



Annual Report

Rīpoata ā-tau
2019

Driving prosperity by transforming agriculture

Ānga taurikura whakamua mā
te whakaumu ahuhenua

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About us

Ko wai mātou

742

Science projects

295

Commercial reports

722

AgResearch staff

332

International collaborations

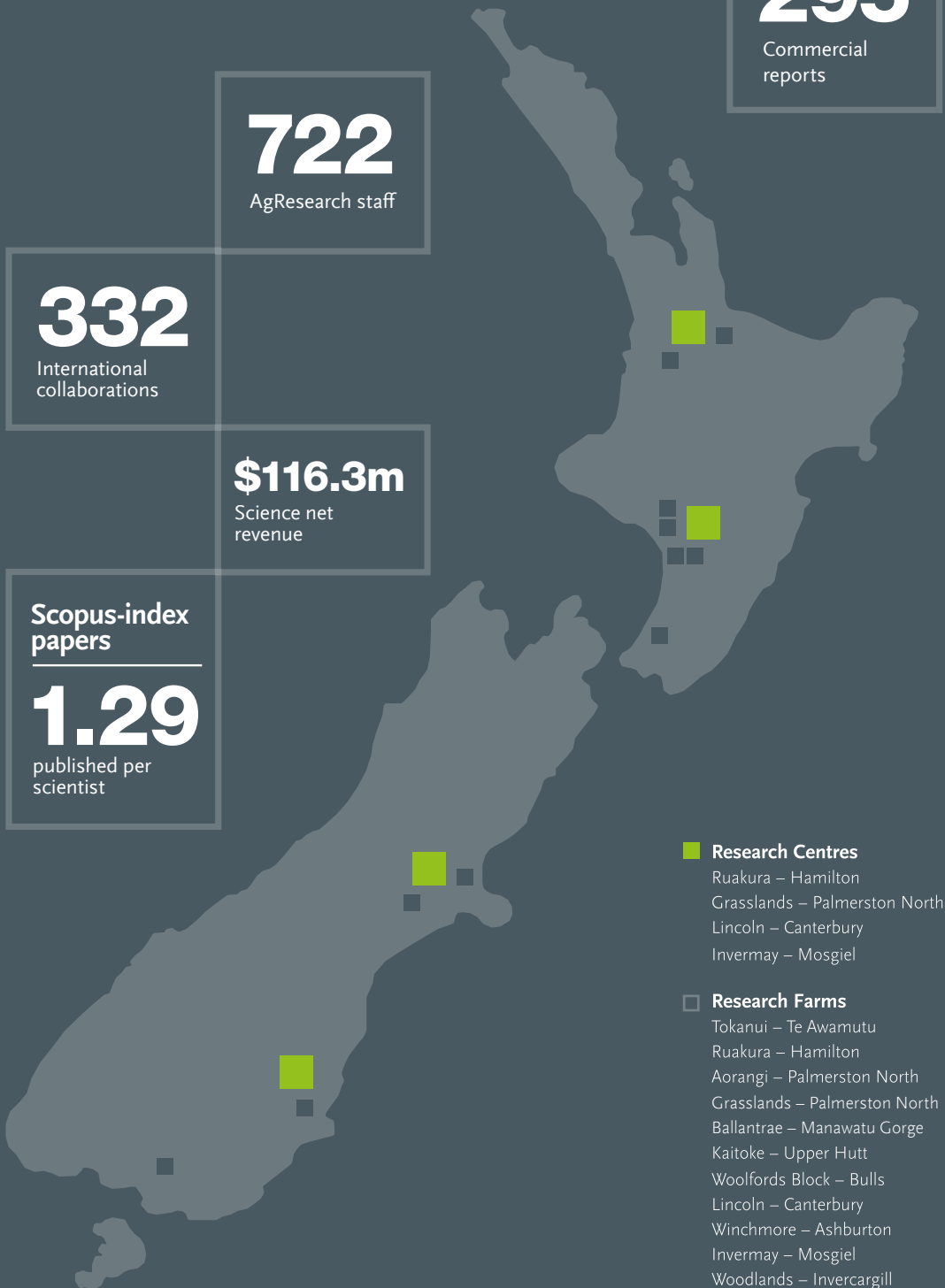
\$116.3m

Science net revenue

Scopus-index papers

1.29

published per scientist







Chair and Chief Executive's review

Ngā arotakenga o te Heamana me te Tumuaki Whakahaere

Our role as the Crown Research Institute (CRI) within the pastoral agriculture sector sees us working closely with sector partners to drive national and regional prosperity by transforming agriculture in New Zealand.

We are a key contributor to the diversification of New Zealand's primary industries and its changing land use.

Three distinct trends are already starting to challenge the value we as a nation derive from our primary industries:

- Awareness is growing about the climate change implications of greenhouse gas emissions produced from intensive livestock farming;
- The impact of alternatives to pastoral-produced meat and dairy products is increasing and now clearly evident; and
- Consumers are changing in both their views and preferences in relation to meat consumption and their understanding of where food comes from, including how it is produced.

The position our farmers hold in the fabric of society, their social licence to operate, and the markets they participate in are all changing at a rate never witnessed before largely due to the influence of the global digital revolution.

At AgResearch we have decided to embrace this challenge and exploit the opportunities afforded us by refocusing and refreshing our Science Plan to bring it into line with the imminent changes.

We believe AgResearch, a world-renowned leader in land-based and food systems research, is uniquely placed to act as a thought leader and a bellwether for change.

We have an embedded culture of embracing change and a history of adopting and adapting technology to suit New Zealand's agricultural needs, whether it be through animal genomics or by promoting farm systems for the betterment of the environment.

The challenges are considerable. But we are excited to be partnering with key stakeholders and leading technology providers to do the science of today that will enable the pastoral sector to transition to a more adaptive and sustainable "bioeconomy" of tomorrow.

This year we started an 18-month research programme we believe will help harness digital

technology and transform New Zealand's agricultural systems. Under the New Zealand Bioeconomy in the Digital Age (NZBIDA) research programme, funded by the Ministry of Business, Innovation and Employment (MBIE), we are exploring new "proof-of-concept" ways of harnessing the power that today's data-rich world offers, on behalf of the farming sector.

Our AgResearch Science Prize recognises outstanding achievement in research quality. This year's winners, Federico Tomasetto and Stephen Goldson, collaborated on a paper that described the potential impact of agricultural monocultures on biodiversity as observed through the relatively rapid failure of biocontrol agents. The Science Prize selection panel said that this paper highlights a previously unknown relationship between ecological and evolutionary processes in biological control that will have potentially wide-ranging implications and impact.

The AgResearch Impact Prize recognises the achievement of outstanding scientific output that contributes to sector impact. The MBIE funded "Boosting exports of the emerging New Zealand dairy sheep industry" was a deserving winner of the 2019 Impact Prize. The transdisciplinary science team, led by Linda Samuelsson, made a tangible contribution to industry growth in line with the objective of growing the value of New Zealand's exports. Moreover, their contribution across the value chain – from on-farm productivity and environmental impact through to consumer-focused product attribute verification – was clearly evident.

AgResearch continued its engagement with Government on climate change research. Our scientists were involved in the development of an important discovery to help lower methane emissions from animals. The findings have just been published online in the respected *International Society for Microbial Ecology Journal*. The science break-through received widespread media coverage.

National Fielddays held at Mystery Creek always provides AgResearch with an important opportunity to showcase our science to stakeholders, the wider agriculture sector, and general public. This year's event was a major success for AgResearch and our fellow CRI collaborators. In partnership with Scion,

the Institute of Environmental Science and Research (ESR) and Manaaki Whenua – Landcare Research, we won the Supreme Award for Best Exhibit at the event.

Stakeholder engagement continued to be a major area of focus throughout the year. 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 across Māoridom and develop Māori agribusiness research priority areas and strategic research direction. This will enable AgResearch to improve our understanding of, integration with and delivery of, Mātauranga Māori.

We continue to invest in our people across the organisation. AgResearch launched our new employee experience programme, Our Voice. An annual engagement survey will now form just one aspect of our wider employee experience activities. The Our Voice programme will include new twice-yearly Pulse Surveys, and surveys that specifically target the experiences that our people have during their time with AgResearch, including post-recruitment and on-boarding, exit and any significant change programme.

As an outcome of our continued commitment to ensure the safety and wellbeing of our people, this year saw a marked improvement in our health and safety performance across the board. By focusing on our critical risks and promoting a worker-centric culture, we experienced a significant shift in our lag and lead indicators this year with 47% fewer injuries requiring medical treatment, 57% fewer near misses, and 20% more uncontrolled hazards reported. Additionally, the improvements in our health and safety, and injury management performance were recognised by the Accident Compensation Corporation, with AgResearch regaining tertiary-level Partnership Programme accreditation in 2018.

Our significant infrastructure programmes continue to make solid progress. The Joint Food Science Facility in Palmerston North remains on track for completion in the first quarter of 2020. Work continues behind the scenes on ensuring a seamless transition for our employees to their new building and new ways of working.

The interim management operating committee (made up of AgResearch, Massey University and Riddet Institute staff) is working through important issues like health and safety, compliance management, and efficient and effective IT systems operation in readiness for moving early next year.

In Lincoln, AgResearch plans to invest in modern facilities to transform the future of food production. The AgResearch Board has focused its energies over recent months on reviewing the partnerships and facilities required to deliver on our refreshed Science Plan. An important outcome of this strategic review has been that the Board and our Science Advisory Panel (SAP) have reaffirmed the criticality of our four-campus model to deliver on our strategy and balance our national and regional needs. Because this four-campus model relies on each campus being a vibrant attractor for science talent and partner co-location, AgResearch entered into a conditional agreement to purchase land from Lincoln University, who share our commitment to developing an education, research and innovation precinct in the town. We plan to independently build facilities for our staff that can be jointly used by tertiary education providers and private sector collaborators. At the time of writing, we are close to completing a Single Stage Business Case for Ministerial approval and look forward to announcing more details about reaching further key milestones in our wider organisational change programme in the new financial year.

For the last financial year, AgResearch's gross revenue was \$157.3m which is \$6.8m higher than budgeted and the net loss before tax is \$4.8m as at 30 June 2019. This is higher than the FY19 budgeted loss of \$3.1m. The variance to the budget is primarily due to the \$8.8m impairment in our investment in the Lincoln University AgResearch Jointly-owned Facility, which will now be separately owned, offset by an increase in revenue and improved cost management.

The main areas of cost reduction have been in our restructuring and joint facility relocation costs this year. In addition, we have delivered higher interest income than budget due to higher cash reserves. The increase in cash reserves is due to the delay of the Lincoln Precinct capital project.

The organisation has enjoyed a period of stability at governance level. The SAP is an independent panel made up of New Zealand and overseas-based scientists established at the direction of the AgResearch Board. The panel provides strategic advice on research priorities and direction, scientific programmes and the knowledge of technology transfer that will help us deliver our core purpose.

In October 2018, three new members joined the panel: Rickey Yada, Dean of the Faculty of Land and Food Systems at the University of British Columbia; Henning Steinfield from the Food and Agriculture Organisation of the United Nations; and Emily Parker, Professor in Chemical Biology at Victoria University of Wellington. We would like to thank Brian Keating, Bruce German and Frank O'Mara, who retired from the panel, for their valued contribution.

Our Board of Directors welcomed Rukumoana Schaafhausen at the beginning of the financial year. Rukumoana is chairperson of Te Arataura, the executive arm of Te Whakakitenga o Waikato, the tribal authority representing the people of Waikato-Tainui. Her leadership, legal expertise and energy have been a welcome addition to the AgResearch Board.

In summary, it has been another successful year for AgResearch. We are uniquely placed to tackle the national and international challenges that await and deliver the science excellence that we are respected for. The Board and management team look forward to continuing to contribute to New Zealand's prosperity in the year ahead.



Dr Paul Reynolds QSO
Chair,
AgResearch



Dr Tom Richardson
Chief Executive,
AgResearch

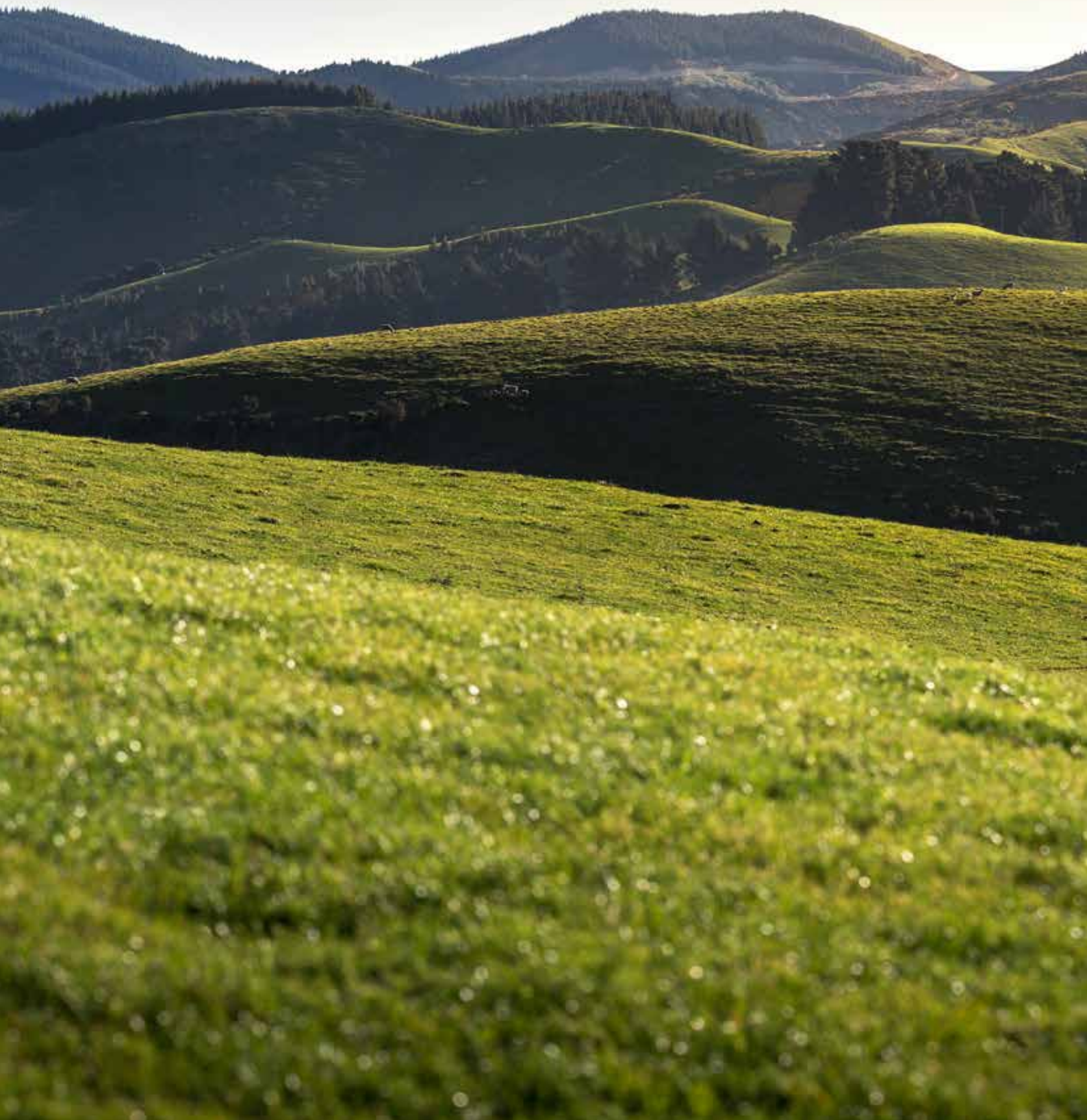






Our strategy

Tā mātou rautaki





Our strategic direction

Tā mātou aronga rautaki

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

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

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

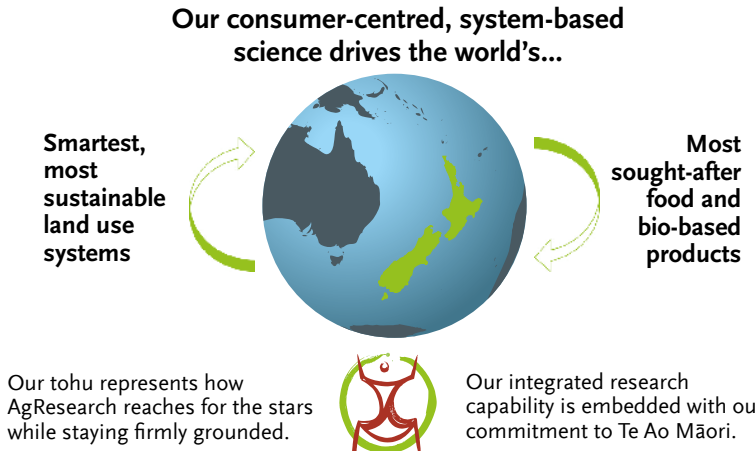
The AgResearch strategy is well aligned to government priorities and will support accelerating the shift from volume to value agricultural production, enabling the transition to a productive, sustainable and low emissions economy, and directly support thriving sustainable regions.

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

agresearch
āta mātai, mātai whetū

Driving prosperity by transforming agriculture

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



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

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

- F **Financial Strength** – Financial sustainability allowing reinvestment into science capability and capacity over time.
- R **Revitalised Science Plan** – Creating enduring value via integrated and focused areas of research that capitalise on emerging opportunities from rapid changes in food and farming technology, science, consumer drivers and environmental constraints.

- O **One AgResearch** – Investing in an aligned organisational culture that is innovative, energised, vibrant and collaborative.

