the International Council for Laboratory Animal Science (ICLAS) that promotes international cooperation to secure humane and high-quality laboratory animal science across the world.

ICLAS has 55 member-organisations, based in 21 countries. It was established in 1956 at the initiative of the United Nations Educational, Scientific and Cultural Organization, the Council for International Organizations of Medical Sciences and the International Union of Biological Sciences.



Natalie Ahlborn

PhD student Natalie Ahlborn was awarded a FoodHQ / International Food and Agribusiness Management Association (IFAMA) scholarship. The scholarship is open to postgraduate students and young professionals in the agri-foods area and means Natalie will represent New Zealand in the IFAMA student case competition in Rotterdam.

Science New Zealand awards

Ngā tohu Pūtaiao o Aotearoa



'Genotyping-by-Sequencing'

2019 Team Award

Represented by Drs Jeanne Jacobs (pictured above), Shannon Clarke, Ken Dodds and Marty Faville; but also includes John McEwan, Rudiger Brauning, Andrew Griffiths, Alan McCulloch, Tracey van Stijn, Hannah Henry, Hayley Baird, Rayna Anderson, Craig Anderson, Anna Larking, Mingshu Cao, Won Hong, Timothy Bilton, Rachael Ashby and Sofie Pearson.

The team has widely embedded 'genotyping-by-sequencing' and new genomic tools in industry breeding programmes (sheep, cattle, deer, goats, salmon, green-lipped mussel, ryegrass, clover), in ecological studies on weeds and insects, and for conservation purposes in diverse indigenous species.

The award-winning team has produced efficient pipelines from large-scale DNA extraction through to analysis of genomic variation among individuals. This work involved using new tools to interrogate genomic data and estimate genetic relatedness and parentage, and derive genomic estimate breeding values for genomic selection in both animals and plants.



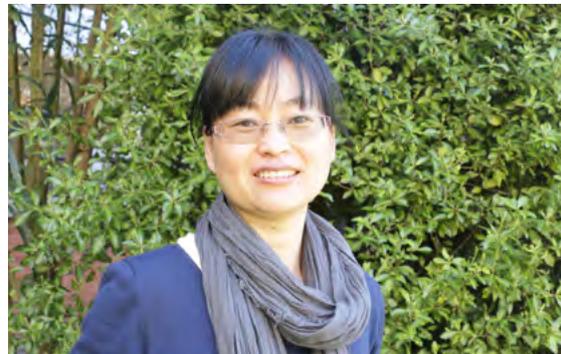
Dr Barbara Barratt

Principal Scientist, Forage Science
2019 Lifetime Achievement Award

Barbara Barratt has contributed an outstanding science career to AgResearch (and predecessor organisations) for 41 years and has pioneered internationally relevant research and risk assessment related to the biosafety of introduced insect biocontrol agents. Her excellent research has had a significant impact on New Zealand and global biocontrol science and practice and will continue to do so into the future.

Barbara has also contributed strongly to the wider science community through executive roles for science societies, associate editorship roles and work for international organisations.

She has authored or co-authored more than 200 peer-reviewed science publications, is a Fellow of the Entomological Society of New Zealand and was recently awarded the New Zealand Plant Protection Medal in recognition of her exceptional contribution to New Zealand plant protection science.



Dr Shengjing Shi

Senior Scientist, Soil Microbiology
2019 Early Career Research Award

Shengjing Shi has a strong background in molecular microbiology, biochemistry, soil ecosystem functioning and bioinformatics. Her research initially focused on soil microbiomes and microbial regulated nutrient cycling and has since broadened to embrace plant–microbial interactions.

Shengjing is a highly talented emerging science leader with strong science quality attributes. An outstanding component of Shengjing's career to date has been the quality of science journals in which she has published. All her scientific publications have been in journals with very high impact factors, and she already has an average of more than 65 citations per paper.

Rewarding excellence within AgResearch

Whakanui i ngā huhuatanga pai o AgResearch

Each year, AgResearch awards a Science Prize, Impact Prize and Student Prize to recognise outstanding achievement.



2020 Science Prize Winner

Our Science Prize was awarded to researchers involved in producing the paper “Cultivation and sequencing of rumen microbiome members from the Hungate1000 Collection”, which was published in the *Nature Biotechnology* journal.

A large number of current and former AgResearch staff contributed to this multi-organisational paper. They include Rekha Seshadri and Sinead Leahy (joint first authors); Graeme T Attwood, Koon Hoong Teh, Suzanne C Lambie and Adrian L Cookson; Hungate1000 project collaborators Nikola Palevich, Peter H Janssen, Ron S Ronimus, Samantha Noel, Priya Soni and Kerri Reilly; as well as Rechelle Perry, Gemma Henderson and William J Kelly.

The depth of data is impressive; this paper presents reference genomes for 410 cultured bacteria and archaea, representing approximately 75% of

genus-level bacteria and archaeal taxa in the rumen. As such, this critical piece of science has generated significant new knowledge that will allow the science community to use rumen microbiome data to engineer rumens that reduce methane emissions and improve productivity and sustainability outcomes.

The authors' ability to assign function to taxa is a significant advance, as is their capacity to understand potential vertical inheritance.

This was complex and deep research involving large data sets and a big international team that took an innovative approach to a well-established problem. It was published in a journal with a very high impact factor (35.7) and had 7,829 article accesses and 82 citations, providing strong evidence that it is being used broadly within the science community.

2020 Impact Prize Winner

The AgResearch team behind the Deer Progeny Test (DPT) included Jamie Ward, Sheryl-Anne Newman, Bryan Thompson, Mary Wheeler, Karren O'Neill, Geoff Asher, Ian Scott, Helen Manly, Julie Everett-Hincks, Jason Archer and Rachel Worth.

New Zealand deer farmers are heavily reliant on genetic selection for achieving permanent and cumulative productivity gains in their herd. The DPT programme was established in 2011 with the aim of achieving, via the DEERSelect platform, greater farm productivity and profitability by improving the quality, availability and visibility of relevant production genetics within the New Zealand deer industry.

The DPT programme directly contributed to many specific industry benefits. Notably, first, the rate of genetic gain increased significantly for both wapiti and red deer compared with the pre-DPT period. In addition, the industry median slaughter age fell by between 37 and 61 days, while industry-related revenue in the period 2015–2018 rose by 26%. Another benefit was that the programme helped to achieve 100% data linkage across breeding herds, facilitating meaningful analysis and comparison between sires.

It also contributed to the ongoing development of the breadth of genetic characteristics being measured, with 100+ traits now incorporated and over 50% of all industry breeders using the resulting breeding values to influence stag selection.

In addition, the DPT programme has not only reconnected breeders and improved recording practices, but also upskilled breeders and educated producers.

Further evidence of the impact of the programme is that it has developed a range of collaborative initiatives in conjunction with industry including breeder workshops, the DEERSelect Stakeholder Reference Group and other stakeholder workshops.



Above: CT scanning a rising yearling to assess body composition.



2020 Student Prize Winner

This is a new award to highlight student achievement. Our first recipient was Timothy Bilton, for a paper he co-authored “Accounting for errors in low coverage high-throughput sequencing data when constructing genetic maps using biparental outcrossed populations”. It was published in *Genetics*.

The paper describes how high-density genetic linkage maps can be constructed with next-generation sequencing-based genotyping platforms. Unfortunately, data generated through these platforms often contain errors because low sequencing depth leads to miscalled bases and missing parental alleles. The paper offers a solution in the form of a new statistical method for modelling low-coverage sequencing data in the construction of genetic linkage maps in full-sib (biparental) families and inbred line crosses. The editors selected the paper as an issue highlight and it has since received significant interest, as documented by 2,822 full reads and 10 citations already.

Timothy is currently a postdoctoral scientist in our Knowledge and Analytics team.



An aerial photograph of a large, well-maintained green lawn. Several people are seen walking across the grass, their shadows cast long and dark on the surface. The text is overlaid on the upper right portion of the image.

Corporate governance

Te kāwanatanga
ā-rangatōpū

Our Board

Tō mātou Poari



Dr Paul Reynolds, QSO
Chair

Dr Paul Reynolds served as Chief Executive of the Ministry for the Environment from 2008 until 2015. Prior to that he worked at the Ministry of Research, Science and Technology (1998–2002) as Chief Policy Adviser and then, from 2002–2008, was Deputy Director General (Policy) at the Ministry of Agriculture and Forestry.

Paul has a background in scientific research, holding a PhD in Biochemistry from the University of Otago. He is also Deputy Chair of Manaaki Whenua – Landcare Research, Chair of Trust Tairāwhiti and Chair of the Sir Peter Blake Trust.

Paul was made Companion of the Queen's Service Order in the Queen's Birthday Honours, 2018.



Kim Wallace
Deputy Chair
Chair – Audit and Risk
Committee

Kim Wallace is an experienced independent director. She currently serves on the boards of Quotable Value and Port Nelson. Before pursuing a full-time career in governance in 2017, Kim enjoyed a 24-year career in the global dairy industry, which included working in senior executive roles based in New Zealand, USA, Germany and Australia.



Jackie Lloyd
Director
Chair – People and
Culture Committee

Jackie Lloyd is an independent director. She is currently Chair of Experience Wellington (Wellington Museums Trust), a director of Kiwi Group Holdings and Naylor Love Enterprises, a board member of New Zealand Cricket and Museum of New Zealand Te Papa Tongarewa, a trustee of The Lion Foundation and a member of the National Council of the Institute of Directors in NZ (Inc).



**Rukumoana
Schaafhausen**

Director

A lawyer, director and an influential member of her iwi, Rukumoana Schaafhausen joined the AgResearch Board in July 2018. She is the chairperson of Te Arataura, the executive arm of Te Whakakitenga o Waikato, the tribal authority representing the people of Waikato-Tainui.



Colin Armer

Director

Colin Armer has been involved in the industry for 30 years and is a partner and director of Dairy Holdings Ltd. His farming interests are focused in the Bay of Plenty and Central Plateau region.



Dr Louise Cullen

Director

Louise Cullen combines her environmental science and dairy farming backgrounds to bring a pragmatic, evidence-based focus to the businesses and organisations she works with. Louise is currently a director for the Tatua Co-operative Dairy Company and a member of a number of agricultural industry groups. Louise joined the Board in March 2020.



Lain Jager

Director

Lain Jager is best known for his time with Zespri where he was CEO from 2008 to 2017. Today, Lain is involved in a range of investment projects in tourism and agribusiness, serves as a director on several boards and acts as a strategic advisor to a small number of companies. Lain was appointed to the Board in July 2020.

Governance and leadership at AgResearch are complementary teams that work together to promote excellence and accountability.

The Board promotes the highest standards of corporate governance practice and ethical conduct by all Directors and employees of AgResearch Limited and its subsidiaries.

The Board endorses the overall principles embodied in the New Zealand Institute of Directors' "Code of Practice for Directors". It has only independent Directors on the Board, whose skills and experience bring balance and diversity to decision-making.

Role of the Board

The Board is responsible to shareholders for charting the direction of the Company by: setting objectives, strategy and key policies; and monitoring management's running of the business to ensure it is aligned with the direction set.

The Board delegates the conduct of the day-to-day affairs of the Company to the Chief Executive. The Board is responsible for the appointment, from time to time, of the Chief Executive and annually reviews their performance.

The workings of the Board and its code of conduct are governed by the Companies Act 1993, AgResearch's constitution, the Crown Research Institutes Act 1992, the Crown Entities Act 2004, the annual Statement of Corporate Intent and the Board's manual. This manual sets out all the functions and operating procedures of the Board. The policies approved by the Board clearly set out those matters on which only the

Board can make decisions. These include dividend payments, solvency certificates, raising new capital, major borrowings, approval of the annual financial statements, appointment of directors to subsidiaries and associates, major capital expenditure and acquisitions.

Each year, the Company produces a Statement of Corporate Intent and an operating budget, which are reviewed and approved by the Board. Monthly management accounts are prepared and these are reviewed by the Board throughout the year to monitor management's performance against the budget and the Statement of Corporate Intent.

Independent professional advice

With the prior approval of the Chair, each Director has the right to seek independent legal and other professional advice at the Company's expense concerning any aspect of the Company's operations or undertakings to help them fulfil their duties and responsibilities as a Director.

Director education

The Board had a budget of \$15,000 to assist Directors with the financial costs of attending courses and conferences on governance matters. Directors who attend report back at Board meetings on matters learnt that would improve the governance of the Company. The Chair authorises expenditure from this budget.

Board membership

The constitution currently sets the size of the Board at a minimum of two Directors and a maximum of nine Directors.

The Board in the financial year consisted of the Chair and five other Directors. Directors are generally appointed for a three-year term and may be reappointed for further terms.

Dr Louise Cullen was appointed to the Board on 16 March 2020. She joined Colin Armer, Jackie Lloyd, Rukumoana Schaafhausen, Kim Wallace and Dr Paul Reynolds, who was confirmed in the role of Board Chair in September 2019.

Board and standing committee meetings

The table below sets out the Board and committee meetings that Directors attended during the financial year. The Board has established two standing committees to guide and assist the Board with overseeing certain aspects of corporate governance – the Audit and Risk Committee and the People and Culture Committee.

The Board and each committee are empowered to seek any information they require from employees in pursuing their duties and to obtain independent legal or other professional advice.

Board of Directors	Board meetings attended	Audit and Risk Committee	People and Culture Committee
Dr Paul Reynolds (Chair)	9	2	5
Kim Wallace (Chair Audit and Risk Committee)	9	5	
Jackie Lloyd (Chair People and Culture Committee)	8		5
Colin Armer	9	5	
Dr Louise Cullen	4		2
Rukumoana Schaafhausen	8		5
Dr Peter Stone (Ceased directorship on 30 September 2019)	1		
Number of meetings held	9	5	5

Statutory reporting – Board

For the year ended 30 June 2020

To our shareholders and stakeholders

The Directors are pleased to report that AgResearch Limited met its obligations in all material aspects under the Crown Research Institutes Act 1992 for the year ended 30 June 2020.

Dividends

No dividends were declared during the year to 30 June 2020.

Directors' interests

The Board received no notices during the year from Directors requesting the use of Company information that would not otherwise have been available to them. There were no share dealings by Directors with the Company.

Directors' interests disclosed during the year to 30 June 2020 are set out in the table below. The "Director" and "Trustee" columns also identify Chair and Deputy Chair roles where relevant. Interests do not include trusteeships, directorships or shareholdings in private trusts and small companies with whom no transactions have occurred during the year. These interests have been appropriately recorded within the interest register, which is updated regularly.

AgResearch Interest List FY20

	Director of	Officer of	Trustee of	Shareholder of
REYNOLDS, Paul (Chair)	<ul style="list-style-type: none"> Landcare Research Ltd. (Deputy Chair) Toitu Envirocare (Chair) Blinc Innovation Ltd (ceased Directorship 2 December 2019) 		<ul style="list-style-type: none"> Trust Tairāwhiti (Chair) Sir Peter Blake Trust (Chair) Student Volunteer Army Foundation (Chair) 	
ARMER, Colin	<ul style="list-style-type: none"> Armer Farms (NI) Limited Dairy Holdings Limited and its subsidiaries Dacca Investments Limited Hirata Dairies Limited Icena Investments Limited Armer Group Limited Pasture Conference Limited Pure Pasture Investments Limited Calf Co Ltd 		<ul style="list-style-type: none"> Pasture Conferences Trust 	<ul style="list-style-type: none"> Armer Farms (NI) Limited Dairy Holdings Limited and its subsidiaries Dacca Investments Limited Hirata Dairies Limited Calf Co Ltd Icena Investments Limited Armer Group Limited Fonterra Ballance Ravensdown Silver Fern Farms Pure Pasture Investments Limited

	Director of	Officer of	Trustee of	Shareholder of
CULLEN, Louise	<ul style="list-style-type: none"> Tatua Co-operative Dairy Company Ltd Cookson Trust Farms Ltd Balachraggan Farms Ltd Capra Farming Ltd Acorn Goats Ltd 			<ul style="list-style-type: none"> Fonterra Co-operative Group Ballance Agri-Nutrients Ltd Ravensdown Dairy Goat Co-operative Livestock Improvement Corporation Tatua Co-operative Dairy Company Ltd
LLOYD, Jackie	<ul style="list-style-type: none"> Kiwi Group Holdings Limited Naylor Love Museum of New Zealand Te Papa Tongarewa NZ Cricket (Board Member) 		<ul style="list-style-type: none"> Lion Foundation Wellington Museums Trust (trading as Experience Wellington) (Chair) 	
SCHAAFHAUSEN, Rukumoana	<ul style="list-style-type: none"> Te Waharoa Investments GP Limited Hautupua GP Limited Regional Facilities Auckland 	<ul style="list-style-type: none"> Te Arataura, the Executive of Te Whakakitenga o Waikato Incorporated Society (Waikato-Tainui) 	<ul style="list-style-type: none"> Tindall Foundation The Prince's Trust 	<ul style="list-style-type: none"> Schaafhausen Inc Limited
STONE, Peter (ceased directorship on 30 September 2019)	<ul style="list-style-type: none"> National Centre for Engineering in Agriculture (University of Southern Queensland) Rockies Trustee Limited Dorothea Stone Limited Hocken Enterprises Limited Octagon Enterprises Limited 			<ul style="list-style-type: none"> Nufarm Limited Argo Rockies Trustee Limited Dorothea Stone Limited Hocken Enterprises Limited Octagon Enterprises Limited Euroflex New Zealand Limited
WALLACE, Kim	<ul style="list-style-type: none"> Port Nelson Limited (Audit Chair) Christchurch City Council (Chair of Assurance and Risk Committee) Ministry for Primary Industries (Assurance and Risk Committee) NZ Transport Agency (Consultant) KiwiRail (Consultant) Kim Wallace Consulting Limited Seahorse Beach Investments Limited 			<ul style="list-style-type: none"> Seahorse Beach Investments Limited Kim Wallace Limited

Directors	2020	2019
Dr Paul Reynolds (Chair)	74,744	72,000
Colin Armer	37,372	37,056
Louise Cullen	10,949	-
Jackie Lloyd	42,372	37,056
Rukumoana Schaaafhausen	37,372	37,056
Dr Peter Stone	9,264	37,056
Kim Wallace	42,372	42,060
Grasslanz Technology Limited		
Robert John Hay (Chair)	20,004	20,004

Our Executive Leadership Team

Tō mātou Tumuaki Whakahaere



Dr Sue Bidrose
Chief Executive Officer

Dr Sue Bidrose joined AgResearch as CEO in July 2020. She started her working life with the Ministry of Agriculture and Fisheries as a laboratory technician specialising in metabolic diseases of dairy cattle. She then worked in the community sector and, after completing her Doctorate in Psychology, worked in central government in research, policy and operational leadership roles. She then moved across to local government, most recently as Chief Executive of Dunedin City Council, before returning to the agricultural science sector here at AgResearch.



