



Plant & Food
Research[®]
Rangahau Ahumāra Kai

A smart
green
future.
Together.

Annual Report 2023

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Annual Report**

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**This annual report presents operating results
for The New Zealand Institute for Plant and
Food Research Limited (Plant & Food Research)
for the financial year ending 30 June 2023.**

It meets our reporting requirements for
the Acts of Parliament under which we are
governed. Unless otherwise stated,
all figures are in New Zealand dollars (\$).

This report also demonstrates how we are
supporting our Core Purpose industries in
meeting their targets for economic and
environmental sustainability. It provides
easy-to-read information outlining our
performance and strategy against our
Statement of Corporate Intent 2022/23,
as well as case studies that demonstrate a
cross-section of our research and outreach
activities. This information is presented for
the interest of our key stakeholders, including
shareholders, staff, commercial partners,
customers and research collaborators.



Cover photo

We have a team of 1,000 people, including
Mathew Cumming, undertaking research and
using new technologies to create a smart
green future for Aotearoa New Zealand.



plantandfood.co.nz

More information can be found on our website
and our social media channels.

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Our Core Purpose

To enhance the value and productivity of New Zealand's horticultural, arable, seafood and food and beverage industries to contribute to economic growth and the environmental and social prosperity of New Zealand



About us

At Plant & Food Research, we believe science can create a better future. By finding smarter, greener options today, we're helping secure the world we want to live in tomorrow. With our partners, we use world-leading science to improve the way they grow, fish, harvest and share food. Every day, we have 1,000 people working across Aotearoa New Zealand and the world to help deliver healthy food from the world's most sustainable systems.

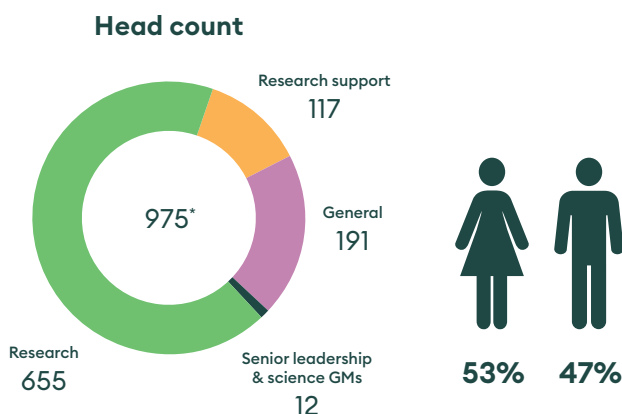
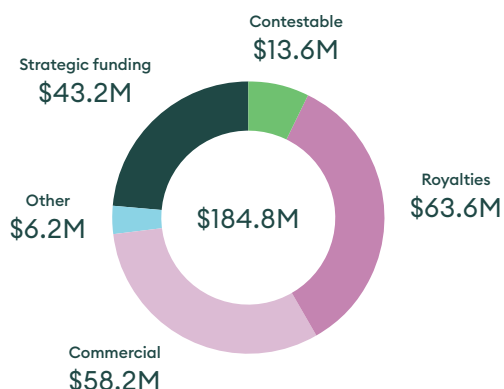
The Institute brings together more than 90 years of research supporting the primary industries.

- 1926** The Department of Scientific and Industrial Research (DSIR) formed
- 1928** DSIR joined with the Department of Agriculture in establishing a Plant Research Station
- 1936** Plant Research Station transferred entirely to the DSIR. The DSIR began doing its own research rather than coordinating those of other institutions
- 1980** The Fish Research Unit established at DSIR
- 1987** Ministry of Agriculture and Forestry (MAF) Technology division formed
- 1992** Ten Crown Research Institutes (CRIs) established out of former government departments, including DSIR and MAF Technology
- 2008** Plant & Food Research formed following the merger of former CRIs HortResearch and Crop & Food Research

Our Mission — to create the world's most sustainable food systems

Our activities are funded through direct commercial research for our customers, the reinvestment of royalties and the New Zealand Government's investment in science.

We have more than 900 staff based at 14 sites across New Zealand, as well as offices in Australia and the USA.

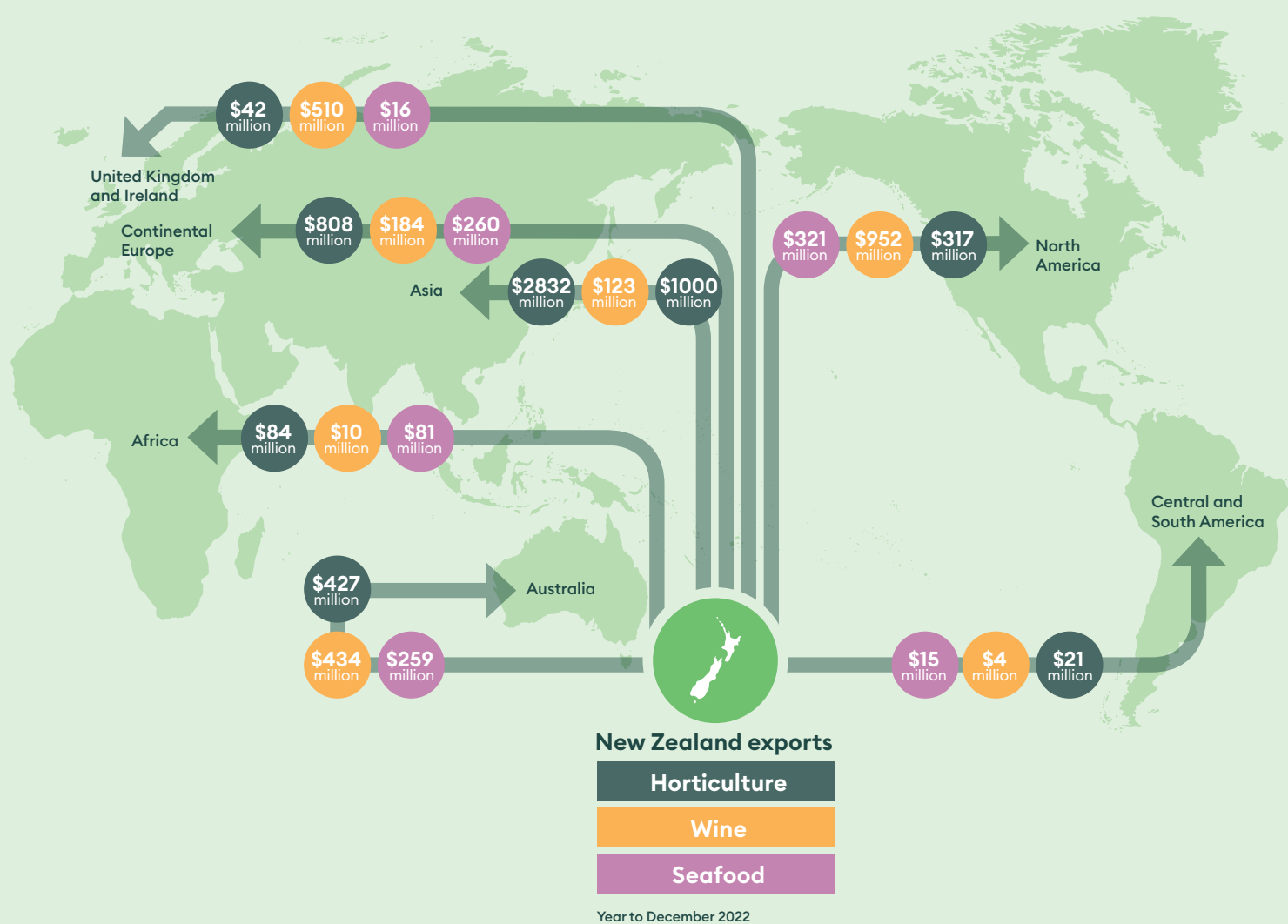


Strategic funding – Government investment allocated directly to each CRI
 Contestable – Government investment allocated through competitive bidding
 Royalties – Commercial return from plant varieties and IP
 Commercial – Direct investment by customers
 Other – All other income sources

*Parent and 100% owned subsidiaries.

Our science plays a vital role in the success of our sectors

	Horticulture	Wine	Seafood	Total food & beverage
2022 Export market value (\$NZB)	4.6	2.2	2.0	46.5



Statistics source: Ministry for Primary Industries

Our locations



New Zealand



Australia



USA

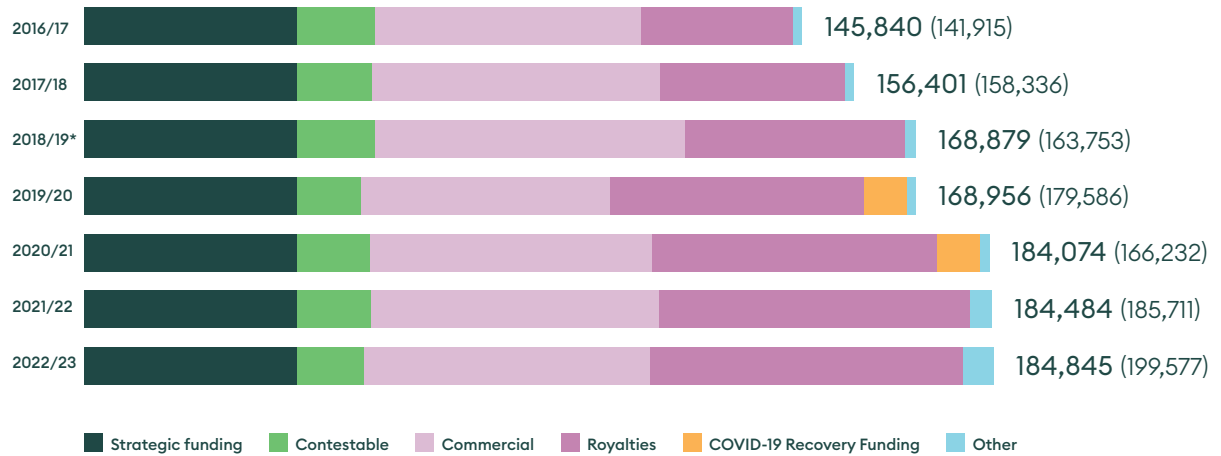
Key



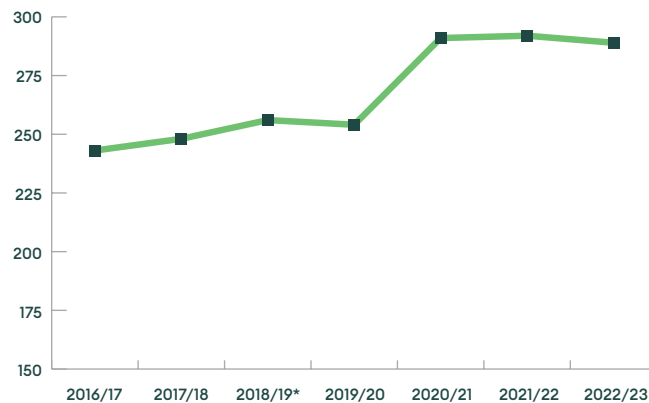
1/ Kerikeri				2/ Auckland				3/ Pukekohe				4/ Ruakura					
SITE AREA (ha)		Total	Research farm	SITE AREA (ha)		Total	Research farm	SITE AREA (ha)		Total	Research farm	SITE AREA (ha)		Total	Research farm		
		52	46			7	-			3	2			6	1		
RESEARCH PLANTINGS		  		RESEARCH PLANTINGS				RESEARCH PLANTINGS		  		RESEARCH PLANTINGS					
STAFF	Research	General	Total	STAFF	Research	General	Total	STAFF	Research	General	Total	STAFF	Research	General	Total		
	5	8	13		172	154	326		2	-	2		58	13	71		
5/ Te Puke				6/ Hawke's Bay				7/ Palmerston North				8/ Wellington					
SITE AREA (ha)		Total	Research farm	SITE AREA (ha)		Total	Research farm	SITE AREA (ha)		Total	Research farm	Co-located at Science New Zealand					
		46	37			48	44			9	6						
RESEARCH PLANTINGS		 		RESEARCH PLANTINGS		    		RESEARCH PLANTINGS									
STAFF	Research	General	Total	STAFF	Research	General	Total	STAFF	Research	General	Total	STAFF	Research	General	Total		
	28	14	42		57	25	82		93	25	118		1	2	3		
9/ Motueka				10/ Nelson				11/ Blenheim				12/ Lincoln					
SITE AREA (ha)		Total	Research farm	SITE AREA (ha)		Total	Research farm	Co-located at Marlborough Research Centre. Includes 10ha of research farm		SITE AREA (ha)		Total	Research farm	SITE AREA (ha)		Total	Research farm
		55	52			1	-					186	176				
RESEARCH PLANTINGS		   		FINFISH FACILITY 590,600L				RESEARCH PLANTINGS				RESEARCH PLANTINGS		   			
STAFF	Research	General	Total	STAFF	Research	General	Total	STAFF	Research	General	Total	STAFF	Research	General	Total		
	31	10	41		49	11	60		11	2	13		133	50	183		
13/ Clyde				14/ Dunedin				15/ 16/ Australia				17/ USA					
SITE AREA (ha)		Total	Research farm	Co-located at University of Otago				15. South Australia 16. Queensland				17. Oregon					
		58	57														
RESEARCH PLANTINGS		  															
STAFF	Research	General	Total	STAFF	Research	General	Total	STAFF	Research	General	Total	STAFF	Research	General	Total		
	6	4	10		4	-	4		4	-	4		-	2	2		

Our performance

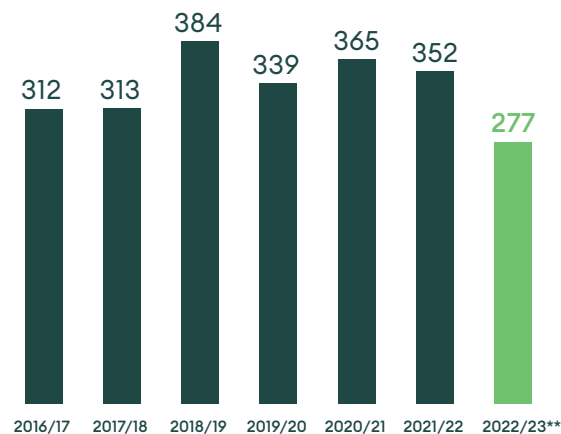
Revenue (\$000) Budgeted figure in brackets



Annual revenue / science FTE (\$000)



Peer-reviewed publications



* Revenue as reported in the 2018/19 financial year reflects the impact of adoption of New Zealand Equivalents to International Financial Reporting Standards 15 (NZ IFRS 15).

** Below target, see page 63.

Highlights



Research to develop a uniquely Aotearoa wellbeing diet

Joined with LeaderBrand Produce and Countdown on a transformative project to investigate the impacts of regenerative practices on vegetable farming. The three-year project will trial regenerative practices, evaluating the environmental, economic, and social impacts, and deliver a framework for how growers can produce food sustainably, now and for future generations.

Received \$3 million in funding from the MBIE Endeavour Fund for three Smart Ideas projects focused on improving fruit production through better flowering and pollination. Our scientists will also collaborate on new Endeavour projects led by the University of Canterbury, Cawthron Institute and Nga Uri O Te Ngahere Trust.
[For more go to page 46](#)

Established, with Moana New Zealand, Sanford and Sealord Group, the joint venture Precision Seafood Harvesting Limited to drive further development and commercialisation of the Modular Harvesting System (MHS). Around \$9.5 million will be spent on the next phase of development of this sustainable fishing technology, with just over 50 percent coming from Precision Seafood Harvesting and the remainder from MPI.
[For more go to page 28](#)

Celebrated the launch of Tutti™, the world's first apple variety bred specifically for production in hot climates. Tutti™ is the first apple brand to be released commercially by the Hot Climate Partnership, our collaboration with the Spanish institute IRTA, Catalanian producer association Fruit Futur, and VentureFruit®, who are responsible for the commercialisation and licensing of new varieties from the Partnership.

Joined a team of researchers developing a uniquely Aotearoa New Zealand wellbeing diet, He Rourou Whai Painga, to tackle diabetes, heart, and other non-communicable diseases. Part of the High-Value Nutrition National Science (HVN) Challenge, the \$4 million project explores the impact of a high-quality, locally sourced diet on health and wellbeing.

Released three new dragon fruit varieties with excellent grower and consumer characteristics from our joint breeding programme with the Southern Horticultural Research Institute (SOFRI) in Viet Nam. VentureFruit®, T&G Global's IP management and commercialisation company, has joined the collaboration with exclusive global commercialisation rights to the first three varieties from the programme.
[For more go to page 29](#)

Celebrated the release of Superdelic™, a brand-new hop cultivar from our hop breeding partnership with NZ Hops Ltd. Its excellent yield potential will allow growers to produce high-quality hops more efficiently and sustainably. Commercialisation of a new variety is a vital part of NZ Hops' commitment to innovation as the leader in this country's hop industry. Over 85% of New Zealand-grown hops are exported, with a turnover of around \$40 million.
[For more go to page 55](#)



Established the Precision Seafood Harvesting joint venture

Joined, with representatives from a range of New Zealand businesses, the Prime Minister's trade delegation to Viet Nam. This included a showcase of our international development work at AgriConnectionNZ in Hanoi – an event designed to highlight and promote the Viet Nam–New Zealand partnership in agribusiness.

Launched the fourth of our Ngā Pou Rangahau Growing Futures™ Directions, Authentic Taonga Foods. This Direction will develop the science manaakitanga and research required to develop novel foods and bio-based products from indigenous biota through a partnered design approach with Māori.

[For more go to page 61](#)

Launched EarlyBell™, a new raspberry variety from Pacific Berries, our joint breeding programme with Northwest Plant Company in Washington, USA. EarlyBell™ has good winter hardiness, the fruit matures early in the season and has great machine harvestability. EarlyBell™ will help growers in the Pacific Northwest supply fruit for longer and manage harvests more efficiently.

Provided research expertise for a project funded by the HVN National Science Challenge, examining the uniqueness and nutritional value of Aotearoa New Zealand-grown macadamias. The analysis of six varieties of Torere Macadamias nuts will provide knowledge to develop and validate innovative high-value products for future local and export markets.

[For more go to page 39](#)

Joined Moananui, a new partnership based in Nelson focused on accelerating the growth of the blue economy, as a founding partner. The new collaboration between organisations received \$500,000 from the Ministry for Primary Industries (MPI) Sustainable Food and Fibre Futures fund for projects focused on transforming Aotearoa New Zealand into a world leader in oceans development.

Deployed a first-generation static imaging rig on our Hawke's Bay research orchard. The rig is designed to capture full three-dimensional scans of a growing tree as the first step in building an orchard digital twin.



New research to future-proof New Zealand's wine sector

Announced the development of a new \$3.3 million Experimental Future Vineyard facility at the recently launched New Zealand Wine Centre — Te Pokapū Wāina o Aotearoa, which will support industry-wide winegrape research programmes. We will develop research programmes in collaboration with the Marlborough Research Centre, national and local government, and the New Zealand wine industry, while providing student opportunities through the Nelson Marlborough Institute of Technology Te Pūkenga.

Partnered with Clayton Hops to trial and evaluate a suite of hop varieties from our hop breeding programme. The hop selections were chosen for their unique flavour and aroma characteristics and will offer Clayton Hops customers exclusive access to an enhanced portfolio of hop products designed with brewers in mind.

Partnered with AgFirst to deliver research showing almonds could be a viable new crop for the Hawke's Bay region, particularly in the Heretaunga Plains and the Poverty Bay area. Funded primarily by the MPI's Sustainable Food and Fibre Futures fund, the research included economic analysis, land use and climate suitability modelling, and consumer research.

Celebrated T&G Global's release of Joli™, a new full-flavoured bright red juicy premium apple. Using natural breeding techniques, we cultivated the plant material to develop its unique traits. We worked with Prevar and the VentureFruit® team to conduct extensive growing trials to ensure the tree grows well in different environments, copes with various climatic conditions, and produces great tasting fruit that stores well.



Celebrated release of new premium apple

Celebrating our people



Royal Society Te Apārangi Companion



ISHS Fellowship

John Palmer (above), Honorary Fellow from the Fruit Crops Physiology team in Motueka, was recognised by the International Society for Horticultural Science (ISHS) with the ISHS Fellow Award. The ISHS Fellow Award is presented to a person who is a member of ISHS, in recognition of those who've made outstanding contributions to horticultural science worldwide. John was one of only four people awarded the honour in 2022, joining a group of 34 Fellows worldwide.

Bruce Campbell, former Chief Operating Officer, was recognised in the 2023 New Year Honours and made a Companion of the New Zealand Order of Merit in acknowledgement of his 38-year career working in a range of organisations to connect science with horticultural and agricultural industries in order to grow New Zealand food productivity and export earnings.

Jill Stanley (left) was elected a Companion of the Royal Society Te Apārangi. Jill's experience includes leading the summerfruit aspects of Future Orchard Planting Systems, a transformational programme that can double tree productivity and improve orchard efficiency. She was also a key researcher in the development of three exciting new apricot cultivars that were recently released.

Howard Wearing, Honorary Fellow, was awarded an Officer of the New Zealand Order of Merit in the 2023 King's Birthday Honours for his services to entomology and the fruit and orchard industries. The research programmes he led over 30 years played a key role in the implementation of best-practice modern apple production in New Zealand, supporting growers to minimise damage to fruit while maintaining high yields.

Reuben Panting, a student at Plant & Food Research, was the inaugural recipient of a new T&G student grant. Reuben is in his first year studying for a Master of Science through the University of Auckland, with a focus on plant and microbial biotechnology.



Royal Society Te Apārangi Fellow

Andrew Allan (above) was elected as a Fellow to the Academy of the Royal Society Te Apārangi in recognition of more than 30 years researching plant genetics. His research looks at the genetic controls of key plant characteristics, such as fruit colour and flowering, and how this knowledge can be applied to breeding new cultivars for the horticultural sector.



Sue Muggleston (above), IP manager, has received an inaugural University of Auckland Business School Supporters Award in recognition of a consistent decade and a half's involvement with three Business Master's programmes – Masters of Bioscience Enterprise (MBE), Masters of Commercialisation & Entrepreneurship (MCE) and Masters of Business Development (MBusDev) – and the quality of her support and guidance for the students.

Steve Green (below) received the 2022 Kiwifruit Innovation Award for his work to understand the impact the kiwifruit industry is having on our land and water resources. Recognising the importance of our water resources, Dr Green has led the design and development of tailored scientific tools for measuring the flow of nutrients and water in orchards.



Internal awards

Chair Awards

Chair Awards recognising outstanding contributions to Plant & Food Research were awarded to:

Daryl Rowan and Tony McGhie for their dedication over four decades leading chemistry research programmes and advancing knowledge in the area of metabolite chemistry.

Petra Malkova for stepping up to cover additional responsibilities at the Clyde research orchard to support successful science delivery, and implementing new management practices and systems to enhance science output.

The SLMACC team – Brendon Malcolm, Shane Maley, Steve Dellow, Mike George, Steve Green, Wei Hu, Alex Michel, Edmar Teixeira, Edith Khaembah, Stewart Armstrong and Sarah Eady – for working collaboratively with farmers, industry groups, rural professionals, regional councils and other researchers to develop and demonstrate novel management practices that reduce environment risks associated with winter grazing of forage crops.

Steve Green, Erin Lawrence-Smith, Nathan Arnold, Mike Cummins, Patrick Snelgar, Juanita Dunn and Matt Norris for exceptional leadership and delivery of critical environmental research for the kiwifruit industry.

Science New Zealand Awards

Daryl Rowan (below) received the Lifetime Achievement Award. An accomplished organic chemist, Daryl is a former Principal Scientist and Science Group Leader and is now an Honorary Fellow of the Biological Chemistry & Bioactives Group. He has over 40 years research experience and has played a pivotal role in developing metabolomics capabilities within Plant & Food Research.