- N **New Ways of Working** – Implementing the four-campus model, including new facilities, and developing research, innovation and education centres facilitating collaboration. This means investing in people and processes to support the transformation process.

- T **Transforming through Technology** – Embracing technology to change the way we deliver science and to improve enabling systems and processes to enhance impact.



Our Science Plan

Tā mātou mahere pūtaiao

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

The AgResearch Science Plan has been through several refinements following consultation with internal and external stakeholders.

In October 2018 we introduced the draft Science Plan to the SAP. The SAP then identified five macro-trends driving the future economic and environmental sustainability of our food production systems and, therefore, our sectoral and national prosperity. These were: a hungrier world, a bumpier ride, a wealthier world, transformative technologies and choosy customers.

From here, the Objectives were further defined and the originally named outcomes developed into three Overarching Principles.

In June 2019, AgResearch reached out to the wider organisation. We invited our people to get involved over a week to workshop and define impact metrics, key performance indicators and heat maps to show the relative importance and intensity of each focus area.

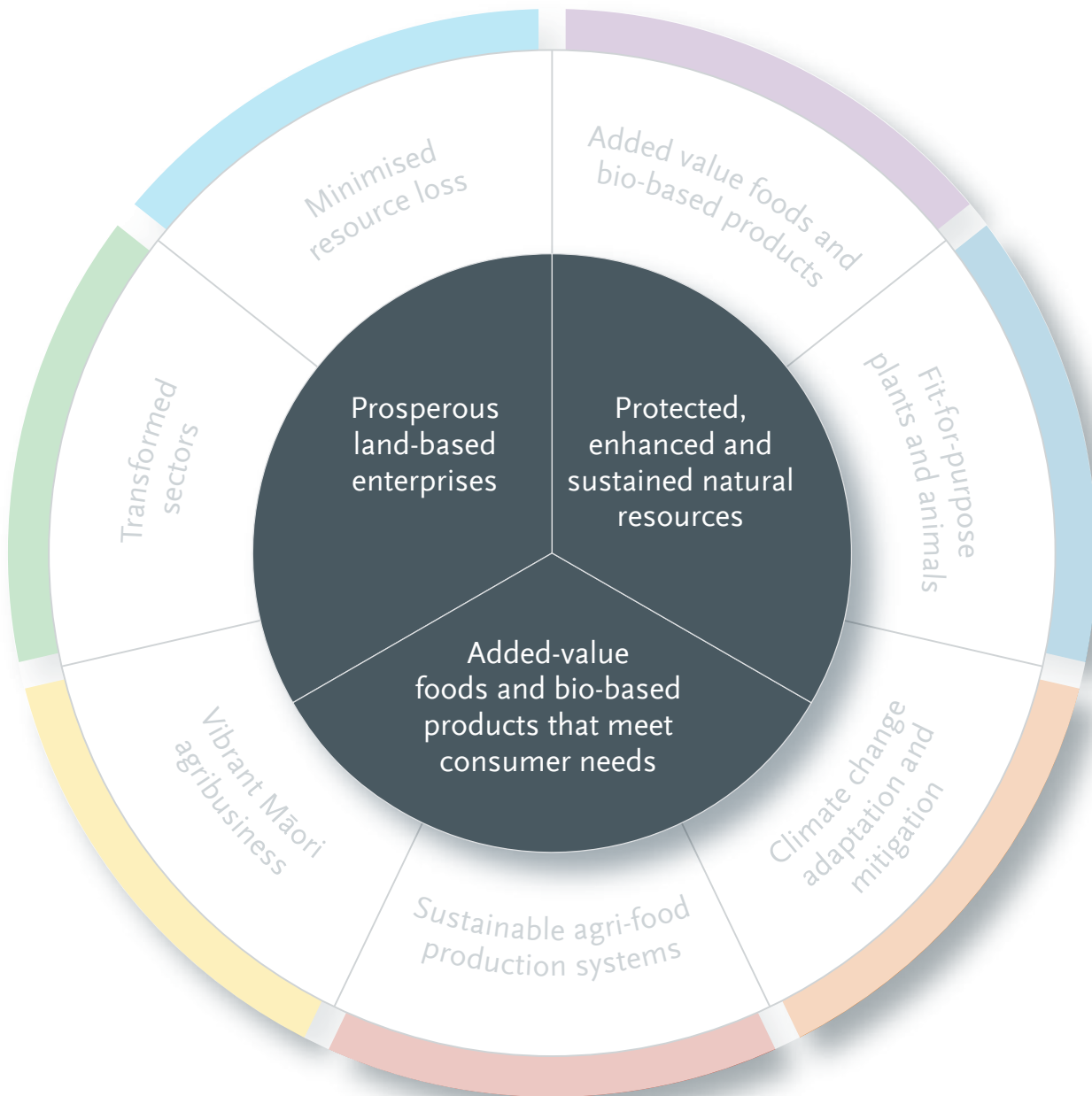
This process introduced a series of quantitative and process-oriented measures to i) operationalise the plan, ii) direct

decision-making on science investment priorities, iii) define the core elements of our science delivery structure and iv) provide a robust framework to communicate and demonstrate current and future value of AgResearch to stakeholders.

Critical drivers for the Science Plan include:

- Providing specific science and innovation targets that define success;
- Identifying particular synergies that differentiate AgResearch;
- Maximising the value of our science and innovation support capacity;
- Accelerating deployment and impact of our science; and
- Creating a culture of innovation excellence.

As a result of refining our Science Plan, national-level "Challenge Targets" with a 2030 delivery date are being developed to align with our Overarching Principles. We look forward to confirming these in the next financial year along with the final Science Plan.



Overarching Principles

The AgResearch Science 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.

Our Science Objectives

Seven highly interconnected Science Objectives guide the areas of activity required to deliver the Plan. Specific quantitative impact metrics have been developed for each of these Objectives.

A. Sustainable agri-food production systems

We will improve the performance of our land (whenua) and our water (awa) quality in response to land use choices and our management decisions to deliver equitable and balanced economic, social, cultural and environmental outcomes by:

- Designing diversified landscapes and enterprises that support regional economies while operating within natural resource limits;
- Reducing environmental footprints at both farm and catchment scale;
- Maximising the biological and economic efficiency of farm systems; and
- Enhancing natural capital stocks and flows.

B. Climate change adaptation and mitigation

We will adapt to and mitigate the effects of climate change while enhancing biosecurity by:

- Reducing methane and nitrous oxide emissions from pastoral systems;
- Designing low carbon-emitting and high carbon-sequestration systems;
- Developing adaptive animal breeds, forage cultivars and farm systems;
- Developing strategies and tools to prevent incursions and manage pests and diseases, including next-generation biocontrol agents; and
- Building farm system resilience to extreme weather events.

C. Vibrant Māori agribusiness

We will enable vibrant Māori agribusinesses, unlocking the unique characteristics, mātauranga and values of Te Ao Māori by:

- Designing holistic land use configurations centred on kaitiakitanga principles;
- Networking Māori properties and value webs built on aligned kaupapa; and
- Developing product attributes and business models that reflect Te Ao Māori.

D. Fit-for-purpose plants and animals

We will develop forages and animals with the attributes that meet the requirements of future diverse production systems and value webs by:

- Matching animals and forages for minimised environmental impact and maximised product value; and
- Developing world-leading animal health and welfare systems.

E. Added value foods and bio-based products

We will create safe food and bio-based products with optimised nutritional, sensory and performance attributes, capturing value through provenance and credible consumer health and wellbeing effects by:

- Ensuring full food safety, traceability and validated provenance;
- Taking a consumer-centric approach to differentiating New Zealand raw materials and whole foods;
- Undertaking a robust scientific evaluation of the effect of functional foods and ingredients on consumer health and wellbeing;
- Developing non-invasive food and bio-based product evaluation tools;
- Using systems biology approaches for predictive control of food and bio-based product properties from pasture to plate; and
- Understanding global consumer trends and markets.

F. Minimised resource loss

We will maximise value and minimise waste from whole-of-resource across production to consumption by:

- Using the circular bio-economy concept to reduce waste and optimise energy and water usage efficiency from agri-food production; and
- Developing new technologies to unlock the inherent biological value in secondary food and bio-based product processing streams.

G. Transformed sectors

We will provide the underpinning science evidence to support the transformational agenda of the agri-food sector and aid transition to new agri-food systems that enhance societal and environmental conditions by:



- Developing knowledge and technical capabilities that either disrupt existing competencies and technologies or complement them to produce new combinations;
- Developing new tools, processes and systems to enable implementation of effective practice and behaviour change;
- Designing interventions with policy and practice to support society-accepted transition pathways and transformation; and
- Developing improved practice for monitoring and evaluation of impact within complex systems.

In the next section “Our research”, we include a selection of science impact stories that exemplify our Science Plan. These stories are laid out in line with the Overarching Principles and the Science Objectives.





Our research

Tā mātou rangahau





Protected, enhanced and sustained natural resources

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



Measuring and modelling nitrate losses



Nitrogen (N) is an essential nutrient for plant growth. Agricultural plants take up nitrogen primarily as nitrate – the most abundant mineral for N in the soil. Nitrate leaching, a naturally occurring process, occurs when nitrate drains from soil before it can be used by plants and micro-organisms. Leached nitrate-nitrogen (nitrogen in the form of nitrate) in fresh water is an environmental pollutant and causes ecological harm.

In 2013, MBIE funded a six-year research programme, “Forages for Reduced Nitrate Leaching” (FRNL), that aimed to reduce nitrate leaching losses across the primary sector by 20% while maintaining and/or boosting production levels. It combined AgResearch’s expertise and resources with those of DairyNZ, Beef + Lamb New Zealand, Plant and Food Research, Lincoln University, the Foundation for Arable Research and Manaaki Whenua – Landcare Research.

A key output of FRNL has been the development of a simulation tool for modelling the dynamic changes of nitrogen. This work augments two previous FRNL SSIF projects focused on understanding post-ruminal amino acid flows and urine patch size and edge effects.

Extensively used in Australasia and internationally, the tool (APSIM; www.apsim.info) contains a suite of modules that simulate a range of plant, animal, soil, climate and management interactions. AgResearch was actively involved in the development of APSIM for several years before formally joining the APSIM Initiative (AI) in 2015. Established in 2007, AI is responsible for the development, maintenance and commercialisation of APSIM. Other foundation members include Commonwealth Scientific and Industrial Research Organisation (CSIRO), the State of Queensland and the University of Queensland.

This international collaboration has provided an excellent platform and effective pathways to impact this SSIF project. Using research data generated from previous years, and from the wider FRNL programme, five new crop models have been developed for APSIM and are available for calculating nitrogen loss at the individual urine patch level, the paddock level, and, eventually, also the whole farm level. The wider FRNL programme is due to end in September 2019, and the research outputs and tools produced in this SSIF project have contributed, and will continue to contribute, to the successful delivery of overall programme outcomes beyond the term of its contract.



Genomics for production and security in a biological economy



Advances in genomics can accelerate genetic gains in plants and animals for improving productivity and sustainability in crop and livestock production. The same technology can also be used to support genetics efforts for improving survival rates of endangered species.

Traditional genomic analyses rely on the use of single-nucleotide-polymorphism (SNP) genotype panels, or SNP chips. These SNP chips are expensive. As a faster and more cost-effective method, low-depth genotyping-by-sequencing (GBS) has become increasingly popular in recent years. Through using enzymes that divide the genome into fragments and allow for a small fraction of the genome to be studied, GBS reduces genome complexity and does not require the use of pre-developed SNP chips.

The three-time gold-rated Enabling Technologies Programme funded by MBIE, “Genomics for production and security in a biological economy”, has developed laboratory, bioinformatics and statistical tools to enable routine use of GBS for research and commercial purposes at a low cost. Through our work in collaboration with other CRIs, research organisations, universities and commercial companies, this programme has demonstrated the benefits of GBS application, processing over 400,000 samples in-house across more than 75 species, including 20 taonga species, as of July 2019.

New Zealand has many economically important species that form the basis of high-value export products for which there are limited genomic tools available, inhibiting genetic improvement through genomic selection. In particular the development of a GBS system optimised for genomic selection, through novel statistical method (i.e. Kinship using GBS with Depth adjustment), and further enhancements of DNA sample collection and lab protocols has benefitted the forage species, ryegrass and white clover.

The implementation of GBS in commercial, as well as research programmes, represents a step change in the ability to rapidly analyse a large number of biological samples. It has made it possible to develop high-density genetic marker data sets for a wide range of applications in a cost-effective manner. This makes it easier for industries to make genome-wide SNP discoveries where no prior knowledge of the genome sequence exists.

Similarly, for many important New Zealand native populations, such as the kākāpō, a flightless critically endangered parrot, low-cost genotyping system enables studies of genomic relationships to assess population fitness and assist managed breeding to minimise inbreeding.

Next generation biopesticides



Synthetic chemical pesticides have played an important role in agricultural intensification. However, pesticide residues in soil, air, water and food have become a major environmental, health and safety concern. Due to the increasing incidence of pesticide resistance and the high development cost of novel chemical molecules, fewer and fewer pesticides are available for agricultural use. Made from naturally occurring substances, biopesticides have little or no residual effects and pose less threat to the environment and human health.

Very few biopesticides are currently available in New Zealand. Funded by MBIE, an Endeavour Research Programme “Next Generation Biopesticides” (NGB) is a collaboration between AgResearch, Plant & Food Research, BioProtection Centre and Lincoln University. Through our close work with industry partners (Agrimm Ltd, UPL Ltd, Biostart, Foundation for Arable Research, Grasslanz Technology Ltd and Zespri), the programme has established new linkages underpinning development, commercialisation and uptake of biopesticides in New Zealand.

The aim of the programme was to develop at least three biopesticide prototypes that, once commercialised by programme partners, could reduce the damage caused by targeted pests and diseases by 50%.

Five biopesticide prototypes have been passed on to partners for commercialisation and use in the pastoral, arable and horticultural sectors. A new bio-bactericide for kiwifruit developed by the NGB team, Aureo® Gold, has completed its full Agricultural Compound and Veterinary Medicine (ACVM) registration in New Zealand. Launched to market in November 2018, the biocontrol agent offers a local solution to the management of *Pseudomonas syringae* pv. *actinidiae* (Psa-V).

The first limited-volume release of the product sold out within 72 hours. For the 2019 season, sufficient product to treat a large percentage of the 13,000 hectares of kiwifruit planted will be produced.

A second biopesticide developed during this programme for combating kiwifruit disease is Kiwivax™. This root drench can reduce Psa-V symptoms in kiwifruit vines by boosting naturally occurring resistance mechanisms within infected plants. Based on results from glasshouse trials, Kiwivax™ has obtained registration from ACVM with a limited label claim.

A further three prototype biopesticidal microorganisms identified within the programme are at various stages of evaluation under commercial agreements with partners ranging from national to multinational organisations.

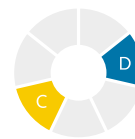


Prosperous land-based enterprises

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



Targeting early life animal nutrition for better performance



The competitive advantage of New Zealand's livestock industry depends on the efficient use of pasture as a low-cost animal feed.

To this end, a programme funded under the SSIF Agri-food Production funding platform is "Improving Productive Performance of Ruminants in Pastoral Systems through Targeted Early Life Nutritional and Microbial Strategies". This programme aims to enhance whole-of-life animal performance through more efficient use of local pasture feed resources and development of novel strategies to reduce animal wastage and improve production efficiency, particularly through early life interventions.

In collaborative work involving AgResearch and international researchers from Instituto de Investigaciones Agropecuarias, UC Davis, Hohenheim University, Wageningen University and industry partners, investigations into feed-microbiome-animal interactions have built a strong evidence base for the lifetime value proposition of investing in early-life nutrition.

In the past two decades, multiple lamb births have become increasingly common, with lambing percentages increasing from 100% in 1990 to 127% in 2017. However, lower survival rates of multiple-born lambs (59.3% for triplets compared with 82.6% for single lambs) are a major challenge for the industry.

Pregnancy and neonatal nutrition plays a crucial role in lamb survival. A triplet-bearing-ewe

trial in this programme has demonstrated the importance of balanced diets for protein intake to maintain ewe body condition and normal lamb birth weight in ewes fed a fodder crop. It has also shown the potential for specific nutrient supplements to influence multiple-born lamb survival and growth.

Through farmer and stakeholder interactions, outcomes of this research will contribute to delivery of practical options for using cost-effective winter feeds.

Each year around 30% of the calves born in the dairy industry are reared for beef production. This programme has demonstrated that nutritional strategies in the first seven months of a calf's life can accelerate growth, thereby reducing time to slaughter and reducing environmental impact. Furthermore, pre-weaning nutritional interventions were associated with changes in marbling (a desirable eating quality trait) while maintaining other carcass and meat quality traits.

Strategies to achieve whole-of-life grass-fed beef have also been demonstrated without compromising lifetime growth or meat yield and quality. This research, conducted in partnership with ANZCO Foods and FirstLight Foods, provides beef farmers with strategies to increase dairy-beef production efficiency. These may also contribute to new opportunities to use surplus calves for veal/beef production, minimising the threat to New Zealand's market reputation posed by the slaughter of bobby calves.



Adding value to forage



New Zealand has a total land area of 26.8 million hectares. About half – 13.2 million hectares – is grassland. New Zealand's economy is heavily reliant on primary exports, and the majority of dairy, sheep, beef and deer farms in New Zealand operate on a grass-fed production system. Investing in pasture renewal can improve pasture production and performance.

By matching the right plant species and cultivar to the right farm system, climate and soil, farmers can prolong the life of pasture and optimise feed resources, achieving greater resilience and profitability.