Tony Hickmott
Finance and Business
Performance Director

Tony Hickmott held the position of Acting Chief Executive at AgResearch from October 2019 to July 2020. As Finance and Business Performance Director, Tony is an experienced leader with a wealth of knowledge in finance, audit and risk plus Government funding models.



Jo Brady
Communications and
Marketing Director

Jo Brady has an executive leadership background in central government and the tertiary sector and brings significant expertise in strategy development, marketing, communications, business development and organisational change and has held several governance and national industry advisory roles.



Stuart Hall
Partnerships and
Programmes Director

Stuart Hall's key areas of experience include sales and marketing execution, leadership and strategy development. He has extensive experience in a number of executive sales and commercial roles.



Natasha Barnett
Health, Safety and
Environment Director

Natasha Barnett has extensive experience in high-risk, safety-critical industries including the primary industry and agricultural sectors, aviation, healthcare and government, as well as other corporate sectors.



Chris Koroheke
Kaiurungi Ahuwhenua
Māori

Chris Koroheke's role on the Executive Leadership Team is to strengthen the relationships across the burgeoning Māori agribusiness sector. His background is in developing relationships across organisations and iwi.



Fleur Evans
Acting People and
Culture Director

Fleur Evans is an experienced organisational development professional with a proven track record in leading organisational culture change programmes, developing strategies to build critical skills and leadership capability, and strategic workforce planning.



Dr Trevor Stuthridge
Research Director

Dr Trevor Stuthridge brings extensive international executive and governance experience in science, innovation and technology commercialisation organisations. He has served as director on 10 boards and strategic advisor for 12 industry/academic research consortia.



Greg Rossiter
Technology and Digital
Services Director

Greg Rossiter is an experienced IT professional with an extensive background leading cross-functional teams to deliver major change projects.



John O'Dea
Infrastructure
Director

John O'Dea has extensive experience in the property and construction sectors including the long-term planning and re-development of Lyttelton Port following the 2010–11 earthquakes.

Statutory reporting – Company

For the year ended 30 June 2020

Remuneration greater than \$100,000

During the year ended 30 June 2020, 238 staff received remuneration of or exceeding \$100,000 per annum, as shown in the table below.

Remuneration included performance awards, superannuation benefits, vehicle benefits, and severance and exit payments.

Remuneration was received by Science (163); Chief Executive's Office, Infrastructure, People & Culture, Communications & Marketing and Finance & Business Performance (69); and Subsidiaries (6).

Remuneration band	Number of employees
\$100,000 to \$109,999	43
\$110,000 to \$119,999	41
\$120,000 to \$129,999	41
\$130,000 to \$139,999	30
\$140,000 to \$149,999	20
\$150,000 to \$159,999	15
\$160,000 to \$169,999	7
\$170,000 to \$179,999	10
\$180,000 to \$189,999	7
\$190,000 to \$199,999	4
\$200,000 to \$209,999	3
\$210,000 to \$219,999	2
\$220,000 to \$229,999	4
\$240,000 to \$249,999	1
\$250,000 to \$259,999	1
\$260,000 to \$269,999	1
\$270,000 to \$279,999	1
\$280,000 to \$289,999	1
\$300,000 to \$309,999	1
\$320,000 to \$329,999	1
\$340,000 to \$349,999	1
\$390,000 to \$399,999	1
\$470,000 to \$479,999	1
\$830,000 to \$839,999	1
Total	238

Termination payments

During the year, the Group made the following payments to former employees in respect of termination of their employment with the Group.

Total amount paid	\$1,138,276
Number of employees	31

Executive remuneration reporting

AgResearch's remuneration policy is to reward employees at all levels of the organisation fairly and consistently under the following principles:

Market Relativity <ul style="list-style-type: none">• Market practice• Market position• Labour market conditions	Internal Relativity <ul style="list-style-type: none">• Recognising different levels of complexity and accountability between roles
Ability to Pay <ul style="list-style-type: none">• Balancing company responsibilities with commitment to competitive market positioning	Performance <ul style="list-style-type: none">• Reward for delivery and high performance

Total remuneration is made up of fixed remuneration and variable remuneration. Fixed remuneration includes base salary and employer contribution of Kiwisaver.

Base salary is agreed with reference to the fixed pay market median data provided by external independent advisors and is reviewed by the Board annually.

Variable remuneration for the Executive Team (ET) is an at-risk performance payment designed to motivate and reward for individuals' performance in the financial year. The target value of the at-risk performance payment is usually set as a percentage of the executive's base salary and is paid based on the accomplishment of the organisational and individual Key Performance Indicators (KPIs) for the previous financial year. These KPIs are approved by the Chief Executive (CE) and the Board for ET (except CE) and by the Board at the CE level.

Chief Executive's remuneration

Dr Tom Richardson was appointed CE in September 2010 and his employment with AgResearch ceased on 25 October 2019. Mr Tony Hickmott was appointed Acting CE from that date. The remuneration that the CE and Acting CE received for the year ending 30 June 2020 and comparative periods are disclosed as following:

in thousands of New Zealand dollars	2020	2019
Salary and other shortterm employee benefits	894	680
Termination payments	292	-
Total	1,186	680

Donations

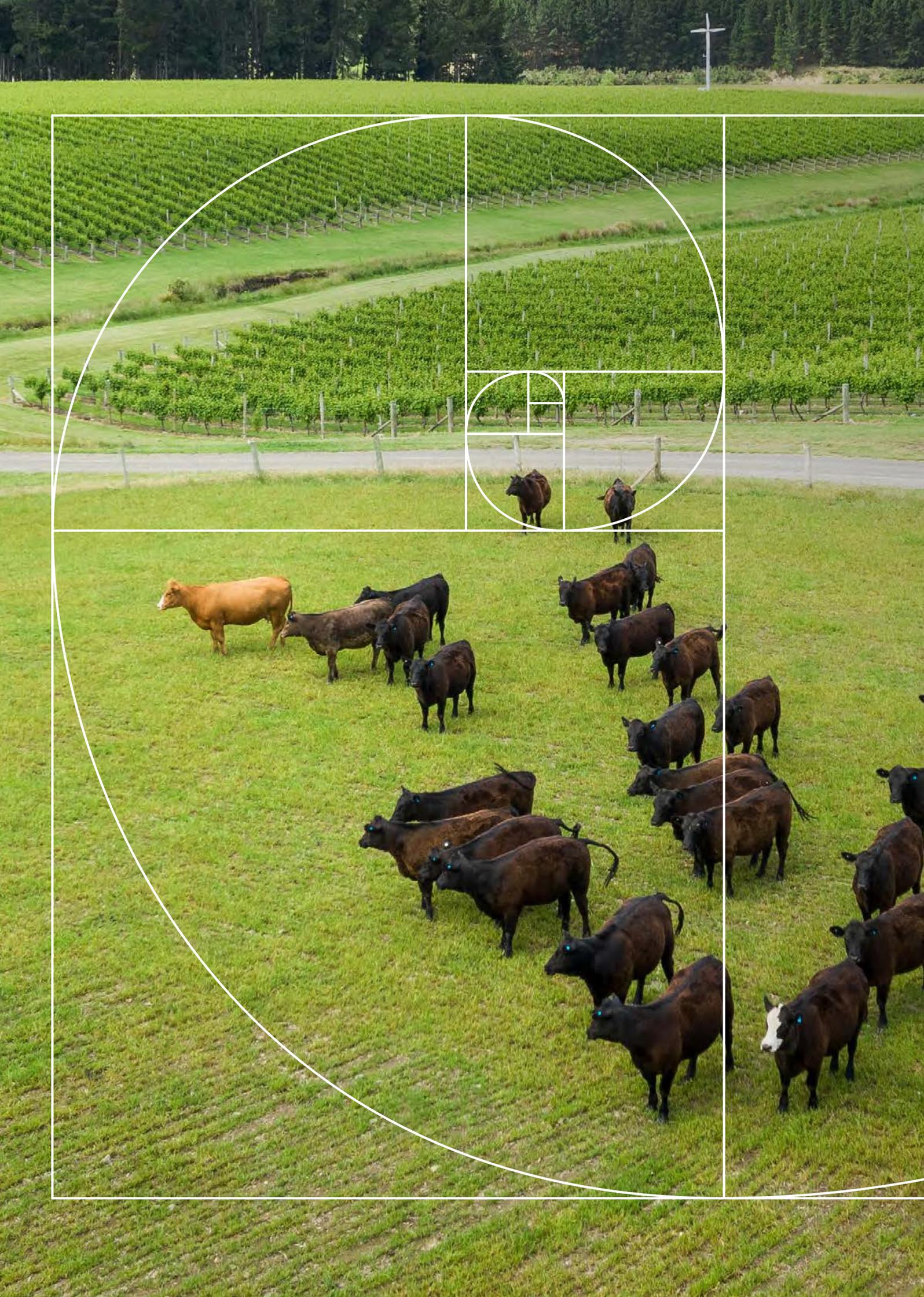
Donations paid during the year ended 30 June 2020 were \$3,567

Directors and employees indemnity and insurance

During the year, the Company indemnified Directors and certain employees to the fullest extent permissible by law. The Company also has Directors and Officers insurance.

Auditor

Paul Bryden of Deloitte Limited is the appointed auditor of the Company under contract from the Office of the Auditor-General and under section 21 of the Crown Research Institutes Act 1992.



An aerial photograph of a rural landscape. In the foreground, a lush green field contains several brown cows. A dirt road or path runs horizontally across the middle ground. Behind the road is a large, rectangular pond. The background is dominated by a vast, well-maintained vineyard with rows of young grapevines. The entire scene is framed by a white border, with a white diagonal line cutting across the bottom right corner.

Performance indicators

Ngā whāinga paearu mahi

Key performance indicators

as at 30 June 2020

	Strategic goal	Objective	Key performance indicators for FY20	Result for FY20
People	Innovative and high-performing workforce.	Staff engagement increased.	Increase Engagement Index from the previous staff survey result by 3%	In July 2020, our Staff Engagement Index was 72%, up from 68% in 2019.
		We will all have a safe workplace.	Total Medical Treatment Injuries (MTI) and MTI causing lost time <30 per year.	From 1 July 2019 to 30 June 2020, the total number of MTI and MTI causing lost time was 6, down from 16 last year.
			No serious harm accidents.	We had no "serious harm" incidents.
Stakeholders	Comprehensive understanding of the sector, including key and emerging players and their relationships.	Grow our understanding of the sector and the sector's recognition of that understanding.	>90% of surveyed stakeholders rate AgResearch's understanding/contribution to their strategy as good or better.	In 2019, 70% of surveyed stakeholders rated AgResearch's understanding/contribution to their strategy as good or better.
	Co-owned strategy with key stakeholders.	Grow commercial revenue through closer alignment of stakeholder and AgResearch strategic goals.	Successful engagement with Government, key industry and wider stakeholders to identify the new science that is needed to meet New Zealand's critical challenges around agricultural profitability, enhancement of the environment and mechanisms to fund that, resulting in significant new investment.	
			Deliver \$54.7 million of stakeholder-driven commercial science revenue. Deliver \$4.07 million of international organisation-driven revenue.	We achieved \$48.76m of stakeholder-driven commercial science revenue We achieved \$5.21m of international revenue.
Research	Research and Development solutions that meet sector needs and contribute to Impacts and Outcomes identified in our strategy (SCI).	Ensure AgResearch has the research portfolio and capabilities that will meet current and future stakeholder needs and deliver our strategy.	Implement AgResearch's revitalised Science Plan	The revitalised Science Plan, comprising seven highly connected Science Objectives, was launched in August 2019. Specific quantitative impact metrics and key performance indicators have been developed for each of these Objectives. During the year, a Science Plan Accelerator Fund (SPAF) was established using SSIF to fund activities designed to accelerate implementation of the Science Plan. These activities included the development of foresight-led science strategies for key integrated initiatives and enabling platforms, exploring our Partnerships by Design concept, and co-designing our Te Ao Māori Strategy.

	Strategic goal	Objective	Key performance indicators for FY20	Result for FY20
Research			Map science skill capability.	Utilising a framework of core capability topic areas for the organisation, we have mapped across AgResearch. The outputs produced will be used to ensure we have the appropriate skills to deliver our Science Plan and identify where external partnerships are needed.
	High-quality, relevant science.	Deliver relevant, high-quality, reliable Research and Development outputs that meet stakeholder needs and deliver to our strategy.	> 1.0 Scopus-indexed papers published per scientist.	1.16 Scopus-indexed papers were published per scientist.
Infrastructure	Infrastructure aligned to strategy.	AgResearch infrastructure is fit for purpose.	Develop campuses and hubs to agreed milestones and budgets for FY20.	Te Ohu Rangahau Kai, the joint food science facility located at Massey University, opened to staff in June 2020.
				The Grasslands Greenhouses opened in September 2019. The build of a new facility at Lincoln was formally approved in June 2020, following the submission of an implementation business case. Design work is progressing well, with construction work due to commence on site in the third quarter of 2021.
Financial	Sustainable financial performance to enable achievement of strategic goals.	Achieve financial targets.	Operating Profit budget achieved.	Our Operating Profit is \$6.8m, compared with a budgeted operating loss of (\$3.6m).
			Net Profit Before Tax budget achieved.	Our Net Profit Before Tax is \$3.8m compared with a budget loss of (\$4.5m).

Key performance indicators (continued) as at 30 June 2020

AgResearch's 2019/2020–2023/2024 Statement of Corporate Intent (SCI) identified the following non-financial operating indicators against which progress to achieve the SCI operating outcomes is measured. Target figures in [brackets] are from AgResearch's 2019/2020–2023/2024 SCI.

Core operating indicators

ID	Indicator	Definition	Measure [target]
G.1	End-user collaboration	Revenue per full-time equivalent (FTE) from commercial sources.	\$75.6k [\$84.8k]
G.2	Research collaboration	Publications with collaborators. Percentage of publications with a) only AgResearch authors, b) other New Zealand authors, c) international authors or d) a combination of New Zealand and international authors. <i>(Data for this indicator is reported for calendar years.)</i>	(a) 12% [14%] (b) 35% [39%] (c) 25% [26%] (d) 28% [21%]
G.3	Technology and knowledge transfer	Commercial reports per scientist FTE.	1.16 [1.0]
G.4	Science quality	Impact of scientific publications. The average value of two-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. <i>(Data for this indicator is reported for calendar years.)</i>	2.44 [2.7]
G.5	Financial indicator	Revenue per FTE, based on average FTEs over the year.	\$240.0k [\$225.4k]

AgResearch-specific indicators of end-user engagement and science relevance

ID	Indicator	Definition	Measure [target]
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.	64% [>60%]
1.3		Satisfaction with our service – “Very Good” or “Better” satisfaction rating.	70% [>70%]
1.4		Dealing with us – “Preference to Work” rating.	57% [>60%]
1.5		Familiarity with our capability – “Very Familiar” rating.	45% [>40%]
1.6		Contribution to stakeholder strategy – “Good” or “Better” rating.	70% [>90%]
1.7		Consistent implementation of agreed science service/ interaction plan.	Achieved [Achieved]
1.8		a) Total revenue b) Total science revenue c) Commercial science revenue d) Intellectual property revenue e) International revenue f) Māori revenue.	a) \$154.91m [\$155.4m] b) \$103.73m [\$114.6m] c) \$48.76m [\$54.7m] d) \$11.32m [\$10.9m] e) \$5.21m [\$4.07m] f) \$0.11m [\$0.335m]