The multi-disciplinary Filling the Void project received the Team Award for their work in laying the foundation for a new breeding programme for Aotearoa, New Zealand. Their goal was to develop a novel berry that would combine the commercial benefits of blueberries with the colour-filled flesh of bilberries.

[For more go to page 49](#)

Rebecca Bloomer received the Early Career Researcher Award. She leads Plant & Food Research's medicinal cannabis breeding and germplasm research. She also provides expert knowledge to identify the role of epigenetics in delivering resilient Plant & Food Research potato varieties, and is making a significant contribution to the 'The Flowering Crisis: Confronting a changing climate's threat to New Zealand's tree crops' project.

Our researchers, like Jasmine Divinagracia (left) and Azadeh Esfandiari (right), support New Zealand's food sector through the delivery of science across a range of areas, including fundamental plant science.





Our Strategy



Up to the
challenge

Report from the Chair



The world is still feeling the effects of the COVID-19 pandemic and the ongoing conflict in the Ukraine, particularly with disruptions in supply chains. Alongside this, the global recession is putting increasing pressure on both businesses and individuals as the costs of goods and services increase. Extreme weather events are becoming more frequent as climate change progresses, with heatwaves across Europe, North America and China during the summer of 2023.

Aotearoa New Zealand's food sector has been strongly affected by these global issues. Being situated so far from markets means the costs of transportation of our exports has always been high, as are our labour costs. To compensate for our high prices, we have built a reputation based on high quality produce. However, the reduced labour force due to COVID-19 restrictions combined with the extreme rain events of 2023 have resulted in reduced production and lower quality than anticipated. Sustainability of our horticultural sector – both financial and in resilience to the changing climate – is more important than ever in ensuring the world's food supply.

Changes to the research system identified during the Te Ara Paerangi Future Pathways review come at a critical time. It is vital that our science sector is fit-for-purpose and can confidently and expertly address the needs of Aotearoa's future. Identifying and establishing National Research Priorities will bring the innovation sector together with a renewed focus on the areas that will make the most difference to our nation's social, environmental and economic sustainability.

Financial sustainability of Plant & Food Research

The pressures felt by the food sector are reflected in Plant & Food Research's financial situation. We're seeing this impact not only on the investment available for research but also in the royalty income that has recently made up around a third of the organisation's revenue. Royalty calculations are based on ongoing discussion



and predictions made by partners, but unanticipated events, such as Cyclone Gabrielle, that negatively affect the sector also negatively affect Plant & Food Research.

In the short term, this has meant a metaphorical 'tightening of the belt' by the organisation, and the Senior Leadership Team and Plant & Food Research staff have done an admirable job of continuing to deliver their activities while under budgetary constraints. For the immediate future, the organisation will remain fiscally prudent. The Senior Leadership Team and Board will continue to prioritise activities, particularly in the capital works programme, to ensure the staff have access to the right facilities and equipment to do their mahi and support the food sector's ambitions despite these constraints.

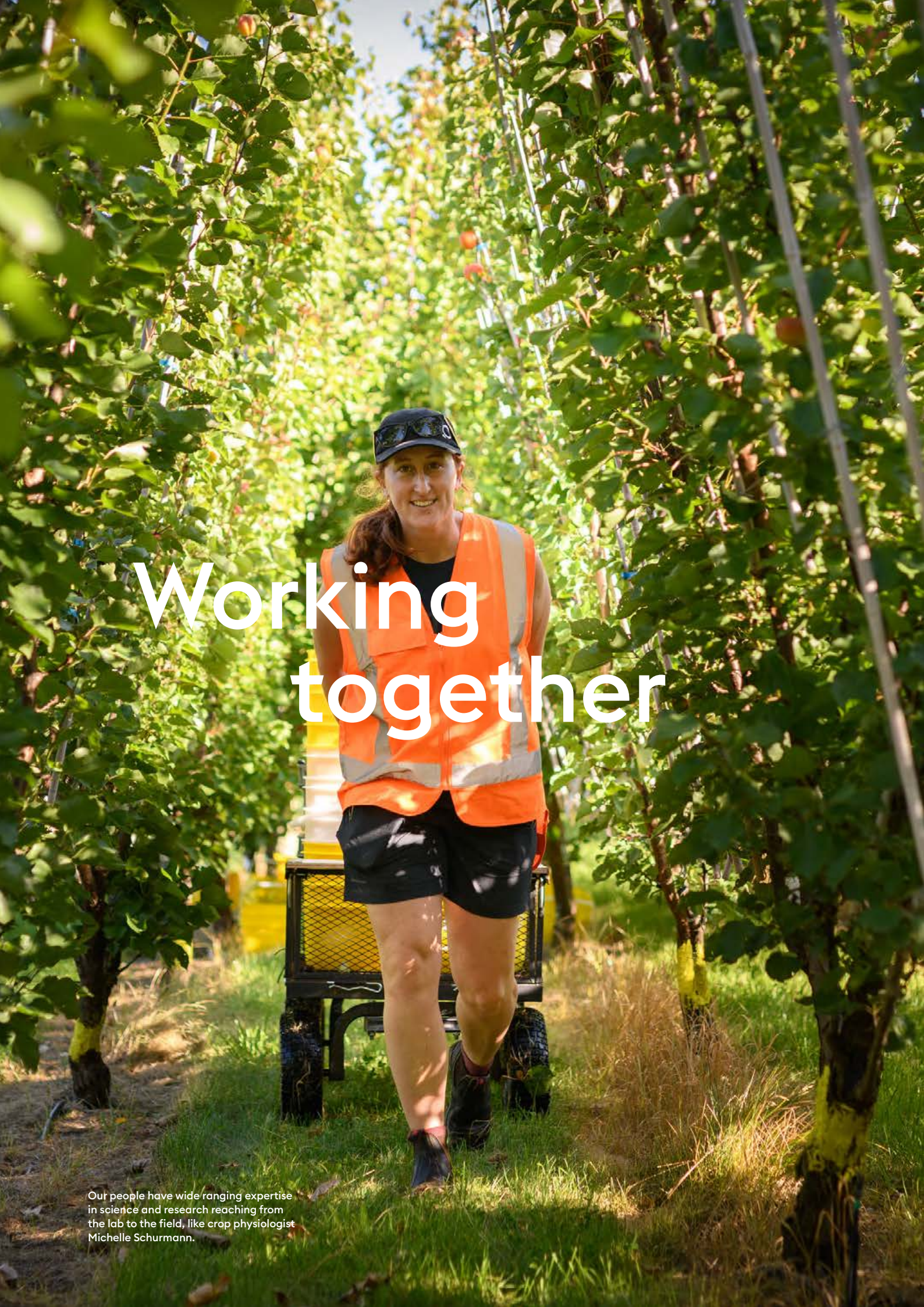
A new CEO

On behalf of the Board, and the wider Plant & Food Research community, I would like to thank David Hughes for the past 15 years, the last five years as CEO. Under your leadership we have transitioned to a more commercially savvy organisation with a greater appreciation of the potential of our research outside the immediate needs of our partners and customers. I'd also like to thank Parmjot Bains for her five-year term as a Director of Plant & Food Research. It has been a great pleasure working alongside both of you during my time as Chair.

I would also like to welcome Mark Piper as CEO. The Board is excited to see how Mark's vision will influence the Plant & Food Research strategy to meet the needs of the future, particularly with Te Ara Paerangi Future Pathways and National Research Priorities influencing the organisation's direction.

Despite the current challenges it faces, I know Plant & Food Research is well positioned to progress and will continue to deliver excellent science that ensures sustainability of the food sector into the future.

Nicola Shadbolt
CHAIR

A woman with reddish-brown hair, wearing a black cap with sunglasses, an orange safety vest over a black shirt, and black shorts, is walking towards the camera in a field of tall, green crop plants. She is smiling. Behind her is a small, black utility vehicle with a yellow mesh basket. The field is filled with rows of tall, green plants, possibly corn or sorghum, with some ripe, reddish-brown heads visible. The ground is covered in green grass and some dry, yellowed grass. The lighting is bright, suggesting a sunny day.

Working together

Our people have wide ranging expertise in science and research reaching from the lab to the field, like crop physiologist Michelle Schurmann.

CEO's review

“

When I started as CEO in May, I knew Plant & Food Research was making a difference. It is only as I have learnt more about the organisation that I've fully been able to appreciate the breadth and depth of research activities underway. I am constantly impressed with the people – whilst I was aware there were many subject matter experts here, I did not fully appreciate how many weren't just leaders in their fields in Aotearoa New Zealand, but also world leaders. They are also amazing people who pull together as a highly effective community when needed.

For many, the past year has been challenging. The extreme weather events we've seen in Aotearoa have had major impacts on people, on communities and on the sectors Plant & Food Research supports. I'm proud to be part of an organisation that has stepped up in the wake of these disasters. The people of Plant & Food Research have not only found ways to help each other, but have also looked for new ways to employ their scientific expertise to minimise the impact of the weather on growers and on the horticultural sector as a whole. As the climate changes, we are likely to see more weather extremes, and our dedicated teams are working to learn as much as they can so we can ensure the long-term future for Aotearoa New Zealand.



The close relationships held with our sectors become apparent during times of crisis. It is only through these deep, collaborative partnerships that Plant & Food Research can swiftly act and divert its efforts to support our partners. In addition to weather-related losses, our sectors are still experiencing the impact of COVID-19, with labour shortages during peak times resulting in reduced quality, most noticeably in Aotearoa's kiwifruit sector. These impacts felt by our partners flow on to Plant & Food Research, affecting our royalties and our bottom line. Our staff have made great efforts to reduce expenditure whilst still delivering their research and I, and my Senior Leadership Team, thank them for their endeavours.

The next year is still likely to hold some challenges. We are not yet sure of the long-term impacts of Cyclone Gabrielle on the pipfruit sector. Global inflation is creating additional costs for our sectors and labour shortages are likely to continue to present challenges. On an organisational front, we are working alongside MBIE and are looking forward to the first initiatives from their Te Ara Paerangi Future Pathways review, which will be rolled out over the next 12 months.

It is only by working together and finding new ways to create the smart green future we all envisage that we can support the long-term resilience of Plant & Food Research, of our sectors and of Aotearoa New Zealand. I am excited by the potential within the organisation and the difference we have made and can continue to make.

Mark Piper
CEO

Our Strategy

We believe our science can make the world a better place. That by working together, we can create a smart green future for Aotearoa New Zealand and the world.

We invest in our people, our facilities, our information systems and in future science. We believe that these are vital parts of creating an organisation that delivers world-class science.

We know our science can only make a difference if it is applied outside the lab. We build relationships with customers and partners, including with Māori organisations, to find the best ways for our science to help their businesses grow.

We then share our knowledge and skills, so that our customers, our partners and Plant & Food Research itself receive fair value from the results of our science. We provide R&D services for those that need it and create pipelines of new technologies for commercialisation, either directly by us or in partnership with others.

For us, a smart green future means we use all available knowledge to produce healthy, nutritious food from the land and sea, while ensuring we protect our environment and create opportunities for future generations.

Our Strategy will:

Enable
New Zealand
to build ...

A smart green future. Together.

... by achieving
our mission of ...

Creating the world's most sustainable food systems

... with science
focused on
6 themes ...

Healthy
ecosystems

Positive
foods

Aotearoa
provenance

Smart
food systems

Climate
resilience

Full bioresource
utilisation

... underpinned
by a business
framework ...

**INVEST
WHAKANGAO**

to create world-leading
science

- Investing in future science
- Investing in people
- Investing in facilities & information

**APPLY
WHAKAMAHI**

that science to maximise
value creation

- Stronger partnerships with Māori
- Lifting customer engagement, brand & innovation

**SHARE
TUARI**

that value fairly across
the value-chain

- Profitable growth in science services
- A world-class technology development business

... guided by
our values ...

Mana tangata

We contribute our unique talents and perspectives

Manaakitanga

We show respect, generosity and care for others

Whai māramatanga

We always look for a better way

Our sustainability agenda

The main goal of Plant & Food Research is the development of healthy food from the world's most sustainable food systems. Sustainability is at the heart of everything we do, and we are committed not only to helping our customers, partners and the wider food sector improve the sustainability of their businesses, but also to leading by example and making sure we are working in the most sustainable ways in our own organisation.

We want to know our work is beneficial to people and the planet, and has purpose, as well as delivering profit, primarily for our customers but also to allow us to invest in our own organisation – the multiple bottom line of a sustainable business.

Our sustainability agenda has three strands:

Thought leadership – sharing with others our knowledge and insights of ways to be a sustainable business to create new conversations about the future of food

Innovation leadership – making sure our customers and partners understand how our science can help their businesses be more sustainable

Authentic leadership – making sure Plant & Food Research includes sustainability in its own business decisions.

Advancing our sustainability agenda

Creating a smart green future requires that our work benefits people and the planet, and that we lead by example.

Plant & Food Research also must demonstrate that we are a sustainable business and do this transparently so that our performance can be fairly assessed against our goals. While being sustainable requires that we consider our effects on the planet and take stock of our footprint, it also involves us in leading thinking around sustainable food systems in New Zealand and providing innovative science to address today's challenges and create future options.

Our commitment to sustainability doesn't just make good business sense through reduced impacts and costs and being a more 'future fit' organisation. It's also important to the people who work at Plant & Food Research, and to those who will join our teams in the years ahead.

Our six elements



ENVIRONMENT

Our impact on the planet



SOCIETY AND RELATIONSHIPS

Our networks and collaborations



PEOPLE

Our staff, students and contractors



INNOVATION

Our products and services



FINANCE

Our financial resources



INFRASTRUCTURE

Our physical and virtual assets

We have aligned the seven strategic strands of our business framework with these elements and identified Key Performance Indicators that will enable us to evaluate our impacts on them.

We will measure our progress using the Future-Fit Business Benchmark and report on our progress using Integrated Reporting (IR).



Understanding and reducing our carbon footprint

In May 2023, Plant & Food Research achieved certification under the Toitū carbonreduce programme. Through this programme, Plant & Food Research has collected baseline data for the 2018/19 year and carbon audits for subsequent years will take place in the 2023/24 financial year.

To meet its obligations under the certification and ensure ongoing reduction of greenhouse gas emissions, Plant & Food Research has:

- Co-hosted, with AgResearch, a collaborative brainstorming workshop – ‘Carbon Leap’ – to identify options for emissions reductions. This has led to the development of an emissions reduction programme focused on reducing emissions from infrastructure, from business travel, and from staff commuting to work.
- Commissioned an independent energy options assessment that has recommended options for improving energy efficiency, switching fossil fuel use for electricity, and installing renewable generation. These recommendations are now being incorporated into our ongoing capital expenditure programme.
- Established a working group to identify ways to support staff in remaining closely connected to partners, customers and peers while reducing travel. This will build on the existing Sustainable Travel Policy and aims to reduce the need for travel, provide feedback to travellers on the emissions associated with their travel, and explore options for more carbon efficient travel such as the use of public transport and battery electric hire cars.
- Undertaken a survey of commuting behaviour to prioritise the most useful support that Plant & Food Research can provide in changing commuting habits. This might include facilitating car sharing, providing better cycling facilities, or installing EV charging points.

10,275*
Tonnes of CO₂ equivalent emitted

94% (≥75%)
Staff awareness of
sustainability initiatives

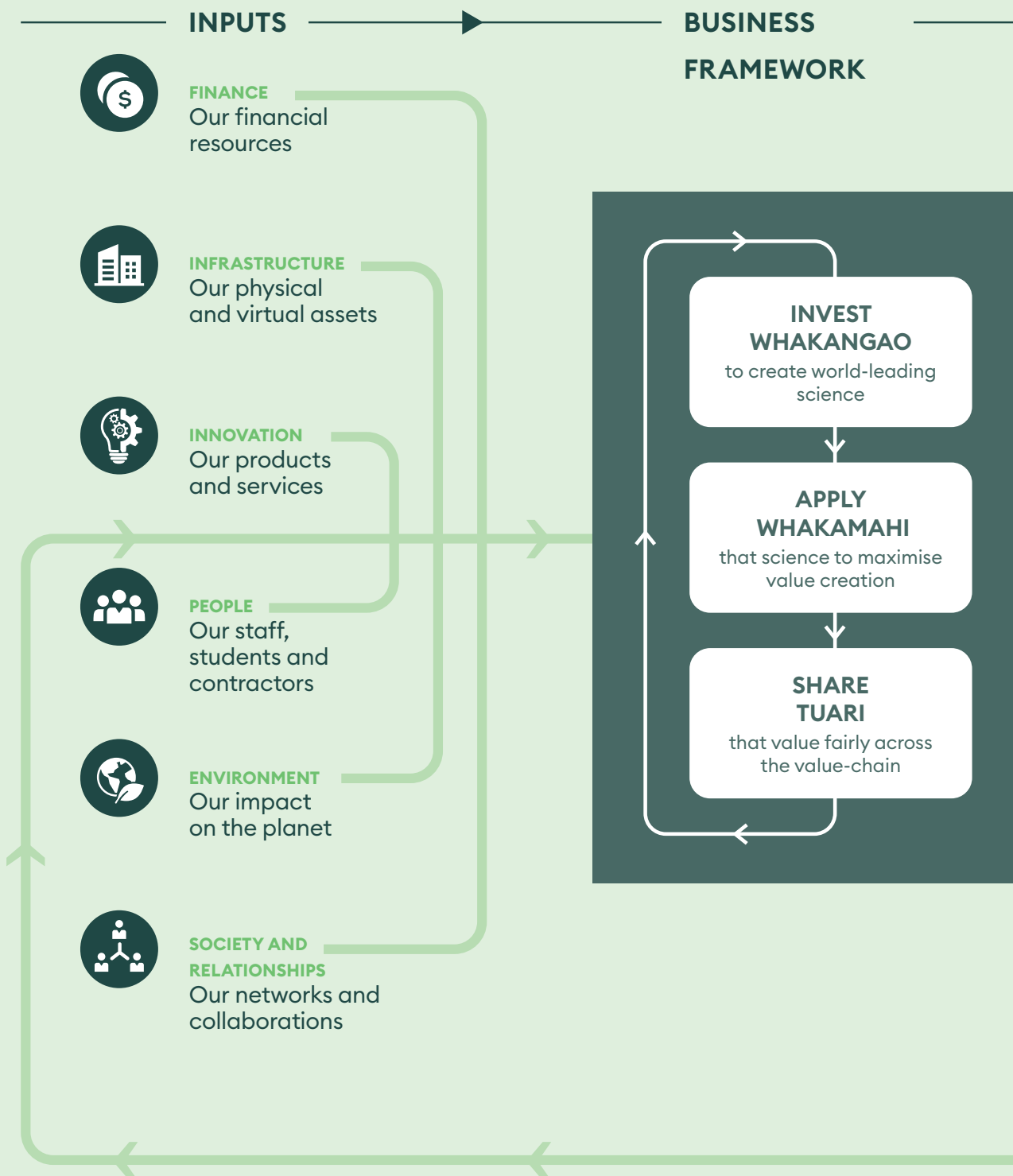
BRACKETS INDICATE TARGET
* FOR THE BASELINE YEAR (2018/19)

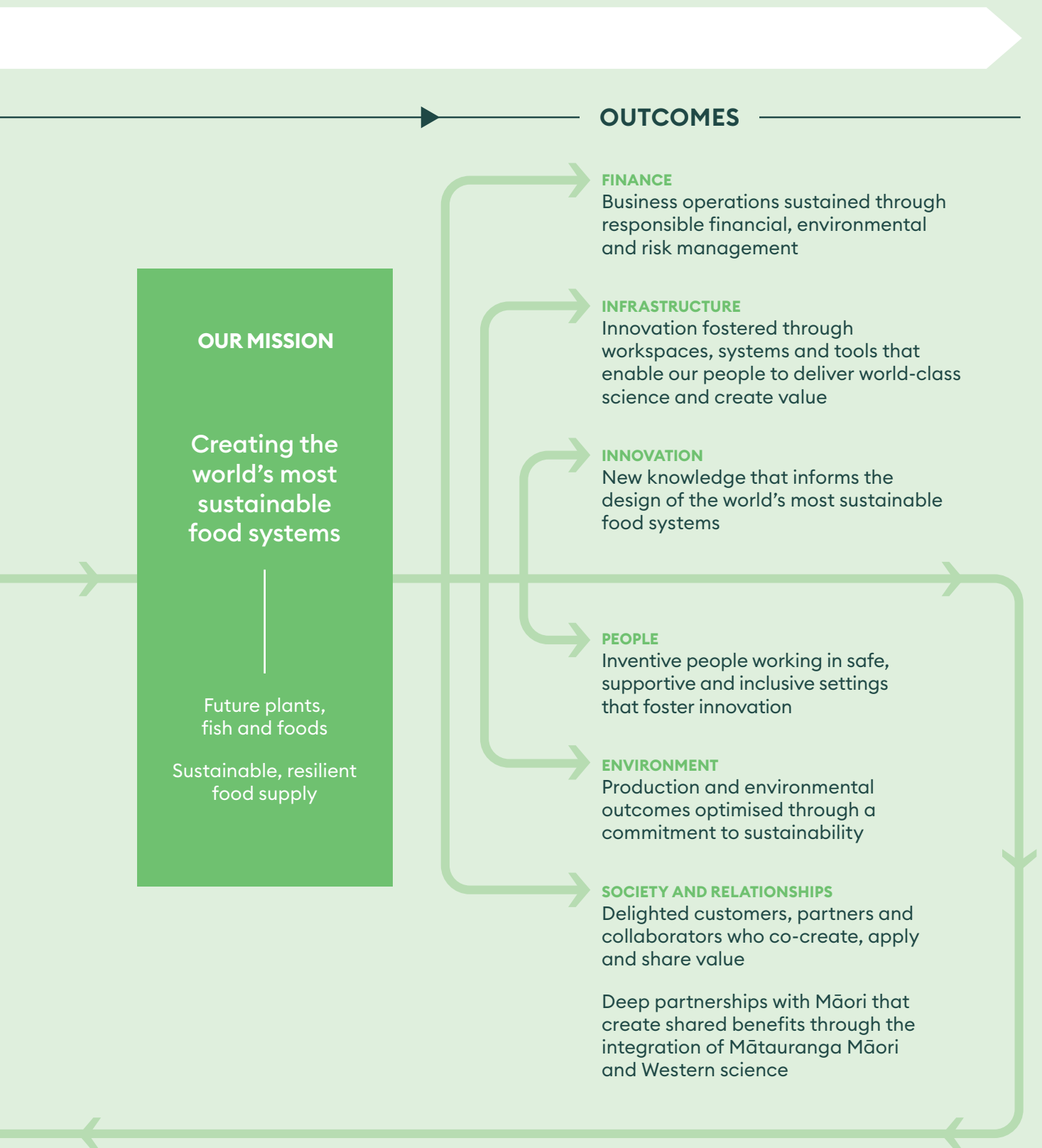


Stephen Wallace has been appointed Sustainability Manager, a shared position with AgResearch to enable sharing of best practice and support ongoing environmental sustainability initiatives across both organisations.

How we define and create value

Value creation over time





Sustainability highlights

We have adopted the Future-Fit Benchmark tool. This allows us to benchmark against 23 science-based 'break-even' (or cause-no-harm) goals and 24 'positive pursuits' to assess how our activities contribute to a future-fit society.

For more information and the full list of Future-Fit Business Benchmark Goals visit futurefitbusiness.org



Break-Even Goals



Positive Pursuits



SOCIETY AND RELATIONSHIPS

Championing our sustainability initiatives through our nationwide Site Sustainability Liaison team.

24 Social norms increasingly support the pursuit of future-fitness

Engaging with Tono rūpū on māra kai projects at our Te Puke and Ruakura research centres and a community garden project at Havelock North.

20 Social cohesion is strengthened

Expanding our network of organisations actively working in sustainability initiatives to energise conversations and activities.

24 Social norms increasingly support the pursuit of future-fitness

Developing a huatahi rubric to deepen relationships with Māori.