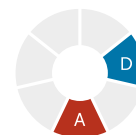
Ryegrass is the most common choice of pasture grass in New Zealand and cultivars with varying characteristics are used for animal feed across the country. To help dairy farmers to objectively select the most suitable ryegrass cultivars for their region and farm system, an online Cultivar Selector Tool was built by DairyNZ with New Zealand Plant Breeders and Research Association using the Forage Value Index (FVI) developed by AgResearch. The FVI evaluates the performance value and economic value of cultivars based on their seasonal dry matter yield, metabolisable energy content and persistence traits.

Funded under the SSIF Agri-food Production funding platform, the "Forage Value"

programme investigates the fundamental knowledge underpinning the development of FVI as well as its future expansion. The Forage Value Technical Working Group is responsible for the practical development of the FVI. It comprises representatives from all seed companies in New Zealand, who will use knowledge from this programme for mapping future breeding directions and strategies. Including an environmental benefit ranking in the FVI will allow farmers to select the most suitable cultivars for the catchment according to their mitigation strategy and regulatory requirements.

A number of plant traits associated with lower environmental impacts of grazed pasture have been discovered by the programme. Novel germplasm from an interspecific clover hybrid has been developed with thicker leaves and the potential to reduce the amount of nitrogen deposited in livestock urine patches. Other findings indicated that ryegrass with shorter and less dense root hairs do not impact on plant growth, but its reduced competitive ability for soil phosphate can increase phosphorus uptake by 30% and promote the growth of companion clover plants. These findings will potentially allow a reduction in phosphate fertiliser application rates, which will have both environmental and economic benefits.

Hitting targets for deer industry profitability



New Zealand dominates deer farming internationally and supplies more than 50% of the world's traded deer venison. However, farmed deer numbers in New Zealand have almost halved over the past decade due to commodity price fluctuations and strong returns from alternative land uses.

Deer breeding has made significant genetic progress in on-farm performance traits. While growth and velvet antler yield traits remain as the key criteria for breed selection, other genetic characteristics and breeding objectives have become more important as farmers face challenges from parasites and stress, growing demand from consumers for ethical production and increasing environmental regulations.

Funded under the SSIF Agri-food Production funding platform, the "Hitting targets for deer industry profitability" programme investigates the underpinning science and technology for accelerating rates of genetic gains in deer and improving farm system knowledge. This programme has secured significant long-term co-funding from the deer industry via DEEResearch Limited, a joint venture partnership between AgResearch and Deer Industry New Zealand (DINZ). Aligned with DEEResearch's 2015 – 2020 Science Strategy, it supports the "Passion2Profit" Primary Growth Partnership to achieve the industry's 10-year productivity and profitability targets.

The research is conducted in collaboration with Otago University and Lincoln University, and

with support from DINZ and Pāmu. It integrates a comprehensive phenotyping programme with routine genotyping to inform future breeding values, improving the accuracy of genetic selection for difficult-to-measure traits, in particular host resistance to parasite infection.

To help stud breeders and commercial farmers objectively select superior animals for breeding, a national deer recording database, DEERSelect, was developed by AgResearch with support from DEEResearch Limited. The database stores pedigree and performance (trait) records and evaluates genetic merit of animals by calculating and providing estimated breeding values and economic indices.

Carbohydrate larval antigen (CarLA), which measures antibodies triggered when parasites are ingested by animals, was the latest trait investigated by the programme. Its recent incorporation into DEERSelect will give industry the potential to breed for deer that are resistant to parasitism.

Overall, this programme integrates genetics with health and welfare, building a strong evidence base for specific breeding outcomes, which will contribute to increasing rates of genetic gains in productivity and resilience across the industry. These outcomes will contribute to improving profitability by minimising losses and growing farmer confidence in the viability of deer farming as a land use.



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.



Ngā Tāngata



Food provenance and assurance



Agricultural exports underpin the New Zealand economy. The future success of the sector depends on our ability to produce high-quality food with exceptionally high food safety standards, and to meet consumers' increasing requirements around ethical and sustainable food production systems.

However, the sector faces challenges that only science can solve. For example, food-borne bacterial pathogens, such as shiga toxin-producing *Escherichia coli* (STEC) bacteria, have become a growing food safety and public health concern worldwide. Spore-forming bacteria in the dairy and meat industries have become more resistant to heat and various disinfectants, which increases wastage and reduces product shelf life. A further challenge is counterfeit products, which put at risk our market reputation, and product and brand integrity.

There is now an urgent need for end-to-end visibility and assurances within our food systems. This applies to everything from farming and processing practices and animal welfare, through to packaging, transport and marketing.

Funded under the SSIF Premium Agri-foods, Product and Services funding platform, the "Food Provenance and Assurance" programme confronts these industry challenges by investigating the transmission paths and survival of bacteria in various parts of the supply chain.

While young calves have been identified as a key reservoir for STEC, prior to this programme very little was known about the prevalence of the seven major serogroups in the dairy farm environment. Similarly, good progress has been made in identifying spore-forming bacteria in dairy farms. Thanks to the co-operation of sheep dairy companies, this work has been extended to the sheep dairy industry.

The programme has demonstrated that a non-invasive system can be adopted for authenticating the integrity of dairy powders, and freedom to operate in this area has been determined. The research output has attracted interest of multiple industry users in the potential of applying hyperspectral imaging to dairy.

Another future challenge for the New Zealand food industry is the rapid emergence and adoption of data-intensive tools in food safety, such as whole genome sequencing (WGS), metagenomic methods and phenotypic arrays to investigate microbial ecology and source attribution. WGS is the main regulatory and surveillance tool for granting market access that the United States, China, the European Union and others use. Capability in advanced genomic and phenotypic technologies (Micro-Food Omics) is critical for the future growth of the industry, which is being developed through collaborative PhD and postdoctoral positions under this programme.



Unlocking value from the whole carcass



The red meat industry is New Zealand's second-largest exporter earner. In the year to March 2019, approximately 26 million sheep and cattle were slaughtered, processed and exported to customers in 120 different countries, earning \$7.2 billion in export revenue. Achieving sustainable long-term growth is a key challenge for the industry.

Current meat prices are pinned to tenderness, a desirable quality trait of fresh and aged meat. The most tender cuts taken from the middle of the carcass comprise only 23% of carcass weight but deliver 45% of carcass value. Research is developing techniques to isolate muscles in ways that yield more tender cuts. Carcass value would increase if the lesser parts and co-products could be used more efficiently and more sophisticated applications could be found.

Funded under the SSIF Premium Agri-foods, Product and Services funding platform, the "Unlocking Value from the Whole Carcass" programme focuses on the composition of carcass components. It incorporates stakeholders' needs and insights into local and overseas production and markets.

Major New Zealand meat processors recognise that understanding and exploiting the compositional and functional properties of meat

will enable them to differentiate their exports in the modern market. The work of this programme reveals additional product opportunities beyond business-as-usual abattoir practices, with implications for maximising utilisation and value of animal resources.

Downstream from the carcass, the value of meat can surpass familiar table uses when it is used in processed foods or delivered in consumer-friendly formats, such as meals ready-to-eat or requiring minimal preparation time. Global processed food trade volumes are growing at 4% compound annual growth rate, which offers opportunities for New Zealand meat processors that are willing to extend their business to food manufacturing.

By targeting food solution companies' interests in nutritional trends and the re-purposing of meat, novel food concepts have been designed to anticipate how meat will be consumed in the future. The programme team continues to draw on AgResearch's customer-facing support teams when reaching out to manufacturers and retailers that might participate in advancing this research. It is working with local chefs, butchers and food service professionals to close the loop between abattoir initiatives and accommodating consumers' demand for new ways to select, prepare and enjoy meat.

Boosting exports of the emerging New Zealand dairy sheep industry



The sheep dairy industry serves a small niche market, supplying 1% of world milk production. The nutritional value of sheep milk is higher than that of goat and cow milk, with higher levels of proteins, lipids, and some minerals and vitamins essential to human health. The growing consumer demand for healthier foods is a significant market opportunity for the sheep dairy industry. However, the growth of consumer demand and acceptance has been held back by the lack of scientific evidence for the health benefits of sheep milk and the limited range of viable products due to inadequate processing capability.

Similarly, the lack of robust data in animal performance and productivity on farm has deterred farmers from entering this market, restricting milk supply and industry growth.

Currently, the sheep dairy industry has approximately 30,000 milking ewes, up 15% from early 2014. Research funded by MBIE, titled “Boosting Exports of the Emerging New Zealand Dairy Sheep Industry”, has provided the emerging industry with a collection of data, knowledge and on-farm practice guidelines to address the challenges the industry faces, as noted above, and enable

it to transform into a mature high-value export industry. AgResearch, in collaboration with Callaghan Innovation, the Ferrier Institute, the University of Otago and industry partners, has built a credible scientific basis for the industry to create high-value sheep milk export products underpinned by profitable and environmentally friendly sheep dairy farm systems.

Human nutritional studies in this programme have characterised a number of health properties of sheep milk, including its unique effect on intestinal and bone health. The most recent breakthrough in the programme has been the development of processing methods for extending the shelf life of liquid sheep milk, such as through ultra-heat treatment options.

In addition, on-farm research conducted during this programme has developed tailored solutions for improving ewe health, lamb-rearing outcomes and milk production levels. Through better animal nutrition and lamb-rearing protocols, partner farmers have confirmed that lamb mortality has fallen and milk production has increased by 25–70% per lactation season, from 120–130L to 200–215L per ewe.





Transition mapping of Ngāti Porou food and fibre products to novel value chains



Māori agribusinesses play an important role in the New Zealand economy. AgResearch has forged a close collaboration with Ngāti Porou, the second-largest iwi in New Zealand, designed to initiate social and cultural benefits to iwi and communities in Aotearoa.

During 2017 and 2018, AgResearch and members of businesses owned by Te Runanganui o Ngāti Porou developed a culturally responsive tool called “Whaowhia te kete mātauranga” or “Fill your basket of knowledge”. The tool is being used at hui to explore the cultural provenance and value-add of Māori agribusiness value chains.

The follow-on project, “Transition mapping of Ngāti Porou food and fibre products to novel value chains”, was funded by MBIE’s Te Pūnaha Hihiko: Vision Mātauranga Capability

Fund and AgResearch’s Māori Agribusiness Strategic Science Investment Fund in 2018/19. Building on previous research, this project developed transition maps for real-world Māori agribusinesses based on co-innovation principles.

In the partnership with Ngāti Porou, a number of business units within Ngāti Porou Group Holding Ltd (NPGHL) were used as exemplars in the project:

- Ngāti Porou Seafoods Ltd – fishery and processing;
- Ngāti Porou Miere – honey production;
- Pakihiroa Farms Ltd (PFL) – red meat and wool production; and
- Ngāti Porou Forestry – forestry and log production and export.

This relationship was then strengthened, and new value chain opportunities resulted in some of Ngāti Porou's primary products being included in Air New Zealand's supply chain.

These business units executed transition maps to:

- Move some of their products into new value chains;
- Modify and/or extend their level of participation in existing value chains in response to rapidly evolving opportunities and threats;
- Leverage new and existing business arrangements to broaden their offering to value chain partners; and
- Underpin open, honest and transparent discussions with other entities within a potential value chain.

In particular, Ngāti Porou and Air New Zealand established a relationship to expand tourism on the East Cape and contract a carbon offset deal.

This relationship was then strengthened. It opened up new value chain opportunities that resulted in some of Ngāti Porou's primary products (e.g., smoked fish and mānuka honey) being included in Air New Zealand's supply chain.

These successful "low risk" transitions have enabled NPGHL to gain confidence in transition mapping and plan further improvements of its supply chains in line with its cultural values.







Our people, stakeholders and partnerships

Ō mātou kaimahi, te Hunga whaipānga
me ngā Rangapū





Our people

To tātou iwi

Our focus has been on building OneAgResearch. To our people, including our partners and stakeholders, OneAgResearch means an aligned culture that is innovative, energised, vibrant and collaborative.

This culture will attract and retain the people who are the best at what they do, will strengthen our organisation's collective expertise and will position us to meet the challenges of the future.

Our team of around 700 people includes science and support staff who are specialists in their own disciplines. We operate in a safe, healthy and sustainable environment that enables our staff to deliver significant impact – regardless of role.

We are committed to fostering a “growth mindset” across the organisation. We support our people to enhance their leadership capability through targeted leadership development programmes and cultural development that focuses on growing the skills and behaviours that uphold a constructive, positive, engaged and values-based workplace.

Our robust workforce planning framework helps us to identify the capability required to ensure

that we continue to deliver the right science and to identify emerging talent and leadership potential. We have adopted a design thinking approach to challenge current mindsets and to engender a more innovative approach to customer relationships.

Our People Strategy

Our People Strategy consists of four pillars:

1. Talent and Leadership
2. Employment and Industrial Relations
3. Change Management
4. People Information

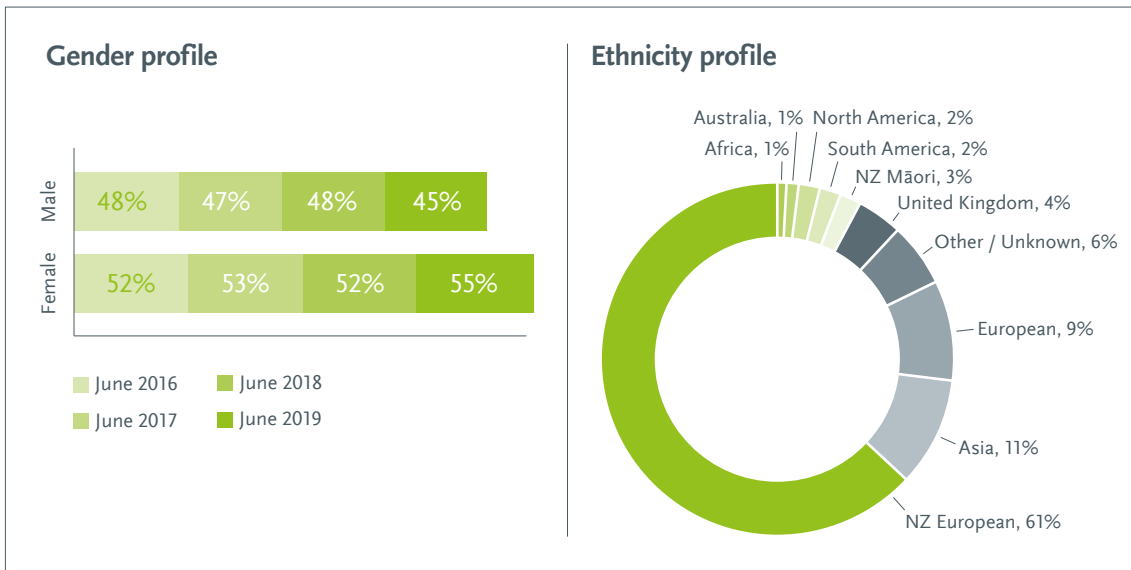
Under each of these pillars, we have established a set of strategic projects that are aligned to organisation's strategic initiatives.

Diversity and Inclusion

We promote and celebrate diversity and inclusivity and we are committed to delivering a psychologically safe working environment. We are developing a Diversity and Inclusion strategy that will include equal employment opportunity strategies, raising awareness of unconscious bias and defining our zero tolerance for bullying and harassment in the workplace. The initiatives in this strategy will help our people to nurture

and appreciate the uniqueness and diversity of our organisation, customers and stakeholders.

We are an accredited employer with Immigration New Zealand, and we continue to attract and welcome international talent. Additionally, we are working hard to increase the number of Māori science employees and to embrace Mātauranga Māori in everything we do.

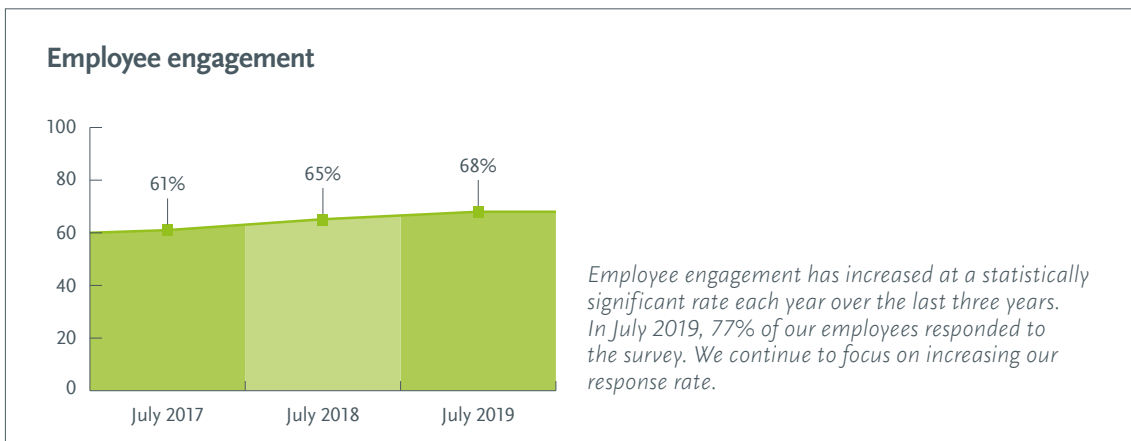


Building an engaged, values-based culture

Our values continue to be a driving force for determining how we interact with one another at AgResearch, how we respond to issues and how we acknowledge and support one another.

We have improved our Employee Experience (previously Engagement) Programme by transitioning from an annual survey to checking in with our people three times a year.

We have established an Employee Experience Working Group to understand how high levels of engagement can be achieved in a research organisation. This collaborative and consultative approach, we believe, is a primary contributing factor to our improved results in this area.



Driving change successfully

Our culture is one of transformational change and we encourage and support our people to embrace, adopt and use change quickly and more proficiently. The AgResearch Change Management Framework, based on Prosci methodology, is intended to provide a consistent and comprehensive approach to change management at AgResearch.