AgResearch-specific operating indicators of delivery to Vision Mātauranga

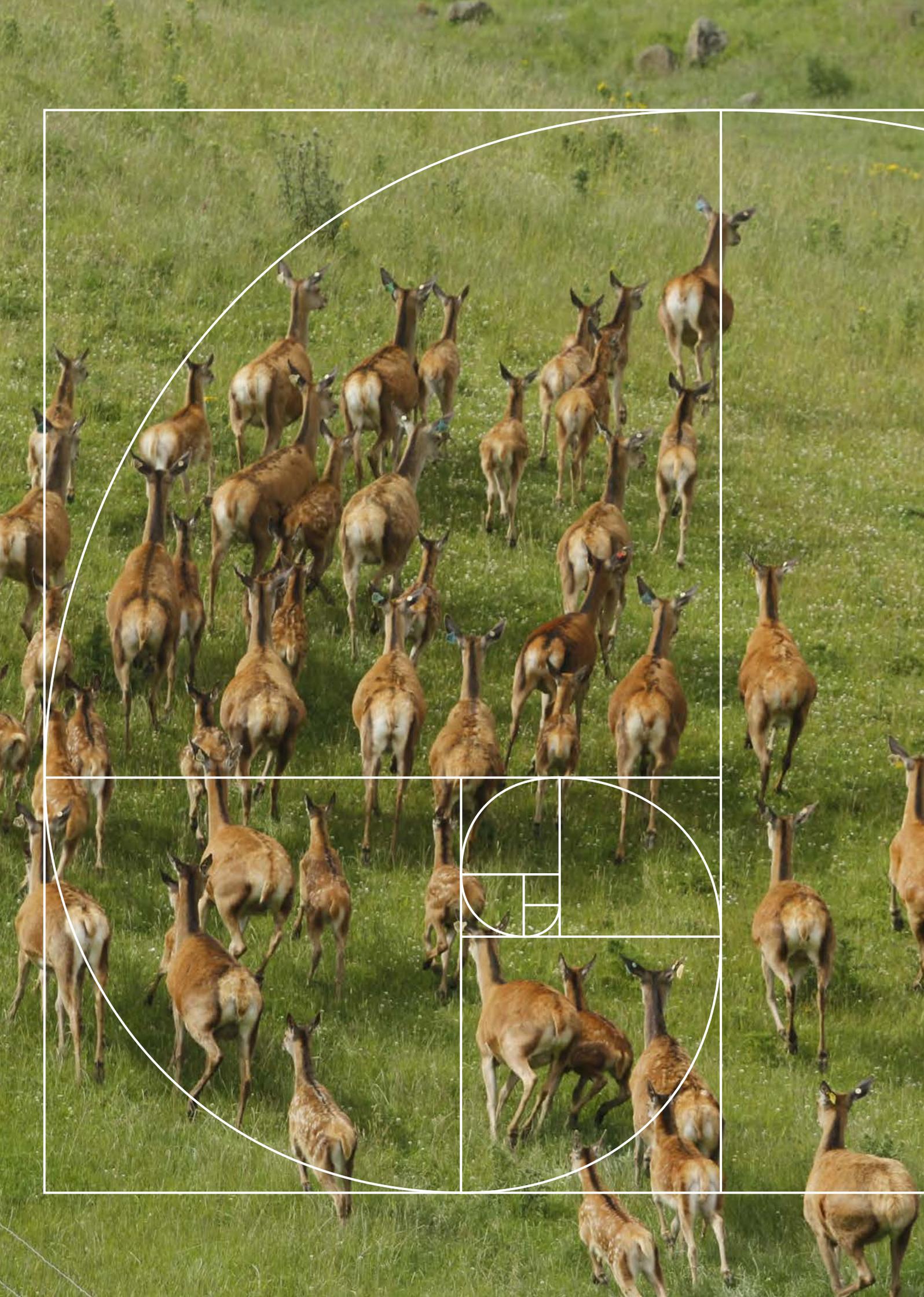
ID	Indicator	Definition	Measure [target]
2.1	Collaboration with Māori	Cultivate collaboration to support Māori agribusiness by co-developing funding proposals with stakeholders.	7 [6]

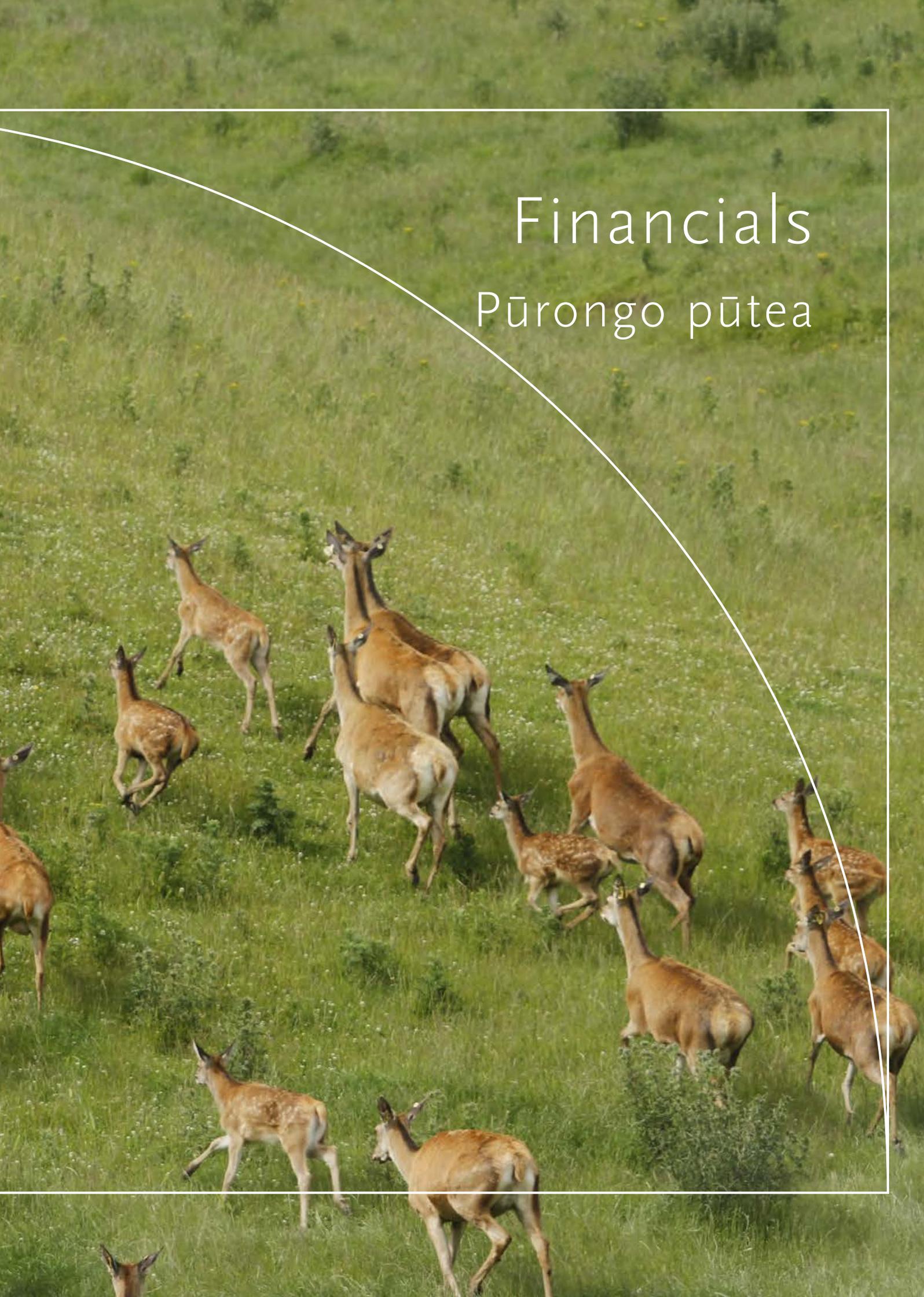
AgResearch-specific workforce indicators

ID	Indicator	Definition	Measure [target]
3.1	Staff engagement	Increase Engagement Index by 5 points.	72% [70%]
3.2	Health and safety	No notifiable injuries and <2 notifiable events.	0 [<2]
3.3	Employee engagement with Health and Safety	Employee engagement index of Health & Safety within AgResearch increases with >75% score.	91% [>75%]

AgResearch-specific financial performance

ID	Indicator	Definition	Measure [target]
4.1	Financial target	Operating Profit budget achieved.	Achieved (including COVID-19 Response and Recovery Fund) [Achieved]



A herd of deer is running through a lush green field. The deer are in various stages of motion, some running towards the viewer and others away. The field is filled with tall grass and small white flowers. The background is a soft-focus green landscape. A white curved line separates the text from the image.

Financials

Pūrongo pūtea

Financial performance indicators

For the year ended 30 June 2020

	Actual 2020	Budget 2020	Actual 2019
Cash flow			
• Net cash flow from operating activities \$k	34,384	9,476	14,142
• Net cash flow from investing activities \$k	(25,427)	(16,860)	(12,280)
• Net cash flow from financing activities \$k	(2,179)	-	-
• Total net cash flow \$k	6,778	(7,384)	1,862
• Effect of exchange rate changes \$k	43	-	8
• Cash at the beginning of the year \$k	48,186	21,795	46,316
• Cash at the end of the year \$k	55,007	14,412	48,186
Operating Margin %	9.6%	(1.3%)	8.9%
Operating Margin per FTE \$k	23.1	(3.0)	21.2
Revenue Growth %	(0.8%)	(1.2%)	7.9%
Quick Ratio	2.9	1.5	2.7
Interest Coverage	15	7.7	870
Operating Margin Volatility %	45.1%	25.2%	43.9%
Forecasting Risk %	1.8%	-	1.1%
Adjusted Return on Equity %	4.1%	(2.4%)	(4.7%)
Capital Renewal	1.9	-	1.2
Equity Ratio %	76%	82.7%	79.9%

Indicator definitions:

Adjusted Return on Equity: Surplus after tax (excluding fair value movements net of associated tax impact) ÷ Average shareholder's funds excluding asset revaluation reserve, expressed as a percentage.

All other indicators are based on the Treasury prescribed calculations which may differ from normal accounting calculations for that indicator.

Consolidated statement of comprehensive income

For the year ended 30 June 2020

in thousands of New Zealand dollars	Note	Actual 2020	Budget 2020	Actual 2019
Revenue	1			
Ministry of Business, Innovation and Employment				
• Strategic science funding	1	43,889	43,889	43,889
• Our Land and Water National Science Challenge	1	4,289	8,696	6,424
• COVID-19 Response and Recovery Fund	1	13,570	-	-
• Other	1	17,049	17,450	22,495
Commercial	1	56,929	64,691	62,199
Farm produce	1	4,530	5,798	4,956
Other revenue	1	15,817	14,963	17,348
Total operating revenue		156,073	155,487	157,311
Operating expenditure	2	(149,265)	(159,118)	(153,800)
Other gains/(losses)	3	(1,046)	-	(7,073)
Finance costs	4	(962)	(52)	(16)
Share of deficit of associates	5	(1,020)	(800)	(1,266)
Surplus/(deficit) before tax		3,780	(4,483)	(4,844)
Tax expense/(benefit)	6	(2,203)	(1,255)	2,164
Net surplus/(deficit) after tax for the year		5,983	(3,228)	(7,008)
Other comprehensive income				
<i>Items that will not be reclassified subsequently to surplus or deficit:</i>				
Revaluation of properties	8	(1,992)	-	-
Income tax relating to components of other comprehensive income	6	(169)	-	-
Other comprehensive income for the year net of tax		(2,161)	-	-
Total comprehensive income for the year net of tax		3,822	(3,228)	(7,008)
Net surplus/(deficit) is attributable to:				
Equity holders of the parent		5,983	(3,228)	(7,008)
Total comprehensive income is attributable to:				
Equity holders of the parent		3,822	(3,228)	(7,008)

The statement of accounting policies and the accompanying notes form an integral part of these financial statements.

Consolidated statement of financial position

As at 30 June 2020

in thousands of New Zealand dollars	Note	Actual 2020	Budget 2020	Actual 2019
Current assets				
Cash and cash equivalents		55,007	14,412	48,186
Trade and other receivables	9	22,175	45,592	31,798
Prepayments		2,250	1,889	2,021
Lease receivable – current	12	196	-	-
Biological assets – livestock	11	3,933	3,487	4,190
Inventory		1,142	1,095	1,027
Derivative financial instruments		-	-	5
Property held for sale		-	763	-
Current tax	6	-	1,223	-
Total current assets		84,703	68,461	87,227
Non-current assets				
Investments in associates and joint ventures	5	6,035	7,336	6,068
Other investments	15	2,659	2,241	2,241
Property, plant and equipment	8	210,791	202,302	204,963
Biological assets - forestry	14	1,245	1,157	1,157
Other non-current receivables		-	4,629	-
Goodwill	17	907	907	907
Intangible assets		2,450	1,138	1,745
Right-of-use assets	13	27,154	-	-
Total non-current assets		251,241	219,710	217,081
Total assets		335,944	288,171	304,308
Less:				
Current liabilities				
Trade and other payables	10	42,322	28,742	39,721
Derivative financial instruments		11	-	-
Provisions	18	6,181	5,739	5,406
Current tax	6	2,638	-	718
Lease liabilities	16	2,099	-	-
Other current liabilities		-	936	9
Total current liabilities		53,251	35,417	45,854
Non-current liabilities				
Deferred tax	6	11,579	14,827	16,368
Lease liabilities	16	25,449	-	-
Other non-current liabilities	19	536	596	766
Provisions - non-current	18	22	34	35
Total non-current liabilities		37,586	15,457	17,169
Total liabilities		90,837	50,874	63,023
Net assets		245,107	237,297	241,285

in thousands of New Zealand dollars	Note	Actual 2020	Budget 2020	Actual 2019
Equity				
Share capital	7	47,268	47,268	47,268
Revaluation reserves	7	90,950	102,602	93,111
Retained earnings		106,889	87,427	100,906
Total equity		245,107	237,297	241,285

The statement of accounting policies and the accompanying notes form an integral part of these financial statements.



Dr Paul Reynolds
Chair
11 September 2020



Kim Wallace
Deputy Chair
11 September 2020

Consolidated statement of changes in equity

For the year ended 30 June 2020

in thousands of New Zealand dollars	Note	Share capital	Revaluation property, plant and equipment	Retained earnings	Total equity
Balance at 1 July 2018		47,268	102,211	98,814	248,293
Deficit after tax for the year		-	-	(7,008)	(7,008)
Revaluation of properties	8	-	-	-	-
Transfer of revaluation reserve on sold assets	8	-	(9,100)	9,100	-
Income tax relating to components of other comprehensive income	6	-	-	-	-
Total comprehensive income		-	(9,100)	2,092	(7,008)
Balance at 30 June 2019		47,268	93,111	100,906	241,285
Balance at 1 July 2019		47,268	93,111	100,906	241,285
Profit after tax for the year		-	-	5,983	5,983
Revaluation of properties	8	-	(1,992)	-	(1,992)
Transfer of revaluation reserve on sold assets	8	-	-	-	-
Income tax relating to components of other comprehensive income	6	-	(169)	-	(169)
Total comprehensive income		-	(2,161)	5,983	3,822
Balance at 30 June 2020		47,268	90,950	106,889	245,107

The statement of accounting policies and the accompanying notes form an integral part of these financial statements.

Consolidated statement of changes in equity

Consolidated statement of cash flows

For the year ended 30 June 2020

in thousands of New Zealand dollars	Note	Actual 2020	Budget 2020	Actual 2019
Cash received from operating activities				
Receipts from customers		175,522	168,656	161,082
Interest received		1,155	306	1,227
Dividends received		-	-	5
Total cash received from operating activities		176,677	168,962	162,314
Cash disbursed on operating activities				
Payments to employees		71,463	67,365	67,664
Payments to suppliers		68,033	90,426	79,374
Restructuring		1,173	1,643	812
Income tax paid		662	-	306
Interest paid		962	52	16
Total cash disbursed on operating activities		142,293	159,486	148,172
Net cash flow from operating activities	21	34,384	9,476	14,142
Cash received from investing activities				
Disposal of property, plant and equipment		17	19,520	19,404
Disposal of investments and intangible assets		742	-	626
Total cash received from investing activities		759	19,520	20,030
Cash disbursed on investing activities				
Investment in property, plant and equipment		22,684	33,033	30,289
Purchase of other investments and intangible assets		2,577	2,373	1,096
Partner contribution to research consortia		925	975	925
Total cash disbursed on investing activities		26,186	36,381	32,310
Net cash flow from investing activities		(25,427)	(16,861)	(12,280)
Cash received from financing activities				
Term loan drawdown		-	5,551	-
Total cash received from financing activities		-	5,551	-
Cash disbursed on financing activities				
Term loan repayments		-	5,551	-
Repayment of the lease liabilities		2,179	-	-
Total cash disbursed on financing activities		2,179	5,551	-
Net cash flow from financing activities		(2,179)	-	-
Total net cash flow		6,778	(7,384)	1,862
Cash at beginning of year		48,186	21,795	46,316
Effect of exchange rate changes on the balance of cash held in foreign currencies		43	-	8
Cash at end of year		55,007	14,412	48,186

The statement of accounting policies and the accompanying notes form an integral part of these financial statements.

Statement of accounting policies

For the year ended 30 June 2020

Reporting entity

The Consolidated Financial Statements of AgResearch Limited and its subsidiaries, associates and joint arrangement interests (collectively, the Group) for the year ended 30 June 2020 were authorised for issue by the Directors on 11 September 2020. AgResearch Limited (the Company or Parent) is a limited liability company incorporated in New Zealand.

Operating as a Crown Research Institute, its principal activity is research and development in the pastoral sector of New Zealand. The Consolidated Financial Statements have been prepared in accordance with the requirements of the Companies Act 1993, the Financial Reporting Act 2013, the Crown Research Institutes Act 1992 and the Public Finance Act 1989. Information on related party relationships of the Group is provided in note 25.

Basis of preparation

The Consolidated Financial Statements have been prepared in accordance with Generally Accepted Accounting Principles in New Zealand (NZ GAAP). They comply with the New Zealand Equivalents to International Financial Reporting Standards (NZ IFRS) and other applicable financial reporting standards as appropriate for tier 1 profit-orientated entities.

The Consolidated Financial Statements have been prepared on the basis of historical cost, except for the revaluation of biological assets, certain non-current assets and financial instruments. Cost is based on the fair value of the consideration given in exchange for assets.

Accounting policies are selected and applied in a manner which ensures that the resulting financial information satisfies the concepts of relevance and reliability, so that the substance of the underlying transactions or other events is reported.

The Consolidated Financial Statements are presented in New Zealand Dollars (NZD), which is the presentation currency of the Group unless otherwise indicated.

Critical accounting estimates and judgements

The preparation of Consolidated Financial Statements conforming with NZ IFRS requires the use of certain critical accounting estimates. It also requires the Directors to exercise judgement in the process of applying the Group's accounting policies. The areas involving a higher degree of judgement or complexity, or where assumptions and estimates are significant to the Consolidated Financial Statements, are disclosed in the relevant accounting policy or note.

The estimates and associated assumptions are based on historical experience and various other factors that are believed to be reasonable under the circumstances.

Actual results may differ from these estimates.

The estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates are recognised in the periods affected by the revision.

Information about significant areas of estimation uncertainty and critical judgements in applying accounting policies, that have the most significant effect on the amounts recognised in the financial statements, are:

Significant influence

Pastoral Greenhouse Gas Research Consortium is treated as an associate of the Group as it has significant influence over the Consortium by virtue of:

- Its participation in the Board activities
- The provision of funding
- Its undertaking science research for the consortia.