20 Social cohesion is strengthened

Upskilling 18 Eco-Cadets to support the Ūawanui Sustainability Project.

[For more go to page 38](#)

24 Social norms increasingly support the pursuit of future-fitness



PEOPLE

Ensuring all employed staff are paid the living wage.

11 Employees are paid at least a living wage

Recruiting 42 students through our Summer Studentship programme, including 20 Māori students into the Te Rito pathways programme.

[For more go to page 67](#)

17 People's capabilities are strengthened

Upskilling four Te Puke High School students through the Whakakotahi Cadetship programme

[For more go to page 38](#)

17 People's capabilities are strengthened

Donating excess fruit and vegetables to local community organisations in Te Puke, Ruakura, Hawke's Bay, Lincoln and Clyde.

16 More people are healthy and safe from harm

Supporting staff and industry partners affected by Cyclone Gabrielle and other weather events.

[For more go to pages 30 and 65](#)

18 More people have access to economic opportunity



Through a Vision Mātauranga Capability Fund project, we have helped train 18 Eco-Cadets to support the Ūawanui Sustainability Project.



INNOVATION

Sharing the stories of our science and our scientists with a broader audience through our brand awareness campaigns.

For more go to page 27

- 15** Product communications are honest, ethical, and promote responsible use

Discussing the opportunities and risks for precision breeding techniques with stakeholders.

For more go to page 27

- 24** Social norms increasingly support the pursuit of future-fitness



INFRASTRUCTURE

Reviewing our use of LPG to determine alternatives.

- 06** Operations emit no greenhouse gases

Partnering with MPI to build new facilities at our Mt Albert Research Centre.

- 21** Infrastructure is strengthened in pursuit of future-fitness

Relocating researchers at our Mt Albert Research Centre into new energy-efficient labs and offices.

For more go to page 65

- 21** Infrastructure is strengthened in pursuit of future-fitness



FINANCE

Partnering with AgResearch to conduct an energy audit, sharing costs and insights.

- 06** Operations emit no greenhouse gases



Our staff are restoring native plantings on marginal land at our Te Puke Research Centre.



ENVIRONMENT

Installing new coolstores at the Te Puke and Mt Albert research centres that use non-synthetic refrigerants to reduce adverse effects of greenhouse gas emission.

- 05** Operational emissions do not harm people or the environment

Trialling new biodegradable orchard materials, for example flagging tape, orchard twine, weedmat and spray guards, at several research orchards.

- 07** Operational waste is eliminated

Trialling and installing strip curtains at coolstore facilities at Ruakura Research Centre.

- 01** Energy is from renewable sources

Supporting the replacement of methyl bromide, an ozone depleting chemical.

For more go to pages 35 and 47

- 08** Others generate fewer harmful emissions

Ongoing efforts to remove community rubbish in proximity of Hawke's Bay and Ruakura research centres.

- 09** Harmful emissions are removed from the environment

Removing noxious weeds from and safeguarding endemic rare plant species at our Mt Albert Research Centre.

- 13** Ecosystems are restored

Collecting fruit waste from research projects at our Ruakura Research Centre for local farmers to feed to livestock.

- 11** Waste is reclaimed and repurposed

Restoring native plantings at the Te Puke Research Centre.

- 13** Ecosystems are restored

Trialling new crops, such as dragon fruit at our Kerikeri Research Centre (see page 29), will support the long-term sustainability of Aotearoa New Zealand's horticulture sector.





Apply /
Whakamahi

Dr Zhigang Wang, China's Minister for Science and Technology, and senior officials visited the Mt Albert Research Centre in June 2023, recognising the enduring relationship between Plant & Food Research and Chinese research partners.



Lifting our customer engagement, brand & innovation

Our customers are part of our community. We work alongside them, often over many years, to create research plans and deliver the science that helps their businesses grow. We work with these customers in a number of different ways. They may fully fund research themselves, but we may also work together to find investment from other organisations, or use our own money as co-investment in a project. What's important is that our customers know we're behind them and will find a way to help their business succeed.

We value our relationships with our partners and customers, with investment agencies, and with our science collaborators. We share stories of these relationships, to show how our science and our staff are helping to create a smart green future.



SOCIETY AND RELATIONSHIPS

Media partnership to increase awareness

In April 2023, Plant & Food Research started a six-month partnership with NZME, one of Aotearoa New Zealand's largest media companies, to continue building visibility and understanding of the organisation's research with the target audience of "informed New Zealanders".

Through this partnership, Plant & Food Research is sponsoring the New Zealand Herald's sustainability section Our Green Future. The sponsorship demonstrates how the organisation's science is aligned with improving sustainability by showcasing people and research projects, as well as partners, through advertorial content.

Each month is themed around one of the new Strategic Research Themes (see page 45), to provide readers of the New Zealand Herald with multiple ways to learn more about the research supporting the food sector. This includes written content (online and in print) and video across the New Zealand Herald website, supported by a radio campaign on Newstalk ZB introducing some of the featured scientists.

\$5.1M (\$3.0M)
Revenue from new customers

11 (10–15)
New licences

38% (≥37%)
Brand awareness amongst
informed New Zealanders
and industry

BRACKETS INDICATE TARGET



SOCIETY AND RELATIONSHIPS

Engaging stakeholders in the gene editing discussion

In early 2023, Plant & Food Research engaged foresighting expert Melissa Clark-Reynolds in order to better understand stakeholders' attitudes to precision breeding techniques (such as gene editing) and explore what the future could look like.

Interviews and workshops were held in Wellington and Tauranga, with representatives from key Plant & Food Research horticulture and food sector partners and government stakeholders. Clark-Reynolds explored the opportunities and risks for precision breeding techniques, and identified a range of insights for society, industries and researchers, including the potential hurdles to acceptance.

Stakeholders were generally positive about exploring opportunities for precision breeding techniques in an Aotearoa New Zealand context, particularly in addressing key issues such as climate change and environmental sustainability. There was agreement over some initial actions required, such as considering the impact of the Treaty of Waitangi and Wai262, and the need for further engagement with Māori.



Plant & Food Research sponsored the Ahuwhenua Trophy for Excellence in Māori Horticulture. The trophy was awarded to Wi Pere Trust at the Awards dinner held in Hamilton, where Trust representatives Kingi Smiler (front centre left) and Trudy Meredith (front centre right) celebrated with attendees from Plant & Food Research.



SOCIETY AND RELATIONSHIPS

Equity investment as a pathway to commercialisation

To support commercialisation of research, Plant & Food Research explores different business models that provide partners and Plant & Food Research with a fair share of the risk and the return. This includes spinning out companies for further private investment, as well as undertaking research-for-equity to support innovative early-stage companies. Plant & Food Research now has a strong portfolio of companies in which it holds equity (see page 103 in financials).



Scientian Bio Limited (49.88% shareholding)

Scientian Bio was spun out of Plant & Food Research in 2021, with investment from Sprout and its investment partners – Finistere Ventures, Fonterra and OurCrowd, with funding from Callaghan Innovation. Scientian Bio is developing novel biosensors based on insect odorant receptors, and its seven-person team is based in labs at Plant & Food Research's Mt Albert Research Centre.

In 2022, the company was awarded a US\$1.7M grant by the Bill & Melinda Gates Foundation to further research into disease detection.

www.scientianbio.com

Biopolymer Network Limited (BPN) (42.7%)

BPN is a partnership with sister Crown Research Institutes Scion and AgResearch, formed in 2005. The joint venture has refocused its business to drive commercial uptake of bioplastic materials, including Zealafoam®, an alternative to polystyrene for food packaging, and EcoBeans, plant-based beans for bean bags.

www.biopolymernetwork.com

Precision Seafood Harvesting Limited (25%)

Precision Seafood Harvesting Limited was formed to commercialise the Modular Harvesting System (MHS), a new technology that replaces the traditional mesh lengthener and cod-end of the trawl net. The MHS technology has set a new benchmark in quality by delivering fresh wild-capture fish in pristine conditions while improving the sustainability through increased survivability of unwanted by-catch and juvenile fish. Precision Seafood Harvesting Limited is a partnership between Plant & Food Research and three of Aotearoa New Zealand's leading seafood companies – Moana New Zealand, Sanford Limited and Sealord Group Limited. MPI's Sustainable Food and Fibre Futures funding is helping to support the validation of the MHS technology in international markets with initial trials completed in the Netherlands.

In 2022, PSH was a finalist in the Global Fisheries Innovation Awards.

www.precisionseafoodharvesting.co.nz

Prevar Limited (29%)

Prevar, a partnership with NZ Apples and Pears Inc. and Apple and Pears Australia, was established in 2004 to commercialise apples and pears from the Plant & Food Research breeding programme. Since its inception, it has commercialised 14 new cultivars, including Smitten®, Dazzle™ and Rocket® brand apples, and Piqa® brand pears.

In June 2023, a new Prevar cultivar, branded as Joli™, was launched by T&G company VentureFruit®.

www.prevar.co.nz

Calocurb Holdings Limited (4.88%)

Calocurb was founded in 2017 to commercialise Amarasate™, an extract from Aotearoa New Zealand-grown hops identified by Plant & Food Research scientists as having potential for controlling appetite. Plant & Food Research has continued to support development through a pipeline of clinical trials that demonstrate activity and effectiveness of the Amarasate ingredient in controlling satiety. In 2022, Plant & Food Research strengthened its relationship with Calocurb through committing to a research-for-equity arrangement that sees Plant & Food Research deliver a significant clinical trial to demonstrate weight-loss outcomes.

www.calocurb.co.nz

Forage Innovations Limited (49%)

Forage Innovations is a partnership with PGG Wrightson Seeds, formed in 2009, to commercialise forage brassicas bred by Plant & Food Research. Since its inception, Forage Innovations has commercialised 31 cultivars, primarily in New Zealand but also in Australia, Canada, the USA, Europe and South America.



Three new dragon fruit cultivars have the potential to extend where dragon fruit is grown, including in Aotearoa New Zealand, and increase choice for global consumers.

Working with Viet Nam's Southern Horticultural Research Institute (SOFRI), Plant & Food Research has bred three new dragon fruit cultivars that will be commercialised globally by T&G company VentureFruit®. Initially, the varieties will be commercially developed in Viet Nam for export markets, with the first commercial shipments of fruit expected from 2027. However, evaluation trials are planned in other production regions, including New Zealand.

An ongoing trial at Plant & Food Research's Kerikeri Research Centre will determine if dragon fruit could be a commercial opportunity for the sub-tropical northern region of New Zealand. The Northland climate is expected to warm significantly as an impact of climate change, with temperature increases and reduced rainfall. Introducing crops more suited to these conditions may create new climate-resilient opportunities for the Northland region.

The new varieties have been developed as part of the New Premium Fruit Variety Development project, supported from 2013 to 2021 with funding from the New Zealand Ministry of Foreign Affairs and Trade and, more recently, with investment as one of Plant & Food Research's Technology Development Missions. Plant & Food Research has also worked with VentureFruit® to develop a technical guide for growers to support production, harvest and postharvest processes to maintain high quality fruit.

New dragon fruit for global consumers



2before Performance Nutrition Limited (18.2%)

2before was spun out of Plant & Food Research in 2019, and in 2021 received significant investment from Chiron Limited to support its growth into new markets such as North America. 2before has developed a pre-work-out product that is based on Plant & Food Research's science on the sport performance benefits of New Zealand blackcurrant. Plant & Food Research scientist Dr Roger Hurst acts as Chief Science Advisor.

www.2before.com

Senztec Limited (50%)

Senztec is a joint venture with Champtech. The company seeks to develop and commercialise fruit sensor labels.

Pacific Berries LLC (50%)

Pacific Berries LLC was established in 2012 as a joint venture with Northwest Plant Company, a berry nursery in Washington, USA, to breed and commercialise new berry varieties. The company launched the raspberry variety 'NN08002', marketed as Wake®Haven, in 2016, which complements the Plant & Food Research cultivar 'Wakefield', marketed as Wake®Field. Together, the Wake® varieties account for around 50% of reported raspberry plant sales in Washington State. Cultivars have also been released in South America, Europe, Australia and Aotearoa New Zealand.

The latest cultivar 'NN1237.057', marketed as EarlyBell™, was launched in the USA in 2023.



Reducing the impact of Cyclone Gabrielle

In mid-February 2023, Cyclone Gabrielle, a category 3 tropical cyclone, landed in New Zealand, bringing high intensity winds and rain to the North Island. One of the most severely affected areas was the Hawke's Bay, with widespread damage to homes, infrastructure and to the region's horticultural industries, with large areas of flood damage and silt deposition.

Hawke's Bay is home to around 70% of the country's pipfruit sector, and, with the cyclone hitting so close to harvest, there were significant losses to the annual crop. Similarly, the wine, summerfruit and vegetable sectors were affected. According to a report by Boston Consultancy Group for Horticulture New Zealand, lost production was estimated at \$500 million, with a total estimated cost of close to \$1.5 billion, including lost production over future years, clean-up costs and damage repair.

Plant & Food Research immediately began working with the horticulture sector, providing expert advice on the most pressing challenges created by the cyclone and flooding. As part of our critical industry response, approximately \$590,000 of funding was realigned from internal Strategic Science Investment Funding to deliver research defined as urgent and critical to industry decision-making following the cyclone. This included research into soil health and recovery, fruit-rot risk management, and tree health and survival. The quick response helped answer immediate questions and guide growers on good practice and management of orchards under extreme events, giving confidence to the sector.

The research supported the Hawke's Bay apple industry in safely picking, packing and exporting around 70% of the crop volume anticipated prior to the cyclone.

In the 2023/24 financial year, research efforts will continue, with a focus on controlling pests and diseases, particularly around those areas with significant blocks of land currently not being actively managed for crop production. Research will also continue on the long-term effects of silt damage on plant growth and health, as well as building understanding of the practices that most effectively rebuild soil health.

Impact on Hawke's Bay Research Centre

Plant & Food Research's Hawke's Bay Research Centre was severely affected by the rain and flood waters. Many staff who were not severely impacted themselves joined local volunteer efforts in the most affected communities.

The major impact at the Research Centre was to the 44-hectare research orchard. Flood waters remained high for several weeks, as local rivers continued to overflow with no capacity for additional drainage. A concerted effort by our Field Research Network over a period of six weeks saw many of the damaged blocks re-established with new support systems and trees propped or reattached to give them the best opportunity to recover. However, some orchard blocks suffered a total loss of trees.

Ongoing monitoring of the research orchard will determine the impact of the cyclone on the long-term health of the trees, and to the research programmes the orchard supports.





Jim Walker (centre) was seconded to New Zealand Apples and Pears Incorporated to work alongside their staff, like Danielle Adsett (right), and orchardists, such as Brydon Nisbet (left), in coordinating the industry-science response to Cyclone Gabrielle.

As part of a critical industry response, approximately \$590,000 of funding was realigned from internal Strategic Science Investment Funding to deliver research defined as urgent and critical to industry decision-making following the cyclone. This included research into soil health and recovery, fruit-rot risk management, and tree health and survival.

Health of apple orchards surveyed in cyclone aftermath

Scientists from Plant & Food Research, in partnership with horticultural consultants AgFirst and Fruition Horticulture, have been collecting data from apple orchards to better understand the impact of the cyclone on plant and soil health.

The Soil Health – Assessment and Recovery Project has involved working with about 30 orchard owners and managers to study the effects of silt and waterlogging on apple blocks. Working with industry body New Zealand Apples and Pears Inc., the aim is to develop resources that will be shared industry wide and help optimise growers' spend on recovery efforts.

Around 4,000 hectares of apple orchards have been affected by silt or waterlogging following the cyclone. In preparation for winter pruning, growers needed to consider where to focus recovery efforts, with the hope of nursing any stressed trees back to good health and ensuring they can deliver a crop in coming seasons.

Waterlogging can suffocate trees, and extremely wet soils can lead to serious root disease issues. The data will improve understanding of the issues presented in the different blocks and which management practices were more effective, enabling growers to make better decisions when floods occur in the future.

The first round of surveying on orchards took place two weeks after the cyclone, and orchard blocks were revisited in May to reassess the condition of trees and groundcover.



SOCIETY AND RELATIONSHIPS

International Development

Our International Development Unit enables Plant & Food Research to provide a tailored approach to our work in developing countries – building our reputation in partnering to develop and implement projects across the value chain that deliver sustainable impact, reduce poverty and improve lives.

Our current portfolio of projects focuses on the horticultural and seafood sectors, with projects in the Pacific, Asia, Africa and the Caribbean. These projects contribute to and support the priorities of the New Zealand Government and the United Nations' Sustainable Development Goals (SDGs); expand the experience-base and worldliness of our scientific capability; create opportunities for New Zealand industry in rapidly developing economies; and expand our brand profile in new markets.



High quality horticulture in Cambodia

The New Zealand International Development Cooperation Programme-funded Cambodia Quality Horticulture project is a private sector-led initiative, looking to grow income and opportunities throughout the Cambodian horticultural value chain. The programme has a strong focus on training farmers and postharvest operators on best practices aligned with GAP (Good Agriculture Practice) and/or preferred supplier programmes. Human-centred design is also being used to develop new agronomic and postharvest solutions, including the development of a new washing table to deliver clean product to consumers. We are also working closely with the Cambodian Government on the implementation of GAP systems. A project extension by two years to 2024 has goals that include an additional 2000 farmers to be trained by our partner agronomists.

2017–2024

Myanmar resilient horticulture

The Myanmar Resilient Horticulture (MRH) project aims to increase the incomes and food security of rural farmers in Myanmar. With in-country partner, Proximity Designs, Plant & Food Research has selected onion, tomato, potato, cabbage, and chillies as target crops, providing further diversification and income generation to farmers who traditionally grow paddy and pulses. This five-year project funded by the New Zealand International Development Cooperation Programme began with a research and design phase to understand constraints, to co-design and to test new services and products with smallholder farmers. The MRH project will strengthen farmer advisory services to provide tailored information to smallholder farmers and introduce new irrigation products that are climate-smart and designed to meet smallholder needs. The MRH project also works to strengthen linkages between rural producers and domestic markets with a focus on reducing post-harvest losses and improving the quality and safety of horticultural products.

2019–2025

Passion fruit value chains in Viet Nam

During 2020–2021, we designed a new five year project funded by the New Zealand International Development Cooperation Programme to support the development of the passion fruit sector in Viet Nam. The programme commenced in July 2022. Plant & Food Research is partnering with the Southern Horticulture Research Institute (SOFRI) and the Northern Mountainous Agriculture and Forestry Science Institute (NOMAFSI). The programme aims to increase the productivity and resilience of passion fruit production systems; improve postharvest and processing technologies; develop effective extension systems; and strengthen market linkages to enable development of the sector in a way that is inclusive of small farmers and enterprises.

2020–2028





Avocado farming in Kenya

We're working alongside New Zealand industry partner Olivado and the New Zealand International Development Cooperation (IDC) Programme to support sustainable economic development of small-holder avocado orchards in Kenya. In late 2019, we entered the extension phase of this programme, designed to scale up the adoption of the research innovation beyond the Olivado supply chain. Key achievements include the creation of a Time to Harvest model that predicts the date that fruit at any altitude will be ready for harvest. It has been widely distributed and over 100 avocado exporters are trained to use it.

2013–2023

Mango exporting from the Philippines

We are helping the Philippines reverse a decline in fresh mango exports to lucrative markets due to pesticide residue and poor compliance with other agricultural practices. The project will develop a high-quality export spray programme for mango, improve chemical application and supply chain quality assurance, and increase the pack out of high-quality mango. Forty percent of the funding is provided by the local government Municipality of Midsayap, with the balance from the Ministry of Foreign Affairs & Trade (MFAT), facilitated by NZG2G. The Philippines is a major player in world mango production and exporting, but in recent years its fresh mango exports have been downgraded in value due to violations of maximum pesticide residue limits on arrival in countries like Japan and South Korea. This has reduced the profitability of growers in the region of Mindanao.

2023–2025

Vanilla sector development in Tonga

Plant & Food Research is leading a five-year project funded by the New Zealand International Development Cooperation Programme, to increase the resilience of the Tongan vanilla industry, with a target to increase production and improve quality. The project, in partnership with the Tongan Ministry of Agriculture, Food and Forests, aims to help growers generate higher incomes by improving the yield and quality and managing variation in their crop. The science-based approach also aims to support household resilience and stress caused by weather and climate change. This project is developing a package of best practices through applied research and providing knowledge transfer and extension support to improve productivity, quality, and resilience of smallholder vanilla growers.

2019–2024





Developing horticulture in Northern India

A partnership between New Zealand and the State of Himachal Pradesh, northern India, is working to improve production of the region's key fruit crops, with a particular focus on apples. Funded by the World Bank, the Himachal Pradesh Horticultural Development project involves a range of scientists from New Zealand organisations, including Plant & Food Research, with support from the New Zealand apple and pear industry and government agencies.

2018–2023



Sargassum seaweed in the Caribbean

In the Caribbean, a New Zealand International Development Cooperation-funded Activity is focused on the problem of Sargassum seaweed inundations and their impact on tourism, fisheries, human health and the environment (for example, beach erosion). In partnership with the Caribbean Regional Fisheries Mechanism (CRFM) we are looking at product development options for this seaweed.

2020–2024



Head of International Development Dr Suzie Newman (third from right) joined the New Zealand trade delegation to Viet Nam, which included AgriConnectionNZ, an event designed to highlight and promote Viet Nam–New Zealand partnership in agribusiness. The event was also attended by Prime Minister Jacinda Ardern and Minister of Agriculture, Damien O'Connor (centre), who met with Plant & Food Research staff and collaborators showcasing dragon fruit research (see page 29).



More than 90% of households in Samoa rely on agriculture for food security and income generation. Taro is the largest horticultural export, with almost all Samoan-grown fresh taro shipped to Aotearoa New Zealand. Key challenges for the Samoan taro sector are ensuring consistent high-quality corms and managing pests and diseases to meet phytosanitary regulations of importing countries.

Methyl bromide has been the primary method for treating taro to control pests and diseases. Each year, more than 90% of taro consignments from Samoa are fumigated with methyl bromide on arrival in New Zealand after failing phytosanitary inspection. There is a global move to reduce and replace methyl bromide because of its ozone depleting characteristics. Through a Better Border Biosecurity (B3) funded project – and collaborating in Samoa with the Ministry of Agriculture and Fisheries, the Scientific Research Organisation of Samoa and Ah Liki Investment Corporation Limited – Plant & Food Research scientists developed new postharvest protocols that reduce the need for methyl bromide use.

Through the project, scientists demonstrated the potential of high pressure and hot water washing as effective postharvest treatments to avoid the need for methyl bromide fumigation. A pilot-scale treatment facility developed by project engineers and installed at the largest exporter of taro in Samoa was used to confirm the effectiveness of the treatment. Through the programme, staff at the exporters were trained and a user manual developed. The technology is now being scaled up for use at commercial supply levels, through investment by the exporter with additional funding through a Pacific Horticultural and Agricultural Market Access Plus programme (supported by the Australia and New Zealand governments).

The new treatment reduces the time shipments need to remain in import facilities, as the fumigation process can take up to 3 days to complete. By reducing fumigations and storage time, consumers are offered fresher, higher quality taro. The treatment may also support Samoan exports to countries, including Australia, where border restrictions apply to fresh Samoan taro imports because of the risks associated with taro leaf blight.

Supporting exports of Samoan taro

Scientists demonstrated the potential of high pressure and hot water washing as effective postharvest treatments.



A photograph of two men standing in a field of young plants. The man on the left, Renata Blissett, has a beard and is wearing a dark blue blazer over a patterned shirt. The man on the right, David Chagné, is wearing a black leather jacket and is holding a small plant. They are both looking at the plant with interest. In the background, there are more plants and a green structure.

Our researchers, like David Chagné (right), are building collaborative partnerships with our Māori partners, like Renata Blissett (left) from Rangitāne O Manawātū.