The change programmes we are fully engaged to support are:

- New Ways of Working
- Joint Food Science Facility
- New AgResearch Lincoln Facility
- Project Management Software implementation (Waka)

We will continue to focus on building our capability and approach to supporting change management across AgResearch.

He Ara Hou (New Ways of Working)

We have a strong organisational focus on our “new ways of working”. He Ara Hou, our New Ways of Working (NWOW) Framework, has been developed to clearly define all aspects of what our NWOW will be and how we will support and measure this across the organisation. To achieve our He Ara Hou vision, changes are required not only in our physical working environment but also in our culture and how we behave. He Ara Hou will be achieved through our people.

Preparing for new buildings

The Joint Food Science Facility (JFSF) in Palmerston North will provide a modern working, teaching and research environment. In preparation for our relocation to the new JFSF, we have developed a robust change programme to facilitate a successful transition to the new working environment in the coming year.

The change objectives are to:

- Shape a strong and collaborative culture for the JFSF that supports the desired culture of AgResearch, Massey University and Riddet Institute;
- Develop and embed NWOW guiding principles and protocols that leaders, staff and students need to follow to realise strategic and cultural objectives of the JFSF and Food HQ;

- Create a positive and future-focused view of the new work environments; and
- Prepare employees and students for the NWOW that will be required in the new facilities, in open environments, and working alongside colleagues from partner organisations.

Building our cultural capability

We embrace Mātauranga Māori in all aspects of our work as we collaborate closely with iwi on mutually beneficial and important scientific projects. We have established the Kāhui Tikanga Whatu rōpū to support the integration of Mātauranga Māori concepts into the fabric of our culture. Additionally, our people are actively engaged in a range of formal opportunities we provide to gain an understanding about the Treaty of Waitangi and Tikanga – “the Māori way of doing things”. They are participating in Vision Mātauranga initiatives, panels and workshops, along with Noho Marae and te reo Māori lessons.

Informal approaches to embedding Māori language and culture include celebrating Matariki and Te Wiki o Te Reo Māori (Māori Language Week), incorporating pōwhiri into our Corporate Induction days and encouraging our people to use Te Reo Māori in our day-to-day work.

Leading with purpose

Enhancing leadership effectiveness is a continued area of focus. We are committed to supporting our leaders across all levels of the organisation to increase their self-awareness and to build trust and inspire their people to deliver their work with impact.

The Whole Person Leadership programme is one of the strategic projects that has been identified as a key enabler to embed a One AgResearch culture. Whole Person Leaders are successful based on total impact. They value people, profits, relationships, results, character and competence. They are empathetic, authentic, “walk the talk” and have a ripple effect on the entire culture. Whole Person Leadership builds on Our Values Framework and is aligned with the He Ara Hou Framework. In the coming year, we will implement the first phase of this programme.

Technology driving people information

We have begun to design and implement a new people information platform that includes a Human Resources Information System (HRIS) and Payroll system. The new platform will provide our people managers with a single point

of access for all people-related information, automate and streamline people-related processes and deliver a greater level of accuracy, integrity and access for our people data.



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
- MAHITAI -
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 kaimahi



James Turner

James Turner, a Senior Scientist in the Farm Systems and Environment team, was invited to join the Ministry for Primary Industries' *Mycoplasma bovis* Strategic Science Advisory Group (SSAG) chaired by the ministry's Chief Science Advisor Dr John Roche. SSAG provides advice and recommendations to support the eradication of *Mycoplasma bovis* in New Zealand.

Julie Dalziel

Julie Dalziel, Senior Scientist from the Food Nutrition and Health team, was appointed to serve on the 2019 Marsden Fund Cellular and Molecular Physiology Assessment Panel. Julie was appointed by the Royal Society Te Apārangi after being recommended by the Fund Council and will serve for a maximum of three years.



Tim Hale

Tim Hale, Operations Manager at Ruakura Research Farm, became a Fellow of the New Zealand Institute of Primary Industry Management. This recognises his outstanding contribution to the rural profession and to the Institute, whose purpose is to build the capability and capacity of rural professionals operating within New Zealand's primary industries.



John Caradus

John Caradus, the Chief Executive of our subsidiary Grasslanz Technology Ltd, received Life Membership of the New Zealand Grassland Association. The aim of the association is to enhance pastoral agriculture through providing a forum for communication of science, technology and knowledge.



Geoff Asher

Geoff Asher, a Senior Scientist with the Farm Systems team, and based at Invermay, received the Deer Industry Award at the industry's 2019 conference. Geoff is a leading deer production scientist and has been involved in deer research for over 40 years – almost all of his career. He co-ordinates the “Hitting Targets” programme of deer research carried out by AgResearch for DEEResearch and is the lead researcher for several of its component studies.

David Hume and the AgResearch Endophyte team

David Hume, acting Science Impact Leader, and the Plant-Fungal Interactions team won the AGMARDT Technology Transfer Award for their development of the ryegrass endophyte strain AR37 and the transfer of this technology to New Zealand's pastoral industry. AR37 has made a significant positive impact on the industry since its commercial release in 2007.



Barbara Barratt

Barbara Barratt, a Principal Scientist with the Biocontrol and Biosecurity team, was the recipient of a New Zealand Plant Protection Medal awarded by the New Zealand Plant Protection Society to honour those who have made exceptional contributions to plant protection. Barbara pioneered international strategic research into the biosafety of introduced biological control agents for insect pests.

Science New Zealand awards

Ngā Tohu Putaiao o Aotearoa

Jim Crush

Individual Lifetime Achievement Award

For 45 years, Jim has been at the leading edge of research on the ecophysiology of pasture plant species, including the morphology and physiology of roots underpinning the development of forage cultivars for sustainable pastures. A key demonstrated benefit of Jim's recent research achievements has been the development and application of methods for screening plants, especially ryegrasses and clovers, for root form and function.



Jim has been a prolific author of publications on forage species, with over 150 peer-reviewed journal papers, book chapters and conference proceedings. He is a thought leader for the pastoral sector and a trusted collaborator and mentor. For his career contribution to New Zealand agricultural science, he was recently made a fellow of the New Zealand Institute of Agricultural and Horticultural Science.



Ngā Tāngata

Congratulations to the winners who received their awards at the Science New Zealand National Awards Dinner in November 2018.

Suzanne Rowe

Early Career Researcher Award

Suzanne is part of the Animal Science Group and is involved in livestock genomics programmes for sheep, cattle and deer. She specialises in analysing and practically incorporating genomic information into livestock breeding programmes, and statistical analysis of livestock populations using linear mixed models with a particular focus on gene discovery, genome partitioning, microbial sequence analysis and their distributional properties.



Rumen Microbiology

Team Award

For more than a decade, the Rumen Microbiology team has conducted ground-breaking research and published many peer-reviewed papers in high-quality journals, cementing its reputation as a global leader in the area. The research emanating from this team has been critical in the development of global research programmes, demonstrating the leadership of New Zealand in the fight against climate change.

Current team members as of 1 July 2019:

Catherine Andrews, Jacinda Aplin, Graeme Attwood (far left), Vince Carbone, Rosemary Heathcott, Peter H. Janssen (middle left), Michelle Kirk, Allison McCarthy, Christina Moon, David Pacheco, Kerri Reilly, Ron Ronimus (far right), Carrie Sang, Linley Schofield, Priya Soni, Sinead Leahy (middle right), Ambarish Biswas, Laureen Crouzet and Rachel Kaminsky.

Departed members: *Eric Altermann and Yang Li.*

Rewarding excellence within AgResearch

Whakanui i ngā huhuatanga pai o AgResearch

The AgResearch Science Prize recognises outstanding achievement for high-quality, relevant research, while the Impact Prize recognises significant sector impact through technology transfer and sector practice change. Each of these awards has been presented annually since 2012.

2019 Science Prize Winner

Intensified agriculture favors evolved resistance to biological control. Published in the *Proceedings of the National Academy of Sciences*, 2017.

This year's Science Prize was awarded to the team who highlighted a previously unknown relationship between ecological and evolutionary processes in biological control that will have potentially wide-ranging implications and impact.

This paper describes the potential impact of agricultural monocultures on biodiversity – as observed through the relatively rapid failure of biocontrol agents. This work provides compelling evidence that biodiversity can be of critical importance to the maintenance of healthy ecosystems.

The observation that the success of this particular biocontrol intervention begins to fail – consistently – after 14 host generations provides an exciting opportunity to study complex inter-species interactions and to explain the causative phenotypic/genotypic nature of what could be rapid evolutionary adaptation. As such, the paper is of extremely high value to international audiences.

Congratulations to the paper's authors: Federico Tomasetto (below left), Stephen Goldson (below right) from AgResearch and external collaborators/authors J. M. Tylianakis, M. Reale and S. D. Wratten.





2019 Impact Prize Winner

Boosting exports of the emerging New Zealand dairy sheep industry.

Research conducted by the Dairy Sheep Science programme has helped the dairy sheep industry establish the particular qualities and advantages New Zealand's systems produce, so that it can grow and prosper.

This transdisciplinary team works across the value chain from on-farm productivity and environmental impact through to consumer-focused product attribute verification. It also takes a consistent, collaborative approach with industry that includes excellent ongoing science communication, which has led to the strong and rapid adoption and uptake of research outputs. Our three stakeholders have implemented individually tailored lamb-rearing practices that have reduced lamb mortality and increased milk yield by 25–30% per season (for two of our stakeholders).

Our research has shown (in a rat model) that sheep milk proteins are more readily digested than cow milk proteins and that sheep milk is a better source of essential amino acids. This information is helping the industry by providing scientific data on how sheep milk is different from other milks.

Our data on dairy sheep farm effluent has provided the industry with nutrient concentration and load data. This has been particularly helpful for stakeholders when they have applied for legal consents from regional councils.

A lower nitrogen footprint of dairy sheep systems has also been demonstrated in a nitrogen leaching trial under grazed dairy sheep. Data from this trial enables farmers and the wider dairy sheep industry to demonstrate their lower environmental footprint for environmental compliance and in international markets.

The Dairy Sheep Science team has provided, and continues to provide significant thought and industry leadership to an exciting emerging industry with a bright future.

Congratulations to Linda Samuelsson (above), Li Day (below left), Marita Broadhurst, Wayne Young, David Stevens (below middle), Sue McCoard (below right), Natalie Bartlett, Diana Selbie and Ross Monaghan.





Our international connections

Ō mātou hononga ā-tāwāhi

AgResearch partners with organisations around the world to carry out a wide range of research programmes. These span the breadth of AgResearch's scientific capability and reinforce the success of global relationships.

AgResearch has international organisation-to-organisation formal collaborations with:

- Commonwealth Scientific and Industrial Research Organisation (CSIRO) – Australia
- Teagasc – Ireland
- Scottish Rural College (SRUC) – Scotland
- University of California, Davis – United States of America
- Chinese Academy of Agricultural Sciences (CASS) – China
- Instituto Nacional de Investigación Agropecuaria (INIA) – Uruguay
- Institute of Agrifood Research and Technology (IRTA) – Spain
- Colombian Agricultural Research Institute (AGROSAVIA) – Colombia

Learning and sharing best operational practices between global research organisations

AgResearch has a strategic partnership with three of the world's pastoral food system research organisations: Teagasc (Ireland), INIA (Uruguay) and IRTA (Spain). In June, members of each organisation met in Spain to take the opportunity to focus on our strategic and operational working environment and to share and learn about the practices used within each organisation.

Over the week, the organisations shared lessons and challenges around human resources; international strategies and revenue; and research strategy, structure and support.

Cecile de Klein, Principal Scientist, Genevieve Thornley, Contestable Funding Manager, and Laura Vandemoortele, Project Specialist, represented AgResearch at the meeting following consultation with the relevant parts of the organisation to confirm the content of the workshop.

Following the workshop, each organisation took the lessons and opportunities learnt to improve process and strategies both individually and collectively through the partnership.

Adding value for PhD students

AgResearch is part of a collaboration with Teagasc and the Scottish Rural College, co-locating PhD students across the organisations. The students see real value in working between two countries, including being exposed to a wider network, sharing research developments first hand and benefiting from the exposure to different organisational cultures and processes.

61

Countries and regions

332

Collaborations

55

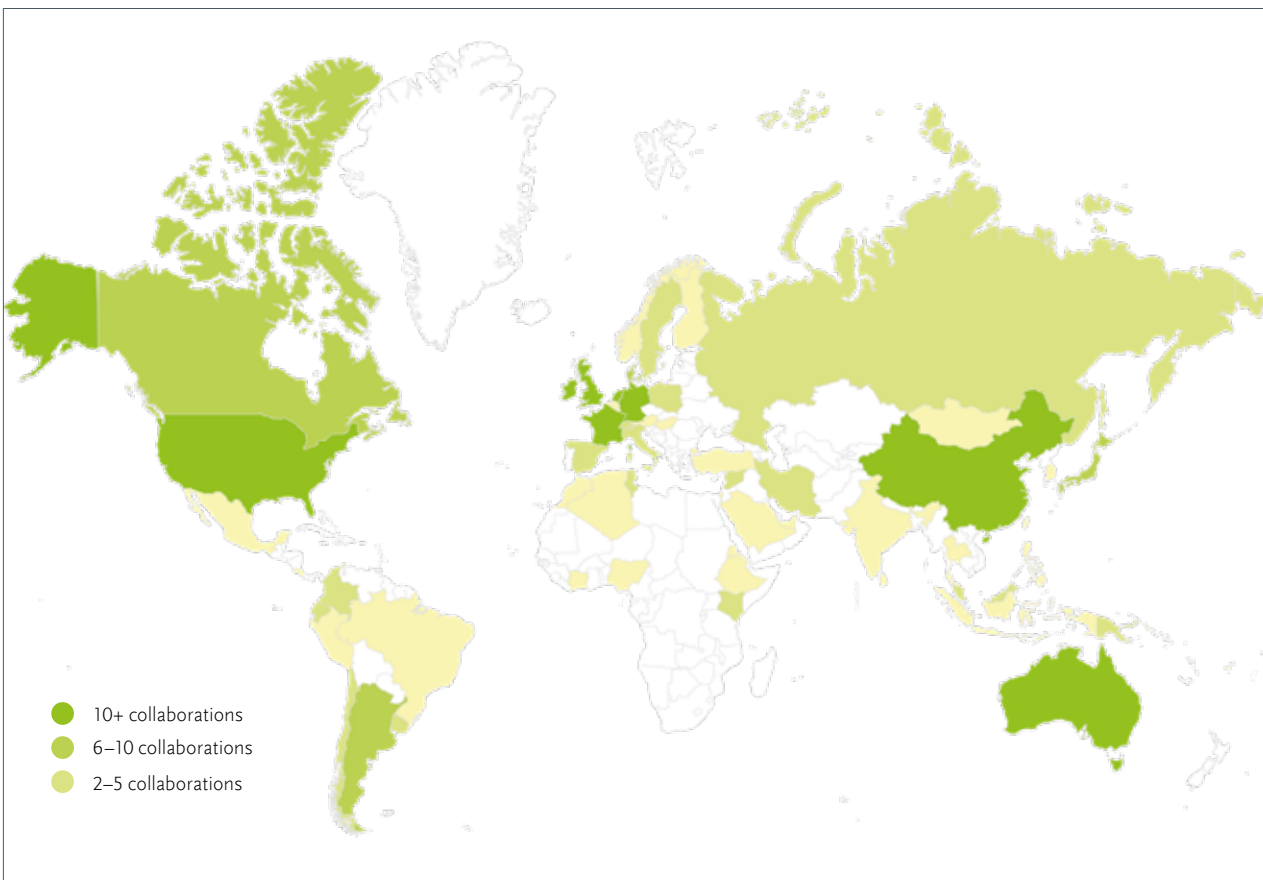
Collaborations with USA

30

Collaborations with China

40

Collaborations with Australia



We collaborate with:

Algeria, Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Costa Rica, Cote d'Ivoire, Denmark, Ecuador, Eritrea, Ethiopia, Fiji, Finland, France, Germany, Hong Kong, Hungary, India, Indonesia, Iran, Ireland, Israel, Italy, Japan, Kenya, Malaysia, Maldives, Mexico, Mongolia, Morocco, Netherlands,

Nigeria, Norway, Papua New Guinea, Peru, Philippines, Poland, Russia, Samoa, Saudi Arabia, Singapore, Solomon Islands, South Korea, Spain, Sri Lanka, Sweden, Switzerland, Syria, Taiwan, Thailand, Tunisia, Turkey, United Arab Emirates, United Kingdom, United States of America, Uruguay



Our subsidiaries and joint ventures

Ā mātou turuki me ngā kaupapa pakihi ngātahi

As a CRI with obligations to be a strategic guardian of New Zealand's current and future needs and to retain and develop capability (people, facilities, equipment, databases and collections), we have forged enduring relationships with collaborators and stakeholders in both the public and private sectors to ensure our science remains relevant and has impact.

AgResearch's relationships with stakeholders are in many cases decades old, meaning interests and goals have been developed in unison and have influenced both strategy and the breadth of research conducted. AgResearch, with the support of our partners, continues to commercialise scientific intellectual property. As part of this process a number of different vehicles are employed including wholly owned subsidiary companies and a number of joint ventures. One example is wholly-owned subsidiary Grasslands Technology Ltd. Grasslanz delivers innovative forage technologies and explores new opportunities offered by plant biotechnology and microbiology. Based in Palmerston North and Lincoln, Grasslanz is a leading source of *Epichloë endophytes* for ryegrass. It has established alliances with seed companies and works with an international network of investors and research organisations to develop innovative new plant and microbial products.