Joint operation

Grasslands Innovation Limited is considered a joint operation by virtue of the contractual arrangements which specify the parties' rights to the economic inputs and outputs of the joint arrangement and retention of ownership rights to pre-existing intellectual property (IP) contributed by the parties.

Impairment of assets

Before balance date each year, the Directors review property, plant and equipment not held at fair value, intangible assets and other assets for indications of impairment. In particular, consideration is given to whether there are indications that:

- The market value of the asset has significantly declined
- Significant changes have taken place during the period, or will take place in the near future, in the technological, economic or legal market to which the asset is dedicated
- Market interest rates or other market rates of return on investments have increased during the period, and those increases are likely to affect the discount rate used in calculating an asset's value in use and decrease the asset's recoverable amount materially
- There has been obsolescence or physical damage of the asset
- Significant changes with an adverse effect on the Group have taken place during the period, or are expected to take place in the near future, which impacts the extent to which, or manner in which, an asset is used or is expected to be used. These changes include the asset becoming idle, plans to discontinue or restructure the operation to which an asset belongs, plans to dispose of an asset before the previously expected date, and reassessing the useful life of an asset
- From internal reporting, the economic performance of an asset is, or will be, worse than expected
- Other relevant factors apply.

Where an indication of impairment exists, the recoverable amount is the higher of fair value less costs to sell or value in use. The value in use is based on the net present value of future cash flows where no active market exists.

Impairments made appear in note 3 and note 8.

Revenue from contracts with customers

The Group applied the following judgements that significantly affect the determination of the amount and timing of revenue from contracts with customers:

Identifying performance obligations in a contract

The Group provides research services that are either for an entire project or part of a project that is managed by the Group for customers. The research services are a promise to report findings and related IP in the future and are part of the negotiated work performed between the Group and the customer.

The Group determined that the milestones within each contract are generally not capable of being distinct. The fact that the Group would not be able to sell the individual milestones on a stand-alone basis indicates that a customer could not benefit from an individual milestone. In addition, the individual milestones are highly correlated, because the Group would not be able to transfer the work performed to date if the customer terminated the contract prior to completion.

The Group determined that the input method is the best method in measuring progress of the research services because there is a direct relationship between the Group's effort (i.e. cost hours incurred) and the transfer of service to the customer. The Group recognises revenue on the basis of the cost incurred relative to the total expected contract cost to complete the contract.

Principal versus agent consideration

The Group occasionally enters into a contract with a customer that requires a third party to perform the work, on the customer's behalf, with the third party receiving full consideration and autonomy from the Group. Under these contracts, the Group provides hosting services (i.e. coordinating the selection of third parties and managing the delivery of contract). The Group determined that it does not control the service, and it does not obtain benefits from the services performed. Therefore, the Group determined that it is an agent in these contracts.

Revaluation of farm assets

The Group's farm assets, encompassing farm land, land improvements, buildings and building fitouts, are stated at their revalued amounts, being the fair value at the date of revaluation, less any subsequent depreciation and impairments.

The Group's farm assets have been valued using either market value or optimised depreciated replacement cost. For non-specialised assets where there is an active market for the same or a similar asset, value is determined by one or more of the following:

- Direct comparison
- Income
- Cost approach.

Assets that have a specialised use for the Group have been valued at optimised depreciated replacement cost. These assets include site improvements such as roads and fences as well as buildings. Optimised depreciated replacement cost is a method of valuation based on an estimate of the current gross replacement cost of an asset less allowances for physical deterioration, and optimisation for obsolescence and surplus capacity. The majority of the Group's farm assets have been classified as non-specialised assets and have therefore been assigned a market-based value. Refer to note 8 for further information of revaluation of farm assets.

Impact of COVID-19

COVID-19 has had a significant impact on the Group in the following aspects:

- Commercial revenue. Commercial revenue from some science research projects was permanently lost and some other projects will be deferred through to FY21 and beyond due to the significant uncertainties facing the commercial customers. Refer to note 1 for further information.
- Government grants. COVID-19 Response and Recovery Fund (CRRF) of \$13.57m to replace revenue impacted by COVID-19 was received from MBIE in June 2020. It is recognised in profit and loss in the current financial year according to NZ IAS 20, Accounting for Government Grants and Disclosure of Government Assistance.
- Farm assets valuation. The Group's farm assets were revalued as of 30 June 2020. COVID-19 has placed significant uncertainties on the assets valuation due to the rapidly changing economic and market conditions, hence the valuation may change significantly and unexpectedly post balance date due to the ongoing impacts of COVID-19 on the New Zealand economy. Refer to note 8 for further information.
- The Group continues to monitor the impacts of COVID-19. Effective measures have been taken to manage the operating costs while maintaining science capabilities. A second CRRF grant of \$13.57m is confirmed to be received from MBIE in the financial year 2021/22. Refer to note 29 for further information.

Fair value estimates

The fair value of financial assets and financial liabilities must be estimated for recognition, measurement and disclosure purposes.

The fair value of financial instruments traded in active markets is based on quoted market prices at the end of the reporting period. The quoted market price used for financial assets held by the Group is the current bid price. Financial liabilities are held at amortised cost.

The fair value of financial instruments that are not traded in an active market (for example, over-the-counter derivatives and forward exchange contracts) are determined using the mark to market rate provided by the banking institution or using forward exchange market rates at the end of the reporting period.

For instruments not to take the mark to market rate from observable markets where possible, a degree of judgement is required in establishing fair values. Judgements include

considerations of inputs such as liquidity risk, credit risk and volatility. Changes in assumptions relating to these factors could affect the reported fair value of financial instruments.

The nominal value less estimated credit adjustments of trade receivables and payables are assumed to approximate their fair values.

Budget figures

The budget figures are those approved by the Board and presented in the Statement of Corporate Intent, noting that the Board approval is of the Statement of Comprehensive Income, Statement of Financial Position and Capital Expenditure budget. The budget has been prepared using the same accounting policies as for these Consolidated Financial Statements except that the leases are treated under the previous accounting standard for leases (NZ IAS 17) in the budget.

Changes in accounting policies and disclosures

The Group adopted NZ IFRS 16 Leases from 1 July 2019. NZ IFRS 16 introduces new or amended requirements with respect to lease accounting. It introduces significant changes to the lessee accounting by removing the distinction between operating and finance lease requirements and requiring the recognition of a right-of-use asset and a lease liability at commencement for all leases, except for short-term leases and leases of low-value assets. In contrast to lessee accounting, the requirements for lessor accounting have remained largely unchanged. The Group applied NZ IFRS 16 using the modified retrospective approach. Therefore, the comparative information was not restated and continues to be reported under NZ IAS 17 and related interpretations. The details of the new accounting policy and the impact of first-time adoption are described below:

The Group as lessee

Leases as at transition date

NZ IFRS 16 changes how the Group accounts for leases previously classified as operating leases under NZ IAS 17. For all former operating leases (except the low-value and short-term leases noted below) as at 1 July 2019, the Group:

- Recognises lease liabilities in the Consolidated Financial Statements, initially measured at the present value of future lease payments;
- Recognises right-of-use assets including the initial measurement of the corresponding lease liabilities and lease payments made at or before the transition date in the consolidated financial statements;
- Recognises depreciation of right-of-use assets and interest on lease liabilities in profit or loss; right-of-use assets are depreciated over the shorter period of the remaining lease term and remaining useful life of the underlying assets as at 1 July 2019.

In the adoption of NZ IFRS 16, the Group elected to use the following practical expedients:

- Apply a single discount rate to a portfolio of leases with reasonably similar characteristics
- Do not apply the new lessee accounting model to leases for which the lease term ends within 12 months after the date of initial application. Instead, those leases

are accounted for as short-term leases with the lease payments recognised as an expense on a straight-line basis over the lease term

- The Group has elected to apply the exemption for low-value assets leases which are the leases with annual lease payments less than NZD \$7k. The lease payments associated with those leases are recognised as an expense on a straight-line basis over the lease term.

New leases post transition date

The Group assesses whether a contract is or contains lease, at inception of the contract. The Group recognises a right-of-use asset and a corresponding lease liability with respect to all lease arrangements in which it is the lessee, except for short-term leases (defined as leases with a lease term of 12 months or less) and leases of low-value assets. For these leases, the Group recognises the lease payments as an operating expense on a straight-line basis over the term of the lease unless another systematic basis is more representative of the time pattern in which economic benefits from the leased assets are consumed.

The lease liability is initially measured at the present value of the lease payments that are not paid at the lease commencement date, discounted by using the rate implicit in the lease. If this rate cannot be readily determined, the Group uses its incremental borrowing rate.

Lease payments included in the measurement of the lease liability comprise:

- Fixed lease payments (including in-substance fixed payments), less any lease incentives
- Variable lease payments that depend on an index or rate, initially measured using the index or rate at the commencement date
- The amount expected to be payable by the lessee under residual value guarantees
- The exercise price of purchase options, if the lessee is reasonably certain to exercise the options
- Payments of penalties for terminating the lease, if the lease term reflects the exercise of an option to terminate the lease.

The lease liability is subsequently measured by increasing the carrying amount to reflect interest on the lease liability (using effective interest rate method) and by reducing the carrying amount to reflect the lease payments made.

The Group remeasures the lease liability (and makes a corresponding adjustment to the related right-of-use asset) whenever:

- The lease term has changed or there is a change in the assessment of exercise of a purchase option, in which case the lease liability is remeasured by discounting the revised lease payments using a revised discount rate
- The lease payments change due to changes in an index or rate or a change in expected payment under a guaranteed residual value, in which case the lease liability is remeasured by discounting the revised lease payments using the initial discount rate unless the lease payments change is due to a change in a floating interest rate, in which case the lease liability is remeasured by discounting the revised lease payments using a revised discount rate.

The right-of-use assets comprise the initial measurement of the corresponding lease liability, lease payments made at or before the lease commencement date and any initial direct costs. They are subsequently measured at cost less accumulated depreciation and impairment losses.

Right-of-use assets are depreciated over the shorter period of the lease term and useful life of the underlying asset. If a lease transfers ownership of the underlying asset or the cost of the right-of-use asset reflects that the Group expects to exercise a purchase option, the related right-of-use asset is depreciated over the useful life of the underlying asset. The depreciation starts at the transition date of the lease.

The Group applies NZ IAS 36 to determine whether a right-of-use asset is impaired.

Variable rents that do not depend on an index or rate are not included in the measurement of the lease liability and the right-of-use assets. The related payments are recognised as an expense in the period in which the event or condition that triggers those payments occurs and are included in the statement of comprehensive income.

The Group as lessor

NZ IFRS 16 does not change substantially how a lessor accounts for leases. The Group enters into lease arrangements as a lessor. Leases for which the Group is a lessor are classified as finance or operating leases. Whenever the terms of the lease transfer substantially all the risks and rewards of ownership to the lessee, the contract is classified as a finance lease. All other leases are classified as operating leases.

When the Group is an intermediate lessor, it accounts for the head lease and the sublease as two separate contracts. The sublease is classified as a finance or operating lease by reference to the right-of-use asset arising from the head lease.

Rental income from operating leases is recognised on a straight-line basis over the term of the relevant lease. Initial direct costs incurred in negotiating and arranging an operating lease are added to the carrying amount of the leased asset and recognised on a straight-line basis over the lease term.

Amounts due from lessees under finance leases are recognised as receivables at the amount of the Group's net investment in the leases. Finance lease income is allocated to accounting periods so as to reflect a constant periodic rate of return on the Group's net investment outstanding in respect of the leases.

The effect of adopting NZ IFRS 16 as at 1 July 2019 was as follows:

Consolidated statement of financial position as at 1 July 2019

	Increase/ (Decrease)
in thousands of New Zealand dollars	
Assets	
Prepayments	(61)
Right-of-use assets	29,632
Total assets	29,571
Liabilities	
Lease liabilities	(29,571)
Total liabilities	(29,571)

When measuring lease liabilities for leases that were classified as operating leases, the Group discounted lease payments using its incremental borrowing rate at 1 July 2019. The rate applied by the Company is 3.3% for leased properties and 3.7% for other assets.

The explanation of the difference between operating lease commitments disclosed as at 30 June 2019 when applying NZ IAS 17 to the lease liabilities recognised as at 1 July 2019 is presented in the table below:

	1 July 2019
in thousands of New Zealand dollars	
Operating lease commitments as at 30 June 2019 under NZ IAS 17	7,530
Present value of the lease payments due in periods covered by extension options that are reasonably certain	21,254
Effect of discounting	(482)
Lease not included in 2019 disclosures	1,412
Low-value and short-term leases not included in NZ IFRS 16 adoption	(143)
Lease liabilities as at 1 July 2019	29,571

The right-of-use assets by categories as at 1 July 2019 are disclosed as below:

	Property	Plant & equipment	Vehicles	Total
in thousands of New Zealand dollars				
	28,973	243	416	29,632
Right-of-use assets as at 1 July 2019	28,973	243	416	29,632

Significant accounting policies

The significant accounting policies used in the preparation and presentation of the Consolidated Financial Statements are (where applicable) disclosed in the corresponding note. The remaining significant accounting policies are set out below.

A. Basis of consolidation

The Consolidated Financial Statements comprise the Financial Statements of the Company and its subsidiaries as at 30 June 2020. Control is achieved when the Group is exposed, or has rights, to variable returns from its involvement with the investee and has the ability to affect those returns through its power over the investee. Specifically, the Group controls an investee if, and only if, the Group:

- Has power over the investee
- Is exposed, or has rights, to variable returns from its involvement with the investee
- Has the ability to use its power to affect its returns.

The Directors reassess whether or not the Group controls an investee if facts and circumstances indicate that there are changes to one or more of the three elements of control listed above.

When the Group has less than a majority of the voting rights of an investee, it has power over the investee when the voting rights are sufficient to give it the practical ability to direct the relevant activities of the investee unilaterally. The Directors consider all relevant facts and circumstances in assessing whether or not the Group's voting rights in an investee are sufficient to give it power, including:

- The size of the Group's holding of voting rights relative to the size and dispersion of holdings of the other vote holders
- Potential voting rights held by the Group, other vote holders or other parties
- Rights arising from other contractual arrangements
- Any additional facts and circumstances that indicate that the Group has, or does not have, the current ability to direct the relevant activities at the time that decisions need to be made, including voting patterns at previous shareholders' meetings.

Consolidation of a subsidiary begins when the Group obtains control over the subsidiary and ceases when the Group loses control of the subsidiary. Specifically, income and expenses of a subsidiary acquired or disposed of during the year are included in the profit and loss from the date the Group gains control until the date when the Group ceases to control the subsidiary.

Profit or loss and each component of other comprehensive income are attributed to the owners of the Company. Total comprehensive income of subsidiaries is attributed to the owners of the Company.

When necessary, adjustments are made to the Consolidated Financial Statements of subsidiaries to bring their accounting policies into line with the Group's accounting policies.

All intragroup assets and liabilities, equity, income, expenses and cash flows relating to transactions between members of the Group are eliminated in full on consolidation.

Consistent accounting policies are employed in the preparation and presentation of the Consolidated Financial Statements.

B. Comparatives

When the presentation or classification of items is changed, comparative amounts are reclassified unless the reclassification is impracticable. In addition, a Statement of Financial Position is presented as at the beginning of the earliest comparative period, when the Group has applied an accounting policy retrospectively, makes a retrospective restatement of items, or when it has reclassified items.

C. Government grants

Government grants are assistance provided by the government in the form of transfers of resources to the Group in return for past or future compliance with certain conditions relating to the operating activities of the Group. Government grants are only recognised when there is a reasonable assurance that:

- (a) The Group will comply with the conditions attaching to them; and
- (b) The grants will be received.

The income approach is adopted when government grants are recognised and they are recognised in profit or loss on a systematic basis over the periods in which the Group recognises as expenses the related costs for which the grants are intended to compensate. The Group receives two streams of government grants. Sustainable science investment funding (previously core funding) from the Crown commenced from 1 July 2011 and is recognised in the profit and loss in the year it is received. The primary condition is that the Group should undertake research activities as defined under the contractual agreement that awards the funding.

The Group received \$13.57m of the COVID-19 Response and Recovery Fund from MBIE in June 2020. COVID-19 has significantly impacted the commercial revenue stream of the Group. Some science research project revenue is permanently lost and some is significantly delayed. The CRRF is a fund to replace the revenue lost due to COVID-19 and support the Group to maintain its national science capability and continue capital investment programmes which will support the health and primary sectors' and New Zealand's COVID-19 recovery path. There are no conditions or obligations associated with the grant and it is recognised in the year when the fund is received.

D. Foreign currency

The individual financial statements of each Group entity are presented in the currency of the primary economic environment in which the entity operates (its functional currency). For the purpose of the Consolidated Financial Statements, the results and financial position of each group entity are expressed in New Zealand dollars (NZD), which is the functional currency of the Group and the presentation currency for the Consolidated Financial Statements.

In preparing the financial statements of the individual entities, transactions in currencies other than the entity's functional currency (foreign currencies) are recorded at the rates of exchange prevailing at the dates of the transactions. At each balance date, monetary items denominated in foreign currencies are retranslated to the functional currency at the rate prevailing at the end of the reporting period. Non-monetary items carried at fair value that are denominated in foreign currencies are retranslated to the functional currency at the rates prevailing at the date when the fair value was determined. Non-monetary items that are measured in terms of historical cost in a foreign currency are not retranslated.

Exchange differences are recognised in the profit and loss in the period in which they arise except for:

- Exchange differences that relate to assets under construction for future productive use, which are included in the cost of those assets when they are regarded as an adjustment to interest costs on foreign currency borrowings;
- Exchange differences on transactions entered into in order to hedge certain foreign currency risks; and
- Exchange differences on monetary items receivable from or payable to a foreign operation for which settlement is neither planned nor likely to occur, which form part of the net investment in a foreign operation, and which are recognised in the foreign currency translation reserve and recognised in profit or loss on disposal of the net investment.