Stronger partnerships with Māori

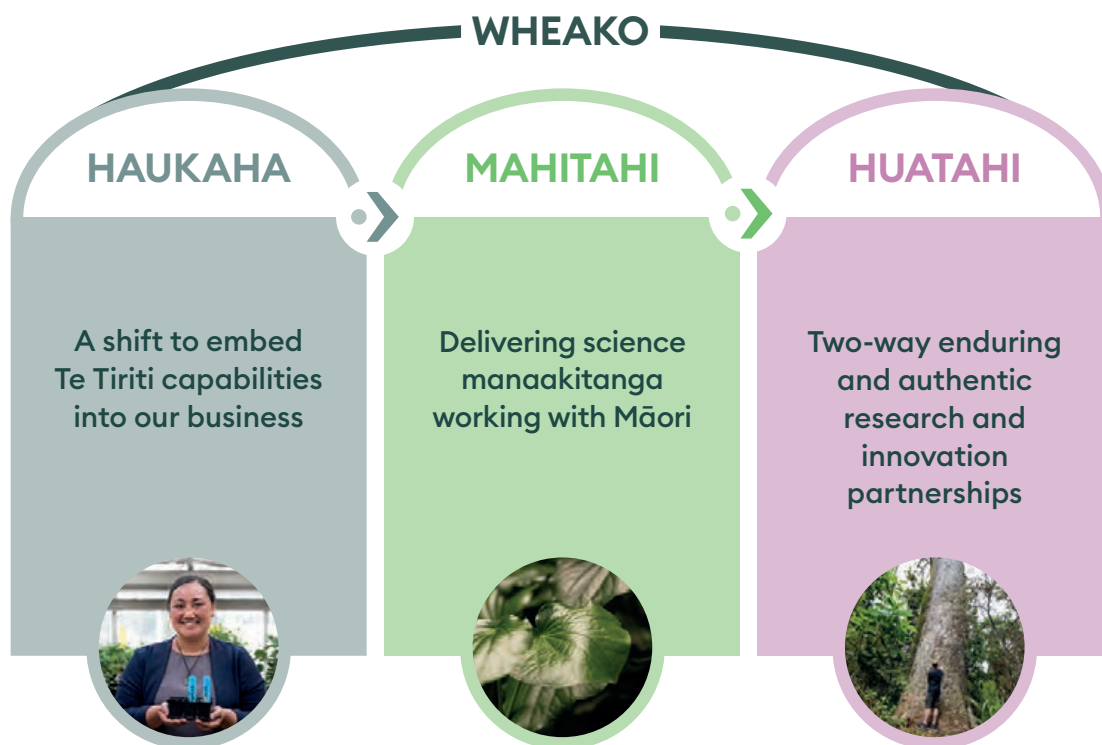
Plant & Food Research partners with Māori, as tangata whenua (the indigenous people of Aotearoa New Zealand). Indigenous people around the globe are recognised for knowledge systems that span thousands of years and oral traditions and cultural customs describing the interconnectedness between all living things in the natural world. Mātauranga Māori (Māori knowledge) and taonga Māori (treasures handed down) are inherited and entrusted to the current generation to care for, to contribute to, and to evolve for future generations.

Plant & Food Research recognises the importance of Te Ao Māori (the Māori world view), concepts such as taiao – the interconnection between all living things – and huatahi – mutually reciprocal relationships, co-designed research and benefit sharing – and we are weaving these into our everyday mahi (work). These values and perspectives support us in developing and sustaining better food systems in the world, starting in Aotearoa New Zealand.

Move to Wheako phase of Tono strategy

Over the past four years, we have delivered the first phase of our Tono strategy, building a strategic framework to support stronger partnerships with Māori. There has been an increase in our organisation investing and in growing understanding of Te Ao Māori across our organisation at all levels, with a growing network of rōpū (regional teams) across our sites to champion Te Ao Māori and working towards building genuine partnerships with mana whenua (representing local Māori interests). There has also been a shift in behaviour and attitudes towards Mātauranga Māori and better understanding of how Te Ao Māori and Mātauranga Māori intersect with our science and research which can create whai maramatanga – new co-innovation and knowledge, together.

We are now transitioning to the second phase of our 10-year strategy, Wheako, which translates to ‘realise’ or ‘experience’. In this phase, we will seek to deliver science manaakitanga to enhance authentic research experiences with Māori and taonga Māori through novel research and innovation. Through this work, we aspire to become a trusted and enduring partner with Māori, working together to protect indigenous flora and fauna, Te Reo Māori (Māori language) and Mātauranga Māori, and enable our huatahi partners to unlock the value of their whenua (land) and taonga through huatahi partnership.



Wheako (realise/experience) is the second phase of our strategy to build stronger relationships with Māori.



SOCIETY AND RELATIONSHIPS

Providing opportunities for rangatahi in science (Goal 1)

The Te Rito Cadetship is one of our pathways that provides opportunities for Year 12 & 13 rangatahi to gain exposure to science and to learn more about career opportunities in STEMM (science, technology, engineering, mathematics and Mātauranga Māori) and encourage on-going engagement in science and Mātauranga education pathways. In the April 2023 school holidays, four Year 12/13 students from Te Puke High School spent the break at the Te Puke Research Centre helping with a range of lab-based tasks. These included testing vitamin C levels in kiwifruit, image modelling of kiwifruit wood anatomy, and identifying sooty mould on fruit. The students were also challenged to give a presentation on their activities to members of the school Board on the last day of their placement.



SOCIETY AND RELATIONSHIPS

Summer student project: fall armyworm (Goal 1)

We also offer Te Rito summer internships. One of our student alumni Jordan Pickering (Ngāpuhi), spent the 2022/23 summer developing resources for mana whenua in Te Tai Tokerau Northland to work with Māori and to help inform the potential impact of fall armyworm and how to find and identify it.

Fall armyworm is an invasive pest moth new to New Zealand, with the larval life stage feeding primarily on maize and corn. Supported by Better Border Biosecurity (B3) and the Ministry for Primary Industries, Jordan's project recognised that Te Tai Tokerau, with an abundance of maize and corn crops and a warm climate suited to the pest, would likely be one of the first places fall armyworm could establish. He developed whānau-friendly videos in Te Reo Māori and English to support Māori in scouting for and identifying fall armyworm on crops, and in community and home gardens.



SOCIETY AND RELATIONSHIPS

Developing Eco-Cadets with the Ūrawanui Sustainability Project (Goal 2)

A recently completed Vision Mātauranga Capability Fund project has seen 18 Eco-Cadets gain NCEA Level 3 credits to support the propagation of native plants for Te Aitanga-a-Hauiti.

Through the project, the Ūrawanui team gained plant skills, including expertise in seed collection, germination, growth and nursery management, to support the propagation and release of thousands of native plants for local restoration projects. The trained Eco-Cadets have also gained additional plant management and life skills as part of the programme, and have subsequently developed strategies for managing key local issues, alongside Ūrawanui governance and the district council, such as managing challenges created by heavy rainfall and protection of native wildlife.



INNOVATION

Identifying new crops for Rawhiti (Goal 2)

Through a two-year Vision Mātauranga Capability Fund, Māori landholders are growing kai (horticultural crops) as well as new subtropical crops in Te Tai Tokerau.

In partnership with the Te Aroha Witehira Whanau Trust, based in Rawhiti, Te Tai Tokerau, traditional Māori kai such as kūmara, peruperu and kamokamo were grown, and different soil management practices were explored to regenerate soil health in the māra kai (horticultural gardens). Additionally, the suitability of the whenua to produce a selection of subtropical crops was assessed. Bananas, coffee, and cherimoya were identified as potential novel crops for the Rawhiti rohe.

The second year of the project focused on growing these crops experimentally in the ngahere (bush) and in open areas and comparing crop establishment in different environments. Longer term monitoring of the plants' performance plus microenvironmental conditions will reveal whether growing subtropical crops in the ngahere in the Far North is a viable strategy for Māori-owned land that has greater potential for utilisation, while also respecting the mana (authority) and mauri (life force) of the whenua.



Macadamia nuts are one of the most valuable nuts in the world, with a kernel value up to three times that of almonds. Representing just 1% of global tree nut production, macadamias are regarded by consumers as the nut for special occasions. Growing macadamias has lower environmental impact compared with some other nuts, as the trees are grown in regions that require little or no irrigation or other inputs and provide significant carbon sequestration benefits.

Macadamias grown in Torere, along the east coast of Aotearoa New Zealand's North Island, have been recognised as the biggest and best tasting in the world. As the largest certified organic macadamia producer in Aotearoa New Zealand, and with exclusive access to local and imported macadamia varieties trialled over more than 20 years, Torere Macadamias Ltd is well positioned to drive the growth of the macadamia sector, with the aim of increasing organic production from 10 hectares in 2018 to 1,000 hectares by 2029.

Compositional analysis of Torere Macadamias nuts by Plant & Food Research has shown they have higher concentrations of three key nutrients – vitamin C, vitamin B6 and selenium – when compared with macadamias grown overseas. The analysis also showed that the vitamin B6 found in Torere Macadamias nuts reached concentrations that support a range of health benefits, including combatting tiredness and fatigue, as well as maintaining a healthy metabolism.

In addition to vitamin B6, several other nutrients were at concentrations shown to have positive health benefits, including a good source of manganese (for bone and joint health) and a source of magnesium (for bone and oral health, and for the brain and nervous system) and dietary fibre (for digestive health). Torere Macadamias nuts were also found to be low in sodium and cholesterol, and free from trans fatty acids.

This information has been incorporated into Torere Macadamias' marketing strategy to build on the macadamia as a high-value, niche product from Aotearoa New Zealand, and gives Torere Macadamias, and the wider macadamia sector, a competitive advantage in export markets.

Torere Macadamias have a strong commitment to employing predominantly Māori staff and incorporating Mātauranga Māori into their production systems. Torere Macadamias is also working with iwi groups to establish new, or expand existing, macadamia orchards in the Gisborne and East Coast regions.

Torere Macadamias is working with Plant & Food Research to develop a long-term industry strategy that identifies ways to add value and reduce barriers to growth. Building on Plant & Food Research's expertise with the Australian nut sector, researchers are working alongside Torere Macadamias' team to develop orchard management protocols to replace outdated models based on old or overseas-grown varieties. Work includes shortening harvest windows, optimising pollination, and applying growing techniques tailored to the New Zealand environment and soil, to increase yields of high-quality nuts with good nutritional profiles while aligning with Te Ao Māori values and perspectives.

The analysis of Torere Macadamias nuts was funded by the High-Value Nutrition (HVN) National Science Challenge. Additional work is being funded by Plant & Food Research's internal He Kākano Whakatipu fund and Torere Macadamias to explore pathways to strengthen Mātauranga Māori and science weaving together.

Adding value to local nuts





SOCIETY AND RELATIONSHIPS

Manawatū staff increase cultural confidence (Goal 1 & 3)

Staff at our Te Papaioea Palmerston North Research Centre have made steps towards a huatahi partnership with local iwi Rangitāne o Manawatū which includes a series of in-person wānanga facilitated hosted by the iwi.

Through an internal He Kākano Whakatipu-funded project, 28 members of staff – from both science and administrative teams – were welcomed to wānanga at Te Hotu Manawa O Rangitāne O Manawatū Marae to learn more about the aspirations of the iwi, its history and experience iwi manaakitanga (hospitality). Members of the group participated – some for the first time – in a pōwhiri, with staff from our TONO rōpū taking a tuakana (supporting) role in preparing and supporting their peers to be able to actively participate in the process. During the programme, the group discussed how they could incorporate the Wai 262 best practice principles into their work processes, and were given a cultural confidence framework to guide their personal development.

As partners, Plant & Food Research and Rangitāne o Manawatū are working together on research focused on conservation of taonga plant species in the local rohe, such as swamp maire and kūmarahou. Staff who attended the wānanga felt that their confidence to work towards partnering with the iwi increased through building mutual understanding of shared aspirations.



SOCIETY AND RELATIONSHIPS

Measuring performance with Māori organisations (Goal 3)

Plant & Food Research has engaged a team of external Māori evaluators to improve the way we work with Māori partners to deliver value and benefit from research through a Māori-informed approach.

DBZ Consultancy Ltd, part of the Tuakana Teina Evaluation Collective, conducted interviews with Māori partners currently working with Plant & Food Research to better understand the key behaviours and activities they expect in good partnerships. DBZ identified some particular aspects that Māori see as fundamental to strong partnerships and improvements that Plant & Food Research could action to support huatahi partnerships that meet all the requirements identified by our Māori partners.

39 with **10** (35 with 7)
Rangatahi placements
co-invested with partners

30% (>25%)
Staff participation in
Te Ao Māori initiatives

\$13.4M (\$8M)
Revenue involving Māori

5 (3)
New Tono regional hubs

BRACKETS INDICATE TARGET



Serious games help tackle climate change decision-making

Climate change is likely to have a profound impact on whenua Māori, including whenua that is remote or close to areas of potential flooding. Social science coupled with Mātauranga Māori approaches can provide insights for Māori land managers and scientists to inform decision-making in a changing environment.

Plant & Food Research has created a new whānau-friendly 'serious game' to support decision-making for māra kai (traditional food gardens). Co-developed with social scientists at NIWA and Māori participants, the new board game presents real-life scenarios in a fun, engaging way and provides players with the opportunity to discuss those scenarios, make decisions and experience the resulting consequences in a simulated setting.

The board game centres around growing kūmara and provides players with opportunities to invest in their māra kai, for example, buying water tanks or modifying their soil. The type and intensity of weather for the season is decided by a roll of the dice, which affects the performance of the māra kai in different ways depending on the investment strategy. At the end of the season, the harvested kūmara can be stored, saved as seed for future planting, shared with the community, or sold to fund additional investment.

Over several seasons, the game demonstrates the impact of different weather events and investment strategies on the success of the māra kai. This promotes discussion of how food production will be affected by climate change, application of Mātauranga Māori and consideration of different ways to mitigate and adapt for long-term food security. Through the discussion, the players develop a better sense of shared values and appetite for risk, which can inform the development of investment strategies and research programmes in the real-world.



The game promotes discussion of how food production will be affected by climate change, application of Mātauranga Māori and consideration of different ways to mitigate and adapt for long-term food security.

Our crop breeding teams, like Honorary Fellow Ron Beatson (left) and hop breeder Kerry Templeton, work with our partners and customers to deliver new cultivars with unique traits.





Share /
Tuari



Our researchers, like Isabelle Sorensen (left) and Keith Vincent (right), are developing new technologies to optimise crop production and minimise environmental impacts.

Profitable growth in science services

Our science is helping our customers create the world's best food production systems — addressing challenges including environmental sustainability, enhanced crop production, protection from pests and diseases, reducing waste, and understanding the consumer.

Our customers across the agrifood and seafood sectors – including government departments, industry bodies and commercial businesses – have very specific needs from our science to help them meet their strategic priorities.

We work with them to create R&D programmes that help answer some of the issues facing them now and in the immediate future.

Our international network means we can work with other science organisations to help customers with their global business, working with them in overseas markets to understand consumers and create resilient food supply chains.



Our research is looking at ways to reduce waste and use all bioresources, for example, through the Cyber-Marine programme led by Susan Marshall.

Our new strategic research themes

In the 2022/23 financial year, we embarked on a project to co-create a theme-based strategic research framework, identifying the areas of science on which we will focus to achieve our mission of creating the world's most sustainable food systems. These themes will be used to provide staff and stakeholders with a line of sight between the research we do and how it contributes to our overall mission, as well as position us to engage with the development of national research priorities.

Through ideation workshops, focus groups, surveys and other collaborative methods, more than 200 staff engaged directly with the research theme project. The project team then considered and organised the data and ideas generated, with the support of our social science experts, and refined them into six strategic research themes.

Our strategic research themes:

Aotearoa provenance

Creating foods from our unique place with authenticity, identity and traceability

Climate resilience

Designing technologies to help food producers limit, mitigate and adapt to climate-driven changes

Full bioresource utilisation

Creating new ways to use everything we grow and harvest, improving efficiency and eliminating waste

Healthy ecosystems

Building healthy, balanced ecosystems resilient to future challenges and with enhanced biodiversity

Positive foods

Creating new healthy, delicious foods and bioproducts that are good for both people and the planet

Smart food systems

Harnessing new technologies and digital innovations to transform our food systems

\$59.2K* (\$62.8K)
Revenue per FTE
from commercial sources

0.67* (0.70–0.75)
Commercial reports
per scientist FTE

74% (≥80%)
Staff biosafety awareness score

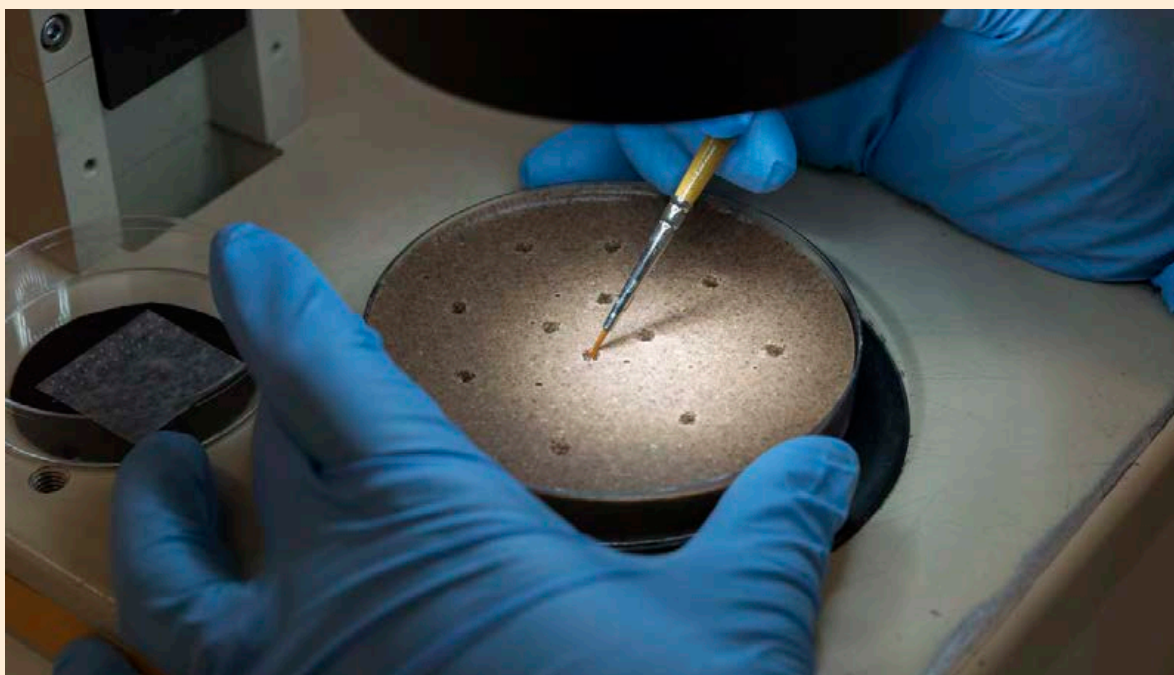
BRACKETS INDICATE TARGET
* LOWER THAN EXPECTATION DUE TO REDUCED
COMMERCIAL REVENUE, SEE PAGE 80

Successful funding applications

We apply for funding, either at an Institute level or in partnership with our customers, through the New Zealand Government's investment processes to support the development of research directly linked to our sectors' requirements.

In the 2022/23 financial year, Plant & Food Research was successful in a number of research funding applications.

- MBIE Endeavour Smart Ideas
 - How many flowers? Sugars, hormones and dioecy
 - Beekeeping outside the box: developing innovative colony handling and hive architecture
 - Sustainable, intelligent fruit production through novel nozzles for autonomous pollination
- Catalyst Fund
 - Catalyst Seeding: Developing tools and knowledge to understand how plants engineer their environments
 - Catalyst Seeding-Leaders New Zealand/China Exchange: Biofortified and climate-resilient crops
 - Catalyst Seeding-Leaders New Zealand/China Exchange: Development of fruit without fertilisation
 - Dumont d'Urville New Zealand-France Science & Technology Support Programme: FRUIT-TE: A consortium to unravel the role of complex genomic regions (transposable elements) in the domestication of fruit trees



Plant & Food Research scientists' expertise in developing new breeding and rearing systems for insect pests, including developing new artificial diets for healthy larval growth, was key in providing scientific validation of EDN as an effective fumigant.

Safer treatment for log exports

In 2022, Aotearoa New Zealand exported forestry products valued at more than \$6 billion. Logs and timber have historically been treated with methyl bromide (MB), a chemical now known to be an ozone-depleting gas, to meet phytosanitary requirements of export markets. National and international regulatory bodies have resolved that MB use will be phased out, so alternatives for MB are required that meet overseas market requirements for pest control.

Ethanedinitrile (EDN[®]) was identified as a potential replacement for MB in a Scion-led research programme funded by MBIE. Subsequently, Plant & Food Research scientists, with Scion collaborators, worked with chemical company Draslovka and in association with MPI, to determine the efficacy of EDN as a fumigant for New Zealand log and timber exports. EDN is a 'drop in' replacement for MB which is neither ozone-depleting nor a greenhouse gas, and has been evaluated based on modern worker safety standards. Through the PHYTOS (formerly STIMBR or Stakeholders in MB Reduction) collaboration, Plant & Food Research

has undertaken a series of laboratory toxicity and commercial validation trials to support the registration of EDN as a MB replacement for forest exports.

Key research focused on determining the effectiveness of EDN against three major insect pests – the black pine bark beetle (*Hylastes ater*), the golden-haired bark beetle (*Hylurgus ligniperda*) and the burnt pine longhorn beetle (*Arhopalus ferus*). Tests were conducted in the laboratory and in the field with commercial-sized log stacks, setting a new benchmark in phytosanitary fumigation research.

The research determined that EDN was an effective alternative fumigant to MB for the phytosanitary treatment of logs exported from New Zealand, and its use was approved by the Environmental Protection Authority in April 2022. The data are supporting negotiations with regulatory officials in overseas markets to ensure market access and development of fumigation schedules approved by key trading partners.



Our researchers, like Falk Kalamorz, have developed methods to move disease-free kiwifruit material to the South Island.

The arrival of the vine killing disease *Pseudomonas syringae* pv. *actinidiae* (Psa) into Aotearoa New Zealand in 2010 had a devastating impact on the North Island's kiwifruit industry — with losses estimated to be around \$1 billion. In response to the outbreak, the movement of kiwifruit plant material was restricted between the North Island, where the outbreak occurred, and the South Island, which remains Psa-free.

While these regulations have helped the South Island avoid Psa, they have meant South Island orchardists have not been able to access new kiwifruit cultivars that have been developed and released to North Island growers, such as 'Zesy002' (known as Gold3, marketed as Zespri™ SunGold™ Kiwifruit, and 'Zes008', marketed as Zespri RubyRed™ Kiwifruit.

In response to this challenge, scientists from Plant & Food Research have worked with industry to develop a safe pathway for kiwifruit plant material to cross the Cook Strait. This process involves three stages: laboratory-based tissue culture, a quarantine glasshouse facility, and an outdoor containment facility. Over two years the plants are closely monitored in contained environments, monitored by an expert team to ensure there's no infection risk.

As a result of this programme, plants from Zespri's most recently commercialised variety are in the hands of South Island growers, with around 11 hectares of propagated 'Zes008' vines so far established in the Nelson Tasman region. The industry anticipates this pathway will also be used for other cultivars in the future, unlocking equal opportunity for orchardists and of particular importance with likely changes in suitable production regions due to climate change.

Psa-free pathway south for kiwifruit



Coloured pigments in fruits provide human health benefits. In some fruits these pigments are concentrated around the skin, rather than throughout the flesh. Blueberries contain anthocyanins in their dark blue skins but the flesh is colourless. By contrast, the closely-related bilberry has both blue skin and colourful flesh full of anthocyanins.