AgResearch is also a developer of digital tools that support decision-making by farmers and their advisors. AgResearch owns agricultural software company FARMAX, which has been operating for 15 years and has been used to

add value to over 5,000 farm businesses in New Zealand and internationally. The software is used by farmers and their advisors to analyse, monitor and review farm operations to determine the production and economic outcomes of various managerial options.

Through close and enduring collaborations, AgResearch has entered a number of joint venture relationships to support both innovation and the delivery of impact. Among our joint ventures are:

- Overseer (New Zealand software that enables farmers and growers to improve nutrient use on farms, delivering better environmental outcomes and better farm profitability);
- BioPolymer Network Ltd (leading the way to a sustainable bio-based world);
- Grasslands Innovation Ltd (developing proprietary forage technologies for pasture-based animal production systems); and
- The Southern Dairy Hub (established in response to Southland and Otago farmers wanting dairy challenges in the region to be addressed through local research and demonstration).



National Science Challenges

National Science 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.

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

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

All CRIs - ESR, Geological and Nuclear Science (GNS); Manaaki Whenua – Landcare Research; National Institute of Water and Atmospheric Research (NIWA); Plant and 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. Our Land and Water is funded by MBIE and has 16 research partners, including all New Zealand's CRIs, and the majority of the country's universities.

Our Land and Water National Science Challenge aims to preserve the most fundamental taonga of our country – our land, water and associated ecosystems – while producing value from those same taonga. Our Land and Water is trying to answer the difficult questions from producers and industry such as: How much can I reduce my environmental footprint and still be profitable? If this footprint is still too much, then what other land uses can I change to and where in the landscape is this most profitable and most sustainable?

A fundamental driver in Our Land and Water is the importance of Māori playing a more active role in the sustainable management and economic development of our land and water resources. The Māori world view (Te Ao Māori) is at the heart of Our Land and Water – acknowledging the interconnectedness and interrelationship of all living and non-living things. We have an intergenerational duty to restore and increase the mauri (life force, vitality) of our land and water, and to nurture the reciprocal relationship between tangata (people) and the whenua (land).

After three years of operation, Our Land and Water has made good progress. Over 30 research projects either have been completed or are currently underway, delivering 43 published papers in scientific journals, and numerous reports, workshops and presentations where researchers have shared their work with partners, stakeholders and communities of interest.

A highlight for Our Land and Water in the last financial year was that its revised strategy was considered worthy of its second instalment of government funding at the maximum allowance of \$69.3 million for the five years from July 2019 to June 2024. Our Land and Water's next wave of research consists of six projects to rapidly progress the Our Land and Water mission.

AgResearch staff Richard McDowell, James Turner and David Houlbrooke are contributing to the science thought leadership within Our Land and Water, and our researchers are leading projects. In addition, we have aligned some of our SSIF activities to the goals of Our Land and Water, that most closely align to our revised Science Plan objectives.



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, Ministry for Primary Industries, Department of Conservation

Helping New Zealanders protect our precious environment

AgResearch is part of the Biological Heritage Science Leadership team looking to combat the spread of kauri dieback and myrtle rust. Our scientists, Maureen O'Callaghan and Kathryn McRae, are working with a team with diverse expertise to accelerate the research on fighting these pathogens.

AgResearch scientists have also contributed to the project "Enhancing the ecological function of native biodiversity in agroecosystems" and

are involved in scoping groups helping design the next phase of funding for the challenge.

Our SSIF investment into Better Border Biosecurity is a significant contributor to the goals of this Challenge, which include empowering New Zealanders to value our biological heritage; protecting New Zealand's natural urban and production environments; and restoring a resilient and thriving ecosystem that New Zealanders are proud of.



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 taking a novel, design-led approach to the Additive Manufacturing spearhead project in the Science for Technological Innovation National Science

Challenge. With AgResearch staff working alongside scientists, engineers and designers from other New Zealand CRIs and universities, the project takes biopolymers that originate

in New Zealand, such as lignin, cellulose and protein, and creates new engineered materials suitable for application in 3D printing of manufactured parts or products.

The project focuses on engineering combinations of materials to enable appropriate product requirements. By using 3D printing, we can make complex parts with multi-material components into final products. As the current equipment limits how well biopolymers and

other fibres can be aligned, the project is investigating different design concepts to produce new products using 3D printing of biopolymers and natural fibres.

AgResearch scientists, including Sonya Scott and Duane Harland, are currently adapting innovative 3D and 4D printing techniques to trial different combinations of proteins. This work will provide more opportunities to further test combinations that have looked promising in the lab.

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

AgResearch is a key partner in the High-Value Nutrition National Science Challenge, together with PFR and several universities.

This Challenge is focused around four priority research areas: gut health, metabolic health, immune function, and complementary feeding. AgResearch, via Principal Investigator Nicole Roy, leads the gut health priority area.

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% (currently under 30%). Much of this growth will need to come from the expanding food export markets across Asia and especially China. This level of growth cannot be achieved by productivity gains alone. Instead, the sector will need to derive greater value from the products exported.

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 validated health benefits as a way of driving economic growth.

A highlight of the last year's work has been working closely with the New Zealand food industry on our three contestable projects. A wide range of AgResearch staff are contributing to this Challenge, including Nicole Roy, Karl Fraser, Wayne Young, Ali Hodgkinson, Matt Barnett and Evelyne Maes. In addition, we have aligned SSIF activities working in support of the Challenge vision, and that also strongly aligns to our refreshed Science Plan goals.

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.

National Fieldays at Mystery Creek

At National Fieldays in 2019, our combined stand with other CRIs, Manaaki Whenua – Landcare Research, ESR and Scion, was awarded the Best Agribusiness Indoor Site as well as top honours with the Fieldays Supreme Site award (judged over 1,059 sites). The joint approach with Ministry for Primary Industries across the other side of the walkway created a “Science Alley” that embodied the 2019 Fieldays theme, cultivating value.

In total, 129,000 people attended the four-day event. Our stand profiling two of our research projects attracted strong media and stakeholder attention.

Seth Laurenson, Acting Science Impact Leader, completed multiple interviews on the Hyperfarm concept, including a piece on TVNZ’s Breakfast television programme, and the stories hit the headlines in Greece. The concept has since generated commercial interest from several commercial stakeholders. Alastair Ross, Senior Scientist, also spoke with media on the Rapid Evaporative Ionisation Mass Spectrometer project, gaining a high profile on Radio New Zealand’s Morning Report and midday bulletins.

We had continuous social media during the event reaching over 48,000 users, a 77% increase in reach year-on-year.



Celebrating *Heartland Strong*

In April, an event was held to celebrate the release of *Heartland Strong*, a book comprised of 10 years' of research led by AgResearch in collaboration with colleagues from other CRIs, national and international universities, PwC and rural community members.

The audience of policy makers, agriculture sector leaders, scientists and leading community members heard the highlights of the book from Margaret Brown, AgResearch senior scientist and co-editor. Then the guest speaker, Minister of Agriculture, Honourable Damien O'Connor, reflected on the importance and resilience of New Zealand's rural communities.



The authors and editors of Heartland Strong; (Top L-R) Bruce Small, Mike Mackay, John Rendell, Margaret Brown, Gerry Watson, Ronaldo Vibart; (Bottom L-R) Alec Mckay, Penny Payne, Robyn Dynes, Bill Kaye-Blake.

New Zealand AgriFood Week

AgResearch was again involved in New Zealand AgriFood Week, this time sponsoring a headline event "AgResearch Future Feeders".

Held in Palmerston North in March each year, AgriFood Week celebrates and showcases New Zealand as a Food Nation. It includes complementary events that sit at the intersection of agriculture, food and technology.

The "AgResearch Future Feeders" full-day event explored the future of food production from the perspectives of industry leaders and how New Zealand must adapt to national and global disruptive factors, new innovative products and changing trends. AgResearch Science Impact Leader, David Everett, spoke as

part of a dynamic panel of speakers including entrepreneurs and founders of award-winning food products, researchers at the leading edge of consumer insights, global food innovators and labour market experts.



Wool protein for pet nutrition

In August 2018, we released to media findings of a study by AgResearch scientists showing that proteins from wool can be added to the diets of domestic cats to improve their health. The research helps to support the sheep industry in New Zealand by showing that proteins derived from wool could be used as a dietary supplement to improve digestion and nutrition in a broader range of animals, and potentially humans.

The story was well received and featured in 17 media pieces across New Zealand. These included a feature on 1 News, a radio interview

on Newstalk ZB and written coverage by other media such as Stuff, NZ Herald, Newshub and Farmers Weekly.



Using social media for research

This year, we broadened our use of social media channels to assist our scientists to conduct research into a variety of topics. Through Facebook, Instagram and Twitter, we targeted audiences using sponsored posts to obtain viable sample sizes for the research.

- A study into “Connected Farms”, part of the New Zealand Bioeconomy in the Digital Age programme – **reached 21,835 users**
- An analysis of the relationship between eating red meat and mood – **reached 2,101 users and exceeded the responses required**
- An examination of public sentiment towards “toilet training” cattle – **reached 18,359 users**
- A look into whether or not New Zealanders would consider eating insects as part of their diet – **reached 51,201 users**

5,754 
Twitter followers

9,059

 LinkedIn
followers

2,830

 Facebook
followers



agresearch
āta mātai, mātai w

Giving New Zealand
the advantage

nks t

LabServ

Torpedeer



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, a Trustee of the Eastland Community Trust and Interim Chair of the Our Land and Water Science Challenge.

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



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.



Jackie Lloyd
Director

Jackie Lloyd is an independent director with a background in business transformation, human resources and leadership. She is a member of the National Council of the Institute of Directors in NZ (Inc) as well as a member of Global Women and a Chartered Member of the Institute of Directors.

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



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.




Dr Peter Stone
Director

Dr Peter Stone is General Manager, Agriculture at Australia's Bureau of Meteorology. Previous to this role, Peter worked for Australia's CSIRO as a Research Director in the Land & Water Flagship. Peter has experience in farm management, food industry consulting, grain marketing and agricultural research.



Kim Wallace
Chair - Audit and Risk
Director

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.



Our Board

(continued)

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 (SCI) 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 Acting Chair (appointed Chair 2 September 2019) and five other Directors. Directors are generally appointed for a three-year term and may be reappointed for further terms.

Rukumoana Schaafhausen was appointed to the Board on 1 July 2018. She joined Colin Armer, Jackie Lloyd, Peter Stone, Kim Wallace and Paul Reynolds, who was appointed to Acting Board Chair from his previous Director role.

Board and standing committee meetings

The table below sets out the Board and committee meetings attended by Directors 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 Remuneration 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	Remuneration Committee
Paul Reynolds	10	2	4
Colin Armer	10	4	
Jackie Lloyd	8		4
Rukumoana Schaafhausen	8		2
Peter Stone	7	3	
Kim Wallace	10	4	
Number of meetings held	10	4	4

Statutory reporting – Board

For the year ended 30 June 2019

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 2019.

Dividends

No dividends were declared during the year to 30 June 2019.

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 2019 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 FY19

	Director of	Officer of	Trustee of	Shareholder of
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 Armer Group Limited Fonterra Ballance Ravensdown Silver Fern Farms Pure Pasture Investments Limited
LLOYD, Jackie	<ul style="list-style-type: none"> New Zealand Post Limited (Deputy Chair) and subsidiary Kiwi Group Holdings Limited Naylor Love and group companies Museum of New Zealand Te Papa Tongarewa 		<ul style="list-style-type: none"> Lion Foundation Wellington Museums Trust (trading as Experience Wellington) (Chair) 	
REYNOLDS, Paul	<ul style="list-style-type: none"> Landcare Research Limited Enviro-Mark Solutions Limited Sir Peter Blake Charity Limited Blinc Innovation Limited Eastland Development Fund Limited Prime SPV Limited 		<ul style="list-style-type: none"> The Eastland Community Trust The Sir Peter Blake Trust 	<ul style="list-style-type: none"> Eastland Group Limited Eastland Development Fund Limited Prime SPV Limited Activate Tairāwhiti Limited

	Director of	Officer of	Trustee of	Shareholder of
STONE, Peter	<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
SCHAAFHAUSEN, Rukumoana (appointed 1 July 2018)	<ul style="list-style-type: none"> Te Waharoa Investments GP Limited Hautupua GP Limited Waikato-Tainui Koiora Limited Schaafhausen Inc Limited Te Whaa A Tamihana Limited Miro-Tupu Ake Limited Miro Trading GP Limited 	<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 Prines Trust 	<ul style="list-style-type: none"> Schaafhausen Inc Limited
WALLACE, Kim	<ul style="list-style-type: none"> Quotable Value Limited Port Nelson Limited Seahorse Beach Investments Limited Kim Wallace Limited 			<ul style="list-style-type: none"> Seahorse Beach Investments Limited Kim Wallace Limited

Directors' remuneration

Remuneration and other benefits paid or due and payable to Directors for services as a Director, including membership of Board Committees, during the year were as follows:

Directors	2019	2018
Dr Paul Reynolds (Chair)	72,000	37,056
Colin Armer	37,056	37,056
Jackie Lloyd	37,056	37,056
Rukumoana Schaafhausen	37,056	-
Dr Peter Stone	37,056	37,056
Kim Wallace	42,060	39,975
Jeff Grant (Chair)	-	72,000
Andrew Macfarlane	-	17,525
Tania Simpson	-	37,056
Grasslanz Technology Limited		
Robert John Hay (Chair)	20,004	18,333

Our Executive Leadership Team

Tō mātou Tumuaki Whakahaere



Dr Tom Richardson
Chief Executive

Dr Tom Richardson has held executive roles in New Zealand and Australian science for the past 20 years. Prior to joining AgResearch, he was a scientist and then Chief Executive at Scion.

He is regularly called to serve on advisory boards, external review panels and international science and trade delegations, including the NZ-US Joint Commission on Science and Technology Co-operation and the NZ-EU Joint Commission on Science and Technology Co-operation. Current industry, science and education governance roles include Farmax Ltd; Grasslanz Technology Ltd; Overseer Ltd; Science New Zealand; South Island Dairying Development Centre (SIDDC); Riddet Institute; and Waiariki Bay of Plenty Polytechnic.



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.



Jo Brady
Communications and Marketing Director

Jo Brady brings significant experience in executive leadership, developing and implementing integrated marketing and communications strategies, as well as implementing transformational change.



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.



Lee Gardiner
People and Culture
Director

Lee Gardiner has significant experience in human resources management across a diverse range of sectors including agriculture, tourism and aboriginal education.



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.



Tony Hickmott
Finance and Business
Performance Director

Tony Hickmott was most recently the Chief Financial Officer at Capital & Coast District Health Board in Wellington. He brings with him a wealth of experience in finance, audit and risk and government funding models as well as finance team leadership.



**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 2019

Remuneration greater than \$100,000

During the year ended 30 June 2019, 200 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 (138), Chief Executive's Office, Infrastructure, Communications & Marketing and Finance & Business Performance (56) and Subsidiaries (6).

Group	
\$100,000 to \$109,999	38
\$110,000 to \$119,999	35
\$120,000 to \$129,999	34
\$130,000 to \$139,999	31
\$140,000 to \$149,999	14
\$150,000 to \$159,999	13
\$160,000 to \$169,999	7
\$170,000 to \$179,999	7
\$180,000 to \$189,999	1
\$190,000 to \$199,999	3
\$200,000 to \$209,999	3
\$210,000 to \$219,999	4
\$220,000 to \$229,999	2
\$240,000 to \$249,999	1
\$250,000 to \$259,999	2
\$280,000 to \$289,999	1
\$340,000 to \$349,999	1
\$370,000 to \$379,999	1
\$390,000 to \$399,999	1
\$700,000 to \$709,999	1
Total	200

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	\$691,481
Number of employees	11

Donations

Donations paid during the year ended 30 June 2019 were \$2,000.

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.





Performance indicators

Ngā whāinga paearu mahi



Key performance indicators

as at 30 June 2019

	Strategic goal	Objective	Key performance indicators for FY19	Result for FY19
People	Innovative and high-performing workforce.	Staff engagement increased.	Increase Engagement Index (EI) from the previous staff survey result by 3%	In July 2019, our Staff Engagement Index was 68.0, up from 65.0 in 2018.
		We will all have a safe workplace.	Total Medical Treatment Injuries (MTI) and MTI causing lost time <30 per year.	From 1 July 2018 to 30 June 2019, the total number of MTI and MTI causing lost time was 16, down from 34 last year.
			No serious harm accidents.	We did not have any "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 2018, 83% 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 \$32.4 million of stakeholder-driven commercial science revenue. Deliver \$2.48 million of international organisation-driven revenue.	We achieved \$51.1m of stakeholder-driven commercial science revenue We achieved \$4.7m 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 the recommendations from the 2017 Animal Sciences Roadmap.	The Animal Science Roadmap 2017 developed a number of cross-team initiatives for potential funding applications. In addition, the recommendation to review internal funding for the area of gene-editing in livestock was ratified by the Executive Leadership Team, and resulted in SSIF funding being removed from this area of research and re-prioritised into other areas.