E. Financial assets

Derivatives not designated as hedging instruments reflect the positive or negative change in fair value of those foreign exchange forward contracts that are not designated in hedge relationships, but are, nevertheless, intended to reduce the level of foreign currency risk for expected sales and purchases.

Equity instruments designated at fair value through profit or loss include investments in equity shares of non-listed companies. The Group holds non-controlling interests (between 2% and 9%) in these companies. These investments were irrevocably designated at fair value through profit and loss as the Group considers these investments to be strategic in nature.

Financial assets at fair value through profit or loss include investments in listed equity shares. Fair values of these equity shares are determined by reference to published price quotations in an active market.

Hedging activities and derivatives

The Group is exposed to certain risks relating to its ongoing business operations. The primary risks managed using derivative instruments are credit risk, market risk and liquidity risk.

The Group's risk management strategy and how it is applied to manage risk are explained in note 26.

Derivatives not designated as hedging instruments

The Group uses foreign currency-denominated borrowings and foreign exchange forward contracts to manage some of its transaction exposures. The foreign exchange forward contracts are not designated as cash flow hedges and are entered into for periods consistent with foreign currency exposure of the underlying transactions, generally in next 12 months.

Fair values

Set out in note 26 is a comparison, by class, of the carrying amounts and fair values of the Group's financial instruments, other than those with carrying amounts that are reasonable approximations of fair values.

Management assessed that the fair values of cash and short-term deposits, trade receivables, trade payables, bank overdrafts and other current liabilities approximate their carrying amounts largely due to the short-term maturities of these instruments.

The following methods and assumptions were used to estimate the fair values:

Long-term fixed-rate and variable-rate receivables/borrowings are evaluated by the Group based on parameters such as interest rates, specific country risk factors, individual creditworthiness of the customer and the risk characteristics of the financed project. Based on this evaluation, allowances are taken into account for the estimated losses of these receivables.

The fair values of the non-listed equity investments have been estimated using the quoted rates on the unlisted market or the rates provided by the entity itself. The probabilities of the various estimates within the range can be reasonably assessed and are used in management's estimate of fair value for these non-listed equity investments.

Listed equity investments are valued at the quoted price on an active market.

The Group enters into derivative financial instruments with various counterparties, principally financial institutions with investment grade credit ratings. Foreign exchange forward contracts are valued using valuation techniques, which employ the use of market observable inputs. The most frequently applied valuation techniques include forward pricing and swap models using present value calculations. The models incorporate various inputs including the credit quality of counterparties, foreign exchange spot and forward rates, yield curves of the respective currencies, currency basis spreads between the respective currencies, interest rate curves and forward rate curves of the underlying commodity. Some derivative contracts are fully cash collateralised, thereby eliminating both counterparty risk and the Group's own non-performance risk. As at 30 June 2020, the mark to market value of other derivative asset positions is net of a credit valuation adjustment attributable to derivative counterparty default risk.

Financial assets held at amortised cost

Financial assets held at amortised cost are non-derivative financial assets that are held solely for the collection of principal payments and interest. Financial assets held at amortised cost are stated at amortised cost using the effective interest method less impairment. Interest income is recognised by applying the effective interest rate.

Impairment of financial assets

Financial assets, other than those accounted for at fair value through other comprehensive income, are assessed for indicators of impairment at the end of each reporting period. Financial assets are impaired where there is objective evidence that, as a result of one or more events that occurred after the initial recognition of the financial assets, the estimated future cash flows of the investment have been impacted.

For unlisted shares, a significant or prolonged decline in the fair value of the security below its cost is considered to be objective evidence of impairment.

For all other financial assets, including redeemable notes and finance lease receivables, objective evidence of impairment could include any one of the following:

- Significant financial difficulty of the issuer or counterparty
- Default or delinquency in interest or principal payments
- It becoming probable that the borrower will enter bankruptcy or financial re-organisation.

For certain financial assets held at amortised cost, such as trade receivables, the Group recognises a loss allowance for expected credit losses (ECL) on trade receivables. The amount of expected credit losses is updated at each reporting date to reflect changes in credit risk since initial recognition of the respective financial instrument.

The Group measures the provision for ECL using the simplified approach to measuring ECL, which uses a lifetime expected loss allowance for all trade receivables. The Group determines lifetime expected credit losses for groups of trade receivables with shared credit risk characteristics. Groupings are based on customer, trading terms and ageing.

An expected credit loss rate is determined based on the historical credit loss rates for the Group, adjusted for other current observable data that may materially impact the Group's future credit risk. This other observable data includes specific factors in relation to each debtor or general economic conditions of the industry in which the debtors operate.

Trade receivables are written off when there is no realistic chance of recovery.

F. Inventories

Inventories are valued at the lower of cost, determined on a first in first out basis, and net realisable value. The cost of harvested agricultural produce is measured at fair value less estimated point-of-sale costs at the point of harvest.

G. Intangible assets

Purchased intangible assets

Purchased intangible assets such as intellectual property, patents, trademarks and licences are recorded at cost less accumulated amortisation and accumulated impairment losses. Amortisation is charged over their estimated useful lives, which varies between 5 and 15 years. The estimated useful life and amortisation method is reviewed at the end of each annual reporting period.

Acquired computer software licences are capitalised on the basis of the costs incurred to acquire and bring to use the specific software. These costs are amortised over their estimated useful lives (between 3 and 5 years on a straight-line basis). Costs associated with maintaining computer software programs are recognised as an expense as incurred.

Internally generated intangible assets – research and development expenditure

Research expenditure is expensed in the period incurred.

The cost of an internally generated intangible asset represents expenditure incurred in the development phase of the asset only.

Development expenditure is expensed in the period incurred unless all of the following conditions have been demonstrated:

- The intention to complete the intangible asset and use or sell it
- How the asset created will generate future economic benefits
- The ability to measure reliably the expenditure attributable to the intangible asset during its development
- The availability of adequate technical, financial and other resources to complete the development and to use or sell the intangible asset.

Internally generated intangible assets that satisfy the asset recognition criteria above are amortised on a straight-line basis over future periods from which benefits are expected to accrue. These future periods are between 5 and 7 years.

Computer software development costs that are directly associated with the production of identifiable and unique software products controlled by the Group, and that will probably generate economic benefits exceeding costs beyond one year, are recognised as intangible assets. Direct costs include the software development employee costs and an appropriate portion of relevant overheads.

Computer software development costs recognised as assets are amortised over their estimated useful lives (not exceeding 5 years).

Other intangible assets

Assets with indefinite useful lives are not amortised, but are tested at least annually for impairment. Whenever there is an indication of impairment, the asset is recorded at a revalued amount, being fair value less any accumulated impairment losses. Revaluations are for each intangible asset, not for a class of asset.

Disposal of intangible assets

Realised gains and losses arising from disposal of intangible assets are recognised in the profit and loss in the period in which the transaction occurs.

H. Impairment of non-financial assets

At each reporting date, the Group reviews the carrying amounts of its tangible and intangible assets that are subject to amortisation or depreciation to determine whether there is any indication that those assets have suffered an impairment loss. If any such indication exists, the recoverable amount of the assets is estimated in order to determine the extent of the impairment loss (if any). Where the asset does not generate cash flows that are independent from other assets, the Group estimates the recoverable amount of the cash-generating unit to which the asset belongs.

Goodwill, intangible assets with indefinite useful life and intangible assets not yet available for use are tested for impairment annually and whenever there is an indication that the asset may be impaired. An impairment of goodwill is not subsequently reversed.

If the recoverable amount of an asset (or cash-generating unit) is estimated to be less than its carrying amount, the carrying amount of the asset (cash-generating unit) is reduced to its recoverable amount. The recoverable amount is the higher of an asset's fair value less cost to sell and value in use. An impairment loss is recognised in the profit and loss immediately, unless the relevant asset is carried at a revalued amount, in which case the impairment loss is first treated as a revaluation decrease.

Where an impairment loss subsequently reverses, the carrying amount of the asset (cash-generating unit) is increased to the revised estimate of its recoverable amount, but only to the extent that the increased carrying amount does not exceed the carrying amount that would have been determined had no impairment loss been recognised for the asset (cash-generating unit) in prior years. A reversal of an impairment loss is recognised in the profit and loss immediately, unless the relevant asset is carried at a revalued amount, in which case the impairment loss is treated as a revaluation increase.

I. Employee benefits

Provision is made for benefits accruing to employees in respect of wages and salaries, annual leave, retirement leave/gratuities and sick leave where it is probable that settlement will be made and they are capable of being measured reliably.

Provision for employee benefits expected to be settled within 12 months are measured at their nominal values using the remuneration rates as at the reporting date and are recorded as current liabilities.

Provision for employee benefits which are not expected to be settled within 12 months are measured at the present value of the estimated future cash outflows to be made by the Group in respect of services provided by employees up to reporting date and are recorded as non-current liabilities.

Liabilities for non-accumulating sick leave are recognised when the leave is taken and measured at the rates paid or payable.

Defined contribution plan

A small number of employees are a part of the Crown Defined Benefit Superannuation Plan. Future benefits are generated by the Crown and the Group has no legal or financial contribution liability for future benefits. The Group's contributions to the Plan are expensed when incurred.

All employees of the Group can elect to join the KiwiSaver scheme. The only obligation of the Group is to contribute a specified percentage to the KiwiSaver scheme in line with employee contributions as part of payroll costs.

J. Goods and services tax (GST)

The Consolidated Financial Statements are prepared on a GST exclusive basis, with the exception of receivables and payables which include GST.

K. Statement of cash flows

Cash and cash equivalents

Cash and cash equivalents include cash on hand, cash in banks, demand deposits and other highly liquid investments readily convertible into cash.

Operating activities

Operating activities include all transactions and other events that are not investing or financing activities.

Investing activities

Investing activities are those activities relating to the acquisition and disposal of current and non-current investments and any other non-current assets.

Financing activities

Financing activities are those activities relating to changes in the equity and debt structure of the Group.

L. Insurance contracts

The Group was part of the Accident Compensation Corporation (ACC) Partnership Programme until 31 March 2020. Under the Partnership Programme the Group is liable for all its claim costs for a period of 4 years up to a specified maximum. At the end of the 4-year period, the Group pays a premium to ACC for the value of residual claims and the liability for ongoing claims from that point passes back to ACC.

The liability for the ACC Partnership Programme is recognised in the ACC provision and measured as the present value of expected future payments to be made in respect of the employee injuries and claims up to the reporting date using actuarial techniques. Consideration is given to expected future wage and salary levels and experience of employee claims and injuries.

M. Standards and interpretations effective in the current period

In the current year the Group has adopted all mandatory new and amended standards and interpretations applicable to the Group.

There are no standards or interpretations issued, but not yet effective, that are expected to have a material impact on the Group.

Notes to and forming part of the Consolidated Financial Statements

For the year ended 30 June 2020

1 Revenue

Revenue recognition

Ministry of Business, Innovation and Employment

Revenue received from New Zealand's Strategic Science Investment Fund (SSIF) is considered to be a grant for research purposes and is accounted for under NZ IAS 20, Accounting for Government Grants and Disclosure of Government Assistance.

Our Land and Water National Science Challenge

Revenue received in respect of "Our Land and Water" National Science Challenge funding is accounted for as research revenue and brought to account as services are provided, based upon the proportion of completion of the contract at the end of the reporting period. The stage of completion is the proportion of contract costs incurred for work performed to date compared with the estimated total contract costs.

COVID-19 Response and Recovery Fund

COVID-19 Response and Recovery Fund (the CRRF) is a government grant to replace revenue impacted by COVID-19 and is accounted for under NZ IAS 20, Accounting for Government Grants and Disclosure of Government Assistance.

Commercial revenue

The Group derives revenue from the provision of research services to a range of agriculture-based customers in New Zealand. The Group determined that the milestones within each research contract are generally not capable of being distinct. The fact that the Group would not be able to sell the individual milestones on a stand-alone basis indicates that a customer could not benefit from an individual milestone. In addition, the individual milestones are highly correlated, because the Group would not be able to transfer the work performed to date if the customer terminated the contract prior to completion. Therefore these contracts are typically determined to have one single performance obligation with milestones that are integrated and are fulfilled over time.

The transaction price is normally fixed at the start of the project. The nature of commercial contracts can sometimes lead to variations in the job scope which is known as contract modification. It is also normal practice for contracts to include bonus and penalty elements based on timely construction or other performance criteria known as variable consideration. An estimate of variable consideration is included in the transaction price to the extent that it is highly probable that a significant reversal of revenue will not occur when any uncertainty is subsequently resolved.

Under the terms of the written contracts, the Group is contractually restricted from redirecting research outcomes to another customer and has an enforceable right to payment for work done. Therefore NZ IFRS 15.35(c) is satisfied and the Group recognises revenue in relation to contracting services over time.

Contract assets are initially recognised at fair value. They are subsequently adjusted for credit impairment loss. The income tax expense or credit for the period is the tax payable on the current period's taxable income based on the national income tax rate for each jurisdiction adjusted by changes in deferred tax assets and liabilities attributable to temporary differences between the tax bases of assets and liabilities and their carrying amounts in the financial statements, and to unused tax losses.

The Group becomes entitled to invoice customers for research services based on achieving a series of performance-related milestones. The Group will previously have recognised a contract asset for any work performed. Any amount previously recognised as a contract asset is reclassified to trade receivables at the point at which it is invoiced to the customer. If the milestone payment exceeds the revenue recognised to date under the cost-to-complete method, then the Group recognises a contract liability for the difference. There is not considered to be a significant financing component in commercial contracts with customers as the period between the recognition of revenue under the cost-to-cost method and the milestone payment is always less than one year.

Farm produce

Revenue from the sale of goods is recognised when the Group has transferred the control of the goods to the buyers.

Other revenue – royalties

Royalty revenue is recognised on an accrual basis in accordance with the substance of the relevant agreement and usage volumes provided by licensees.

Other revenue - dividend and interest revenue

Dividend revenue from investments is recognised in the financial period in which the right to receive payment is established. Interest revenue is recognised on a time proportionate basis that takes into account the effective yield on the financial asset.

COVID-19 impact on revenue

The COVID-19 pandemic has had a significant impact on the Group. Although there is no impact on SSIF, commercial revenue from some science research projects was permanently lost and some other projects will have significant delays, to extending to FY21 and beyond. This is due to:

- Commercial customers facing significant uncertainty in the short-to-medium-term, impacting their research and development spending commitment
- Global supply chain disruption and consumer COVID-19 responses generating significant market volatility
- International revenue significantly impacted by the border closure.

1 Revenue (continued)

\$13.57m of the CRRF from MBIE was received in June 2020 to replace the revenue lost due to COVID-19 and support the Group to maintain its national science capability and continue capital investment programmes which will support the health and primary sectors' and New Zealand's COVID-19 recovery path. There are no conditions or obligations associated with the grant; therefore it is recognised in profit and loss in the current financial year.

in thousands of New Zealand dollars	2020	2019
Other revenue		
Interest	1,159	1,247
Dividends	4	4
Royalties	11,322	11,970
Operating lease income	3,332	4,127
	15,817	17,348

2 Operating expenditure

in thousands of New Zealand dollars	Note	2020	2019
<i>Employee related</i>			
Salary and wages		71,590	66,138
Superannuation contribution		1,863	1,741
<i>Operational</i>			
Amortisation of intangible assets		501	620
Depreciation	8	10,244	9,571
Depreciation of right-of-use assets	13	2,634	-
Short-term and low-value lease expenses		245	3,201
Other operating expenses		21,305	25,383
Science 3rd party sub-contracts		17,158	21,490
Site and property expenses		5,931	5,882
Supplies		14,698	16,874
<i>Financial and administration</i>			
Auditor's remuneration - for services as auditor*		273	278
Audit fee - additional fee in relation to prior year audit		65	-
Bad debts		5	14
Change in provision for expected credit loss		(1)	(103)
Directors' fees		275	282
Donations		4	2
Financial and legal expenses		2,475	2,427
		149,265	153,800

* The audit fee includes Office of the Auditor-General overhead contribution of \$21,800 (30 June 2019: \$21,300).

3 Other gains/(losses)

in thousands of New Zealand dollars	Note	2020	2019
Net gain (loss) from foreign currency exchange		9	(30)
Net gain (loss) on sale of property, plant and equipment		(77)	2,430
Net gain (loss) on distribution of investments		625	-
Change in fair value of other investments		11	(805)
Change in fair value of derivative financial instruments		(16)	(53)
Change in fair value of forestry	14	87	192
Change in fair value of livestock	11	(487)	22
(Impairment) / write ups of property, plant and equipment	8	(1,216)	8
Impairment of investments	15	(152)	-
Impairment of LUAGR F*	5	-	(8,837)
Change in fair value of other assets and liabilities	19	170	-
		(1,046)	(7,073)

*Lincoln University AgResearch Joint Facility

4 Finance cost

in thousands of New Zealand dollars	Note	2020	2019
Interest expense on bank overdraft		15	16
Interest expense on lease liabilities		947	-
		962	16

5 Investments in associates and joint ventures

An associate is an entity over which the Group has the capacity to exercise significant influence through participation in the financial and operating policy decisions of the investee, but does not control or have joint control over those policies.

The Consolidated Financial Statements incorporate the Group's interests in associates using the equity method, except when the investment, or a portion thereof, is classified as held for sale, in which case it is accounted for in accordance with NZ IFRS 5.

Under the equity method, an investment in an associate is initially recognised in the consolidated statement of financial position at cost and adjusted thereafter to recognise the Group's share of the profit or loss and other comprehensive income of the associate. When the Group's share of losses of an associate exceeds the Group's interest in that associate, the Group discontinues recognising its share of further losses. Additional losses are recognised only to the extent that the Group has incurred legal or constructive obligations or made payments on behalf of the associate.

An investment in an associate is accounted for using the equity method from the date on which the investee becomes an associate. On acquisition of the investment in an associate, any excess of the cost of the investment over the Group's share of the net fair value of the identifiable assets and liabilities of the investee is recognised as goodwill, which is included within the carrying amount of the investment. The goodwill is assessed annually for impairment as part of the investment. Whenever there is an indication that the goodwill may be impaired, any impairment is recognised immediately in the profit and loss and is not subsequently reversed.