Scientists at Plant & Food Research have initiated a breeding programme to develop berries that combine the commercial benefits of blueberries with the colourful flesh of bilberries. This new hybrid berry would contain up to five times the health promoting anthocyanins of blueberries and offer a potential new crop for Aotearoa New Zealand's horticulture sector.

Since the MBIE-funded Filling the Void programme began in 2017, Plant & Food Research has imported a collection of *Vaccinium* species plants – including bilberry and different blueberry species with wider genetic diversity than the existing blueberry germplasm collection – and completed 4,500 individual crossings to produce hybrid plants with desirable traits. The science team also led a world-first genome sequence of bilberry to identify the genetic markers for fruit colour and developed new imaging techniques to visualise compounds in bilberry to determine the genetic factors driving anthocyanin production in berry flesh and skin. The project has also produced a range of novel bilberry and blueberry plants with doubled chromosome number, which offer better growth habits and will be easier to hybridise between species.

A selection of plants is now being grown to full size for assessment for characteristics required for commercial success. These include plant traits of interest to growers – such as yield – and traits that appeal to consumers – such as fruit colour, size, taste and texture.

Scientists at Plant & Food Research have initiated a breeding programme to develop berries that combine the commercial benefits of blueberries with the colourful flesh of bilberries.

Breeding a new colourful berry





Our researchers, like Thomas Sowersby, are developing new products and processes to support the growth of New Zealand's food sector.

A world-class technology development business

We are never short of ideas. Sometimes it makes sense for us to use science and commercial expertise to take these ideas from concept through to a finished product. Sometimes we may decide we need a partner to co-invest and add their knowledge and commercialising capability into the mix. At other times, we may decide we've done what we can and need alternative ways to take our idea through to market. If that is not looking likely then we pass it back into science to generate new science knowledge.

Through our Technology Development (TD) portfolio we invest in the development of new products or technologies that will have real-world impact. We aim to maximise Plant & Food Research's share of the value created, through well-defined routes to commercialisation such as licensing, partnerships or new commercial ventures.

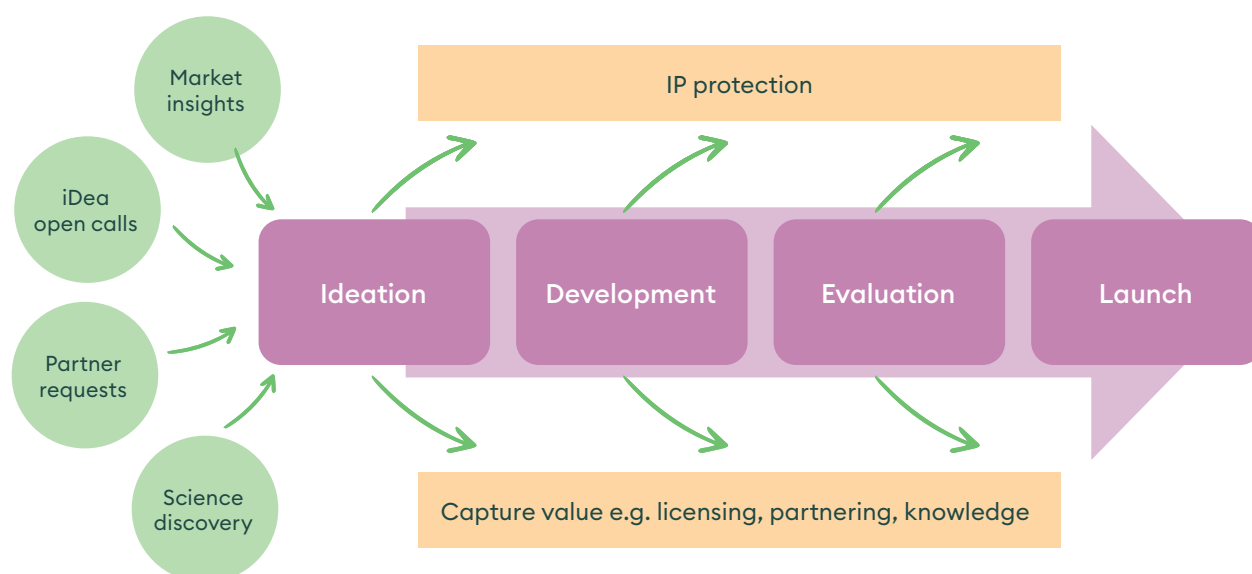
Our pipeline includes a wide range of TD 'Missions' – including targeted breeding of crops, new technologies for pest and disease control, machine-learning software for integrating into digital food production and supply chains, and new food concepts. We have a range of new products and technologies at points across the pipeline.

From ideation to reality

Using a licensed software platform adapted for our own purposes (iDea) we run an open innovation system across the Institute for the filtering and selection of Missions to invest in. This system is designed to bring transparency to the ideation process and provide a means of whole-of-organisation/peer review so that we can capture the full value of the collective knowledge and expertise within our organisation. It also brings a means for making more robust selection of investable opportunities based on a final step – the verbal pitch to senior commercial leaders.

Each Mission has a development timeline, with key stop-go points identified to support a 'fast-fail' development process. Where possible we make full use of co-investment vehicles, such as KiwiNet or MBIE's PreSeed Accelerator Fund (PSAF), to further develop these Missions.

Our Technology Development pipeline





INNOVATION

Examples of current Missions

Developing new barley products

With increasing consumer demand for plant-based food alternatives, barley has potential as a plant-based milk source. Barley is well accepted by consumers and recognised for its health benefits, and has dietary fibres known to be good for health. A suite of Technology Development missions is looking to develop new barley-based foods that could offer a new opportunity for the New Zealand arable foods sector.

The first project will breed a new barley cultivar with key characteristics tailored for human food and ingredient development, rather than traditional cultivars targeted at animal feed and brewing. New cultivars are under development with high concentrations of health compounds, for example, beta-glucan, which is related to blood cholesterol control and GI tract health, and with characteristics suitable for commercial processing.

Alongside this, scientists are developing a new method for processing wholegrain barley that produces a milk alternative with high taste appeal that retains the functionality of key compounds to support marketing health claims, and achieves total utilisation.

Another project is looking at the fermentation process to better understand how different strains of food-safe bacteria used in commercial yoghurt production contribute to texture and flavour development. This knowledge will be used to identify the best bacterial strains for producing yoghurts from barley milk with appealing tastes and texture.

Evaluating pomelo as a new breeding target

The tropical citrus crop pomelo is widely grown in Southeast Asia. However, existing commercially available cultivars commonly have undesirable traits related to fruit quality, fruit size, amount of pulp and peel thickness.

A new project, with established research partner Southern Horticultural Research Institute (SOFRI), will evaluate the potential for a new pomelo breeding programme in Viet Nam. The foundation project will characterise the existing pomelo germplasm collection at SOFRI to determine if there is sufficient breadth in characteristics to support the establishment of a breeding programme targeted at improving fruit quality and size for consumer appeal.

Breeding of a new premium pomelo cultivar would support growth of the pomelo sector in Viet Nam, provide experience for Plant & Food Research scientists in breeding crops for warmer climates, and potentially provide new opportunities for New Zealand growers.



Rockit™ brand apples, denomination 'PremA96', is a snack-sized small apple, perfect for everyone from children to elite athletes. Bred by Plant & Food Research, the apple is a cross between 'Gala' and 'Splendour' cultivars, with a sweet taste and only a third of the size of conventional apples.



Snack sized apple a global hit

Commercialised globally by Rockit Global Ltd, the Rockit™ apple is grown under licence in 10 countries around the world, with licences granted to a single company in each region to maintain high quality standards. The apple is enjoyed by consumers in 30 countries across Asia, Africa, Europe and North America, with marketing targeted at the high-value snack food market. As well as supermarkets, Rockit™ apples are available in outlets where apples are not usually sold, including hospitals, cafes, schools, and amusement parks, including Disney theme parks. Rockit™ apples are sold at US\$3.55 per five apples in 2023, up from US\$3.13 in 2022.

The area planted in Rockit™ apples is expected to exceed 850 hectares by the end of 2023, from 164 hectares in 2018. An early adopter of Plant & Food Research's Future Orchard Planting Systems (FOPS), the trees are grown in a vertical 2-dimensional architecture, which maximises the amount of light available to the tree, increasing yield. Rockit™ grown on FOPS produce up to 45 tonnes of apples per hectare

as three-year old trees, with yields of up to 90 tonnes per hectare anticipated over time, compared with an average yield of apple trees grown in New Zealand of 65 tonnes per hectare.

In 2021, Rockit Global opened a new 21,000 m² United Nations-certified cool store and packhouse facility in Hawke's Bay, which employs 200 full-time employees, with more than 600 seasonal workers at peak times.

In 2023, Rockit™ harvest was disrupted by Cyclone Gabrielle (see page 30), with a quarter of orchards unable to be harvested, and another quarter only partially harvested. Despite the impact of the Cyclone, export volumes were above those of 2022. There is strong market demand due to a global omni-channel marketing campaign – Ready. Set. Rockit. – along with in-market brand partnerships, such as with Minions in China; partnerships with influencers, including New Zealand cricketer Kane Williamson and US teen skateboarder Sky Brown; and a partnership with the Special Olympics.

Predicting health functionality of foods

Consumers are increasingly demanding to understand more about how food can support their health, and purchasing premium products that are marketed with information about beneficial ingredients. However, relatively few compounds found in foods have been identified and studied to this degree.

The Digital Diets programme is using recent advancements in machine learning and chemical structure modelling to predict the functionality of food, and the associated mechanisms of action. The Digital Diets platform analyses food composition to identify the compounds most likely to have a biological effect and predicts the target of this effect in the human body, then generates a list of predicted health benefits from automated mining of scientific literature and databases. The tool can be used to screen existing food products or support food manufacturers in prioritising health research targets.

The Digital Diets team took part in the 2023 Food, Fibre and Agritech Challenge, a pre-accelerator programme aimed at developing and validating new commercialisation ideas, and was recognised with the Emerging Technology Award.

Predicting disease in grapevines

Early detection and containment of affected material is crucial to controlling plant diseases. Grapevine leafroll disease (GLD) causes vines to produce smaller bunches of grapes, reducing yield and productivity.

VinEye is a digital tool, powered by artificial intelligence and machine learning, that can scan vines for visual signs of disease – in the case of GLD, the presence of red tinted leaves – in a faster, more accurate way than manual detection. Plant & Food Research plans to partner with commercial operators around the world to deploy VinEye to help growers control this serious disease. VinEye could be deployed on agricultural robots equipped with cameras for real-time monitoring of vine health or via an app on any smartphone.

VinEye was initially developed for GLD, but the tool could be adapted to detect other wine grape diseases with visual symptoms, such as botrytis and grapevine trunk diseases, or for diseases in other crops.

9 (4–8)
Patents granted

3 (2–3)
Plant Variety
Rights granted
New Zealand

8 (3–4)
Plant Variety
Rights granted
international

\$49.8M (\$48.1M)
Value of portfolio
of investment

\$4.3M (\$4.5M)
Investment in
non-breeding
TD Missions

\$3.7M (\$1M)
Investment in
foundation TD
initiatives

BRACKETS INDICATE TARGET



Two new hop varieties, bred by Plant & Food Research and commercialised by NZ Hops Limited, are taking the global craft market by storm..

Nectaron®, denomination ‘Hort4337’, was launched in August 2020. With intense tropical pineapple, passionfruit and stone fruit flavours, the hop lends itself to a range of beer styles, including IPA (India Pale Ale) and hazy IPA styles. The hop was named in honour of Plant & Food Research hop breeder Dr Ron Beatson, who retired in 2022 after more than three decades leading the hop breeding programme. More than 180 hectares of Nectaron® are currently planted in New Zealand, with estimated production of around 300 tonnes per year.

Superdelic™ (‘NZH131’) was launched in February 2023, with red fruit, candy, citrus and tropical fruit characteristics, and performs particularly well for hazy IPA style beers. The first 15 hectares of Superdelic™ have been planted, anticipated to increase to 30 hectares in 2024 to produce an estimated 50 tonnes per year.

Both varieties were bred by Plant & Food Research for their unique aroma profiles, which appeal to craft brewers in particular. As part of the commercialisation process, NZ Hops developed exciting, vibrant brand personalities for the hops which brewers can incorporate into their own marketing as appropriate. New Zealand exports about 85% of the 1500 tonnes of hops harvested with a value of \$60 million each year – the majority of hops planted in New Zealand have been bred by Plant & Food Research.

New hops for New Zealand



New Zealand exports about 85% of the 1500 tonnes of hops harvested with a value of \$60 million each year — the majority of hops planted in New Zealand have been bred by Plant & Food Research.

The new Research Vessel Tuhiata, named after the first glimpse of light at dawn, which signals the opportunity for new ideas and inspiration. The new vessel will support better understanding of fish species and the development of new aquaculture opportunities.





Invest /
Whakangao



Our researchers, like Jay Liu (left) and Amira Mahmoud (right), are looking at new ways to reduce waste, such as using insects to convert horticultural by-products to fish feed.

Investing in future science

The world is changing, with more people, shifting diets and a greater awareness of the impact humans are having on the planet. Our science needs to make sure that producing nutritious, tasty foods remains sustainable for future generations.

We have thought about how our science could help create more sustainably produced food for future generations. We have chosen areas of science in which we think Aotearoa New Zealand can lead the way — our Ngā Pou Rangahau Growing Futures™ Directions.

Each of our Ngā Pou Rangahau Growing Futures™ Directions is focused on creating science for what we think Aotearoa New Zealand, and the world, will need in 20 years' time. We've come up with some big ideas and have long-term research plans that will help make these a reality. If for some reason we never reach, or need, our ambitions, we're still confident that each small step will create new technologies and scientific expertise that will help our industry partners better prepare for the future.

3 (5–15)

International awards

2 (1–3)

Science reviews

7 (1–2)

Cross-cutting workshops

25.8% (25%)

Research activities aligned with Growing Futures™

BRACKETS INDICATE TARGET

Our Ngā Tohu Pūtaiao — Growing Futures™ Directions are:

Hua ki te Ao

Horticultural Production goes Urban

Creating the plants and systems needed to grow plant-based foods close to where people live

Digital Horticultural Systems

Creating a digital world to test our new growing systems and protect our environment

Ngā Tai Hōhonu

Open Ocean Aquaculture

Understanding how to raise healthy fish in captivity in the open ocean

Authentic Taonga Foods

Working in partnership with Māori to create foods and bioproducts from Aotearoa's unique species

We also invest in biosecurity research through the Better Border Biosecurity (B3) collaboration. This collaboration is vital in keeping New Zealand flora and fauna safe from invasive pests and diseases into the future.



Our scientists are looking at new ways to future-proof the food sector, such as developing methods to lab-culture fruit.



INNOVATION

Hua ki te Ao

— Horticultural Production goes Urban



Our Ngā Pou Rangahau Growing Futures™ Direction Hua ki te Ao Horticultural Production goes Urban is looking at how we can grow perennial fruit crops in compact, covered environments to produce food continuously in urban environments. Once we have the right crops, we'll need to figure out the best way to grow them – the right light source, temperature, and water and nutrient requirements – and build new technologies to look after the plants for us.

Hua ki te Ao – by developing sustainable indoor production systems we take our fruits, products, benefits and abundance (hua) to the cities of the world (ki te Ao).

Direction co-leader: Samantha Baldwin

Direction co-leader (Māori): Jenny Green

Research Programmes:

- Future urban consumers
- Traits for life indoors
- Overcoming pollination barriers
- New growing units
- New plants for a new world
- Foods by design
- Environmental plant hacking
- Māori growing practices go vertical

Understanding the future consumer

Social scientists have found that consumers in Aotearoa New Zealand and Australia have similar attitudes towards new food technologies, but these differ to those of some export markets. Quantitative and qualitative research studies, including more than 80 focus groups with more than 500 consumers in four countries, have collected views on gene editing and genetic modification, cell-cultured foods, robotic technologies and controlled environment systems, to better understand consumer acceptance of new technologies in food production. The study will be expanded to include consumers in other key export markets, such as Japan and China.

Developing new multi-crop plants

Being able to grow multiple crops on a single tree would support the design of trees for a range of purposes in different environments. Researchers are developing new ways to graft previously incompatible plant tissues to grow different crops on a single rootstock or stem. The research will also find new ways to improve the success of grafting partially compatible plants, for example pears onto apple rootstocks, or tomato and capsicum plants.

Developing cellular horticulture

Growing fruits in the lab would support the production of food anywhere in the world and require fewer resources than field-grown crops. Scientists are growing fruit-based products in the lab that would still offer consumers a good eating experience as well as high nutrition. Initial trials have used cells harvested from blueberries, apples, cherries, feijoas, peaches, nectarines and grapes in developing methods for lab-based fruit production.



INNOVATION

Digital Horticultural Systems



Our Ngā Pou Rangahau Growing Futures™ Direction Digital Horticultural Systems will create digital production system simulators, which will allow researchers and producers to test and optimise systems before even planting crops. Using the big data generated by monitoring and analysing existing orchards and supply chains, digital twins will be built that can be manipulated to understand the impact of decisions on food production under different future scenarios, including those associated with climate change.

Direction leader: John Mawson

Direction co-leader (Māori): to be appointed

Research Programmes:

- Data architecture, analytics and visualisation
- Modelling high performance apple systems
- Simulating orchard ecosystems
- Smart sensing and imaging systems
- Stakeholder values and metrics



INNOVATION

Ngā Tai Hōhonu

— Open Ocean Aquaculture



Our Ngā Pou Rangahau Growing Futures™ Direction Ngā Tai Hōhonu Open Ocean Aquaculture will develop aquaculture systems that work with nature to grow fish in captivity in the ocean. We're also building other parts of the complex chain of technologies and knowledge needed to be able to produce a diverse range of fish species with the lightest environmental footprint possible. That includes breeding the right fish to survive in an aquaculture system, creating new nutritious foods and mechanisms to feed the fish, finding ways to ensure fish are healthy and monitoring their performance, and understanding how to keep structures clean.

Ngā Tai Hōhonu – developing open ocean production systems in the deep seas (ngā tai hōhonu).

Direction co-leader: Damian Moran

Direction co-leader (Māori): Hemi Cumming

Research Programmes

- Appropriate species selection
- Aquafeed
- Performance measurement
- Research in the open ocean environment
- Species selection framework
- New open oceans ecosystems
- Cellular systems for fish health

Diving into the fish microbiome

New Zealand native fish species, such as tāmure (snapper) and araara (trevally), are currently being researched as potential new aquaculture species. Researchers are looking at the role the fish larvae gut microbiome plays in the health and development of fish larvae, with the aim of developing new powdered feeds to replace the live feeds larvae would eat in the wild. The first stage of the research has been to develop protocols to sample the fish microbiome, which have been adapted from zebrafish to be used successfully with snapper and trevally.

New ways to manage and use biofoul

Biofouling – the accumulation of living organisms on human-made marine structures – currently costs millions of dollars to manage. Scientists are exploring new ways to manage or use biofouling on open ocean structures. The first stage of the research is to understand how biofouling in the open ocean differs from biofouling in other locations to inform the development of advanced biofouling management strategies. In addition, the researchers are investigating whether the marine molecules contained in biofouling could be used as a bioresource, for example as ingredients for fish feed or high-value marine compounds.

Developing new aquafeeds

Growing fish in aquaculture requires providing sustainable feed options for the fish that account for the species, life stage and growing environment. Researchers are investigating whether forage crops, specifically lucerne and perennial ryegrass, could potentially be used as aquafeed, and are developing new cost-effective processes for producing safe, highly digestible feed protein ingredients. They are also investigating whether black soldier fly larvae could be used to process horticultural by-products and then fed to fish as a nutritious fishmeal.



INNOVATION

Authentic Taonga Foods



Through our Ngā Pou Rangahau Growing Futures™ Direction Authentic Taonga Foods, we will work in partnership with Māori to create a taonga foods and bio-based product innovation system for Aotearoa New Zealand. Through the research, a new sector will be developed, offering foods for wellness based on indigenous biology and Mātauranga Māori. New products will create a unique position in the global marketplace, and contribute to economic growth for Māori and for Aotearoa New Zealand.

Direction co-leader (Tangata whenua): Jonni Koia

Direction co-leader (Tangata tiriti): Isabel Moller

Better Border Biosecurity (B3)

The Better Border Biosecurity (B3) collaboration creates new knowledge and technologies to protect the New Zealand border from plant pests and diseases. This science is used to understand how new pests and diseases could affect New Zealand flora and fauna, as well as to find new ways for border agencies to detect and respond to pests and diseases that reach or cross our borders.

Plant & Food Research is leading ten new projects funded by B3 in 2022/23. These are:

- Testing the Toolbox: Reducing uncertainty around non-target impacts from biocontrol agents by validating tool predictions – with AgResearch, Scion, Manaaki Whenua Landcare Research
- New risk assessment and detection tools for cereal and grass pathogens on the seed import pathway
- Further development of the Integrated Biosecurity Risk Assessment Model (IBRAM) for pathogens
- Novel sensor approaches to sniff out biosecurity threats
- Rapid screening method for optimising commodity treatments
- De-risking the plant tissue culture pathway
- Accelerated aging of plants to shorten the post-entry quarantine testing period – with Lincoln University
- The risk of diapausing pest insects on pathways to Aotearoa New Zealand
- Metatranscriptomics informing the relevance of pathogen disease biomarkers in plants
- Expanding our eradication toolbox in NZ: Is biocontrol a feasible tool to incorporate in a response?

Plant & Food Research scientists are also part of four other projects:

- Empowering Te Ao Māori responses to biosecurity threats to taonga species, native ecosystems, and communities – led by AgResearch
- He waka hourua: Matāuranga and Western science navigate a safe course for future biocontrol – led by AgResearch
- Beyond soil baiting: toward application of an eRNA diagnostic tool for Phytophthora – led by Scion
- eDNA for terrestrial biosecurity monitoring – led by Scion.



Dr Desi Ramoo replaced Dr David Teulon as Director of B3 in February 2023.

Use of animals in research

Plant & Food Research is an active signatory to the Openness Agreement on Animal Research and Teaching in New Zealand. We endeavour to reduce or replace animals in research where possible and practicable, and refine husbandry methods to reduce negative impacts on and increase positive welfare for research animals.

Animal numbers by type 2022



*Includes rats, mice

**Includes Trevally, Snapper, Salmon



International science conferences

In the 2022/23 financial year, Plant & Food Research was involved in the organisation of two international science conferences. In March 2023, 105 people attended the 11th Rosaceae Genomics Conference in Nelson. In May 2023, Plant & Food Research and B3 were partners supporting the 4th International Congress on Biological Invasions (ICBI), attended by 480 people.

Plant & Food Research also won the rights to host the 11th Meeting of the IUFRO Working Party: Phytophthora in Forests and Natural Ecosystems (IUFRO2024).

Ensuring our science quality

The quality of our science underpins all our activities. We have a network of collaborators, across Aotearoa New Zealand and internationally, that allows us to access the best teams and facilities globally to support our own research activities. We routinely benchmark our research against the world's leading science organisations, guided by our Science Advisory Panel (see page 75), to ensure we continue to deliver the best science for our customers and our partners.

In the 2022/23 year, we reviewed our science publication outputs, benchmarked against other Crown Research Institutes, which demonstrated a decrease in peer reviewed publications and lower than target commercial reports per scientist FTE. This has triggered a number of questions around publications and the way that the world is absorbing information. In the 2023/24 year, we will be surveying our researchers to determine if there are any barriers to publishing, which will help us understand if any action is required or if this change aligns with the impact focus for CRIs.

Post the COVID-19 pandemic, we have also re-initiated our programme of face-to-face forums with 45 researchers, alongside the Science Advisory Panel and senior leaders, attending the Early Career Researchers Forum in October 2022.