	Strategic goal	Objective	Key performance indicators for FY19	Result for FY19
Research			Implement AgResearch Science Plan.	The Science Plan was fully implemented during FY19 and was used, for example, to inform changes in SSIF investments and focus areas for contestable funding applications and to establish new ways of working to deliver integrated, trans-disciplinary projects. The revitalisation of our Science Plan is underway as one of AgResearch's five current Strategic Initiatives, including the development of challenge targets, impact measure and key performance indicators.
	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.	1.29 Scopus-indexed papers were published per scientist.
Enabling systems	Robust business processes and systems that enable delivery on strategy.	Improve the effectiveness and efficiency of business processes.	Implement Idea to Impact (our new Project Management way of working) to plan and commence benefit realisation.	Our Idea to Impact project management framework and the associated Waka technology solution have now been rolled out to all Science teams and the project has been closed. We are now in a phase of embedding the use of both the framework and tool to realise the benefits.
	Infrastructure aligned to strategy.	AgResearch infrastructure is fit for purpose.	Develop Future Footprint Programme and campuses/hubs to agreed programme milestones and budgets for FY19.	The Joint Food Science Facility located at Massey University is progressing to agreed milestones and due to open early 2020.
				The Grassland Greenhouses are progressing to agreed milestones and due to open late 2019.
Financial	Sustainable financial performance to enable achievement of strategic goals.	Achieve financial targets.	Operating Profit budget achieved.	Our Operating Profit is (\$7.0m), compared with a budget of (\$2.2m).
			Net Profit Before Tax budget achieved.	Our Net Profit Before Tax of (\$4.8m) compared to a budget of (\$3.1m).

Key performance indicators (continued)

As at 30 June 2019

AgResearch's 2018–23 Statement of Corporate Intent 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 2018–23 SCI.

Core operating indicators

ID	Indicator	Definition	Measure [target]
G.1	End-user collaboration	Revenue per full-time equivalent (FTE) from commercial sources.	\$85.4k [\$84.3k]
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) 11% [14%] (b) 34% [39%] (c) 33% [26%] (d) 22% [21%]
G.3	Technology and knowledge transfer	Commercial reports per scientist FTE.	1.29 [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>	2.9 [2.7]
G.5	Financial indicator	Revenue per FTE, based on average FTEs over the year.	\$239.54k [\$225.76k]

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	58% [>60%]
1.3		Satisfaction with our service – “Very Good” or “Better” satisfaction rating	64% [>70%]
1.4		Dealing with us – “Preference to Work” rating	68% [>60%]
1.5		Familiarity with our capability – “Very Familiar” rating	32% [>40%]
1.6		Contribution to stakeholder strategy – “Good” or “Better” rating	83% [>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) \$157.3m [\$145.4m] b) \$124.7m [\$107.5m] c) \$51.1m [\$54.3m] d) \$12.0m [\$9.8m] e) \$4.7m [\$4.1m] f) \$0.3m [\$0.3m]

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.	5 [6]

AgResearch-specific workforce indicators

ID	Indicator	Definition	Measure [target]
3.1	Staff engagement	<i>Increase Engagement Index (EI) by 5 points.</i>	68 [70]
3.2	Health and safety	No notifiable injuries and <2 notifiable events.	0 [<2]

AgResearch-specific financial performance

ID	Indicator	Definition	Measure [target]
4.1	Financial target	Operating Profit budget achieved.	Not Achieved [Achieved]



An aerial photograph of a vast, green field, likely a golf course or a large park. The field is divided into many small, rectangular plots by thin lines, possibly furrows or paths. Several small figures of people are scattered across the field, providing a sense of scale. The lighting is bright, creating a vibrant green color. In the top left corner, there is a solid green horizontal bar.

Financials

Pūrongo pūtea

Financial performance indicators

For the year ended 30 June 2019

	Actual 2019	Budget 2019	Actual 2018
Cash flow			
• Net cash flow from operating activities \$k	14,142	(4,868)	10,570
• Net cash flow from investing activities \$k	(12,280)	(19,452)	(23,329)
• Net cash flow from financing activities \$k	-	(200)	-
• Total net cash flow \$k	1,862	(24,520)	(12,759)
• Effect of exchange rate changes \$k	8	-	32
• Cash at the beginning of the year \$k	46,316	46,316	59,043
• Cash at the end of the year \$k	48,186	21,796	46,316
Operating Margin %	8.9%	0.5%	3.0%
Operating Margin per FTE \$k	21.2	1.0	7.0
Revenue Growth %	7.9%	4.4%	(1.7%)
Quick Ratio	2.7	0.9	2.8
Interest Coverage	870	1,000	151
Operating Margin Volatility %	43.9%	28.5%	38.9%
Forecasting Risk %	1.1%	n/a	1.2%
Adjusted Return on Equity %	(4.7%)	(1.5%)	(0.3%)
Capital Renewal	1.2	4.3	2.4
Equity Ratio %	79.9%	75.4%	81.9%

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 2019

in thousands of New Zealand dollars	Note	Actual 2019	Budget 2019	Actual 2018
Revenue				
Ministry of Business, Innovation and Employment				
• Strategic science funding		43,889	43,889	38,889
• Our Land and Water National Science Challenge		6,424	6,623	6,623
• Other		22,495	24,083	21,766
Commercial		62,199	55,979	57,155
Farm produce		4,956	6,480	4,632
Other revenue	1	17,348	13,492	16,716
Total operating revenue		157,311	150,546	145,781
Operating expenditure	2	(153,792)	(152,835)	(148,017)
Other gains/(losses)	3	(7,081)	-	1,147
Finance costs		(16)	-	(28)
Share of deficit of associates	4	(1,266)	800	(719)
Surplus/(deficit) before tax		(4,844)	(3,089)	(1,836)
Tax expense/(benefit)	5	2,164	(865)	(831)
Net surplus/(deficit) after tax for the year		(7,008)	(2,224)	(1,005)
Other comprehensive income				
Items that will not be reclassified subsequently to surplus or deficit:				
Revaluation of properties	7	-	-	19,431
		-	-	19,431
Items that may be reclassified subsequently to surplus or deficit:				
Changes in fair value of financial assets		-	-	(280)
		-	-	(280)
Income tax relating to components of other comprehensive income	5	-	-	(5,231)
Other comprehensive income for the year net of tax		-	-	13,920
Total comprehensive income for the year net of tax		(7,008)	(2,224)	12,915
Net surplus/(deficit) is attributable to:				
Equity holders of the parent		(7,008)	(2,224)	(1,005)
Total comprehensive income is attributable to:				
Equity holders of the parent		(7,008)	(2,224)	12,915

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 2019

in thousands of New Zealand dollars	Note	Actual 2019	Budget 2019	Actual 2018
Current assets				
Cash and cash equivalents		48,186	21,796	46,316
Trade and other receivables	8	31,798	45,768	33,613
Prepayments		2,021	1,889	2,067
Biological assets - livestock	10	4,190	5,087	4,611
Inventory		1,027	1,095	1,059
Derivative financial instruments		5	-	58
Property held for sale		-	763	763
Current tax	5	-	(2,112)	677
Total current assets		87,227	74,286	89,164
Non-current assets				
Investments in associates and joint ventures	4	6,068	5,607	15,370
Other investments	12	2,241	2,460	3,667
Property, plant and equipment	7	204,963	201,995	193,852
Biological assets - forestry	11	1,157	727	965
Other non-current receivables	13	-	4,629	4,536
Goodwill	14	907	-	1,043
Intangible assets		1,745	2,097	988
Total non-current assets		217,081	217,515	220,421
Total assets		304,308	291,801	309,585
Less:				
Current liabilities				
Trade and other payables	9	39,721	32,217	37,454
Derivative financial instruments		-	-	-
Finance leases – current		-	-	-
Provisions	15	5,406	4,745	6,314
Current tax	5	718	-	-
Other current liabilities		9	936	33
Total current liabilities		45,854	37,898	43,801
Non-current liabilities				
Deferred tax	5	16,368	15,061	15,905
Other non-current liabilities	16	766	596	826
Provisions - non-current	15	35	34	34
Total non-current liabilities		17,169	15,691	16,765
Total liabilities		63,023	53,589	60,566
Net assets		241,285	238,212	249,019
Equity				
Share capital	6	47,268	47,268	47,268
Revaluation reserves	6	93,111	97,974	102,880
Retained earnings		100,906	92,970	98,871
Total equity		241,285	238,212	249,019

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

Dr Paul Reynolds
Chair
11 September 2019



Kim Wallace
Director
11 September 2019



Consolidated statement of changes in equity

For the year ended 30 June 2019

in thousands of New Zealand dollars	Note	Share capital	Revaluation reserves, property, plant and equipment	Investments	Retained earnings	Total equity
Balance at 1 July 2017		47,268	88,204	870	99,762	236,104
Deficit after tax for the year		-	-	-	(1,005)	(1,005)
Revaluation of properties	7	-	19,431	-	-	19,431
Changes in fair value of investments	5	-	-	(280)	-	(280)
Transfer of revaluation reserve on sold assets	6	-	(114)	-	114	-
Income tax relating to components of other comprehensive income	5	-	(5,310)	79	-	(5,231)
Total comprehensive income		-	14,007	(201)	(891)	12,915
Balance at 30 June 2018		47,268	102,211	669	98,871	249,019
Effect of adoption of new accounting standards (IFRS15)		-	-	-	(726)	(726)
FVTPL election on adoption of NZ IFRS 9		-	-	(669)	669	-
Balance at 30 June 2018 (restated)		47,268	102,211	-	98,814	248,293
Deficit after tax for the year		-	-	-	(7,008)	(7,008)
Revaluation of properties	7	-	-	-	-	-
Changes in fair value of investments	5	-	-	-	-	-
Transfer of revaluation reserve on sold assets	6	-	(9,100)	-	9,100	-
Income tax relating to components of other comprehensive income	5	-	-	-	-	-
Total comprehensive income		-	(9,100)	-	2,092	(7,008)
Balance at 30 June 2019		47,268	93,111	-	100,906	241,285

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

Consolidated statement of cash flows

For the year ended 30 June 2019

in thousands of New Zealand dollars	Note	Actual 2019	Budget 2019	Actual 2018
Cash received from operating activities				
Receipts from customers		161,082	161,136	140,541
Interest received		1,227	1,025	2,253
Dividends received		5	-	155
Total cash received from operating activities		162,314	162,161	142,949
Cash disbursed on operating activities				
Payments to employees		67,664	68,561	64,230
Payments to suppliers		79,374	97,523	65,177
Restructuring		812	574	1,048
Income tax paid		306	363	1,895
Interest paid		16	8	29
Total cash disbursed on operating activities		148,172	167,029	132,379
Net cash flow from operating activities	18	14,142	(4,868)	10,570
Cash received from investing activities				
Disposal of property, plant and equipment and biological assets		19,404	14,915	135
Disposal of investments and intangible assets		626	14,014	102
Total cash received from investing activities		20,030	28,929	237
Cash disbursed on investing activities				
Payment for acquisition of subsidiary net of cash acquired		-	-	807
Investment in property, plant and equipment and biological assets		30,289	40,949	16,563
Purchase of other investments and intangible assets		1,096	6,457	5,221
Partner contribution to research consortiums		925	975	975
Total cash disbursed on investing activities		32,310	48,381	23,566
Net cash flow from investing activities		(12,280)	(19,452)	(23,329)
Cash received from financing activities				
Term loan drawdown		-	-	-
Total cash received from financing activities		-	-	-
Cash disbursed on financing activities				
Term loan repayments		-	200	-
Total cash disbursed on financing activities		-	200	-
Net cash flow from financing activities		-	(200)	-
Total net cash flow		1,862	(24,520)	(12,759)
Cash at beginning of year		46,316	46,316	59,043
Effect of exchange rate changes on the balance of cash held in foreign currencies		8	-	32
Cash at end of year		48,186	21,796	46,316

Statement of accounting policies

For the year ended 30 June 2019

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 2019 were authorised for issue by the Directors on 11 September 2019. 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 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 22.

Basis of preparation

The Financial Statements have been prepared in accordance with Generally Accepted Accounting Practice 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 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.

Standards issued but not yet effective

The new and amended standards and interpretations that are issued, but not yet effective, up to the date of issuance of the Group's Financial Statements are disclosed below. The Group intends to adopt these when they become effective.

- NZ IFRS 16 'Leases' (Issue in January 2016 and effective for accounting periods beginning on or after 1 January 2019)

NZ IFRS 16 Leases replaces the guidance in NZ IAS 17 and sets out the principles for the recognition, measurement, presentation and disclosure of leases and requires lessees to account for all leases under a single on-balance sheet model similar to the Accounting for

Finance Leases under IAS 17. The standard includes two recognition exemptions for lessees – leases of 'low-value' assets and short-term leases (i.e. leases with a lease term of 12 months or less). At the commencement date of a lease, a lessee will recognise a liability to make lease payments (i.e. the lease liability) and an asset representing the right to use the underlying asset during the lease term (i.e. the right-of-use asset). Lessees will be required to separately recognise the interest expense on the lease liability and the depreciation expense on the right-of-use asset.

Lessees will also be required to remeasure the lease liability upon the occurrence of certain events (e.g. a change in the lease term, a change in future lease payments resulting from a change in an index or rate used to determine those payments). The lessee will generally recognise the amount of the remeasurement of the lease liability as an adjustment to the right-of-use asset.

Lessor accounting under IFRS 16 is substantially unchanged from today's accounting under IAS 17. Lessors will continue to classify all leases using the same classification principle as in IAS 17 and distinguish between two types of leases: operating and finance leases.

IFRS 16, which is effective for annual periods beginning on or after 1 January 2019, requires lessees and lessors to make more extensive disclosures than under IAS 17.

An impact assessment of the adoption of IFRS 16 has yet to be completed, however, it is expected to be material to the Group.

Critical accounting estimates and judgements

The preparation of 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 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:

Future Footprint Programme (FFP) related costs

Various costs have been incurred during the year in relation to development projects associated with FFP. The capitalisation of costs relating to the building of the Joint Food Science Centre situated on Massey University's Campus and other works at the Group's Grasslands Campus are based on the stage of the project (i.e. feasibility and scoping, concept design, detailed design and construction). Management have estimated a balance of costs that have been transferred to Capital Work in Progress in relation to the new Lincoln Precinct Project.

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; and
- Its undertaking science research for the consortia.

Joint operation

Grasslands Innovation Limited is considered a joint operation by virtue of the contractual arrangements that 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 investments 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, market, economic or legal environment in the 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; and
- 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 2 and note 7.

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 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 were 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 NZ IFRS 15.35(c) satisfies and the Group recognise revenue in relation to contracting service over time.

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 contracts with its customers that requires a third party to perform the work, on the customer's behalf, with the third party receiving full consideration and autonomy by 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 has determined that it acts as a principal on these contracts based on an appropriate assessment of the level of control.

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 where it is not possible to take the mark to market rate from observable markets, 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, 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 Financial Statements.

Changes in accounting policies and disclosures

Accounting policies are changed only if the change is required by a standard or interpretation or otherwise provides more reliable and more relevant information.

New and amended standards and interpretations

The Group applied IFRS 15 and IFRS 9 for the first time. The nature and effect of the changes as a result of the adoption of these new accounting standards are described below.

Several other amendments and interpretations apply effective from 1 January 2018, but do not have an impact on the Consolidated Financial Statements of the Group. The Group has not early adopted any standards, interpretations or amendments that have been issued, but are not yet effective.

IFRS 15 Revenue from contracts with customers
IFRS 15 supersedes IAS 18 Revenue and related Interpretations and it applies, with limited exceptions, to all revenue arising from contracts with customers. IFRS 15 establishes a five-step model to account for revenue arising from contracts with customers and requires that revenue be recognised at an amount that reflects the consideration to which an entity expects to be entitled in exchange for transferring goods or services to a customer.

IFRS 15 requires entities to exercise judgement, taking into consideration all the relevant facts and circumstances when applying each step of the model to contracts with their customers. The standard also specifies the accounting for the incremental costs of obtaining a contract and the costs directly related to fulfilling a contract. In addition, the standard requires extensive disclosures.

The Group adopted IFRS 15 using the modified retrospective method of adoption with the date of initial application of 1 July 2018. Under this method, the standard can be applied either to all contracts at the date of initial application or only to contracts that are not completed at this date. The Group elected to apply the standard to all contracts as at 1 July 2018.

The cumulative effect of initially applying IFRS 15 is recognised at the date of initial application as an adjustment to the opening balance of retained earnings. Therefore, the comparative information was not restated and continues to be reported under IAS 18 and related Interpretations.

The effect of adopting IFRS 15 as at 1 July 2018 was as follows:

	Increase/(Decrease)
Liabilities	
in thousands of New Zealand dollars	
Contract liabilities (non-current)	(726)
Total Liabilities	(726)
Total adjustment on equity	
Retained earnings	726
Total Equity	726

Set out below are the amounts by which each Financial Statement line item is affected as at and for the year ended 30 June 2019 as a result of the adoption of IFRS 15. The adoption of IFRS 15 did not have a material impact on other comprehensive income (OCI) or the Group's operating, investing and financing cash flows. The first column shows amounts prepared under IFRS 15 and the second column shows what the amounts would have been had IFRS 15 not been adopted:

Consolidated statement of profit or loss for the year ended 30 June 2019

	Amounts prepared under		
	IFRS 15	IAS 18	Increase/ (Decrease)
in thousands of New Zealand dollars			
Revenue from contracts with customers	85,084	84,935	149
Revenue	157,311	157,162	149
Operating profit	3,519	3,370	149
Income tax expense	2,164	2,122	42
Profit for the year	(7,008)	(7,115)	107
Attributable to:			
Equity holders of the parent	(7,008)	(7,115)	107
	(7,008)	(7,115)	107

Consolidated statement of financial position as at 30 June 2019

	Amounts prepared under		
	IFRS 15	IAS 18	Increase/ (Decrease)
in thousands of New Zealand dollars			
Equity			
Retained earnings	100,906	100,799	107
Total equity	241,285	241,178	107
Liabilities			
Contract liabilities	14,482	15,119	(637)
Total liabilities	63,023	63,660	(637)
Total equity and liabilities	304,308	304,838	(530)

IFRS 9 Financial Instruments

IFRS 9 Financial Instruments replaces IAS 39 Financial Instruments: Recognition and Measurement for annual periods beginning on or after 1 January 2018, bringing together all three aspects of the accounting for financial instruments: classification and measurement; impairment; and hedge accounting.