Any excess of the Group's share of the net fair value of the identifiable assets and liabilities over the cost of the investment, after reassessment, is recognised in the profit and loss in the period in which the investment is acquired.

The Group recognises its share of an associate's post-acquisition net profit or loss for the year in its profit and loss. The Group's share of an associate's profit or loss is adjusted to align the accounting policies of the investee with that of the Group. The Group recognises its share of other post-acquisition movements in reserves within equity. Dividends received from associates are recognised directly against the carrying value of the investment. In the statement of financial position, the investment and the reserves are increased by the Group's share of the post-acquisition retained surplus and other post-acquisition reserves of the associates. In assessing the Group's share of earnings of associates, the Group's share of any unrealised surpluses between the Group and investee is eliminated.

The Group discontinues the use of the equity method from the date an investment ceases to be an associate, or when the investment is classified as held for sale. When the Group retains an interest in the former associate and the retained interest is a financial asset, the Group measures the retained interest at fair value at that date. The difference between the carrying amount of the associate at the date the equity method was discontinued, and the fair value of any retained interest and any proceeds from disposing of a part interest in the associate is included in the determination of the gain or loss on disposal of the associate. In addition, the Group accounts for all amounts previously recognised in other comprehensive income in relation to that associate on the same basis as would be required if that associate had directly disposed of the related assets or liabilities. Therefore, if a gain or loss previously recognised in other comprehensive income by that associate would be reclassified to profit or loss on the disposal of the related assets or liabilities, the Group reclassifies the gain or loss from equity to profit or loss (as a reclassification adjustment) when the equity method is discontinued.

5 Investments in associates and joint ventures (continued)

When the Group reduces its ownership interest in an associate but continues to use the equity method, it may reclassify previously recognised gains or losses. It does so, if that gain or loss would be reclassified to the profit and loss on the disposal of the related assets or liabilities. Where it does, the proportion of the gain or loss that had previously been recognised in other comprehensive income relating to that reduction in ownership interest is taken to the profit and loss.

When a Group entity transacts with an associate of the Group, profits and losses resulting from the transactions with the associate are recognised in the Consolidated Financial Statements only to the extent of interests in the associate that are not related to the Group.

Associate company	Balance date	% of ownership interest and voting power held by the group		Principal activity
		2020	2019	
Velvet Antler Research New Zealand Limited	30 September	50	50	Managing investments in velvet antler research and commercialising the intellectual property
DEEResearch Limited	30 June	50	50	Research and development relevant to deer farming and processing for deer products (except deer velvet)
Biopolymer Network Limited	30 June	43	33	Research and development of high-performance bio-based products
Pastoral Greenhouse Gas Research Consortium (held via AgResearch [PPGR Consortia] Limited)	30 June	22	22	To undertake research into greenhouse gases produced by ruminants and exploit any resulting intellectual property
Encoate Holdings Limited	30 June	50	50	To research and develop bacteria and probiotics stabilisation technologies
Blinc Innovation Limited	31 December	0	20	Deliver agri-sector research and education opportunities to grow a sustainable agri-sector in New Zealand and internationally
Overseer Limited	30 June	50	50	Operating entity set up to sub-license the Overseer model to end-users
LUAGRJF Limited Partnership*	30 June	0	38.7	Operating entity set up to develop, own and manage a joint facilities building together with Lincoln University. The entity was wound up in the year ended 30 June 2020.
LUAGRJF GP Limited*	30 June	0	38.7	General Partner. The company was wound up in the year ended 30 June 2020.
Southern Dairy Hub Limited Partnership	31 May	37.5	37.5	Promotion and development of good activities in the dairy industry
SDH GP Limited	31 May	37.5	37.5	General partner

All associates are incorporated in New Zealand. There are no restrictions on the ability of any associate to pay dividends, repay loans or otherwise transfer funds to the investor company.

All associates are private entities and there is no quoted market price available for the investments.

*Both AgResearch and Lincoln University agreed not to proceed with construction and as such the LUAGRJF investment was impaired as at 30 June 2019 for \$8.8m.

Summarised financial information for associates and joint ventures

in thousands of New Zealand dollars	2020	2019
Share of profit/(loss) from continuing operations	(1,020)	(1,266)
Share of total comprehensive income	(1,020)	(1,266)
Aggregate carrying amount of the Group and Company's interest in the associate investments	5,246	5,609
Aggregate carrying amount of the Group and Company's interest in the joint ventures	789	459
	6,035	6,068

6 Taxation

Current tax

Current tax is calculated by reference to the amount of income taxes payable or recoverable in respect of the taxable profit or tax loss for the period. It is calculated using tax rates and tax laws that have been enacted or substantively enacted by reporting date. Current tax for current and prior periods is recognised as a liability (or asset) to the extent that it is unpaid (or refundable).

Deferred tax

Deferred tax is accounted for using the comprehensive balance sheet liability method in respect of temporary differences arising from differences between the carrying amount of assets and liabilities in the financial statements and the corresponding tax base of those items.

In principle, deferred tax liabilities are recognised for all taxable temporary differences. Deferred tax assets are recognised to the extent that it is probable that sufficient taxable amounts will be available against which deductible temporary differences or unused tax offsets (for example, losses) can be utilised. However, deferred tax assets and liabilities are not recognised if the temporary differences giving rise to them arise from the initial recognition of assets and liabilities (other than as a result of a business combination) which affects neither taxable income nor accounting profit. Furthermore, a deferred tax liability is not recognised in relation to taxable temporary differences arising from goodwill.

Deferred tax liabilities are recognised for taxable temporary differences arising on investments in subsidiaries, associates and joint ventures except where the Group is able to control the reversal of the temporary differences and it is probable that the temporary differences will not reverse in the foreseeable future. Deferred tax assets arising from deductible temporary differences associated with these interests are only recognised to the extent that it is probable that there will be sufficient taxable profits against which to utilise the benefits of the temporary differences and they are expected to reverse in the foreseeable future.

Deferred tax assets and liabilities are measured at the tax rates that are expected to apply to the period(s) when the assets and liabilities giving rise to them are realised or settled, based on tax rates (and tax laws) that have been enacted or substantively enacted by reporting date. The measurement of deferred tax liabilities and assets reflects the tax consequences that would follow from the manner in which the Group expects, at the reporting date, to recover or settle the carrying amount of its assets and liabilities.

Deferred tax assets and liabilities are offset when they relate to the income taxes levied by the same taxation authority and the Group intends to settle its current tax assets and liabilities on a net tax basis.

Current and deferred tax for the period

Current and deferred tax is recognised as an expense or income in the profit and loss, except when:

- It relates to items recognised in equity, in which case the deferred tax or current tax is also recognised directly in equity; or
- It arises from the initial accounting for a business combination, in which case it is taken into account in the determination of goodwill or excess.

Foreign tax liabilities and assets

Exchange differences on deferred foreign tax liabilities or assets recognised in the profit and loss for the period are classified as deferred tax expense or income.

Foreign deferred tax assets that result from operating losses in respect of subsidiaries, associates, joint venture entities or interests in joint venture operations are recognised, except where the timing of the reversal of the temporary difference is controlled by the Group and it is probable that the temporary difference will not reverse in the future.

in thousands of New Zealand dollars	2020	2019
Tax expense comprises:		
Current tax expense	3,084	1,332
Adjustments recognised in relation to the current tax of prior years	(365)	369
Deferred tax expense relating to the origination and reversal of temporary differences	(5,250)	634
Adjustments recognised in relation to the deferred tax of prior years	328	(171)
Total tax expense/(benefit)	(2,203)	2,164
in thousands of New Zealand dollars	2020	2019
The total charge for the year can be reconciled to the accounting profit as follows:		
Gain (Loss) from continuing operations	3,780	(4,844)
Income tax expense calculated at 28% (2019: 28%)	1,058	(1,356)
Effect of revenue that is exempt from tax	(3,874)	(646)
Effect of reintroduction of tax depreciation of buildings	(3,582)	-
Effect of expenses that are not deductible	3,657	1,039
Effect of impairment (reversals)/losses that are not (assessable)/deductible	462	2,993
Associates' results reported net of tax	(68)	16
	(2,347)	2,046
Adjustments recognised in the current year in relation to the current and deferred tax of prior years	144	118
Income tax expense/(benefit) recognised in profit or loss	(2,203)	2,164

6 Taxation (continued)

in thousands of New Zealand dollars	2020	2019
Current tax assets and liabilities		
Current tax assets		
Tax refund receivable	-	-
Benefit of current year tax losses	-	-
	-	-
Current tax liabilities		
Income tax payable	(2,638)	(718)
Net current tax (liability)/asset	(2,638)	(718)

in thousands of New Zealand dollars	Opening balance	Charged to surplus	Charged to other comprehensive income	Acquisitions/ disposals	Closing balance
Deferred tax assets/(liabilities) arise from the following:					
2020					
Temporary differences					
Biological assets	(807)	66	-	-	(741)
Property, plant and equipment	(18,210)	5,559	(169)	-	(12,820)
Intangible assets	1,060	(475)	-	-	585
Financial assets	(29)	-	-	-	(29)
Provisions	1,618	(229)	-	-	1,389
	(16,368)	4,921	(169)	-	(11,616)
Unused tax losses and credits					
Tax losses	-	37	-	-	37
	(16,368)	4,958	(169)	-	(11,579)
2019					
Temporary differences					
Biological assets	(623)	(184)	-	-	(807)
Property, plant and equipment	(17,665)	(545)	-	-	(18,210)
Intangible assets	1,014	46	-	-	1,060
Financial assets	(261)	232	-	-	(29)
Provisions	1,630	(12)	-	-	1,618
	(15,905)	(463)	-	-	(16,368)
Unused tax losses and credits					
Tax losses	-	-	-	-	-
	(15,905)	(463)	-	-	(16,368)

in thousands of New Zealand dollars	2020	2019
Income tax recognised directly in other comprehensive income		
Revaluation of properties	(169)	-
Total income tax recognised directly in other comprehensive income	(169)	-

In March 2020, as part of the COVID-19 Economic Response Package, the Government reintroduced tax depreciation deductions on industrial and commercial buildings with effect from 1 July 2020. This amendment increases the tax base for these buildings, resulting in a reduced difference between the carrying value and tax base and therefore a reduction in the Group's deferred tax liability. The impact of these changes has been recognised as a \$3.6m tax benefit (reduction in tax expense) in the current year.

7 Equity

Share capital

Capital consists of 47,268,000 fully paid ordinary shares of \$1.00 each (2019: 47,268,000 fully paid ordinary shares).

Reserves

The asset revaluation reserve arises on the revaluation of land, land improvements and buildings. Where revalued assets are sold, the portion of the asset revaluation reserve relating to that asset, and which is therefore effectively realised, is transferred directly to retained earnings.

8 Property, plant and equipment

The Group has the following classes of property, plant and equipment:

- Land and land improvements – campus/farms
- Buildings – campus/farms
- Leasehold improvements
- Plant and equipment
- Vehicles
- Capital work in progress.

Fair value measurement

Land, land improvements and buildings are measured at fair value. Fair value is determined on the basis of an independent valuation prepared by external valuation experts (using either market value or optimised depreciated replacement cost), less any subsequent accumulated depreciation and subsequent accumulated impairment losses. Land, land improvements and buildings are revalued at least every 3 years or whenever there has been an indicator of a significant movement in the fair value. The fair values are recognised in the financial statements of the Group and are reviewed at the end of each reporting period to ensure that the carrying value of land, land improvements and buildings is not materially different from their fair values.

Any revaluation increase arising on the revaluation of land, land improvements and buildings is accumulated in the asset revaluation reserve, except to the extent that it reverses a revaluation decrease for the same asset previously recognised as an expense in profit and loss, in which case the increase is credited to profit and loss to the extent of the decrease previously charged. A decrease in carrying amount on the revaluation of land, land improvements and buildings is charged as an expense in profit and loss to the extent that it exceeds the balance, if any, held in the asset revaluation reserve relating to a previous revaluation of that asset.

All other assets are recorded at cost less accumulated depreciation and accumulated impairment.

Capital work in progress is recorded at cost.

Assets measured at fair value are classified as level 3 assets in the fair value hierarchy.

Depreciation is provided for on a straight-line basis on all tangible property, plant and equipment, other than freehold land and capital work in progress, at depreciation rates calculated to allocate the assets' cost or other revalued amount over their estimated useful lives. Leasehold improvements are depreciated over the period of the lease or estimated useful life, whichever is the shorter, using the straight-line method. The estimated useful lives, residual values and depreciation method are reviewed at the end of each annual reporting period.

Depreciation on revalued buildings is charged to the profit and loss. On the subsequent sale or retirement of a revalued property, the attributable revaluation surplus remaining in the asset revaluation reserve, net of any related deferred taxes, is transferred directly to retained earnings.

The following estimated useful lives are used in the calculation of depreciation:

- Land improvements 5-50 years
- Buildings (including farms) 5-80 years
- Leasehold improvements 3-40 years
- Vehicles 3-10 years
- Plant and equipment
 - Dairy plant and equipment 5-25 years
 - Computer hardware 3-5 years
 - Other plant and equipment 3-15 years.

	Land & land improvements	Buildings	Leasehold improvements	Plant & equipment	Vehicles	Capital work in progress	Total
in thousands of New Zealand dollars							
2020							
Balance at beginning of year	68,904	78,963	197	21,017	116	35,766	204,963
Additions	138	44,876	10	5,689	170	(31,045)	19,838
Disposals (including transfer to leased assets)	-	-	-	(558)	-	-	(558)
Revaluation	(2,743)	751	-	-	-	-	(1,992)
Impairments	(1,092)	(124)	-	-	-	-	(1,216)
Depreciation	(721)	(4,143)	(17)	(5,319)	(44)	-	(10,244)
Balance at end of year	64,486	120,324	190	20,829	242	4,721	210,791
Cost or valuation	65,517	131,552	720	109,818	725	4,721	313,053
Accumulated depreciation	(1,031)	(11,228)	(530)	(88,989)	(484)	-	(102,262)
Balance at end of year	64,486	120,324	190	20,829	242	4,721	210,791

in thousands of New Zealand dollars							
2019							
Balance at beginning of year	78,172	82,978	217	17,811	127	14,547	193,852
Additions	1,859	457	-	9,264	33	21,219	32,832
Disposals	(10,387)	(706)	-	(1,065)	-	-	(12,158)
Revaluations	-	-	-	-	-	-	-
Impairments	-	-	-	8	-	-	8
Depreciation	(740)	(3,766)	(20)	(5,001)	(44)	-	(9,571)
Balance at end of year	68,904	78,963	197	21,017	116	35,766	204,963
Cost or valuation	70,042	86,858	710	104,773	588	35,766	298,737
Accumulated depreciation	(1,138)	(7,895)	(513)	(83,756)	(472)	-	(93,774)
Balance at end of year	68,904	78,963	197	21,017	116	35,766	204,963

A total decrease of assets of \$3,208k (2019: \$8k increase) was reflected:

in thousands of New Zealand dollars	2020	2019
Through the asset revaluation reserve, being a reversal of prior year revaluations	(1,992)	-
Through the profit and loss	(1,216)	8
	(3,208)	8

Had the Group's land and buildings (other than land and buildings classified as held for sale or included in a disposal group) been measured on a historical cost basis, their carrying amount would have been as follows:

in thousands of New Zealand dollars	2020	2019
Land and land improvements	22,481	22,512
Buildings	90,848	46,435

Fair value measurement of the Group's land and buildings

The Group's land and buildings are stated at their revalued amounts, being the fair value at the date of revaluation, less any subsequent depreciation and impairments.

In the current year, land and buildings associated with farm assets were revalued. Included within the categories noted above were \$41m of land and land improvements, and \$5.8m of buildings related to farm assets. The remaining balances within these categories relate to campus assets, which were last subject to revaluation in the year ended 30 June 2018. Management has assessed that the carrying value of these assets is materially consistent with their fair value.

8 Property, plant and equipment (continued)

The Group's farm assets valuation was performed by independent valuers Colliers Limited under the requirements of NZ IAS 16, Property, Plant and Equipment. These valuations were performed using either market value or optimised depreciated replacement cost. For non-specialised assets where there is a comparable market for the same or a similar asset, value is determined by one or more of the following:

- Direct comparison
- Income
- Cost approach.

Assets that have a specialised use for the Group have been valued at optimised depreciated replacement cost. These assets include site improvements such as roads and fences as well as buildings. Optimised depreciated replacement cost is a method of valuation based on an estimate of the current gross replacement cost of an asset less allowances for physical deterioration, and optimisation for obsolescence and surplus capacity. The majority of the Group's farm assets have been classified by Colliers International as non-specialised assets and have therefore been assigned a market-based value. Comparative sales is identified as a significant unobservable input in the valuation and if the value of comparative sales changes by 5%, the fair value of farm assets will change by \$1.9m. The valuation is completed on the basis that the assets will continue to be used as farm properties as in their current status.

On 11 March 2020, COVID-19 was officially characterised as a global pandemic and for all intents and purposes, New Zealand's border has been closed to international visitors from this time. This has curtailed global trade, travel, domestic and international business and consumer spending. The Colliers Valuation Report highlighted "material valuation uncertainty" due to rapidly changing economic and market conditions as a result of COVID-19. Due to COVID-19, there was perceived to be a significant market uncertainty which could potentially have an impact on land values in the future. Values may change more rapidly and significantly than during standard market conditions. To this end, the valuer recommended that the Group keep the valuation of the assets under frequent review. The Group has considered this together with the key assumptions used in the valuation, and believes the valuation still represents the most appropriate value of the property under the current circumstances.

9 Trade and other receivables

in thousands of New Zealand dollars	2020	2019
Trade receivables	19,348	30,354
Receivables from associates	1,995	1,346
Receivables from other related parties	842	108
Total receivables	22,185	31,808
Less provision for expected credit losses	10	10
Net receivables	22,175	31,798

The fair value of trade and other receivables is approximately equal to their carrying value.