4.84 (3.5–4.0)
Impact of science publications
(SciMago)

88% (75–85%)
Publications co-authored
with collaborators

22 (20–40)
Invitations for
international committees

15 (5–15)
Invitations for
editorial boards

BRACKETS INDICATE TARGET

Our new scanning transmission electron microscope allows our scientists to take high-resolution images down to the nano-scale, helping them better understand the living world, such as close ups of beneficial insects like the Samurai wasp *Trissolcus japonicus*.



Investing in facilities & information

We know ideas need the right environment to flourish. Providing the right tools, equipment, technology and resources is the best way we can help our staff do what they do to the best of their abilities. We have long-term plans to make sure our infrastructure is constantly refreshed so we have the specialist facilities, leading-edge equipment and information management systems that we need to deliver world-class science for our customers.



INFRASTRUCTURE

New intranet and collaboration tools, improved cybersecurity

Key communication services including email, telephony, Chat and video calling were successfully migrated to Microsoft 365 (M365) in the preceding two financial years. This provided the foundation for further adoption of Microsoft Cloud delivered services and enabled legacy platforms to be retired.

The 2022/23 financial year focused on content migration, adopting collaboration services and managing user devices using M365 services to protect against data loss. A new intranet was launched along with projects to recreate existing intranet sub-sites and process automation workflows in SharePoint Online.

Wider adoption of Teams collaboration functionality has been supported by user training across the organisation, activating OneDrive Online to replace network file stores and a providing a new model for external collaboration. The content of more than 1200 collaboration sites in the legacy SharePoint platform are being migrated to SharePoint Online following good practice for Information Management.

Intune, a M365 tool, was implemented to manage how devices are used and to enforce policies that control applications on both corporate and personally owned devices to protect against data loss. This tool has been implemented for both corporate and personally owned mobile phones and tablet computers.

The projects to migrate content, recreate intranet sites and rebuild process automation workflows will extend into the 2024/25 year and then enable the legacy SharePoint platform to be retired. Future projects will extend the use of Intune to other end-user devices to improve information security management and protect against data loss.

\$21.3M (\$35.5M)
Expenditure against milestones in long-term capital plan

BRACKETS INDICATE TARGET



INFRASTRUCTURE

Managing disruptions by the weather

The weather in the first half of 2023 created disruptions across New Zealand.

January 2023 was declared the wettest month in recorded history in Auckland. Around half of the month's rain was in a single day, with 211 mm falling in under 6 hours. Kerikeri also suffered torrential rainfall during that period. There was no significant damage to our sites, but some staff were affected by flooding caused by the unprecedented rainfall.

In February 2023, Cyclone Gabrielle hit the North Island of New Zealand. The tropical cyclone had a devastating impact on Hawke's Bay (see page 30) but also saw torrential rain at our Kerikeri, Auckland, Pukekohe, Ruakura and Te Puke research centres, with wind gusts up to 150km/h. For these sites, there was very little damage to buildings, although some trees were damaged. For the safety of staff, these sites were closed for a short period immediately after the storm. In Hawke's Bay, the site was closed for an extended period to enable buildings and orchards to be made safe. A number of staff suffered personal losses due to the weather event.

In June 2023, a severe rainfall event caused flooding at our Ruakura Research Centre. The ground floor offices and laboratory spaces, including the engineering building, were flooded, requiring the closure of the site for several days and the long-term displacement of a number of staff. Restoration of the affected areas will take several months to complete.



INFRASTRUCTURE

Expanding our laboratory space in Auckland

The final storey of the largest building at our Mt Albert Research Centre has been completed, with 38 scientists and students moving in during June 2023.

The Hamilton Building, named after DSIR Director General William Hamilton, was originally opened in 1973, with a refurbishment of most of the floors completed in 2018. The third floor was left temporarily empty, to determine the best use for the space to support Plant & Food Research's future activities.

The floor has been refurbished as office and PC2 (physical containment level 2) laboratory space (currently running at PC1) for 40 people working to determine the genetic controls of key plant characteristics such as colour, flowering and health attributes and ways in which this knowledge can inform breeding of new cultivars.

The fit-out of the Hamilton Level 3 labs and office was completed by Alaska Construction Interiors with support from Bossley Architects and Lab-works Architecture, and externally project managed by 4Work.



We have close to 1,000 people, including Research Associate Kelly Davis, working to create a smart green future for New Zealand and the world.

Investing in people

Māku e kii atu, he tāngata, he tāngata, he tāngata.
What is the most important thing in the world? It is people, it is people, it is people.

Plant & Food Research's success and reputation is based on our people, our values and a culture where every individual truly belongs, thrives and goes home safe and well every day.

Meeting the government's Good Employer Responsibilities and legal compliance are a given. Our commitment is to develop an organisational culture that makes working at Plant & Food Research a great staff experience for all.

Progressive conditions of employment

The Plant & Food Research General Terms & Conditions of Employment include provisions promoting equal employment opportunities, career development and employee participation in the development of the workplace. They provide a wide range of benefits including superannuation, medical insurance and generous leave provisions supporting work-life balance and whanau/family commitments.

- Our partnership agreement with the PSA serves as an effective mechanism for involving staff in the ongoing development of a high quality work environment.
- Additional paid parental leave, on-site childcare facilities at our larger sites and flexible and part-time hours of work enable people to balance their work and family responsibilities and minimise disruption to their careers. 17% of our salaried staff work part-time, including a significant number who have reduced their hours while they care for dependants.
- Career progression remuneration structures utilise standard job evaluation methodologies and peer review to ensure equity and transparency in both pay and promotion opportunities.
- Staff working towards retirement have the option of progressively reducing their hours and responsibilities.
- Retraining and outplacement support is available to staff affected by change in the workplace.
- We have now completed our first remediation for the Holidays Act, making payment to current and previous staff while we continue to work on making our payroll and related processes fully compliant. Work is now focused on moving to online timesheets for our waged workers and introducing fully compliant payroll rules so we can implement a final remediation for all staff.

Kia Toipoto

We are committed to reducing all gender, Māori, Pacific and ethnic pay gaps and have engaged with the national initiative Kia Toipoto to achieve this. Our gender pay gap is 12.6% and an action plan is being developed to close this gap in a systematic and sustainable way.

A culture of belonging

We continue to work on increasing the participation of women and Māori in all parts of our organisation.

The proportion of senior women scientists in leadership positions continues to grow, largely through development and internal promotions.

Our TONO strategy is having a significant organisational impact resulting in an increase of Māori staff from 2% to 4.2% over the last four years. It provides the strategic context for developing Māori cultural capability, leadership and confidence across our staff, which is foundational to our successful partnerships with Māori. Our Te Reo and Te Ao Māori plans are guiding staff in their development.

Our annual Summer Student Programme provides promising students from across the motu with their first experience of working in science. In 2022/23, 20 of the 42 studentships were awarded to rangatahi who participated in the Te Rito pathway of the programme. This programme is a key part of the talent pipeline plan to increase participation of Māori in the research, science and innovation (RSI) workforce. It is receiving national recognition as a Diversity Works finalist in 2023.

Achieving Respect Together is a new initiative sponsored by three members of the Senior Leadership Team. The programme is founded on our new values and aims to educate staff and prevent all forms of harassment, bullying and unacceptable behaviours, and provides clear resolution pathways for staff.

40% (≥42%)
Staff engagement

66% (≥65%)
Participation in pulse surveys

62% (≥75%)
Staff confirm they are encouraged to offer ideas and suggestions on safety improvements

BRACKETS INDICATE TARGET

The Role Clarity and Empowerment and Strategic Research Themes programmes are having a positive impact across the organisation. These programmes are focused on clarifying researcher team and group leader roles, and providing appropriate time, development and support for these critical roles. The strategic research theme project is a consultative process to engage researchers and develop clear lines of sight from their mahi to our Smart Green Future Together vision (see page 45).

Developing talent and leadership

Confident, positive leadership is fundamental to enabling individual, team and organisational success. Building on the success of a leadership hui in 2021, the Leadership Boost Programme is now embedded as the key way we develop and support leaders at all levels. The programme has been expanded to offer workshops for future leaders, and personal leadership for students. More than 200 staff have participated in Leadership Boost programmes. A further development is the concept of team coaching to provide cohort group support to continue their learning beyond the structured workshop programme.

Engaged staff

We continue to use the Gartner quarterly engagement survey tool. Participation levels have remained constant at about 65% since 2019. Engagement has seen a decline over the last three years and there are multiple reasons for this including the impact of the COVID-19

pandemic and cost of living challenges. In Q4 FY2022/23 there was positive improvement in engagement across all factors. Future confidence in Plant & Food Research, staff participation in decision making, and remuneration continue to be concerns for people. We expect the consultative approach to our strategy refresh programme over the next nine months will result in greater staff connection and confidence.

A culture of safety and wellbeing

Following an external audit of Health, Safety and Wellbeing (HSW) in 2022, and the appointment of a new National HSW Leader, an updated HSW strategy has been developed and endorsed by the Plant & Food Research Board.

This will see investment in a new HSW system to improve the ease of reporting, as well as improve data and reporting to support the continuous development of a positive leader-led safety culture.

The Critical Risk Groups have been reviewed and a renewed focus put on five critical risks. Mental Health and Wellbeing is a critical risk and we have been developing capability and capacity in this area. Notably, 51 staff have undertaken Mental First Aid training in 2022/23.

Training is an area that has been identified for further investment and improvement. A HSW Trainer has been appointed and the new system will enable better management and reporting of training across critical and key risks.

A smart green future. Together.

Mana tangata

We contribute our unique talents and perspectives

We value each other's differences and potential.

We step up to support each other and the people, businesses and communities we interact with.

Manaakitanga

We show respect, generosity and care for others

The future we want requires work from us all and the best future is one where the success we achieve is shared by all those who help shape it.

We're approachable, we listen, we help and we grow together.

Whai māramatanga

We always look for a better way

We seek out and respect the knowledge and ideas of others.

We discover, understand, innovate and apply knowledge with integrity to enable positive impact for our partners, Aotearoa New Zealand and the planet.

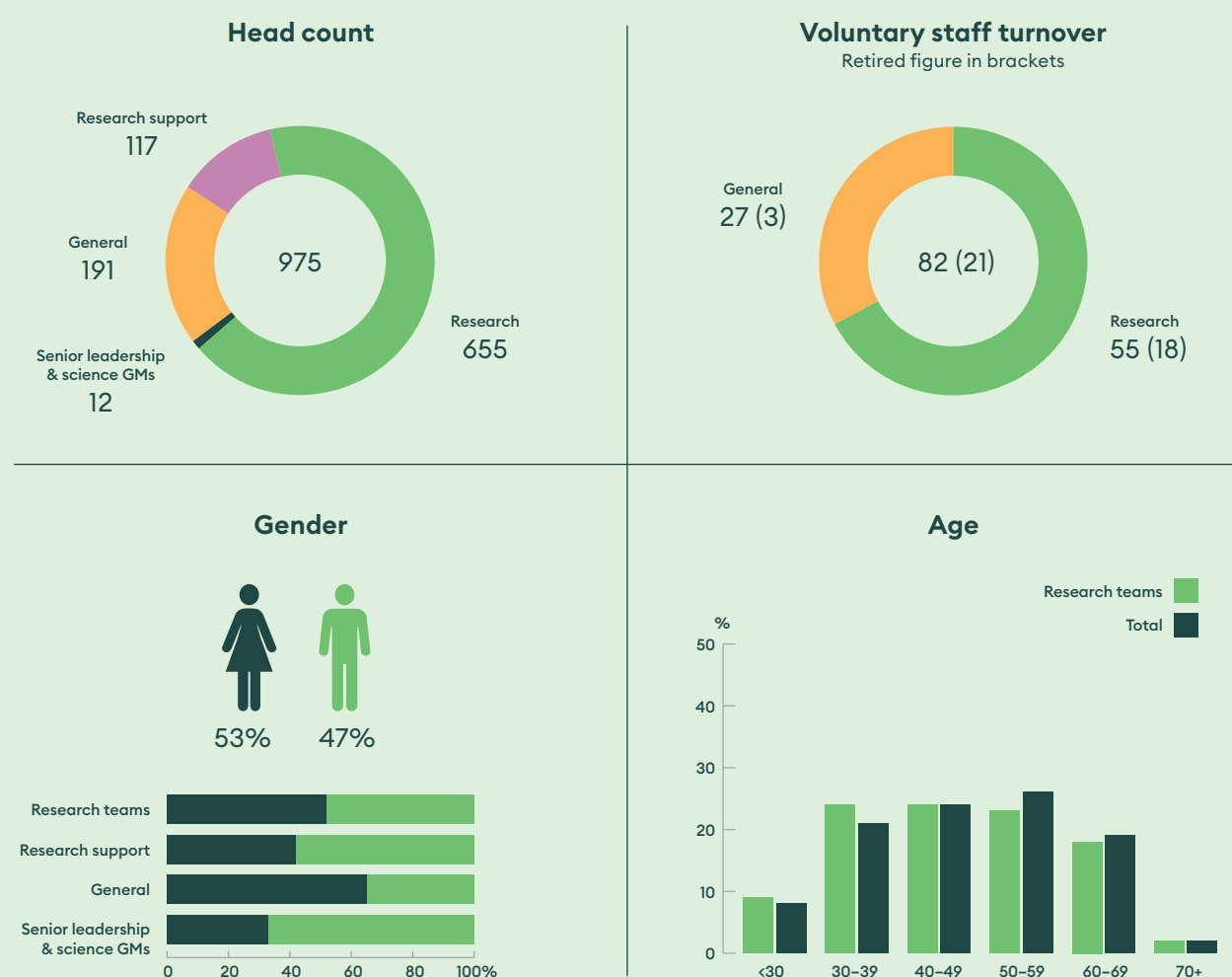
Ehara taku toa i te toa takitahi, engari he toa takitini.

Success is not the work of an individual, but the work of many.

National/ethnic origin of new recruits as at 30 June 2023

	2017	2018	2019	2020	2021	2022	2023
African	1	1	0	0	0	0	0
Asian	24	22	22	9	20	30	15
Latin American	1	6	4	0	2	7	2
Māori	2	7	1	6	9	6	6
Middle Eastern	4	1	5	1	1	1	2
New Zealand European	53	53	47	37	40	58	69
Other	0	2	1	2	4	5	8
Other European	23	23	23	16	13	22	17
Pacific Peoples	1	1	0	0	0	1	1
Unknown	0	0	0	0	0	0	6
Total	109	116	103	71	89	130	126

Workforce profile* as at 30 June 2023



*Parent and 100% owned subsidiaries.





Our Governance

Corporate governance

The Plant & Food Research Board, appointed by the Minister of Science & Innovation, sets the Institute's strategic direction and delegates responsibility for the management of the Institute to the Chief Executive Officer.

Statement of Core Purpose

The Statement of Core Purpose (SCP) outlines the clear, explicit and enduring strategic role for Plant & Food Research as determined by the New Zealand Government. The SCP outlines the Institute's roles and responsibilities and how these will benefit New Zealand, and is used by the Crown to evaluate performance on a four-year rolling basis.

Plant & Food Research's SCP can be found online at plantandfood.com/scp

Statement of Corporate Intent

The Statement of Corporate Intent (SCI) outlines the Institute's five-year strategy, including the nature and scope of activities and performance targets. The SCI includes plans to contribute to the outcomes described in the SCP and outlines key performance indicators to support their delivery.

Plant & Food Research's SCI 2023/24 to 2025/26 can be found online at www.plantandfood.com/en-nz/article/statement-of-corporate-intent-2023-24-2025-26

Legal obligations

Plant & Food Research is subject to (amongst others):

- Crown Research Institutes Act 1992
- Commerce Act 1986
- Crown Entities Act 2004
- Health and Safety at Work Act 2015
- Official Information Act 1982
- Public Audit Act 2001

Board of Directors

The Board of Directors, appointed by the Minister of Science & Innovation according to the Crown Research Institutes Act, sets the Institute's strategic direction and delegates responsibility for the management of the Institute to the Chief Executive Officer.

The Board acts under a Charter which formalises and sets out the manner in which the Board's powers and responsibilities will be exercised and discharged, adopting principles of good corporate governance and practices that accord with best practice and the application of laws in the jurisdictions in which the company operates. In line with best practice, the Board completes an annual Board performance evaluation.

The Board regularly reviews key policies across the Institute. 'Deep-dive' reviews are also periodically undertaken, including most recently a review of the organisational risk framework and supporting risk registers.

For the 2022/23 year

Number of meetings held: 12

Meetings held at: Hawke's Bay, Mt Albert, Blenheim, Lincoln, Kerikeri and online.

- Nicola Shadbolt, Chair (11)
- Colin Dawson, Deputy Chair (12)
- Parmjot Bains (2)
- Justine Daw (12)
- Dean Moana (7)
- Nadine Tunley (9)
- Wendy Venter (10)

(number in brackets indicates number of meetings attended during the 2022/23 year)

Profiles of the current Board of Directors can be found on page 74 or on the plantandfood.co.nz website.

Remuneration details for the Directors can be found on page 81.

Schedule of major annual activities

- August – Annual Report
- October – Annual Risk Review (including Biosafety and Environmental Compliance)
- October – Insurance renewal
- October – Strategy review and Science Advisory Panel
- October – Annual General Meeting
- December – Full year reforecast
- December – Annual Health & Safety review
- March – Strategy review
- April – SCI and Business Plan.

Committees

There are currently two standing Committees operating under the direction of the Board Chair:

Audit & Risk Management Committee

Wendy Venter (Chair), Justine Daw, Dean Moana, Nicola Shadbolt

Number of meetings in 2022/23: 4

The primary objective of the Audit & Risk Management Committee is to act as the main conduit with the company's auditors, to serve as an independent and objective party in reviewing financial information, auditing, accounting, compliance and financial reporting strategies and processes.

Remuneration Committee

Colin Dawson (Chair), Parmjot Bains, Nicola Shadbolt Nadine Tunley, Wendy Venter

Number of meetings in 2022/23: 2

The purpose of the Remuneration Committee is to oversee the appointment, performance review and remuneration of the Chief Executive Officer and senior executives who report directly to the CEO. In addition, the Committee exercises its governance responsibilities in relation to the Institute's remuneration and people management strategies.

Science Advisory Panel

The Board also receives advice from the Institute's external Science Advisory Panel.

The purpose of the Panel is to provide objective strategic advice to the Board to promote its decisions on research strategies, future science activities and development associated with achieving Plant & Food Research's Core Purpose.

Members of the Science Advisory Panel are:

- Professor Gillian Dobbie (University of Auckland)
- Dr Ernst van den Ende (Wageningen University & Research Centre, The Netherlands)
- Professor Selina Stead (Leeds University, UK)
- Professor Weibiao Zhou (National University of Singapore).

Profiles of the Science Advisory Panel members can be found on page 75 or on the plantandfood.co.nz website.

Managing risk effectively

Plant & Food Research has an established framework for managing risk in an effective, efficient and consistent manner, to inform strategic and business planning processes, optimise allocation of resources and allow Plant & Food Research to effectively recognise, prioritise and respond to risks. The Risk Management Framework adopts processes consistent with those established in the

ISO 31000:2009 Standard: Risk Management – Principles & Guidelines.

Plant & Food Research has a Business Continuity Plan (BCP) which acts as a framework for organisational preparedness, emergency response and recovery after disruption by a significant natural or man-made incident. The BCP focuses on the response and recovery of critical assets and operations to mitigate the potential impact of an incident to the Institute's ability to deliver on its business and strategic plan and to protect Institute staff and the wider community. The BCP also includes a framework for site-specific Emergency Response Plans.

Code of Conduct & Ethics

Plant & Food Research's reputation is determined to a large degree by perceptions of the conduct and performance of its staff. The Code of Conduct & Ethics is intended to inform and guide the Institute's staff on the standards of conduct, decision-making and ethical behaviour that are important at Plant & Food Research.

The Code of Conduct & Ethics includes guidelines on:

- Acting with honesty and integrity
- Consistently demonstrating professionalism
- Respecting and acting within the law
- Maintaining confidentiality
- Avoiding conflicts of interest
- Being socially responsible.

Plant & Food Research operates its scientific research activities in accordance with national legislation, including ethics approvals for all human and animal studies (coordinated by the Institute's Biosafety Advisory Committee).

Board of Directors



Nicola Shadbolt, Chair

Nicola Shadbolt has worked in government, agribusiness, consultancy and academia and is a Professor of Farm and Agribusiness Management at Massey University. She serves on the Executive Committee and the Board of the International Food & Agribusiness Association and is a voluntary appointed board member on Cooperative Business New Zealand. With a breadth of experience, she has a particular focus on sustainability and environmental, social, and corporate governance. She is managing director with her husband of four farming and forestry equity partnerships based in the Manawātū. Nicola was made an officer of the New Zealand Order of Merit for services to agribusiness in 2018.



Colin Dawson, Deputy Chair

Colin Dawson has held a number of senior executive positions in the primary, secondary and tertiary health care sectors. Formerly CEO of Otago Innovation, Colin continues to be involved in the commercialisation of research. He has held directorships with a number of biotechnology and medical companies including NZX-listed companies BLIS Technologies and Pacific Edge. He currently chairs the Boards of Tiro Lifesciences, Upstream Medical Technologies and sits on the MARS Bioimaging Board. Colin is a Chartered Fellow of the Institute of Directors and is involved in horticulture via a Central Otago export cherry orchard and small vineyard.

For the 2022/23 year

Number of meetings: 12

Meetings held at: Hawke's Bay, Mt Albert, Blenheim, Lincoln, Kerikeri and online



Justine Daw

Justine Daw has held executive leadership and governance roles in the environmental, science and public policy spheres. As a former career diplomat, she worked internationally on sustainable development, trade and the environment. In New Zealand, Justine led the adaptation programme at the NZ Climate Change Office, and seconded to the first Minister for Climate Change to establish national climate change policies. Justine currently sits on Ministerial Advisory Groups for Community Sector Research and Environmental Targets and Limits. Now based in Northland, and on the board of Reconnecting Northland, she heads up a collaborative programme between the Crown, iwi and regional councils to restore the Kaipara Moana, the largest harbour in the Southern hemisphere.



Dean Moana

Dean Moana is currently a director of the New Zealand Food & Beverage Group Ltd and Ngāti Porou Holding Company Ltd, and a trustee of Te Runanganui o Ngāti Porou and Whangaokena ki Onepoto Kaitiaki Takutai Trust. He was previously Managing Director and Chair of Prepact Ltd, CEO of Prepared Foods Ltd and General Manager of Pacific Marine Farms Ltd. He also served as a director on the board of Ngāti Porou Seafoods Group Ltd, as Chair of Prepared Foods JV Ltd and as a director of the Paua Industry Council. He is a Chartered Accountant and has a Bachelor of Commerce & Administration



Parmjot Bains
(Resigned 31 August 2022)



Nadine Tunley

Nadine Tunley took up the role of Chief Executive of Horticulture New Zealand in June 2021. She has been involved in the food and fibre sector for more than 30 years. Nadine was previously Board member and Chair of NZ Apples & Pears Inc. In 2006, she jointly founded a produce marketing company, Energie Produce Ltd, which was sold to Freshmax NZ Ltd in 2013, and Nadine became the Freshmax Global Exports Manager. Nadine is currently a Director of Scales Corporation Ltd. Nadine was a member of the Primary Sector Council and now sits on the Māori Primary Sector forum (Nga Pouwhiro Taimatua).



Wendy Venter

Wendy Venter is a board director and independent consultant with expertise in governance, risk management, organisational change and assurance. She is a former partner at EY, deputy chief executive at the Ministry of Social Development and assistant auditor-general. Wendy is a director of GNS Science, and a trustee of Wellington's Nikau Foundation. She is a board member of the NZ Auditing and Assurance Standards Board, an independent member of the Treasury's Audit Committee for the Government Financial Statements and the Wellington City Council's audit and risk committee, and chairs the risk and assurance committees of Stats NZ and the Parliamentary Counsel Office. She is a Fellow of Chartered Accountants Australia and New Zealand and a member of the Institute of Directors and the Institute of Internal Auditors

Science Advisory Panel

Our Science Advisory Panel is an important part of ensuring our science continues to have a focus on high quality, and is open to new international developments and ideas. The panel provides our Board with their insights on Plant & Food Research's science quality, strategy, and involvement in and uptake of new international developments.