With the exception of hedge accounting, which the Group applied prospectively, the Group has applied IFRS 9 retrospectively, with an initial application date of 1 July 2018. The Group has not restated the comparative information, which continues to be reported under IAS 39.

The effect of adopting IFRS 9 did not have a material impact on the Group's Statement of Comprehensive Income, Statement of Financial Position or Statement of Cash Flows.

The nature of these adjustments are described below:

Classification and measurement

Under IFRS 9, debt instruments are subsequently measured at fair value through profit or loss, amortised cost, or fair value through OCI. The classification is based on two criteria: the Group's Business Model for managing the assets; and whether the instruments' contractual cash flows represent 'solely payments of principal and interest' on the principal amount outstanding.

The assessment of the Group's Business Model was made as of the date of initial application, 1 July 2018, and then applied retrospectively to those financial assets that were not derecognised before 1 July 2018. The assessment of whether contractual cash flows on debt instruments are solely comprised of principal and interest was made based on the facts and circumstances as at the initial recognition of the assets.

The classification and measurement requirements of IFRS 9 did not have a significant impact on the Group. The Group continued measuring at fair value all Financial Assets previously held at fair value under IAS 39. The following are the changes in the classification of the Group's Financial Assets:

- Trade receivables and other non-current financial assets previously classified as loans and receivables are held to collect contractual cash flows and give rise to cash flows representing solely payments of principal and interest. These are now classified and measured as Debt Instruments at amortised cost.
- Equity investments in non-listed companies previously classified as AFS financial assets are now classified and measured as financial assets at fair value through profit and loss. The Group elected to classify irrevocably its non-listed equity investments under this category as it intends to hold these investments for the foreseeable future. There were no impairment losses recognised in profit or loss for these investments in prior periods.
- Listed equity investments previously classified as AFS Financial Assets are now classified and measured as Financial Assets at fair value through profit or loss.

The Group has not designated any Financial Liabilities as at fair value through profit or loss. There are no changes in classification and measurement for the Group's Financial Liabilities.

In summary, upon the adoption of IFRS 9, the Group had the following required or elected reclassifications:

As at 30 June 2019

	IFRS 9 measurement category			Fair value through OCI
	Fair value through profit or loss	Amortised cost	Fair value through OCI	
in thousands of New Zealand dollars				
IAS 39 measurement category				
Loans and receivables				
Trade receivables*	31,798	-	31,798	-
Available for sale				
Listed equity investments	1,807	1,807	-	-
Non-listed equity investments	434	434	-	-
Quoted debt instruments	-	-	-	-
	2,241	31,798		-

* The change in carrying amount is a result of additional impairment allowance. See Discussion on impairment below.

As at 30 June 2018

	IFRS 9 measurement category		
	Fair value through profit or loss	Amortised cost	Fair value through OCI
in thousands of New Zealand dollars			
IAS 39 measurement category			
Loans and receivables			
Trade receivables*	33,613	-	33,613
Available for sale			
Listed equity investments	2,742	2,742	-
Non-listed equity investments	925	925	-
Quoted debt instruments	-	-	-
	3,667	33,613	-

* The change in carrying amount is a result of additional impairment allowance. See Discussion on impairment below.

Impairment

The adoption of IFRS 9 has fundamentally changed the Group's accounting for impairment losses for Financial Assets by replacing IAS 39's incurred loss approach with a forward-looking expected credit loss (ECL) approach. IFRS 9 requires the Group to recognise an allowance for ECLs for all debt instruments not held at fair value through profit or loss and contract assets.

IFRIC Interpretation 22 Foreign Currency Transactions and Advance Considerations

The Interpretation clarifies that, in determining the spot exchange rate to use on initial recognition of the related asset, expense or income (or part of it) on the derecognition of a Non-Monetary Asset or Non-Monetary Liability relating to advance consideration, the date of the transaction is the date on which an entity initially recognises the Non-Monetary Asset or Non-Monetary Liability arising from the advance consideration. If there are multiple payments or receipts in advance, then the entity must determine the date of the transactions for each payment or receipt of advance consideration. This Interpretation does not have any impact on the Group's Consolidated Financial Statements.

Significant accounting policies

The significant accounting policies used in the preparation and presentation of the 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 2019. 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; and
- 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; and
- 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 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 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. The primary condition is that the Group should undertake research activities as defined under the contractual agreement that awards the funding. The Government grant relating to this funding is recognised as income in the profit or loss on a systematic basis in the period it is received. Sustainable science 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.

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 Group's Financial Statements, the results and financial position of each group entity are expressed in NZD, which is the functional currency of the Group and the presentation currency for the Group's 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 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 and 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 23.

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 23 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.

The 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.

There is an active market for the Group's listed equity investments and quoted debt instruments.

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 2019, the marked-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 with fixed or determinable payments that are not quoted in an active market. 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 OCI, 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:

- Significant financial difficulty of the issuer or counterparty; or
- Default or delinquency in interest or principal payments; or
- 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.

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. Leased assets

Leases are classified as Finance Leases whenever the terms of the lease transfer substantially all the risks and rewards of ownership to the lessee. All other leases are classified as Operating Leases.

Group as lessor

Operating lease receipts are included in profit or loss in equal instalments over the lease term.

Group as lessee

Operating lease payments are included in profit or loss in equal instalments over the lease term.

Assets held under finance leases are initially recognised as assets of the Group at their fair value at the inception of the lease or, if lower, at the present value of the minimum lease payments. The corresponding liability to the lessor is included in the Consolidated Statement of Financial Position as a finance lease obligation.

H. 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 programmes 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; and
- 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.

I. 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.

J. 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 that 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

There are a small number of employees that 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.

K. Goods and Services Tax (GST)

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

L. 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.

M. Insurance contracts

The Group is part of the Accident Compensation Corporation (ACC) Partnership Programme. 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.

N. 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.

Notes to and forming part of the consolidated financial statements

For the year ended 30 June 2019

1 Revenue

Revenue recognition

Ministry of Business, Innovation and Employment (MBIE)

Revenue received from New Zealand's Strategic Science Investment Fund (SSIF) and other MBIE funding is considered to be a grant for research purposes and is accounted for under NZIAS 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 to the estimated total contract costs.

The Our Land and Water National Science Challenge contract is considered to be a Principal relationship for revenue recognition due to:

- The requirement for the AgResearch Board to appoint the OLV Board and oversee its operation
- The involvement of the AgResearch Board and Management in the planning and Directorate of this contract
- The accountability relationship that the AgResearch Board has with MBIE (the customer) over the operations and outcomes of this contract.

Commercial revenue

The Group derives revenue from the provision of research services to a range of Agriculture based customers in New Zealand. These contracts are typically determined to have one single performance obligation which 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 recognise revenue in relation to contracting service 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-cost 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 to the buyer the control of the goods.

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.

in thousands of New Zealand dollars	2019	2018
Other revenue		
Interest	1,247	2,118
Dividends	4	156
Royalties	11,970	11,034
Rent	4,127	3,408
	17,348	16,716

2 Operating expenditure

in thousands of New Zealand dollars	Note	2019	2018
<i>Employee related</i>			
Salary and wages		66,138	63,986
Defined contribution plans		1,741	1,677
<i>Operational</i>			
Amortisation and impairment of intangible assets	14	620	348
Depreciation	7	9,571	9,301
Operating lease expenses		3,201	2,919
Other operating expenses		25,383	24,637
Science 3rd party sub-contracts		21,490	21,193
Site and property expenses		5,882	6,797
Supplies		16,874	14,116
<i>Financial and administration</i>			
Auditor's remuneration - for services as auditor*		278	269
Bad debts		14	1
Change in provision for doubtful debts		(103)	91
Directors' fees		282	333
Donations		2	2
Financial and legal expenses		2,427	2,340
<i>Impairments and write downs/(write backs)</i>			
Impairment of investments		-	-
Impairment/(write back) of financial assets	12	-	-
Impairment of property, plant and equipment	7	(8)	7
		153,792	148,017

* The audit fee includes Office of the Auditor-General overhead contribution of \$21,300 (30 June 2018: \$20,900).

3 Other gains/(losses)

in thousands of New Zealand dollars	Note	2019	2018
Net gain/(loss) from foreign currency exchange		(30)	23
Net gain/(loss) on sale of property, plant and equipment		2,430	93
Net gain/(loss) on sale of investments		(805)	-
Change in fair value of derivative financial instruments		(53)	126
Change in fair value of forestry	11	192	238
Change in fair value of livestock	10	22	398
Impairment of LUAGRJF Limited Partnership*		(8,837)	269
		(7,081)	1,147

*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 \$8,815k (2018:Nil).

4 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.

4 Investments in associates and joint ventures (continued)

The Group 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 in accordance with NZ IAS 39. 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.

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 Group's Consolidated Financial Statements only to the extent of interests in the Associate that are not related to the Group.

Associate companies	Balance date	% of ownership Interest and voting power held by the group		Principal Activity
		2019	2018	
Clone International Pty Limited *	30 June	-	25	Cloning high-value horses, cattle and sheep
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	33	33	Research and development 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	20	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

4 Investments in associates and joint ventures (continued)

Associate companies	Balance date	% of ownership Interest and voting power held by the group		Principal Activity
		2019	2018	
LUAGRJF Limited Partnership**	30 June	38.7	38.7	Operating entity set up to develop, own and manage a joint facilities building together with Lincoln University
LUAGRJF GP Limited	30 June	38.7	38.7	General Partner
Southern Dairy Hub Limited Partnership	31 May	37.5	37.5	Promotion and development of dairy industry good activities
SDH GP Limited	31 May	37.5	37.5	General Partner

* Clone International was deregistered in June 2019. A debt owing from Clone International (\$2.7k) was written off in the year.

** The LUAGRJF investment was impaired as at 30 June 2019, see note 3.

All associates are incorporated in New Zealand except for Clone International Pty Limited, which was incorporated in Australia. 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.

Summarised financial information for associates and joint ventures

in thousands of New Zealand dollars	2019	2018
Share of profit/(loss) from continuing operations	(1,266)	(719)
Share of total comprehensive income	(1,266)	(719)
Aggregate carrying amount of the Group and Company's interest in the associate investments	5,609	14,756
Aggregate carrying amount of the Group and Company's interest in the joint ventures*	459	614
	6,068	15,370

* Pastoral Genomics Greenhouse Gas Research

5 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.

5 Taxation (continued)

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	2019	2018
Tax expense comprises:		
Current tax expense	1,332	211
Adjustments recognised in relation to the current tax of prior years	369	(453)
Deferred tax expense relating to the origination and reversal of temporary differences	634	(589)
Adjustments recognised in relation to the deferred tax of prior years	(171)	-
Total tax expense/(benefit)	2,164	(831)

The total charge for the year can be reconciled to the accounting profit as follows:

Loss from continuing operations	(4,844)	(1,836)
Income tax expense calculated at 28% (2018: 28%)	(1,356)	(514)
Effect of revenue that is exempt from tax	(646)	(400)
Foreign surplus/(deficit) not recognised for tax	-	-
Effect of expenses that are not deductible	1,039	128
Effect of impairment (reversals)/losses that are not (assessable)/deductible	2,993	(90)
Associates' results reported net of tax	9	18
Non assessable capital (gain)/loss	7	27
	2,046	(831)
Adjustments recognised in the current year in relation to the current and deferred tax of prior years	118	-
Income tax expense/(benefit) recognised in profit or loss	2,164	(831)

in thousands of New Zealand dollars	2019	2018
Income tax recognised directly in other comprehensive income		
Deferred tax		
Arising on income and expenses taken directly to equity:		
Property revaluations	-	(5,310)
Revaluations of financial assets	-	79
Total deferred tax recognised directly in other comprehensive income	-	(5,231)

in thousands of New Zealand dollars	2019	2018
Current tax assets and liabilities		
Current tax assets		
Tax refund receivable	-	714
Benefit of current year tax losses	-	2
	-	716
Current tax liabilities		
Income tax payable	(718)	39
Net current tax (liability)/asset	718	677

5 Taxation (continued)

	Opening balance	Charged to surplus	Charged to other comprehensive income	Acquisitions disposals	Closing balance
in thousands of New Zealand dollars					
Deferred tax assets/(liabilities) arise from the following:					
2019					
Temporary differences					
Biological assets	(623)	(184)	-	-	(807)
Property, plant & 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)
2018					
Temporary differences					
Biological assets	(421)	(202)	-	-	(623)
Property, plant & equipment	(13,194)	839	(5,310)	-	(17,665)
Intangible assets	1,224	(167)	-	(43)	1,014
Financial assets	(338)	(2)	79	-	(261)
Provisions	1,467	143	-	20	1,630
	(11,262)	611	(5,231)	(23)	(15,905)
Unused tax losses and credits					
Tax losses	22	(22)	-	-	-
	(11,240)	589	(5,231)	(23)	(15,905)

in thousands of New Zealand dollars	Before tax amount	Tax expense	Net of tax amount
Income tax effects relating to each component of other comprehensive income			
2019			
Revaluation of properties	-	-	-
Financial assets	-	-	-
	-	-	-
2018			
Revaluation of properties	19,431	(5,310)	14,121
Financial assets	(280)	79	(201)
	19,151	(5,231)	13,920

6 Equity

Share capital

Capital consists of 47,268,000 fully paid ordinary shares of \$1.00 each (2018: 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 that is therefore effectively realised, is transferred directly to retained earnings.

An asset is revalued to the lower of its carrying amount or fair value less costs to sell, when it is classified as available for sale. Any impairment loss or gain on this revaluation is recognised in the Profit and Loss.

During 2019 Winchmore Farm was sold, generating a reduction in the asset revaluation reserve of \$9.1m.

7 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
- Vehicles
- Plant and equipment
- 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.

Capital assets are classified as level 2 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							
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)
Revaluation	-	-	-	-	-	-	-
Impairments	-	-	-	8	-	-	8
Reclassified as 'Assets Held for Sale'	-	-	-	-	-	-	-
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

7 Property, plant and equipment (continued)

	Land & land improvements	Buildings	Leasehold improvements	Plant & equipment	Vehicles	Capital Work in Progress	Total
in thousands of New Zealand dollars							
2018							
Balance at beginning of year	76,531	69,788	237	17,681	89	3,122	167,448
Additions	166	439	-	4,952	82	11,425	17,064
Disposals	-	-	-	(20)	-	-	(20)
Revaluation	2,945	16,486	-	-	-	-	19,431
Impairments	1	(8)	-	-	-	-	(7)
Reclassified as 'Assets Held for Sale'	(763)	-	-	-	-	-	(763)
Depreciation	(708)	(3,727)	(20)	(4,802)	(44)	-	(9,301)
Balance at end of year	78,172	82,978	217	17,811	127	14,547	193,852
Cost or valuation	78,611	87,261	716	98,426	570	14,547	280,131
Accumulated depreciation	(439)	(4,283)	(499)	(80,615)	(443)	-	(86,279)
Balance at end of year	78,172	82,978	217	17,811	127	14,547	193,852

A total write down of assets of \$8k (2018: \$1,301k) was reflected

in thousands of New Zealand dollars	2019	2018
Through the asset revaluation reserve, being a reversal of prior year revaluations.	-	921
Through the Profit and Loss Account	(8)	380
	(8)	1,301

A net revaluation increase of assets of \$0 (2018: \$19,431k) consisted of

in thousands of New Zealand dollars	2019	2018
Increases through the asset revaluation reserve	-	20,352
Decreases through the asset revaluation reserve, being a reversal of prior year revaluations.	-	(921)
	-	19,431

A net impairment decrease of assets of \$8k (2018: \$7k) consisted of

in thousands of New Zealand dollars	2019	2018
Impairment through profit and loss	8	(380)
Impairment reversal through profit and loss	-	373
	8	(7)

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	2019	2018
Land and land improvements	22,512	21,004
Buildings	46,435	46,664

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.

The Group's land and buildings were revalued in the prior period. These valuations were performed by independent valuers Darroch Limited under the requirements of NZ IAS 16 Property, Plant and Equipment.

The Group's land and buildings have been valued using either market value or optimised depreciated replacement cost. For 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; and
- 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.

8 Trade and other receivables

in thousands of New Zealand dollars	2019	2018
Trade receivables	30,354	32,675
Receivables from associates	1,346	951
Receivables from other related parties	108	100
Total Receivables	31,808	33,726
Less provision for doubtful debts	10	113
Net Receivables	31,798	33,613

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 2019. (2018: Nil).

Terms of trade vary according to individual customer contracts. As at 30 June 2019, trade receivables of \$719k (2018: \$1,665k) were past due but not impaired. These relate to a number of independent customers for whom there is no recent history of defaults. The Group does not hold any collateral over these balances. The aging analysis of trade receivables is as follows:

in thousands of New Zealand dollars	Gross	Doubtful debts	Net
2019			
Current	28,410	-	28,410
1 to 2 months	1,215	-	1,215
	29,625	-	29,625
<i>Past due</i>			
2 to 3 months	190	-	190
Over 3 months	539	(10)	529
	729	(10)	719
Total trade receivables	30,354	(10)	30,344
2018			
Current	30,260	-	30,260
1 to 2 months	637	-	637
	30,897	-	30,897
<i>Past due</i>			
2 to 3 months	339	-	339
Over 3 months	1,439	(113)	1,326
	1,778	(113)	1,665
Total trade receivables	32,675	(113)	32,562

in thousands of New Zealand dollars	Current	<30 days	30-60 days	61-90 days	>91 days	Total
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	2019	2018
Movement in the provision for doubtful debts		
Balance at beginning of year	113	22
Additional provisions made (reversed during the year)	(103)	91
Receivables written-off during the year	-	-
Balance at end of year	10	113

The Group measures the provision for expected credit losses ('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 aging.