There were no related party past due receivables at 30 June 2020 (2019: Nil).

Terms of trade vary according to individual customer contracts. As at 30 June 2020, trade receivables of \$756k (2019: \$719k) were past due. These relate to a number of independent customers for whom there is no recent history of defaults. The ageing analysis of trade receivables is as follows:

in thousands of New Zealand dollars	Current	<30 days	30-60 days	61-90 days	>91 days	Total
2020						
Expected credit loss rate	0.01%	0.08%	0.10%	0.13%	1.63%	
Estimated total gross carrying amount at default	20,634	795	82	206	468	22,185
Expected credit loss	1	1	0	0	8	10
2019						
Expected credit loss rate	0.01%	0.12%	0.69%	1.07%	1.33%	
Estimated total gross carrying amount at default	30,087	999	194	125	403	31,808
Expected credit loss	2	1	1	1	5	10

in thousands of New Zealand dollars	2020	2019
Movement in the provision for doubtful debts		
Balance at beginning of year	10	113
Additional provisions made (reversed during the year)	-	(103)
Balance at end of year	10	10

The Group measures the provision for expected credit losses using the simplified approach to measuring ECL, which uses a lifetime expected loss allowance for all trade receivables. The Group determines lifetime expected credit losses for groups of trade receivables with shared credit risk characteristics. Groupings are based on customer, trading terms and ageing.

An expected credit loss rate is determined based on the historical credit loss rates for the Group, adjusted for other current observable data that may materially impact the Group's future credit risk. This other observable data includes specific factors in relation to each debtor or general economic conditions of the industry in which the debtors operate.

10 Trade and other payables

Trade payables and other accounts payable are recognised when the Group becomes obliged to make future payments resulting from the purchase of goods and services. Trade and other payables are subsequently measured at amortised cost using the effective interest method. This represents their fair value given the short-term nature of the liability.

in thousands of New Zealand dollars	2020	2019
Trade payables	12,741	23,318
Payables to associates	-	5
Goods and services tax (GST)	3,134	1,221
Income in advance	25,429	14,482
Accrued salaries and wages	1,018	695
Total payables	42,322	39,721

The fair value of trade payables is approximately equal to their carrying value as all amounts are expected to be settled within 90 days. No interest is charged on trade payables.

Financial risk management strategies

The Group has financial risk management policies in place to ensure that all payables are paid within the credit timeframe.

11 Biological assets – livestock

Livestock are valued at their fair value less estimated point-of-sale costs by reference to the most relevant active market. An allowance is made for a reduction in the value of certain livestock held for research trials. Changes in the valuation of livestock are recognised through the profit and loss.

in thousands of New Zealand dollars	Sheep	Beef cattle	Dairy cattle	Deer	Total
2020					
Reconciliation of changes in the carrying value					
Balance at beginning of year	1,367	862	1,416	545	4,190
Increases due to acquisitions	216	396	59	-	671
Decreases due to sales	(1,160)	(694)	(285)	(185)	(2,324)
Net increase due to births, growth and deaths	804	525	322	232	1,883
Changes in fair value less estimated point-of-sale costs	(157)	(132)	19	(217)	(487)
Balance at end of year	1,070	957	1,531	375	3,933
Quantity of livestock at end of year	7,669	1,127	1,038	1,034	
2019					
Reconciliation of changes in the carrying value					
Balance at beginning of year	1,188	1,194	1,553	676	4,611
Increases due to acquisitions	378	392	42	8	820
Decreases due to sales	(1,125)	(1,112)	(408)	(326)	(2,971)
Net increase due to births, growth and deaths	777	382	286	263	1,708
Changes in fair value less estimated point-of-sale costs	149	6	(57)	(76)	22
Balance at end of year	1,367	862	1,416	545	4,190
Quantity of livestock at end of year	8,883	964	967	926	

Livestock valuation method

Livestock was valued by PGG Wrightson Limited by reference to market evidence of recent transactions for similar livestock, taking into account the age, breed, type, condition and location of the animals.

Financial risk management strategies

The Group is exposed to financial risks relating to the damage to livestock from climatic changes, diseases and other natural forces. The Group has processes in place aimed at monitoring and mitigating those risks, including pest and disease monitoring and management strategies.

12 Lease receivables – current

in thousands of New Zealand dollars	2020	2019
Current lease receivables (recoverable within 12 months)	196	-

The lease receivable balance represents a finance lease arrangement of science equipment made by AgResearch for a customer's research programme. It is considered as a finance lease due to the specialised nature of the leased equipment. The finance lease arrangement was in place on 1 July 2019 and the lease ends on 30 June 2021. It does not include variable payments. The effective interest rate contracted is 3.7% per annum. The Group is not exposed to foreign currency risk as the lease is denominated in NZD. Residual value risk on equipment under lease is not significant.

Amounts receivable under finance leases	2020
Undiscounted lease payments within one year	200
Less: unearned finance income	(4)
Net investment in the lease	196

13 Right-of-use assets

in thousands of New Zealand dollars	Property	Plant & equipment	Vehicles	Total
Cost				
At 1 July 2019	28,973	243	416	29,632
Additions	2	32	122	156
At 30 June 2020	28,975	275	538	29,788
Accumulated depreciation				
At 1 July 2019	-	-	-	-
Depreciation	(2,236)	(183)	(215)	(2,634)
At 30 June 2020	(2,236)	(183)	(215)	(2,634)
Carrying amount				
At 30 June 2020	26,739	92	323	27,154
Average lease term (years)	10	1	2	

The Group leases several assets including land and buildings, IT and science equipment, and vehicles. Extension options are included in a number of property leases. In determining the lease term, management has considered all facts and circumstances that create an economic incentive to exercise an extension option. Extension options are only included in the lease term if the lease is reasonably certain to be extended.

14 Biological assets – Forestry

Forests are recorded at their fair value less point-of-sale costs on an annual basis using anticipated harvesting timing and yield and an applicable discount rate. Changes in the valuation of forests are accounted for through profit or loss.

Emissions Trading Scheme

Forestry land is subject to the provisions of the New Zealand Emissions Trading Scheme (ETS). Should the land be deforested (i.e. the land is changed from forestry to some other purpose), a deforestation liability will arise.

Compensation units are recognised based on their cost.

The Group has radiata pine tree crops at Ballantrae, Invermay and Woolford.

in thousands of New Zealand dollars	2020	2019
Reconciliation of changes in the carrying value		
Balance at beginning of year	1,157	965
Decreases due to harvesting and sale of forestry	-	-
Changes in fair value less estimated point-of-sale costs	88	192
Balance at end of year	1,245	1,157
<hr/>		
Area (ha) of forest at end of year	119	116

Forestry valuations

Forestry was valued by Alan Bell & Associates as at 30 June 2020. The value of forestry at 30 June 2020 was \$1,245k (2019: \$1,157k).

The methodology used is 'stand-based' in line with forestry management practices and harvesting. Where transactions have occurred for similar tree crops, value is based on those transactions. Where there have been no such transactions, value is based on:

- For mature crops, estimates of future costs and returns
- For young crops, standard investment costs
- For intermediate crops, a mixture of the above.

Additional inputs to the value arrived at are:

- Anticipated harvest timing and yield
- An 8.5% real discount rate on pre-tax cash flows
- An assumed 3% compounding rate on standard costs
- Current market prices and long-term trends in log prices. Log prices used are based on current market prices and 12-quarter rolling average prices published by the Ministry for Primary Industries.

Emissions units

The Group held 18,975 ETS units as at 30 June 2020. There is no change to the ETS units during the 2020 financial year (2019: 31,142 units were disposed of as part of a previous land sale transaction). All ETS units are carried at their original cost.

Financial risk management strategies

The Group is exposed to financial risks arising from changes in timber prices. The Group is a long-term forestry investor and does not expect timber prices to decline significantly in the foreseeable future. It has therefore not taken any measures to manage the risks of a decline in timber prices.

Land value and contingency

In the event that the forest areas are harvested, a deforestation liability equivalent to the decrease in carbon will be incurred. This liability is not recognised on the balance sheet as there is no current intention of changing the land use subject to the ETS.

15 Other investments

in thousands of New Zealand dollars	2020	2019
Fonterra Co-operative Group Limited	1,775	1,776
BioPacific Ventures	10	10
Other investments	874	455
Total	2,659	2,241

Valuation of other investments

- Investments held through the BioPacific Ventures investment fund are carried at fair value, and are subject to revaluations undertaken by the fund manager.
- Fonterra shares are valued using the quoted market price on the NZX market.
- All other investments are valued using the quoted market price on the NZX listed market, NZX unlisted market or the share prices set by the individual entities as appropriate.

Impairment of other investments

During the year, the impairment of other investments was recognised as follows:

in thousands of New Zealand dollars	2020	2019
BioPacific Ventures	-	-
Other	152	-
Total	152	-

16 Lease liabilities

in thousands of New Zealand dollars	2020	2019
Current	2,099	-
Non-current	25,449	-
Total	27,548	-

Amounts payable under leases	2020
Within one year	2,966
Later than one year but not later than five years	9,257
Later than five years	23,397
Total	35,620

17 Goodwill

The movement of goodwill for 2020 is shown below:

in thousands of New Zealand dollars	2020	2019
Opening balance	907	1,043
Impairment	-	(136)
Closing balance	907	907

Farmax Limited was incorporated as a 100% subsidiary in June 2018. There is no impairment of goodwill during the year ended 30 June 2020 (2019: \$136k).

18 Provisions

Provisions are recognised when:

- The Group has a present legal or constructive obligation as a result of past events
- It is more likely than not that an outflow of resources will be required to settle the obligation
- The amount has been reliably estimated.

Provisions are not recognised for future operating losses.

All provisions are recorded at the best estimate of the expenditure required to settle the obligation at balance date. Where the effect is material, the expected expenditures are discounted to their present value using pre-tax discount rates.

When some or all of the economic benefits required to settle a provision are expected to be recovered from a third party, the receivable is recognised as an asset if it is virtually certain that reimbursement will be received and the amount of the receivable can be measured reliably.

All provisions except for long-term employee entitlements are expected to be paid within the following financial year.

in thousands of New Zealand dollars	Restructuring	Employee entitlements	ACC	Other	Total
2020					
Balance at beginning of year	115	4,830	269	227	5,441
Provisions made during the year	1,581	6,433	357	150	8,522
Provisions used during the year	(1,139)	(5,790)	(107)	-	(7,036)
Provisions reversed during the year	-	(230)	(267)	(227)	(724)
Balance at end of year	557	5,243	252	150	6,203
Represented by:					
Current liabilities	557	5,221	252	150	6,181
Non-current liabilities	-	22	-	-	22
Total provisions	557	5,243	252	150	6,203
2019					
Balance at beginning of year	577	4,678	263	830	6,348
Provisions made during the year	228	2,812	316	-	3,356
Provisions used during the year	(692)	(2,688)	(146)	-	(3,526)
Provisions reversed during the year	2	28	(164)	(603)	(737)
Balance at end of year	115	4,830	269	227	5,441
Represented by:					
Current liabilities	115	4,795	269	227	5,406
Non-current liabilities	-	35	-	-	35
Total provisions	115	4,830	269	227	5,441

Restructuring provision

The restructuring provision represents the direct costs of restructuring that are not associated with the ongoing activities of the Group and includes termination benefits.

Employee entitlements

Employee entitlements represents annual leave, alternative days leave, sick leave, long service leave and performance pay.

ACC provision

The Group decided not to renew its Accredited Employer Programme contract with the Accident Compensation Corporation on 31 March 2020. This means that as of 1 April 2020, ACC will be responsible for managing any new work-related injury claims for our employees where the injury occurred after 31 March 2020. For any injuries that occurred, or were lodged prior to 31 March 2020, the Group will continue to work with the Third-Party Administrator (Wellnz) to manage these claims for the remaining duration of the claims management period. The provision comprises three components as at 30 June 2020: estimated ACC standard levy, claims stop loss limit and claims management cost.

19 Other non-current liabilities

Key money

In 2015, AgResearch Limited sold a building and entered into a sub-lease of the land on which the building is located. The lessee has paid an upfront lump sum as key money in relation to the lease. The key money is being recognised as income over the term of the lease (including renewal periods).

Deferred share purchase settlement

As part of the purchase agreement for the acquisition of the 50% shareholding in Farmax Limited, AgResearch Limited has agreed to pay up to \$200,000 in the event that agreed revenue targets in Farmax Limited are met. Based upon Farmax revenue in the year ending June 2020, \$30k is payable to the original owners of Farmax and the movement from 30 June 2019 is recognised in profit and loss.

in thousands of New Zealand dollars	2020	2019
Key money received in advance	566	626
Key money referable to lease in current period	(60)	(60)
	506	566
Deferred share acquisition costs	30	200
	536	766

20 Investments in subsidiaries

Subsidiaries are entities controlled by the Group.

The results of any subsidiaries that become, or cease to be, part of the Group during the year are consolidated from the date that control commenced or until the date that control ceased.

The interests of any non-controlling shareholders are stated in proportion of the fair values of the identifiable assets and liabilities recognised on acquisition plus their share of post-acquisition surpluses.

Subsidiary companies	Balance date	% of ownership interest and voting power held by the Group		Principal activity
		2020	2019	
Celentis Limited	30 June	100	100	Holding company
Grasslanz Technology Limited	30 June	100	100	Cultivar development and management
AgResearch (USA) Limited	30 June	100	100	Cultivar development and management in the USA
AgResearch (Pastoral Genomics Consortia) Limited	30 June	100	100	Holding company
AgResearch (PPGR Consortia) Limited	30 June	100	100	Holding company
Covita Limited	30 June	100	100	Holding company
Phytagro New Zealand Limited	30 June	100	100	Holding company
Farmax Limited	30 June	100	100	Development and distribution of farm management software

Grasslanz Technology Limited is a direct subsidiary of Celentis Limited. AgResearch (USA) Limited is a direct subsidiary of Grasslanz Technology Limited. All other subsidiary companies are direct subsidiaries of AgResearch Limited.

All subsidiary companies are incorporated in New Zealand.

21 Reconciliation of surplus after tax with net cash flow from operating activities

in thousands of New Zealand dollars	2020	2019
Surplus/(deficit) after tax	5,983	(7,008)
Non-cash items		
Depreciation	10,244	9,571
Intangible assets amortisation	501	620
Depreciation of right-of-use	2,634	-
Net (gain)/loss on sale of property, plant and equipment	77	(2,429)
Share of deficit of associates	1,020	1,266
Investment write down/revaluation	152	8,837
Change in fair value of forestry	(87)	(192)
Change in fair value of livestock	487	(1,729)
Change in fair value of other investments	(637)	805
Property, plant and equipment impairment/(write up)	1,216	(8)
Net (gain)/loss from foreign currency exchange	(10)	30
Change in fair value of derivative financial instruments	16	53
Bad debt provision	4	(103)
Other non-cash items	(368)	(991)
Movements in working capital		
Change in current taxation	1,920	1,395
Change in deferred tax	(4,958)	463
(Increase)/decrease in inventory	(115)	32
(Increase)/decrease in livestock	(229)	2,151
(Increase)/decrease in receivables	9,592	1,785
(Increase)/decrease in prepayments	(290)	46
(Increase)/decrease in other current assets	250	-
(Increase)/decrease in property held for sale	-	763
Increase/(decrease) in provisions	763	(908)
Increase/(decrease) in payables	3,139	2,237
Items classified as investing activities		
Increase/(decrease) in property, plant & equipment, intangible assets and investment accruals	3,080	(2,544)
Net cash flow from operating activities	34,384	14,142

22 Heritage assets

Heritage assets are those assets that are held for the duration of their physical lives because of their unique cultural, historical, geographical, scientific and/or environmental attributes. The Group has identified a germplasm collection as a heritage asset with no acquisition cost. The nature of this heritage asset, and its significance to the science the Group undertakes, makes it necessary to disclose it. The Directors believe there is no practical basis upon which to reliably measure the fair value of this collection. Details of the collection are outlined below:

Asset	Description
Margot Forde Germplasm Centre	New Zealand's national genebank of grassland plants and Australia's genebank for perennial grasses and legumes

23 Operating lease arrangements

The Group as a lessor

in thousands of New Zealand dollars	2020	2019
Non-cancellable operating lease receivables		
Receivable no later than 1 year	2,491	3,200
Receivable later than 1 year and not longer than 5 years	2,900	4,504
Receivable later than 5 years	924	414
Total non-cancellable operating leases	6,315	8,118

Operating lease receivables relate to land and buildings leased on the four campuses owned by AgResearch Limited. The lease terms are between 1 month and 11 years, with one lease having an option to extend for a further five terms, each of 5 years. Lease income is recognised in profit or loss on the straight-line basis over the lease terms. Management constantly manages the risks associated with any rights retained in the leased assets. The following approaches have been taken to reduce the associated risks:

- All leases have the provisions for periodic rent reviews to market rates
- The lessees are liable for any damage or loss to the leased properties caused by careless or abnormal use
- No lessees have an option to purchase the property at the expiry of the lease period.

24 Joint operation investments

Joint operations are joint arrangements between the Group and another party in which there is a contractual agreement to undertake a specific business project and in which the joint parties are severally liable in respect of costs and liabilities of the project and share in any resulting output. The Group's share of the assets, liabilities, revenues and expenses of joint operations are incorporated into the Group financial statements on a line by line basis using the proportionate method. Where the Group transacts with its jointly controlled entities, unrealised profits and losses are eliminated to the extent of the Group's interest in the joint operation.

Details of the Group's material joint operations at the end of the year are as follows:

	Balance date	% of ownership interest and voting power held by the Group		Principal activity
		2020	2019	
Grasslands Innovation Limited	30 June	30	30	To identify, develop and exploit product opportunities in proprietary forage cultivars and other forage technologies

The 30% interest in Grasslands Innovation Limited is held via Grasslanz Technology Limited, a wholly-owned subsidiary of AgResearch Limited. Grasslands Innovation Limited is incorporated in New Zealand. Grasslands Innovation Limited is considered a joint operation by virtue of the contractual arrangements which specify the parties' rights to the economic inputs and outputs of the joint arrangement and retention of ownership rights to pre-existing IP contributed by the parties.