Professor Gillian Dobbie

Department of Computer Science
University of Auckland, New Zealand



Gillian Dobbie is a Professor of Computer Science at the University of Auckland with over 20 years experience in Artificial Intelligence. Her main research interests are artificial intelligence, data stream mining, machine learning, ethics, data management, and software engineering, having published over 170 international peer reviewed papers across these areas. She has extensive experience in the application of technology in healthcare, environmental science and horticulture. She co-directs the Centre of Machine Learning for Social Good (MS4SG) and the Natural, Artificial, and Organisation Intelligence Institute (NAOInstitute). Gill has been elected a Fellow of the New Zealand Royal Society Te Apārangi, and chairs the Marsden Fund Council.

Dr Ernst van den Ende

Managing Director,
Plant Sciences Group (PSG),
Wageningen University, The Netherlands



Professor Ernst van den Ende has an extensive international background in agricultural science, particularly in management of urban green areas, plant diseases, plant pathogenic fungi and plant and crop protection. He has responsibility of the Plant Sciences Group at Wageningen, which conducts plant-related research and teaching programmes from the molecular through to the population level. Prof van den Ende has particular experience in the Wageningen University/PRI structure which provides a relevant model for University/Research Institute collaboration and interaction. This is seen in the cluster of the Plant Sciences Group (PSG) which embodies applied research (Applied Plant Research), strategic research (Plant Research International,) fundamental research and education of (Wageningen University).

Professor van den Ende brings to the panel particular understanding of research collaboration and development of interacting research structures. He also provides an important link with European organisations of interest to Plant & Food Research and international perspective of sustainable plant production.

Professor Selina Stead

Executive Dean,
Faculty of Environment,
Leeds University, UK



Selina is the Executive Dean for the Faculty of Environment, which includes the School of Food Science and Nutrition at Leeds University since January 2022, prior to which she was Head of the Institute of Aquaculture at the University of Stirling. She is a Fellow of the Alan Turing Institute and her research focuses on environmental science, policy, marine planning and governance. Selina was President of the European Aquaculture Society, Chair and Non-Executive Director of the Scottish Government's Science Advisory Board and Ministerial Appointed Scientific Fisheries Advisor. Additionally she has provided advice to Ministers, Select Committees and the Secretary of State.

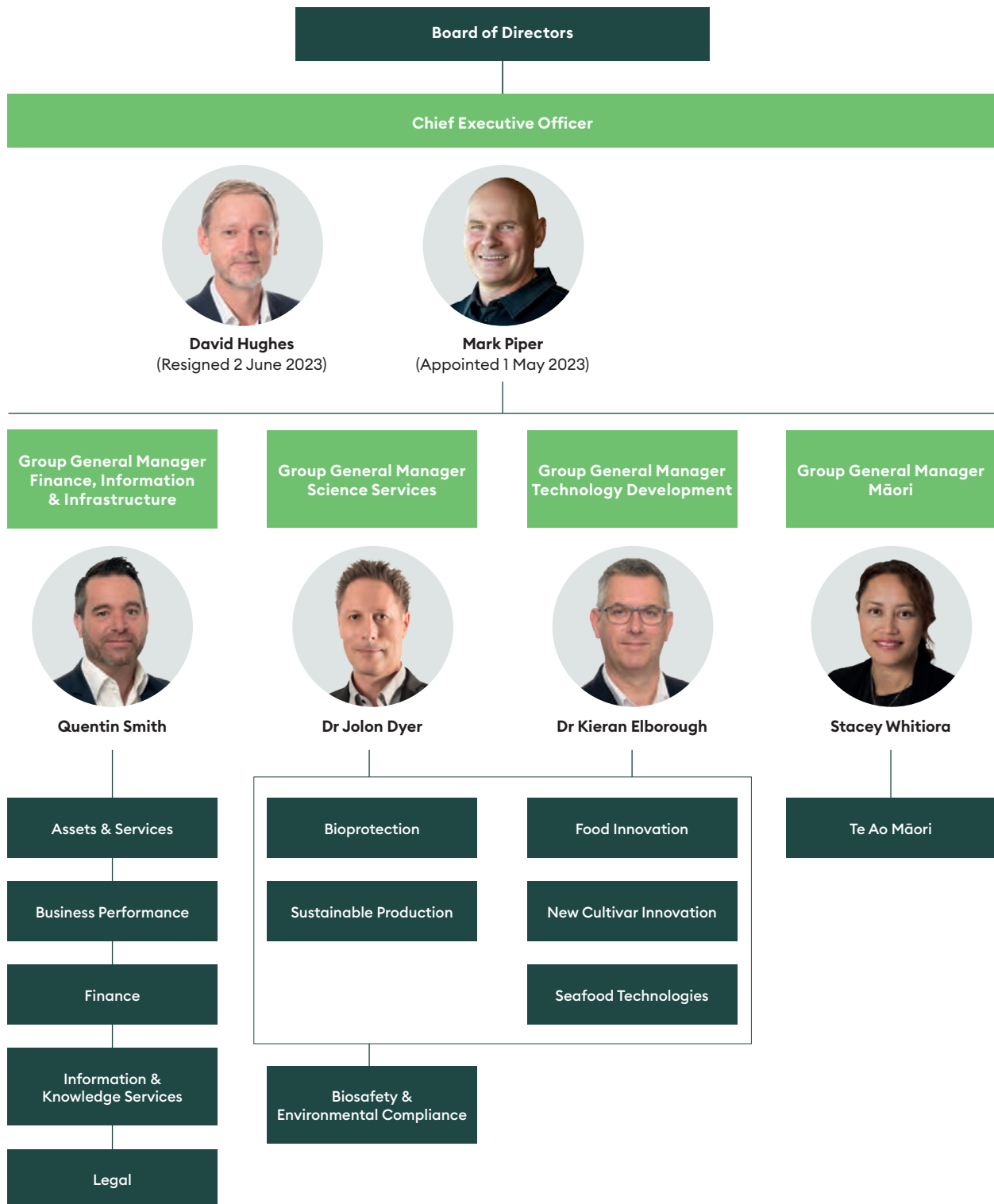
Professor Weibiao Zhou

Head of Department of Food Science
& Technology,
National University of Singapore



Weibiao is Head of the Department of Food Science & Technology at the National University of Singapore. He has previously worked in Australia and is familiar with New Zealand. He has been elected a Fellow of the International Academy of Food Science and Technology (IAFoST) and several other learned & professional societies. His research interests are in the food engineering and food processing areas. Weibiao's food interests match naturally with our research. He has a good understanding of the landscape in New Zealand, has links into a research centre in China, and has chaired Government level committees and been on Boards in Singapore. He was part of the group that originally recommended Singapore move towards being partially food self-sufficient through building up the national agri-food industry's capability and capacity ('30 by 30' initiative).

Organisational chart



Group General Manager
People & Culture



Kath Clarke

Health & Safety

Human Resources

Organisational Development

Payroll

Group General Manager
Marketing & Innovation



Dr Gavin Ross

Business Development

Customer & Brand

Impact Evaluation

Intellectual Property

International Development

Partnerships & Growth

Plant Varieties

Chief Scientist



Professor Richard Newcomb

Our Senior Leadership Team oversees all aspects of Plant & Food Research and is accountable to the Board of Directors via the CEO. Collectively the team ensure the delivery of all research activities, finance and legal requirements, assets and services, human resources, commercial functions and science quality.



A close-up photograph showing a hand wearing a blue nitrile glove holding a white, textured paper bag. The bag is positioned over a cluster of green, leafy plants. The background is slightly blurred, showing more of the same plants. The text "Financial Statements" is overlaid in white, bold, sans-serif font in the lower right quadrant of the image.

Financial Statements

Financial performance

The year that ended 30 June 2023 was a challenging period for Plant & Food Research.

Total revenue for the year of \$184.8M was marginally up on the prior year but materially down on budget (down \$14.8M). The biggest revenue shortfalls to budget were in the commercial and royalty revenue categories. This reflected the challenging operating environment experienced across the horticulture sector. While the 2022 harvest was extremely difficult for our partners, the 2023 season proved to be even more challenging. Unfavourable winter conditions, spring frosts, a very wet summer and the devastation caused by Cyclone Gabrielle in February all conspired to create poor horticultural outcomes again this harvest. This resulted in another year of uneven fruit quality and lower yields and thereby a shortfall in royalty revenue versus expectation. It also resulted in some partners scaling back their research and development investment due to financial constraints.

In response to the revenue growth pressures experienced during the year and unprecedented cost inflation, a range of cost saving initiatives were implemented. Unfortunately, however, the sheer magnitude of the revenue shortfall versus budget and the significant inflationary cost pressures were unable to be fully offset by cost saving interventions. As a result, an after-tax loss of \$6.4M was recorded.

Plant & Food Research's shareholder contributed \$11.0M in new equity in June 2023 to provide additional financial resilience. The shareholder has also approved a further \$17.0M funding being provided to Plant & Food Research for the year ending 30 June 2024, should it be required and conditions are met.

Given Plant & Food Research's direct revenue exposure to the same production and market impacts experienced by our customers/partners, royalty and commercial revenue is expected to remain under pressure in the short term. Over the medium to long term, however, the outlook for the horticulture sector remains positive with revenues expected to grow.

Plant & Food Research continues to benefit from a solid balance sheet, with year-end net assets of \$148.0M. Following the equity injection from the shareholder in June, no borrowings were held at year end.

\$202.6k (\$209.0k)
Annual Revenue
per FTE

\$184.8M (\$199.6M)
Total Revenue

\$9.8M (\$19.1M)
EBITDA

BRACKETS INDICATE TARGET

DIRECTORS' REPORT

THE DIRECTORS ARE PLEASED TO PRESENT THE FINANCIAL STATEMENTS OF THE NEW ZEALAND INSTITUTE FOR PLANT & FOOD RESEARCH LIMITED FOR THE YEAR ENDED 30 JUNE 2023.

	2023 Actual \$000	2023 Budget \$000	2022 Actual \$000
RESULTS OF GROUP OPERATIONS			
Revenue	184,845	199,577	184,484
(Loss)/profit before taxation	(7,510)	159	5,435
Less taxation (credit)/expense	(1,120)	142	1,576
(Loss)/profit attributable to Owners	(6,390)	17	3,859

PRINCIPAL ACTIVITY OF THE GROUP

The Group's principal activity is to provide scientific research that benefits New Zealand, within the horticulture, arable, seafood and processed food industries; in accordance with the purpose and principles for the operation of Crown Research Institutes as set out in sections 4 and 5 of the Crown Research Institutes Act 1992. The Company is a company limited by shares and incorporated in accordance with the Companies Act 1993.

REVIEW OF OPERATIONS

A review of the operations accompany this report on page 13.

SHARE DEALINGS

The Directors have not, and are unable to, trade in shares of the Company as all shares of the Company are held by the Shareholding Ministers on behalf of the Crown. Accordingly the Board has received no notices of dealings in relevant interests in shares of the Company.

DIRECTORS' INSURANCE

Directors' and Officers' liability insurance was effected for the Directors and certain employees of the Company. The insurance is in respect of certain specified liabilities, not including criminal liability, incurred by a Director or employee in respect of any act or omission in his or her capacity as a Director or employee of the Company. The Company has indemnified Directors and certain employees of the Company for costs and proceedings and for liabilities incurred by the Director or employee in respect of any act or omission in his or her capacity as a Director or employee of the Company. The indemnity for liabilities incurred does not extend to criminal liability or liability for breach of a fiduciary duty owed to the Company.

AUDITORS

Troy Florence, with the assistance of PricewaterhouseCoopers, is the appointed auditor on behalf of the Auditor-General. The Auditor-General is the statutory auditor pursuant to section 14 of the Public Audit Act 2001 and section 21 of the Crown Research Institutes Act 1992.

SIGNIFICANT CHANGES

There were no significant changes to the business of the Company during the year.

DIRECTORS' REMUNERATION

During the year the following remuneration was paid or payable to Directors in accordance with the schedule approved by the Shareholding Ministers:

	Group \$
N Shadbolt	72,000
C Dawson	44,000
W Venter	37,000
J Daw	36,000
D Moana	36,000
N Tunley	36,000
P Bains	6,000 (ceased September 2022)

REMUNERATION OF EMPLOYEES

The number of employees and ex-employees whose total remuneration, including benefits and severance payments, on an annualised basis, was in excess of \$100,000 in \$10,000 bands, is:

Remuneration bands in \$000	Number of employees	Remuneration bands in \$000	Number of employees
100 - 109	111	220 - 229	4
110 - 119	70	230 - 239	3
120 - 129	56	240 - 249	5
130 - 139	46	250 - 259	1
140 - 149	36	260 - 269	2
150 - 159	25	300 - 309	1
160 - 169	18	330 - 339	1
170 - 179	15	350 - 359	2
180 - 189	8	360 - 369	1
190 - 199	3	410 - 419	1
200 - 209	3	610 - 619*	1
210 - 219	1		

* Includes the Chief Executive's remuneration (departed 2 June 2023)

For and on behalf of the Board of Directors:



Nicola Shadbolt, Chair
25 August 2023

INDEPENDENT AUDITORS' REPORT

TO THE READERS OF THE NEW ZEALAND INSTITUTE FOR
PLANT & FOOD RESEARCH LIMITED'S GROUP FINANCIAL
STATEMENTS FOR THE YEAR ENDED 30 JUNE 2023

The Auditor-General is the auditor of The New Zealand Institute for Plant and Food Research Limited Group (the Group). The Auditor-General has appointed me, Troy Florence, using the staff and resources of PricewaterhouseCoopers, 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 84 to 109, that comprise the balance sheet as at 30 June 2023, the statement of comprehensive income, statement of changes in equity and cash flow statement for the year ended on that date 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 2023; 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 (NZ IFRS) and International Financial Reporting Standards (IFRS).

Our audit was completed on 25 August 2023. 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 there is no realistic alternative but to do so.

The Board of Directors' responsibilities arise from the Crown Research Institutes Act 1992.

RESPONSIBILITIES OF THE AUDITOR FOR THE AUDIT OF THE FINANCIAL STATEMENTS

Our objectives are to obtain reasonable assurance about whether the financial statements, as a whole, are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion.

Reasonable assurance is a high level of assurance, but it is not a guarantee that an audit carried out in accordance with the Auditor-General's Auditing Standards will always detect a material misstatement when it exists. Misstatements are differences or omissions of amounts or disclosures and can arise from fraud or error. Misstatements are considered material if, individually or in the aggregate, they could reasonably be expected to influence the decisions of readers taken on the basis of these financial statements.

For the budget information reported in the financial statements, our procedures were limited to checking that the information agreed to the Group's statement of corporate intent.

We did not evaluate the security and controls over the electronic publication of the financial statements.

As part of an audit in accordance with the Auditor-General's Auditing Standards, we exercise professional judgement and maintain professional scepticism throughout the audit. Also:

- We identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- We obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances but not for the purpose of expressing an opinion on the effectiveness of the Group's internal control.
- We evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Board of Directors.
- We conclude on the appropriateness of the use of the going concern basis of accounting by the Board of Directors and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to continue as a going concern.
- We evaluate the overall presentation, structure and content of the financial statements, including the disclosures and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- 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 Directors' Report on page 81, and the Performance Indicators and Statement of Responsibility on pages 110 to 111, but does not include the financial statements, and our auditor's report thereon.

Our opinion on the financial statements does not cover the other information and we do not express any form of audit opinion or assurance conclusion thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information. In doing so, we consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated. If, based on our work, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

INDEPENDENCE

We are independent of the Group in accordance with the independence requirements of the Auditor-General's Auditing Standards, which incorporate the independence requirements of Professional and Ethical Standard 1: International Code of Ethics for Assurance Practitioners (including International Independence Standards) (New Zealand) (PES 1) issued by the New Zealand Auditing and Assurance Standards Board.

In addition to the audit we have carried out an engagement in the area of agreed-upon procedures regarding financial processes and information associated with a royalty arrangement, which is compatible with those independence requirements. Other than the audit and this engagement, we have no relationship with or interests in the Company or any of its subsidiaries.



Troy Florence
PricewaterhouseCoopers

On behalf of the Auditor-General
Auckland, New Zealand
25 August 2023



STATEMENT OF COMPREHENSIVE INCOME

for the year ended 30 June 2023

		GROUP		
		2023	2023	2022
		Actual	Budget	Actual
			Unaudited	
Note		\$000	\$000	\$000
PROFIT AND LOSS				
Revenue				
	Strategic funding	43,174	43,428	43,150
	Crown-funded research contracts	13,585	14,850	14,978
(4)	Commercial science research contracts	121,864	136,423	121,820
	Other income	6,222	4,876	4,536
		184,845	199,577	184,484
Less operating costs				
(4a)	Personnel costs	110,384	110,337	105,448
(5)	Depreciation expense	14,570	14,825	14,277
(5)	Amortisation expense	2,282	2,745	2,207
	(Gain) on sale of assets	(2,678)	-	(381)
(6)	Other operating expenses	67,330	70,187	57,031
		191,888	198,094	178,582
	(Loss)/profit before interest & taxation	(7,043)	1,483	5,902
	Finance income	634	251	249
	Finance costs	(1,281)	(1,138)	(1,130)
(15)	Share of profit/(loss) of associates and joint ventures	180	(437)	414
	(Loss)/profit before taxation	(7,510)	159	5,435
(7)	Taxation (credit)/expense	(1,120)	142	1,576
	(Loss)/profit after taxation attributable to owners	(6,390)	17	3,859
OTHER COMPREHENSIVE INCOME				
Items that may be reclassified subsequently to profit or loss:				
	Currency translation differences	4	-	50
(18)	Cash flow hedges	281	-	(203)
	Other comprehensive income	285	-	(153)
	Total comprehensive income attributable to owners	(6,105)	17	3,706

The accompanying notes form part of these financial statements.

STATEMENT OF CHANGES IN EQUITY

for the year ended 30 June 2023

ATTRIBUTABLE TO OWNERS OF THE GROUP

	Note	Share capital \$000	Retained earnings \$000	Foreign currency translation \$000	Cash flow hedge \$000	Total Equity \$000
Balance as at 01 July 2021		17,436	122,033	(31)	(58)	139,380
Changes in equity for						
Profit for the year			3,859			3,859
Other comprehensive income, net of taxes						
Currency translation				50		50
Revaluation of cash flow hedges	(18)				(203)	(203)
Balance as at 30 June 2022		17,436	125,892	19	(261)	143,086
Changes in equity for						
Issue of shares	(17)	11,000				11,000
Loss for the year			(6,390)			(6,390)
Other comprehensive income, net of taxes						
Currency translation				4		4
Revaluation of cash flow hedges	(18)				281	281
Balance as at 30 June 2023		28,436	119,502	23	20	147,981

The accompanying notes form part of these financial statements.

as at 30 June 2023

For and on behalf of the Board of Directors:

Nicola Shadbolt, Chair
25 August 2023

Wendy Venter, Director
25 August 2023

The accompanying notes form part of these financial statements.

CASH FLOW STATEMENT

for the year ended 30 June 2023

		GROUP	
	2023	2023	2022
	Actual	Budget	Actual
		Unaudited	
Note	\$000	\$000	\$000
Cash flows from/(applied to) operating activities			
Receipts from customers	183,287	200,227	181,108
Interest and dividends received	1,278	251	359
Payments to employees and suppliers	(173,459)	(180,626)	(156,995)
Interest paid	(1,212)	(1,068)	(1,064)
Tax paid	(1,444)	952	(2,418)
Net cash flows from operating activities	(20) 8,450	19,736	20,990
Cash flows from/(applied to) investing activities			
Sale of property, plant and equipment	2,166	-	135
Purchase of property, plant and equipment	(17,656)	(30,585)	(14,855)
Purchase of intangible assets	(3,654)	(4,904)	(1,860)
Purchase of investments	(399)	(1,600)	(351)
Net cash flows (applied to) investing activities	(19,543)	(37,089)	(16,931)
Cash flows from/(applied to) financing activities			
Proceeds from borrowings	-	12,150	-
Proceeds from issue of shares	11,000	-	-
Repayment of borrowings	-	-	-
Lease principal repayments	(1,162)	(840)	(923)
Net cash flows from/(applied to) financing activities	9,838	11,310	(923)
Net cash flow	(1,255)	(6,043)	3,136
Effect of foreign currency translation adjustment	4	-	49
Opening cash and cash equivalents	12,997	8,819	9,812
Closing cash and cash equivalents	(8) 11,746	2,776	12,997

The accompanying notes form part of these financial statements.

NOTES TO THE FINANCIAL STATEMENTS

for the year ended 30 June 2023

1. REPORTING ENTITIES

The New Zealand Institute for Plant & Food Research Limited (the “Company” or “Plant & Food Research”) and its subsidiaries (the “Group”) is a Crown Research Institute governed by the Crown Research Institute Act 1992 and is a limited liability company incorporated and domiciled in New Zealand. The whole of the share capital is held by Ministers of the Crown on behalf of the New Zealand Government. The Company’s registered office is 120 Mt Albert Road, Sandringham, Auckland 1025.

The Group is primarily involved in research services.

The Group is designated as a profit-oriented entity for financial reporting purposes.

These financial statements have been approved for issue by the Board of Directors on 25 August 2023.

2. BASIS OF PREPARATION

The financial statements are presented in New Zealand dollars (NZD), which is the Company’s functional and presentation currency. All financial information presented in New Zealand dollars has been rounded to the nearest thousand dollars (\$000).

The financial statements have been prepared under the historical cost convention, as modified by the revaluation of certain financial assets and financial liabilities (including derivative instruments) at fair value.

(A) Statement of Compliance

These financial statements have been prepared in accordance with the requirements of the Crown Research Institutes Act 1992, the Public Finance Act 1989, the Companies Act 1993 and the Financial Reporting Act 2013.

The financial statements have also been prepared in accordance with New Zealand generally accepted accounting practice (NZ GAAP). They comply with New Zealand Equivalents to International Financial Reporting Standards (NZ IFRS), and other Financial Reporting Standards, as appropriate for profit-oriented entities. They comply with International Financial Reporting Standards (IFRS).

The Group is a Tier 1 entity.

(B) Use of Estimates

The preparation of financial statements requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenue and expenses. Although these estimates are based on management’s knowledge of current events and actions that may be undertaken in the future, actual results may ultimately differ from estimates. It also requires management to exercise its judgement in the process of applying the Group’s accounting policies.

Estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to estimates are recognised in the period in which the estimate is revised and in any future periods affected. Use of estimates and assumptions is disclosed further in note 3(U).

(C) New and Amended Standards and Interpretations Adopted by the Group

There are no new standards and amendments to standards that became effective in the current period financial statements.

(D) Standards and Interpretations Issued and not yet Adopted

There are no new standards or amendments to standards that have been issued but are not yet effective that have been early adopted by the Group.

(E) Going Concern

During the year ended 30 June 2023 the Group incurred a loss of \$6.4 million, primarily due to a number of adverse weather events that significantly impacted partners in the horticulture sector. A significant portion of the Group’s revenue is closely associated with the market conditions experienced by growers and marketers. As a result, the Group’s royalty revenues for the year were well below expectation, as was commercial science research revenue, albeit to a lesser extent. A number of cost savings initiatives were enacted during the year to help mitigate the Group revenue shortfall and to preserve cash. Over the medium to long term, the outlook for the horticulture sector remains positive with Group revenues expected to grow, however the near-term outlook for the next one to two years will be more challenging as industry partners recover from the recent weather events.