An expected credit loss rate is determined based on the historic 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.

9 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	2019	2018
Trade payables	23,318	23,689
Payables to associates	5	-
Goods and services tax (GST)	1,221	1,527
Income in advance	14,482	11,618
Accrued salaries and wages	695	620
Total Payables	39,721	37,454

The fair value of 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.

10 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
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	96	
2018					
Reconciliation of changes in the carrying value					
Balance at beginning of year	1,139	1,482	1,203	663	4,487
Increases due to acquisitions	250	433	235	-	918
Decreases due to sales	(916)	(1,049)	(309)	(231)	(2,505)
Net increase due to births, growth and deaths	554	429	167	163	1,313
Changes in fair value less estimated point-of-sale costs	161	(101)	257	81	398
Balance at end of year	1,188	1,194	1,553	676	4,611
Quantity of livestock at end of year	8,121	1,413	1,071	1,019	

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.

11 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 (the land is changed from forestry to some other purpose), a deforestation liability will arise.

Compensation units are recognised based on their market value on the date received.

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

in thousands of New Zealand dollars	2019	2018
Reconciliation of changes in the carrying value		
Balance at beginning of year	965	727
Decreases due to harvesting and sale of forestry	-	-
Changes in fair value less estimated point-of-sale costs	192	238
Balance at end of year	1,157	965
Area (ha) of forest at end of year		
	116	110

Forestry valuations

Forestry was valued by Alan Bell & Associates as at 30 June 2019. The value of forestry at 30 June 2019 was \$1,157k (2018: \$965k).

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; and
- 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 (2018: 9%);
- An assumed 3% compounding rate on standard costs (2018: 3%); and
- 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

During the 2019 financial year, 31,142 ETS units were disposed of (2018: Nil) as part of a previous land sale transaction. All remaining units are carried at their original cost of \$4.15 per unit.

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.

12 Other investments

in thousands of New Zealand dollars	2019	2018
Fonterra Co-operative Group Limited	1,776	2,717
BioPacific Ventures	10	10
Other investments	455	940
Total	2,241	3,667

During the year \$145k of Fonterra shares were sold. As part of the Winchmore Farm sale, \$458k of Ashburton Lyndhurst irrigation shares were disposed of.

Valuation of other investments

- Investments held through the BioPacific Ventures investment fund are carried at fair value, less any impairment arising from 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.

12 Other investments (continued)

Impairment of other investments

During the year, the impairment of other investments in prior years were reversed as follows:

in thousands of New Zealand dollars	2019	2018
BioPacific Ventures Fund	-	-
Other	-	-
Total	-	-

13 Other non-current receivables

During 2014, the Company entered into an agreement for the sale of land, buildings and other property, plant and equipment at its Flock House site. With the exception of one parcel of land (and associated improvements) - referred to as Property B - delivery of, and payment for, those assets also occurred during that year.

Under the sale and purchase agreement, the parties agreed to defer settlement of Property B until May 2019. The cash consideration for Property B was received in May 2019.

in thousands of New Zealand dollars	2019	2018
Amount receivable under Sale & Purchase Agreement	-	4,700
Less discount to net present value	-	(171)
Present value of non-current receivable	-	4,529
Non current debtor in respect of shares sold	-	7
Present value of non-current receivable	-	4,536

14 Goodwill

The movement of goodwill for 2019 is shown below:

in thousands of New Zealand dollars	2019	2018
Opening Balance	1,043	-
Goodwill on Acquisition	-	1,043
Impairment	(136)	-
Closing Balance	907	1,043

Farmax Limited was incorporated as a 100% subsidiary in June 2018. In June 2019 goodwill on acquisition was impaired by \$136k.

15 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; and
- 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.

15 Provisions (continued)

in thousands of New Zealand dollars	Restructuring	Employee entitlements	ACC	Onerous contract	Total
2019					
Balance at beginning of year	577	4,678	263	830	6,348
Provisions made during the year	228	2,777	351	-	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	4,795	304	227	5,441
Represented by:					
Current liabilities	115	4,795	269	227	5,406
Non-current liabilities	-	-	35	-	35
Total provisions	115	4,795	304	227	5,441
2018					
Balance at beginning of year	165	4,700	272	-	5,137
Provisions made during the year	1,563	5,898	333	830	8,624
Provisions used during the year	(1,048)	(5,840)	(206)	-	(7,094)
Provisions reversed during the year	(103)	(80)	(136)	-	(319)
Balance at end of year	577	4,678	263	830	6,348
Represented by:					
Current liabilities	577	4,678	229	830	6,314
Non-current liabilities	-	-	34	-	34
Total provisions	577	4,678	263	830	6,348

Onerous contracts

A provision for an onerous contract is recognised where the economic benefits expected to be derived from a contract are less than the unavoidable costs of meeting the Group's obligation under the contract. Present obligations arising under onerous contracts are recognised as a provision to the extent that the present obligation exceeds the economic benefits estimated to be received.

The amount provided in 2019 as an onerous contract relates to costs expected to be incurred in remediating asbestos contamination at its Grasslands campus.

Restructuring provision

The restructuring provision represents the direct costs of restructuring which is 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 partnership programme

Liability valuation

An independent actuarial valuer (AON New Zealand) has calculated the Group's liability as at 30 June 2018, as a result of this, the valuer attested satisfaction as to the nature, sufficiency and accuracy of the data. The data at 30 June 2018 has been used to determine the outstanding liability as at 30 June 2019.

For the claim year ended 2019 the Group has chosen a stop loss limit of 175% of risk which means that the Group will only carry the total cost of claims up to a limit of \$159k. Pre-valuation date claim inflation has been taken as 50% of movements in the Consumer Price Index (CPI) and 50% of the movements in the Average Weekly Earnings (AWE) Index. Post-valuation date claim inflation rates are Treasury-issued future rates as at 31 January 2019. The discount rates are Treasury-issued risk-free future rates as at 31 January 2019.

The movement in the value of the liability is not material for the Group's Financial Statements. Therefore, any changes in assumptions will not have a material impact on the Financial Statements.

The Group is not exposed to any significant concentrations of insurance risk as work-related injuries are generally the result of an isolated event to an individual employee.

Objectives for managing risks

The Group manages its exposure arising from the programme by promoting a safe and healthy working environment by:

- Implementing and monitoring health and safety policies;
- Induction training on health and safety;
- Actively managing workplace injuries to ensure employees return to work as soon as practical;
- Recording and monitoring workplace injuries and near misses to identify risk areas and implementing mitigating actions; and
- Identifying workplace hazards and implementation of appropriate safety procedures.

16 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. The amount payable is based upon revenue receivable in the year ending June 2020.

in thousands of New Zealand dollars	2019	2018
Key money received in advance	626	685
Key money referable to lease in current period	(60)	(59)
	566	626
Deferred Share acquisition costs	200	200
	766	826

17 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
		2019	2018	
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.

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

in thousands of New Zealand dollars	2019	2018
Surplus after tax	(7,008)	(1,005)
Non-cash items		
Depreciation	9,571	9,301
Intangible assets amortisation and impairment	620	348
Share of deficit of associates	1,286	719
Change in fair value of forestry	(192)	(238)
Change in fair value of livestock	(1,729)	(398)
Asset impairment/write down	(8)	7
Investment impairment/write-down	8,837	(269)
Net (gain)/loss from foreign currency exchange	(83)	23
Change in fair value of derivative financial instruments	829	(126)
Other non-cash items	(972)	(332)
Movements in working capital		
Change in current taxation	1,395	(2,138)
Increase/(decrease) in deferred taxation	463	4,665
(Increase)/decrease in inventory	32	114
(Increase)/decrease in livestock	2,151	274
(Increase)/decrease in receivables	1,785	(3,948)
(Increase)/decrease in prepayments	46	95
(Increase)/decrease in property held for sale	763	(718)
Increase/(decrease) in provisions	(908)	1,211
Increase/(decrease) in payables	2,237	9,619
Items classified as investing activities		
Net (gain)/loss on sale of property, plant and equipment	(2,429)	(93)
Increase/(decrease) in property, plant & equipment, intangible assets & investment accruals	(2,544)	(6,541)
Net (gain)/loss on sale of investments and intangible assets	-	-
Net cash flow from operating activities	14,142	10,570

19 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. The nature of this heritage asset, and its significance to the science the Group undertakes, make it necessary to disclose it. The Directors believe there is no practical basis upon which to reliably measure the 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

20 Operating lease arrangements

in thousands of New Zealand dollars	2019	2018
Non-cancellable operating lease payables		
Payable no later than 1 year	2,751	3,001
Payable later than 1 year and not longer than 5 years	3,819	5,649
Payable later than 5 years	960	1,573
Total non-cancellable operating leases	7,530	10,223

All significant operating lease commitments relate to land and buildings.

20 Operating lease arrangements (continued)

The land lease with Tainui Group Holdings Limited is in perpetuity but with rights of renewal that are executable by AgResearch Limited. The lease has a restriction in respect of the right to occupy in perpetuity, which only continues if AgResearch Limited is using the land primarily for agricultural purposes and/or research and development purposes.

Building leases are for at least 10 years or have rights of renewal that are, in aggregate, for at least that period. All leases have normal provisions for periodic rent reviews to market rates.

Refer to note 2 where the operating lease expense for the year is disclosed.

in thousands of New Zealand dollars	2019	2018
Non-cancellable operating lease receivables		
Receivable no later than 1 year	3,200	2,556
Receivable later than 1 year and not longer than 5 years	4,504	5,741
Receivable later than 5 years	414	1,989
Total non-cancellable operating leases	8,118	10,286

Operating lease receivables relate to land and buildings owned and leased 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. With one exception, operating leases have normal provisions for periodic rent reviews to market rates. No lessees have an option to purchase the property at the expiry of the lease period.

21 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
		2019	2018	
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.

22 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

in thousands of New Zealand dollars	2019	2018	2019	2018
	Sale of services		Due from	
Research, development and other services				
<i>Transactions between AgResearch and related parties:</i>				
Subsidiaries	3,877	4,016	1,061	1,950
Associates and joint ventures	9,176	8,310	1,346	951
Joint operations	393	346	108	100
<i>Transactions between the Group and related parties:</i>				
Entities of which key management personnel are associated *	5,445	6,536	1,584	2,827

22 Transactions with related parties (continued)

in thousands of New Zealand dollars	Purchase of services		Due to	
	2019	2018	2019	2018
Research, development and other services				
<i>Transactions between AgResearch and related parties:</i>				
Subsidiaries	574	176	53	25
Associates and joint ventures	4,213	3,296	5	-
<i>Transactions between the Group and related parties:</i>				
Entities of which key management personnel are associated *	5,442	6,300	128	172

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.

During the year AgResearch Limited made interest payments of \$122k (2018: \$109k) to its subsidiaries on intercompany current accounts. The weighted average interest rate was 3.18% (2018: 3.39%).

No transactions with other New Zealand Government-owned entities are considered related party transactions in terms of NZ IAS 24.

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

in thousands of New Zealand dollars	Sale of services		Purchase of services		Due from (due to)	
	2019	2018	2019	2018	2019	2018
ANZCO Foods Limited**	-	36	-	-	-	-
Biopolymer Network Limited	264	-	-	-	44	-
Blinc Innovation Limited	134	413	216	203	(5)	154
Deer Industry New Zealand**	-	2	-	-	-	-
Enviro-Mark Solutions Limited	-	-	19	-	-	-
Farmax Ltd	11	7	88	37	(8)	12
Grasslands Innovation Limited	393	-	-	-	108	-
Grasslanz Technology Ltd	3,866	4,009	133	138	1,016	1,914
Landcare Research New Zealand Ltd	777	-	1,740	1,538	305	32
Lincoln University	-	119	-	2,247	-	-
LUAGRJF Limited Partnership***	-	89	3,040	2,135	-	88
Macfarlane Rural Business Limited**	-	-	-	2	-	-
Museum of New Zealand	-	-	108	-	-	-
NZ Post	-	-	98	-	(4)	-
TB Free New Zealand Limited**	-	1,861	-	-	-	455
Total	5,445	6,536	5,442	6,300	1,456	2,655

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

*** Transactions in prior year classed as Lincoln University now classed as LUAGRJF

Equity interest in related parties

Details of the percentage of interests held in related parties are disclosed in notes 4 and 17 to the Financial Statements.

Key management personnel compensation

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

in thousands of New Zealand dollars	2019	2018
Salaries and other short-term employee benefits	3,082	2,581

23 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 from 2018.

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 \$172k (2018: \$219k). It is estimated that a 10% increase in the New Zealand dollar would reduce profit and equity by \$141k (2018: \$179k).

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. Generally, the Group generates sufficient cash flows from its operating activities to make timely payments. It does, however, maintain an overdraft facility of \$1m to cover any shortfalls. As at 30 June 2019, there were no funds drawn against the facility (2018: \$Nil).

23 Financial instruments (continued)

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; and
- Through regular oversight by the Audit & Risk Committee.

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
2019				
Trade and other payables	-	25,239	-	25,239
Derivative financial instruments	-	-	-	-
Finance leases liability	-	-	-	-
	-	25,239	-	25,239
2018				
Trade and other payables	-	25,836	-	25,836
Derivative financial instruments	-	-	-	-
Finance leases liability	-	-	-	-
	-	25,836	-	25,836

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
2019						
Financial assets						
Cash and cash equivalents		48,186	-	-	48,186	48,186
Trade and other receivables	8	31,798	-	-	31,798	31,798
Other non current receivables	13	-	-	-	-	-
Derivative financial instruments		-	5	-	5	5
Non-listed equity investments *	12	-	1,807	-	1,807	1,807
Listed equity investments *	12	-	434	-	434	434
		79,984	2,246	-	82,230	82,230
Financial liabilities						
Trade and other payables	9	-	-	25,239	25,239	25,239
Derivative financial instruments		-	-	-	-	-
		-	-	25,239	25,239	25,239
2018						
Financial assets						
Cash and cash equivalents		46,316	-	-	46,316	46,316
Trade and other receivables	8	33,613	-	-	33,613	33,613
Other non current receivables	13	4,536	-	-	4,536	4,536
Derivative financial instruments		-	58	-	58	58
Non-listed equity investments *	12	-	2,742	-	2,742	2,742
Listed equity investments *	12	-	925	-	925	925
		84,465	3,725	-	88,190	88,190

23 Financial instruments (continued)

* Equity investments consist of Fonterra shares \$1,776k (2018: \$2,717), BioPacific Ventures Fund \$10k (2018: \$10k) and other investments of \$475k (2018: \$939k) as per note 12. The level classification determined is based on the fair value within these investments.

Group overdraft facilities in place from Westpac

in thousands of New Zealand dollars		Interest Rate
AgResearch Ltd	1,000	5.85%
Farmax Ltd	200	7.85%

Westpac also provides a business card facility to the group totalling \$836k and a payroll letter of credit facility totalling \$250k.

24 Contingencies and commitments

in thousands of New Zealand dollars	2019	2018
Capital commitments		
Asset purchases committed to and contracted for at balance date	13,070	26,893
Funding commitments to research consortiums	2,425	1,050
Lincoln University AgResearch Joint Facility	-	4,710
Total capital commitments	15,495	32,653

Other commitments

Glasshouse due for completion by 18 August 2019, current approved budget of \$7.95m.

JFSF construction commenced 28 February 2018 and is due for completion in March 2020, current approved budget \$45.35m.

LUAGRJF is no longer going ahead; work has begun on a new Lincoln AgResearch Precinct, which is in the early design phase and has current contract commitments of \$271k.

AgResearch has committed to investing a further \$595k (US\$400k) in Zealal via Phytagro New Zealand.

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, which has been accepted by the insurer. The quantum of the claim is still to be determined.

25 Capital management

The Group's capital is its equity, which is made up of:

- Share capital;
- Asset revaluation reserve;
- Available-for-sale asset revaluation reserve; and
- 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 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.

26 Significant events after balance date

There are no significant events post balance date.

Auditor's report



INDEPENDENT AUDITOR'S REPORT

TO THE READERS OF AGRESEARCH LIMITED AND GROUP'S FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2019

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 77 to 109, that comprise the consolidated statement of financial position as at 30 June 2019, 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 2019; 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 2019. This is the date at which our opinion is expressed.

The basis for our opinion is explained below. 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.

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.

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.

Auditor's report

Deloitte.

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.
- 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 76, 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 (Revised): *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



Directory

Tohutohu

Executive Leadership Team

Dr Tom Richardson
Chief Executive

Dr Trevor Stuthridge
Research Director
(Joined May 2019)

Natasha Barnett
Health, Safety and
Environment Director

Jo Brady
Communications and
Marketing Director
(Joined May 2019)

Lee Gardiner
People and Culture Director

Stuart Hall
Partnerships and
Programmes Director

Tony Hickmott
Finance and Business
Performance Director

Chris Koroheke
Kaiurungi Ahuwhenua Māori

John O'Dea
Infrastructure Director
(Joined September 2018)

Greg Rossiter
Technology and Digital
Services Director
(Joined January 2019)

Greg Murison
Research Director
(Until February 2019)

Monique Devereux
Communications and
Marketing Director
(Until December 2018)

Board of Directors

Dr Paul Reynolds QSO
Chair
(Appointed Chair
2 September 2019)

Kim Wallace
Chair – Audit and Risk

Colin Armer
Director

Jackie Lloyd
Director

Rukumoana Schaafhausen
Director
(Appointed 1 July 2018)

Dr Peter Stone
Director
(Until 30 September 2019)

Information

Auditors
Deloitte on behalf of the
Auditor-General

Bankers
Westpac Banking Corporation
ANZ Limited

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



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