25 Transactions with related parties

The ultimate shareholder of the Group is the Crown. The Group undertakes many transactions with other Crown entities, state owned enterprises and government departments, which are carried out on a commercial and arm's-length basis. A summary of other related party transactions is detailed below.

Trading transactions with related parties	Sale of services		Due from	
in thousands of New Zealand dollars	2020	2019	2020	2019
Research, development and other services				
<i>Transactions between AgResearch and related parties:</i>				
Subsidiaries	3,954	3,877	28	1,061
Associates and joint ventures	7,875	9,176	1,995	1,346
Joint operations	377	393	685	108
<i>Transactions between the Group and related parties:</i>				
Entities with which key management personnel are associated *	2,746	1,568	842	457

Revenue from MBIE is disclosed in the consolidated statement of comprehensive income and note 1.

25 Transactions with related parties (continued)

in thousands of New Zealand dollars	Purchase of services		Due to	
	2020	2019	2020	2019
Research, development and other services				
<i>Transactions between AgResearch and related parties:</i>				
Subsidiaries	360	574	-	53
Associates and joint ventures	15	4,213	-	5
Joint operations	123	-	-	-
<i>Transactions between the Group and related parties:</i>				
Entities with which key management personnel are associated *	1,641	5,221	102	9

The amounts outstanding are unsecured, on normal trade terms and will be settled in cash. No guarantees have been given or received. No expense has been recognised in the period for bad or doubtful debts in respect of the amounts owed by related parties.

* Trading transactions with entities with which key management personnel are associated include:

in thousands of New Zealand dollars	Sale of services		Purchase of services		Due from (due to)	
	2020	2019	2020	2019	2020	2019
Biopolymer Network Limited	50	264	-	-	-	44
Blinc Innovation Ltd**	88	134	-	216	-	(5)
Enviro-Mark Solutions Limited	-	-	-	19	-	-
Grasslands Innovation Limited	1,502	393	123	-	685	108
Landcare Research New Zealand Ltd	1,030	777	1,308	1,740	52	305
Nufarm NZ Ltd	27	-	-	-	4	-
LUAGRJF Limited Partnership	17	-	-	3,040	-	-
Riddet Institute	32	-	-	-	-	-
Science New Zealand (Acri)	-	-	86	-	-	-
Museum of New Zealand	-	-	46	108	-	-
NZ Post	-	-	78	98	(1)	(4)
Total	2,746	1,568	1,641	5,221	740	448

** Key management personnel are no longer associated with these entities.

Equity interest in related parties

Details of the percentage of interests held in related parties are disclosed in notes 5 and 20 to the Consolidated Financial Statements.

Key management remuneration reporting

The compensation of the Directors and Executives, being the key management personnel of the Group, comprised:

in thousands of New Zealand dollars	2020	2019
Directors' fees	275	282
Salaries and other short-term employee benefits	3,625	2,800
Termination payments	355	-
Total	4,255	3,082

26 Financial instruments

Financial instruments carried in the statement of financial position include cash and cash equivalents, investments, derivative financial instruments, receivables and trade creditors. The particular recognition methods adopted are disclosed in the accounting policies where relevant.

Financial risk management

The Group has exposure to the following risks from its use of financial instruments:

- Credit risk
- Market risk
- Liquidity risk.

The Group has a treasury policy that it applies to actively manage these risks (refer below).

Credit risk

The financial instruments that potentially subject the Group to credit risk are cash, short-term deposits, forward rate agreements and accounts receivable.

Credit risk is managed through the treasury policy, which:

- Places restrictions on the level of investment with any one counterparty;
- Restricts the counterparties that may be used to A Grade registered banks and the New Zealand Government; and
- Sets parameters within which short-term investments must be made.

The Group has no significant concentrations of credit risk. The maximum exposure to credit risk is represented by the carrying value of each financial asset in the Statement of Financial Position.

Trade receivables consist of a large number of customers, spread across diverse sectors and geographical areas. On-going credit evaluation is performed on the financial condition of the trade receivables. Credit assessments are undertaken to determine the credit quality of the customer, taking into account their financial position, past experience and other relevant factors. Individual risk limits are granted in accordance with the internal credit policy and authorised via appropriate personnel as defined by the Group's delegation of authority manual.

The carrying amount of financial assets recorded in the financial statements, net of any allowances for losses, represents the maximum exposure to AgResearch of any credit risk.

AgResearch does not have any significant credit risk exposure to any single counter party. The credit risk on liquid funds and derivative financial instruments is limited because the counter parties are banks with high credit ratings assigned by international credit rating agencies.

AgResearch has not changed its overall strategy regarding the management of risk during the financial year.

Market risk

Currency risk

Revenues and expenses in foreign currency are translated to New Zealand dollars at the exchange rates in effect at the time of the transaction, or at rates approximating them. Assets and liabilities are converted to New Zealand dollars at the rates of exchange ruling at balance date.

Currency risk in respect of the Group's transactions is managed in accordance with the Group's treasury policy and includes the use of forward foreign exchange contracts.

It is estimated that a 10% decrease in the New Zealand dollar would increase profit and equity by \$77k (2019: \$172k). It is estimated that a 10% increase in the New Zealand dollar would reduce profit and equity by \$63k (2019: \$141k).

Cash flow risk

For those currency exposures less certain in their timing and extent, such as future sales and purchases, it is the Group's policy to manage the risk on a group wide basis. Under the treasury policy the purchased cover is up to 100% depending on how far out the anticipated exposure is (to a maximum of 12 months).

The Group uses foreign currency forward exchange contracts, within the above treasury policy limits, to manage these exposures.

There has been no change during the year to the Group's exposure to currency risks or the manner in which it measures the risks.

Interest rate risk

The Group has no borrowings and is therefore not exposed to interest rate risk other than in relation to its investments, which are not material.

Liquidity risk

Liquidity risk represents the Group's ability to meet its financial obligations on time. The Group generates sufficient cash flows from its operating activities to make timely payments.

Liquidity risk is managed:

- By monitoring cash flow forecasts (both operational and anticipated non-recurring items) and aligning investment decisions with these
- Through compliance with the treasury policy, which sets a liquidity buffer for unforeseen cash flows
- Through monthly review by senior management
- Through regular oversight by the Audit and Risk Committee.

26 Financial instruments (continued)

There has been no change during the year to the Group's exposure to liquidity risks or the manner in which it manages and measures the risks.

Maturity analysis – financial liabilities

in thousands of New Zealand dollars	On demand	Less than 1 year	Between 1 year and 5 years	Total
2020				
Trade and other payables	-	16,893	-	16,893
Derivative financial instruments	-	11	-	11
	-	16,904	-	16,904
2019				
Trade and other payables	-	25,239	-	25,239
Derivative financial instruments	-	-	-	-
	-	25,239	-	25,239

Fair value

Cash and cash equivalents, trade receivables, other receivables and payables

The carrying amounts of financial assets and financial liabilities recorded at cost in the financial statements approximate their fair value.

Investments

Investments, except for 'other investments' which are valued at fair value, are carried at cost. It is not practical to estimate the fair values of unlisted associates.

Derivative financial instruments

Foreign currency contracts are shown at fair value

Fair value of financial assets and financial liabilities

in thousands of New Zealand dollars	Note	Loans and receivables	Fair value through profit and loss	Financial liabilities at amortised cost	Carrying amount	Fair value
2020						
Financial assets						
Cash and cash equivalents*		55,007	-	-	55,007	55,007
Trade and other receivables	9	22,175	-	-	22,175	22,175
Lease receivables	12	196	-	-	196	196
Non-listed equity investments **		-	858	-	858	858
Listed equity investments **		-	1,801	-	1,801	1,801
		77,378	2,659	-	80,037	80,037
Financial liabilities						
Trade and other payables	10	-	-	16,893	16,893	16,893
Derivative financial instruments		-	11	-	11	11
		-	11	16,893	16,904	16,904
2019						
Financial assets						
Cash and cash equivalents		48,186	-	-	48,186	48,186
Trade and other receivables		31,798	-	-	31,798	31,798
Other non-current receivables		-	-	-	-	-
Derivative financial instruments		-	5	-	5	5
Non-listed equity investments *		-	434	-	434	434
Listed equity investments *		-	1,807	-	1,807	1,807
		79,984	2,246	-	82,230	82,230
Financial liabilities						
Trade and other payables		-	-	25,239	25,239	25,239
Derivative financial instruments		-	-	-	-	-
		-	-	25,239	25,239	25,239

* Cash and cash equivalents includes \$830k (2019: \$1,296k) that belongs to NZ Agricultural Greenhouse Gas Trust. This fully offsets with the balance owing to NZ Agricultural Greenhouse Gas Trust in trade and other payables.

** Equity investments consist of Fonterra shares \$1,775k (2019: \$1,776k), BioPacific Ventures \$10k (2019:10k) and other investments of \$874k (2019: \$455k) as per note 15. The level classification determined is based on the fair value within these investments.

27 Contingencies and commitments

in thousands of New Zealand dollars	2020	2019
Capital commitments		
Asset purchases committed to and contracted for at balance date	5,743	13,070
Funding commitments to associates	1,550	2,425
Total capital commitments	7,293	15,495

Litigation and other contingent liabilities

There are no known significant contingent liabilities or pending litigation.

Contingent assets

Currently there is a claim with the Company's insurer in respect of damage as a result of the Canterbury earthquakes. The quantum of the claim is still to be agreed.

28 Capital management

The Group's capital is its equity, which is made up of:

- Share capital
- Asset revaluation reserve
- Retained earnings.

The Crown Research Institutes Act 1992 requires AgResearch Limited to maintain its financial viability in order to undertake research for the benefit of New Zealand.

The Group manages its capital to ensure that entities in the Group will operate in a financially responsible manner, be financially viable and continue as a going concern. The Group is not subject to any externally imposed capital requirements.

The Group's policies in respect of capital management and allocation are reviewed regularly by the Board of Directors.

There have been no material changes in the Group's management of capital during the year.

29 Significant events after balance date

A second CRRF grant of \$13.57m is going to be received from MBIE in five tranches in financial year 2020/21.

Auditor's report



Independent Auditor's Report

To the readers of Agresearch Limited and Group's
Financial Statements for the year ended 30 June 2020

The Auditor-General is the auditor of AgResearch Limited and Group (the Group). The Auditor-General has appointed me, Paul Bryden, using the staff and resources of Deloitte Limited, to carry out the audit of the financial statements of the Group on his behalf.

Opinion

We have audited the financial statements of the Group on pages 103 to 137, that comprise the consolidated statement of financial position as at 30 June 2020, the consolidated statement of comprehensive income, consolidated statement of changes in equity and consolidated statement of cash flows for the year ended on that and the notes to the financial statements that include accounting policies and other explanatory information.

In our opinion, the financial statements of the Group:

- present fairly, in all material respects:
 - its financial position as at 30 June 2020; and
 - its financial performance and cash flows for the year then ended; and
- comply with generally accepted accounting practice in New Zealand in accordance with New Zealand equivalents to International Financial Reporting Standards.

Our audit was completed on 11 September 2020. This is the date at which our opinion is expressed.

The basis for our opinion is explained below, and we draw your attention to other matters. In addition, we outline the responsibilities of the Board of Directors and our responsibilities relating to the financial statements, we comment on other information, and we explain our independence.

Impact of Covid-19

Without modifying our opinion, we draw attention to the disclosures about the impact of Covid-19 on the Group as set out in the statement of accounting policies, notes 1, 6 and 8 to the financial statements. We draw specific attention to the following matter due to the significant level of uncertainty caused by Covid-19:

- **Property, plant and equipment**

Note 8 on pages 122 to 124 describes the significant uncertainties highlighted by the valuer, related to estimating the fair values of the group's property, plant and equipment.

Basis for our opinion

We carried out our audit in accordance with the Auditor-General's Auditing Standards, which incorporate the Professional and Ethical Standards and the International Standards on Auditing (New Zealand) issued by the New Zealand Auditing and Assurance Standards Board. Our responsibilities under those standards are further described in the Responsibilities of the auditor section of our report.

We have fulfilled our responsibilities in accordance with the Auditor-General's Auditing Standards.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Auditor's report



Responsibilities of the Board of Directors for the financial statements

The Board of Directors is responsible on behalf of the Group for preparing financial statements that are fairly presented and that comply with generally accepted accounting practice in New Zealand.

The Board of Directors is responsible for such internal control as it determines is necessary to enable it to prepare financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the Board of Directors is responsible on behalf of the Group for assessing the Group's ability to continue as a going concern. The Board of Directors is also responsible for disclosing, as applicable, matters related to going concern and using the going concern basis of accounting, unless the Board of Directors has to cease operations, or has no realistic alternative but to do so.

The Board of Directors' responsibilities arise from the Crown Research Institutes Act 1992.

Responsibilities of the auditor for the audit of the financial statements

Our objectives are to obtain reasonable assurance about whether the financial statements, as a whole, are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion.

Reasonable assurance is a high level of assurance, but it is not a guarantee that an audit carried out in accordance with the Auditor-General's Auditing Standards will always detect a material misstatement when it exists. Misstatements are differences or omissions of amounts or disclosures and can arise from fraud or error. Misstatements are considered material if, individually or in the aggregate, they could reasonably be expected to influence the decisions of readers taken on the basis of these financial statements.

For the budget information reported in the financial statements, our procedures were limited to checking that the information agreed to the Group's statement of corporate intent.

We did not evaluate the security and controls over the electronic publication of the financial statements.

As part of an audit in accordance with the Auditor-General's Auditing Standards, we exercise professional judgement and maintain professional scepticism throughout the audit. Also:

- We identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- We obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances but not for the purpose of expressing an opinion on the effectiveness of the Group's internal control.
- We evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Board of Directors.
- We conclude on the appropriateness of the use of the going concern basis of accounting by the Board of Directors and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to continue as a going concern.
- We evaluate the overall presentation, structure and content of the financial statements, including the disclosures and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

Auditor's report

Deloitte.

- We obtain sufficient appropriate audit evidence regarding the financial statements of the entities or business activities within the Group to express an opinion on the consolidated financial statements. We are responsible for the direction, supervision and performance of the Group audit. We remain solely responsible for our audit opinion.

We communicate with the Board of Directors regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Our responsibilities arise from the Public Audit Act 2001.

Other Information

The Board of Directors is responsible for the other information. The other information comprises the information included on pages 2 to 102, but does not include the financial statements, and our auditor's report thereon.

Our opinion on the financial statements does not cover the other information and we do not express any form of audit opinion or assurance conclusion thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information. In doing so, we consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated. If, based on our work, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

Independence

We are independent of the Group in accordance with the independence requirements of the Auditor-General's Auditing Standards, which incorporate the independence requirements of Professional and Ethical Standard 1: *International Code of Ethics for Assurance Practitioners* issued by the New Zealand Auditing and Assurance Standards Board.

Other than the audit, we have no relationship with, or interests in, the Group.



Paul Bryden
Partner
for Deloitte Limited
On behalf of the Auditor-General
Christchurch, New Zealand

11 September 2020





Directory

Tohutohu

Executive Leadership Team

Dr Sue Bidrose

Chief Executive Officer
(Effective from July 2020)

Tony Hickmott

Acting Chief Executive
(Until July 2020)
Finance and Business
Performance Director

Dr Trevor Stuthridge

Research Director

Natasha Barnett

Health, Safety and
Environment Director

Jo Brady

Communications and
Marketing Director

Fleur Evans

Acting People and
Culture Director
(Effective from November
2019)

Stuart Hall

Partnerships and
Programmes Director

Chris Koroheke

Kaiurungi Ahuwhenua Māori

John O'Dea

Infrastructure Director

Greg Rossiter

Technology and Digital
Services Director

Sharon Cresswell

Interim Finance and Business
Performance Director
(Until June 2020)

Dr Tom Richardson

Chief Executive
(Until October 2019)

Lee Gardiner

People and Culture Director
(Until October 2019)

Board of Directors

Dr Paul Reynolds QSO

Chair
(Appointed Chair
September 2019)

Kim Wallace

Deputy Chair
(Appointed Deputy Chair
July 2020)
Chair – Audit and Risk
Committee

Jackie Lloyd

Chair – People and Culture
Committee

Colin Armer

Director

Rukumoana Schaafhausen

Director

Dr Louise Cullen

Director
(Appointed March 2020)

Lain Jager

Director
(Appointed July 2020)

Dr Peter Stone

Director
(Until 30 September 2019)

Information

Auditors

Deloitte on behalf of the
Auditor-General

Bankers

ANZ Bank New Zealand Limited
Westpac Banking Corporation

Science working for New Zealand

The Crown Research Institutes (CRIs) proudly work, individually and collectively, to create a more prosperous, sustainable and innovative New Zealand



Manaaki Whenua
Landcare Research



www.sciencenewzealand.org

3,600

SMART AND
PASSIONATE PEOPLE

50

SITES ACROSS
NEW ZEALAND

6,000

SCIENCE PROJECTS
EACH YEAR

40

NATIONALLY SIGNIFICANT
DATABASES & COLLECTIONS

AgResearch Limited
NZBN: 9429 038 966 224

Lincoln

Corporate Office
Lincoln Research Centre
1365 Springs Road
Lincoln 7674
Private Bag 4749
Christchurch 8731
T +64 3 321 8731

Hamilton

Ruakura Research Centre
10 Bislely Road
Hamilton 3214
Private Bag 3123
Hamilton 3240
T +64 7 856 2836

Palmerston North

Grasslands Research Centre
Hopkirk Research Institute
Te Ohu Rangahau Kai
Tennent Drive
Palmerston North 4410
Private Bag 11008
Palmerston North 4442
T +64 6 356 8019

Mosgiel

Invermay Agricultural Centre
176 Puddle Alley
Mosgiel 9092
Private Bag 50034
Mosgiel 9053
T +64 3 489 3809

www.agresearch.co.nz