The Group’s shareholders contributed \$11 million in new equity in June 2023 to provide additional financial resilience. The Group’s shareholders have also approved a further \$17 million funding being provided to the Group for the year ending 30 June 2024, should it be required and the conditions are met.

In addition to shareholder funding, the Group has undrawn bank funding at 30 June 2023 of \$15 million (Note 8). Together the shareholder and banking funding are expected to enable the Group to fund any near-term losses.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

3. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

The accounting policies set out below have been applied consistently to all periods presented in these financial statements.

(A) Basis of Consolidation

(i) Subsidiaries

The consolidated financial statements of the Group include the parent entity, Plant & Food Research, and its controlled entities. The Group controls an entity when the Group is exposed to, or has right to, variable returns from its involvement with the entity and has the ability to affect those returns through its power over the entity. This power exists where the Group controls the majority voting power on the governing body or where such policies have been irreversibly predetermined by the Group or where the determination of such policies is unable to materially impact upon the level of potential ownership benefits that arise from the activities of the subsidiary. The financial statements of subsidiaries are included in the consolidated financial statements from the date which the Group obtains control and until such time as the Group ceases to control the entity.

The Group measures the cost of a business combination as the aggregate of fair values, at the date of exchange, of assets given, liabilities incurred or assumed, in exchange for control of the subsidiary plus any costs directly attributable to the business combination.

Any excess of the cost of the business combination over the Group's interest in the net fair value of the identifiable assets, liabilities and contingent liabilities is recognised as goodwill. If the Group's interest in the net fair value of the identifiable assets, liabilities and contingent liabilities recognised exceeds the cost of the business combination, the difference will be recognised immediately in the Statement of Comprehensive Income.

The purchase method of accounting is used to prepare the consolidated financial statements of the Group. In preparing the consolidated financial statements, the effects of all transactions, balances and unrealised gains and losses on transactions between entities in the Group have been eliminated. The Group's investment in its subsidiaries are initially carried at cost in the Parent's financial statements subject to any write down arising from an annual impairment review.

(ii) Associates

Associates are those entities over which the Group has significant influence, but not control, of the financial and operating policies. Investments in associate companies have been accounted for using the equity method of accounting and are initially recognised at cost and the carrying amount is increased or decreased to recognise the Group's share of the surplus or deficit of the associate after the date of acquisition. The Group's share of the surplus or deficit of the associate is recognised in the Group's Statement of Comprehensive Income. Distributions received from an associate reduce the carrying amount of the investment.

If the Group's share of deficits of an associate equals or exceeds its interest in the associate, the Group discontinues recognising its share of further deficits. After the Group's interest is reduced to zero, additional deficits are provided for, and a liability is recognised, only to the extent that the Group has incurred legal or constructive obligations or made payments on behalf of the associate. If the associate subsequently reports surpluses, the Group will resume recognising its share of those surpluses only after its share of the surpluses equals the share of the deficits not recognised.

The Group's share in the associate's surplus or deficits resulting from unrealised gains on transactions between the Group and its associates is eliminated.

(iii) Joint operations

The Group recognises its direct right to the assets, liabilities, revenues and expenses of joint operations and its share of any jointly held or incurred assets, liabilities, revenues and expenses. Transactions are recognised in the Group's consolidated financial statements only to the extent of other parties interests in the joint operation and these have been incorporated in the financial statements under the appropriate headings. Details of the joint operations are set out in Note 15.

(B) Revenue

Revenue is recognised at the fair value of consideration received or receivable to the extent that it is probable, that economic benefits will flow to the Group. Revenue is shown net of GST, returns and discounts and after eliminating sales within the Group. The following specific recognition criteria must be met before revenue is recognised:

(i) Government grants

Strategic funding

Strategic funding from the Crown, was established 1 July 2011 and is recognised as a Government grant in accordance with NZ IAS 20. Government grants are recognised when there is reasonable assurance that the Group will comply with the conditions attaching to them and that the grant will be received. Government grants relating to costs are deferred and recognised in the profit or loss over the period necessary to match them with the costs that they are intended to compensate.

The primary condition is that the Group will deliver science research as specified in the strategic funding contract.

Strategic funding is recognised in the Statement of Comprehensive Income on a systematic basis in the year it is received.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

(ii) Crown-funded research contracts

Crown-funded research contracts have one performance obligation and therefore the full transaction price is allocated to that one performance obligation. Crown-funded revenue is recognised over time using the input method. The input method is based on the Company's efforts to satisfy the performance obligation with revenue recognised by reference to the stage of completion of the performance obligation, assessed on the basis of the actual service provided as a proportion of the total services to be provided.

(iii) Commercial science research contracts

Sale of research services

Research services are provided on a fixed-price contract, with contract terms generally ranging from less than a year to five years.

Commercial research contracts have one performance obligation and therefore the full transaction price is allocated to that one performance obligation. Commercial science revenue is recognised over time using the input method. The input method is based on the Company's efforts to satisfy the performance obligation with revenue recognised by reference to the stage of completion of the performance obligation, assessed on the basis of the actual service provided as a proportion of the total services to be provided.

If circumstances arise that may change the extent of the progress toward completion, the estimates are revised. These revisions may result in increases or decreases in estimated revenues or costs and are reflected in income in the period in which the circumstances that give rise to the revision become known by management.

Royalties

Royalty revenue is recognised when the performance obligation to which the sales-based royalty has been allocated has been satisfied.

(iv) Other income

Rental income receipts under an operating lease are recognised as revenue on a straight-line basis over the lease term. Orchard management services are recognised as revenue on a monthly basis in accordance with the contractual agreement.

(v) Interest revenue

Interest revenue is recognised on a time-proportion basis using the effective interest method.

(C) Foreign Currency Translation

Foreign currency transactions are translated into New Zealand dollars using the exchange rates prevailing at the dates of the transactions, except when forward currency contracts have been taken out to cover short-term forward currency commitments. Where short-term forward currency contracts have been taken out, the transaction is translated at the rate contained in the contract. Foreign currency denominated monetary assets and liabilities are translated at the exchange rate prevailing at the period end. Foreign exchange gains or losses resulting from the settlement of such transactions and from the translation at balance date of foreign denominated monetary assets and liabilities are recognised in the Statement of Comprehensive Income, except when deferred in equity as qualifying cash flow hedges.

The results and balance sheets of all foreign operations that have a functional currency different from New Zealand dollars are translated into the presentation currency as follows:

The assets and liabilities of foreign controlled entities are translated by applying the rate ruling at balance date and revenue and expense items are translated at the average rate calculated for the period. The exchange differences arising on the re translation are taken directly to equity in the foreign currency translation reserve.

On consolidation, exchange differences arising from the translation of the net investment in foreign operations, and of borrowing and other currency instruments designated as hedges of such investments, are taken to shareholder's equity.

(D) Borrowing Costs

Borrowing costs are recognised as an expense in the period in which they are incurred.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

(E) Cash

Cash and cash equivalents includes cash in hand, deposits held at call with banks, other short-term highly liquid investments with maturities of three months or less from date of acquisition, and bank overdrafts. Bank overdrafts are shown within borrowings in current liabilities in the Balance Sheet.

(F) Trade and Other Receivables

Trade receivables are recognised initially at fair value, plus any transaction costs, and subsequently measured at amortised cost using the effective interest method, less any provision for loss allowance.

Collectibility of trade receivables is reviewed on an ongoing basis. Debts which are known to be uncollectible are written off when identified. A provision for loss allowance has been calculated using the simplified approach allowed under NZ IFRS 9 (see Note 9).

When a trade receivable is uncollectible, it is written off against the provision if it has been provided for or immediately recognised in the Statement of Comprehensive Income, within other operating expenses, if not. Any recoveries of trade receivables written off are credited against bad debts in the Statement of Comprehensive Income.

(i) Accrued income (contract asset)

Accrued income is the right to consideration in exchange for services transferred to the customer, conditioned on something other than the passage of time. Accrued income is recognised for the earned consideration that is conditional. The right to consideration is dependent on acceptance by the customer.

(G) Property, Plant and Equipment

The Group has four classes of property, plant and equipment:

- Land
- Buildings
- Plant and equipment
- Motor vehicles

Land is recorded at cost. All other property, plant and equipment is shown at cost less accumulated depreciation and any accumulated impairment losses, except for assets transferred from the Crown. Property, plant and equipment transferred from the Crown has been included in the accounts at values established by independent valuers which is the deemed cost. All subsequent expenditure has been initially recorded at cost.

Cost includes expenditures that is directly attributable to the acquisition of the asset. Subsequent costs are included in the asset's carrying amount only when it is probable that future economic benefits or service potential associated with the asset will flow to the Group and the cost of the item can be measured reliably. All other costs are recognised in the Statement of Comprehensive Income when the expense is incurred. Where an asset is acquired at no cost, or for a nominal cost, it is recognised at fair value as at the date of acquisition. The Group constructs some items of plant for use in research. These have been brought into the accounts at the cost of direct labour and materials plus an appropriate proportion of direct overheads.

Land transferred to the Group cannot be freely traded. Section 30 of the Crown Research Institutes Act 1992 requires that prior to sale sections 40-42 of the Public Works Act 1981 be complied with. These sections require that land offered for sale must be offered to the original owner of that land or their successors. An arbitration clause is included to establish fair values for such offers.

Gains and losses on disposals are determined by comparing the proceeds with the carrying amount of the asset. Gains and losses on disposal are included in the Statement of Comprehensive Income.

(i) Non-current Assets Held for Sale

Non-current assets are classified as assets held for sale when their carrying amount is to be recovered principally through a sale transaction and a sale is considered highly probable. They are stated at the lower of carrying amount and fair value less costs to sell if their carrying amount is to be recovered principally through a sale transaction rather than through continuing use and a sale is considered highly probable.

(H) Depreciation

Depreciation on assets, except land, is calculated using the straight-line method, at rates calculated to allocate the asset's cost, less estimated residual value, over its estimated useful life. Leasehold improvements are depreciated over the shorter of the unexpired period of the lease and the estimated useful life of improvements.

The useful lives of major asset classes of property, plant and equipment have been estimated as follows:

Buildings	10 - 100 years
Plant and equipment	3 - 10 years
Motor vehicles	3 - 10 years

The assets' residual values and useful lives are reviewed, and adjusted if appropriate, at each financial year-end.

The assets' carrying value is written down immediately to its recoverable amount if the asset's carrying amount is greater than its estimated recoverable amount.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

(I) Intangible Assets

(i) Software

The cost of software, databases and related items, either acquired or internally generated, is recognised as an expense when incurred, except for:

The cost of software, databases and related items, either acquired or internally generated, which are unique and controlled by the Group, and that will probably generate measurable economic benefits exceeding costs beyond one year is capitalised as intangible assets.

Costs associated with maintaining computer software are recognised as an expense when incurred.

The carrying value of software is amortised on a straight-line basis over its useful life. Amortisation begins when the asset is available for use and ceases at the date that the asset is derecognised. The amortisation charge for each period is recognised in the Statement of Comprehensive Income.

The useful lives and associated amortisation rates of major classes of intangible assets have been estimated as follows:

Software 3 - 5 years

(ii) Trademarks and licenses

The cost of acquired trademarks and licenses are capitalised as intangible assets where they will probably generate measurable economic benefits exceeding costs beyond one year. Trademarks and licenses have a finite useful life and are carried at cost less accumulated amortisation.

Amortisation is calculated using the straight-line method to allocate the cost over their estimated useful lives, which is between 10 and 15 years.

(iii) Research and development

Research and development is the business of the Company. Most work is performed under contract for others, and in most cases intellectual property rights are retained. All research and development costs are expensed in the period they are incurred.

When a project reaches the stage where it will probably generate future measurable economic benefits exceeding development cost, development cost is recognised as an intangible asset. The asset is amortised from the commencement of commercial production of the product to which it relates, on a straight-line basis, over the period of expected benefit.

(J) Financial Assets

(i) Classification

The Group classifies its financial assets in the following measurement categories: those to be measured at amortised cost and those to be measured subsequently at fair value (either through other comprehensive income, or through profit or loss). The classification depends on the group's business model for managing the financial assets and the contractual terms of the cash flow.

For assets measured at fair value, gains and losses will be either recorded in profit or loss or other comprehensive income. For investments in debt instruments, this will depend on the business model in which the investment is held. For investments in equity instruments, this will depend on whether the Group has made an irrevocable election at the time of initial recognition to account for the equity investment at fair value through other comprehensive income.

The Group reclassifies debt investments when and only when its business model for managing those assets changes.

(ii) Measurement

At initial recognition, the Group measures financial assets at fair value plus, in the case of a financial asset not at fair value through profit or loss, transaction costs that are directly attributable to the acquisition of the financial asset. Transaction costs of financial assets carried at fair value through profit or loss are expensed in profit or loss.

(iii) Financial assets at fair value through profit or loss

This category has two sub-categories: financial assets held for trading, and those designated at fair value through profit or loss at inception. A financial asset is classified in this category if acquired principally for the purpose of selling in the short term or if so designated by management. Derivatives are also categorised as held for trading unless they are designated as hedges. Assets in this category are classified as current assets if they are either held for trading or are expected to be realised within 12 months of the balance sheet date. After initial recognition they are measured at their fair values. Gains or losses on remeasurement are recognised in the Statement of Comprehensive Income.

Financial assets in this category include derivatives, see note 3 (R).

(iv) Financial assets at amortised cost

The Group classifies its financial assets at amortised cost only if both of the following criteria are met:

- the asset is held to collect the contractual cash flows, and
- the contractual terms give rise to cash flows that are solely payments of principal and interest.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

(K) Leased Assets

The Group leases various land, offices and research facilities. The terms of the leases vary, with land and buildings leases ranging from 2 – 28 years.

Contracts may contain both lease and non-lease components. Lease terms are negotiated on an individual basis and contain a wide range of different terms and conditions. The lease agreements do not impose any covenants other than the security interest in the leased assets that are held by the lessor. Leased assets may not be used as security for borrowing purposes.

Assets and liabilities arising from a lease are initially measured on a present value basis. Right-of-use assets are depreciated on a straight line-basis over the period of the lease.

Lease payments include any renewal periods that are likely to be exercised. The lease payments are discounted using the Group's incremental borrowing rate which ranges from 3% to 6% and is the rate the Group would borrow the funds required to purchase an asset of a similar value to the right-of-use asset in a similar economic environment with similar terms, security and conditions.

The Group is exposed to potential future increases in land and building lease payments based on contractual market rent reviews that are not included in the lease liability until the rent review takes effect.

Lease payments are allocated between principal and lease interest. The lease interest is charged to the profit and loss over the term of the lease.

Payments associated with short-term leases of 12 months or less are recognised as an expense in the profit or loss.

(L) Impairment

Impairment of Financial Assets

The Group assesses on a forward looking basis the expected credit losses associated with its assets carried at amortised cost and fair value through other comprehensive income. The impairment methodology applied depends on whether there has been a significant increase in credit risk. Note W details how the Group determines whether there has been a significant increase in credit risk.

For trade receivables only, the Group applies the simplified approach permitted by NZ IFRS 9, which requires expected lifetime losses to be recognised from initial recognition of the receivables.

Impairment of Non-financial Assets

Non-financial assets are tested for impairment whenever events or changes in circumstances indicate that the carrying amount may not be recoverable. Judgement is applied in determining whether events or conditions are sufficiently significant and adverse to trigger an impairment test. Such assessment includes a view of the events or conditions and whether they are likely to indicate a permanent change, or whether they are expected to be temporary.

An impairment loss is recognised for the amount by which the asset's carrying amount exceeds its recoverable amount. The recoverable amount is the higher of an asset's fair value less costs of disposal and value in use. For the purposes of assessing impairment, assets are grouped at the lowest levels for which there are separately identifiable cash inflows which are largely independent of the cash inflows from other assets or groups of assets (cash-generating units (CGU)). Non-financial assets that suffered an impairment are reviewed for possible reversal of the impairment at the end of each reporting period.

The Group has applied judgement in determining that there is one CGU within the Group (apart from investments in joint ventures, associates and other investments) as all parts of the Group operate together and do not generate independent cash flows. As a result, impairment indicators are assessed from a Group perspective and for individual assets.

(M) Trade Payables

Trade payables are initially measured at fair value and subsequently measured at amortised cost using the effective interest method.

(i) Revenue in advance (contract liability)

Revenue in advance is the obligation to transfer services to a customer for which the Group has received consideration from the customer. Revenue in advance is recognised as revenue when the Group performs under the contract.

(N) Provisions

Provisions are recognised when the Group has a present obligation (either legal or constructive), as a result of a past event, it is probable that an outflow of economic benefits will be required to settle the obligation and a reliable estimate can be made of the amount of the obligation. Provisions are not recognised for future operating losses.

Provisions are measured at the present value of management's best estimate of the expenditure required to settle the present obligation at the balance sheet date, the discount rate used to determine the present value reflects current market assessments of the time value of money and the risks specific to the liability. The increase in the provision due to the passage of time is recognised as an interest expense.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

(O) Employee Benefits

(i) Wages and salaries, annual leave, sick leave and other benefits

Provision is made for employee benefits accumulated as a result of employees rendering services up to balance date including related oncosts.

The benefits include wages and salaries, annual leave, sick leave, incentives and other benefits. The provision for employee benefits is measured at the remuneration rates expected to be paid when the liability is settled.

The Group recognises a liability for sick leave to the extent that absences in the coming year are expected to be greater than the sick leave entitlements earned in the coming year. The amount is calculated based on the unused sick leave entitlement that can be carried forward at balance date, to the extent that the Group anticipates it will be used by staff to cover those future absences.

The Group recognises a liability and an expense for bonuses where contractually obliged or where there is a past practice that has created a constructive obligation.

(ii) Long service leave and retirement leave

Service leave and retirement leave entitlements are calculated based on the employee's entitlement and their current pay rate. The liability for long service leave is recognised in the provision for employee benefits and measured as the present value of expected future payments to be made in respect of services provided by employees up to the reporting date. Consideration is given to expected future wage and salary levels, experience of employee departures and periods of service.

Long term benefits expected to be settled within 12 months are classified as employee entitlements under current liabilities.

(iii) Pension and post retirement benefits

The Group operates a defined contribution superannuation plan. A defined contribution plan is a pension plan under which the Group pays fixed contributions to a separate entity. The Group has no legal or constructive obligations to pay further contributions if the fund does not hold sufficient assets to pay all employees the benefits relating to employee service in the current and prior periods.

The Group's contributions made to defined contribution superannuation plans are recognised as an expense in the Statement of Comprehensive Income when they are due.

(P) Income Tax

(i) Current tax

Income tax expense comprises both current tax and deferred tax, and is calculated using tax rates that have been enacted or substantially enacted by balance date. Current tax and deferred tax are charged or credited to the Statement of Comprehensive Income, except when they relate to items charged or credited directly to equity, in which case the tax is dealt with in equity. Current tax is the amount of income tax payable based on the taxable profit for the current year, plus any adjustments to income tax payable in respect of prior years.

(ii) Deferred tax

Deferred tax is the amount of income tax payable or recoverable in future periods in respect of temporary differences calculated using the liability method and unused tax losses. Deferred tax is not accounted for if it arises from initial recognition of goodwill or from initial recognition of an asset or liability in a transaction, other than a business combination, that at the time of the transaction affects neither accounting nor taxable profit or loss.

Deferred tax is recognised if it arises from investments in subsidiaries and associates, and interests in joint ventures, except where the company can control the reversal of the temporary difference and it is probable that the temporary difference will not reverse in the foreseeable future.

Deferred tax is measured using the tax rates (and laws) that have been enacted or substantively enacted by the balance sheet date and are expected to apply when the related deferred income tax asset is realised or the deferred income tax liability is settled. A deferred tax asset is recognised to the extent that it is probable that future taxable profits will be available against which the temporary differences can be utilised. Deferred tax assets are reviewed at each reporting date and are reduced to the extent that it is no longer probable that the related tax benefit will be realised.

(Q) Goods & Services Tax (GST)

The Statement of Comprehensive Income has been prepared so that all components are stated exclusive of GST. All items in the Balance Sheet are stated net of GST, with the exception of receivables and payables which include GST invoiced. Where GST is not recoverable as input tax then it is recognised as part of the related asset or expense. The net amount of GST recoverable from, or payable to, the Inland Revenue Department is included as part of receivables or payables in the Balance Sheet.

The net GST paid to, or received from the IRD, including the GST relating to investing and financing activities, is classified as an operating cash flow in the Cash Flow Statement.

Commitments and contingencies are disclosed exclusive of GST.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

(R) Derivative Financial Instruments

Derivatives are initially recognised at fair value on the date a derivative contract is entered into and are subsequently re-measured to their fair value at the end of each reporting period. The accounting for subsequent changes in fair value depends on whether the derivative is designated as a hedging instrument, and if so, the nature of the item being hedged and the type of hedge relationship designated.

The Group designates their derivatives as hedges of foreign exchange risk associated with the cash flows of highly probably forecast transactions (cash flow hedges).

The Group documents at the inception of the hedging transaction the economic relationship between hedging instruments and hedged items including whether the hedging instrument is expected to offset changes in cash flows of hedged items. The Group documents its risk management objective and strategy for undertaking various hedge transactions at the inception of each hedge relationship.

(S) Borrowings

Borrowings are initially recognised at their fair value net of transaction costs. After initial recognition all borrowings are measured at amortised cost using the effective interest method.

(T) Budget Figures

The budget figures are derived from the Statement of Corporate Intent as approved by the Board, and the Shareholder, at the beginning of the financial year. The budget figures have been prepared in accordance with NZ IFRS, using accounting policies that are consistent with those adopted by the Group for the preparation of these financial statements. The budget figures are unaudited.

(U) Critical Accounting Estimates and Assumptions

In preparing these financial statements the Group has made estimates and assumptions concerning the future. These estimates and assumptions may differ from the subsequent actual results. Estimates and assumptions are continually evaluated and are based on historical experience and other factors, including expectation of future events that are believed to be reasonable under the circumstances. The estimates and assumptions that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year are discussed below:

(i) Revenue recognition

In determining the revenue to be recognised from a contract to provide services judgement is required in respect of assessing the percentage of completion of the project. In making this judgement the actual service provided as a proportion of the total services to be provided is reviewed.

If circumstances arise that may change the extent of the progress the estimates are revised.

(ii) Impairment provisions

The impairment provisions for financial assets disclosed in Note 9 are based on assumptions about risk of default and expected loss rates. The Company uses judgement in making these assumptions and selecting the inputs to the impairment calculation, based on the Company's past history, existing market conditions as well as forward looking estimates at the end of each reporting period.

(iii) Leased assets

The valuation of right-of-use assets and lease liabilities requires judgement to determine the incremental borrowing rate and the likelihood of exercising any rights of renewal to extend the lease term. The Group has assumed that all rights of renewal will be exercised consistent with the Group's usual practice.

(iv) Retirement and long service leave

The present value of the retirement and long service leave obligations depend on a number of factors that are determined on an actuarial basis using a number of assumptions. Two key assumptions used in calculating this liability include the discount rate and the salary inflation factor. Any changes in these assumptions will impact on the carrying amount of the liability.

In determining the appropriate discount rate the Company considered the interest rates on NZ government bonds which have terms to maturity that match, as closely as possible, the estimated future cash outflows. The salary inflation factor has been determined after considering historical salary inflation patterns. A weighted average discount rate of 4.5% and a salary inflation factor of 3.2% were used.

If the discount rate were to differ by 1% from the Company's estimates, with all other factors held constant, the carrying amount of the liability would be an estimated \$54,000 higher / lower.

If the salary inflation factor were to differ by 1% from the Company's estimates, with all other factors held constant, the carrying amount of the liability would be an estimated \$14,000 higher / lower.

The carrying amount of employee entitlements are disclosed in the Balance Sheet.

(v) Holiday pay remediation provision

The Company provisioned for holiday pay remediation payments in 2022. The Company used judgement in determining the level of provisioning made based on variance calculations up to 31 March 2021 and an estimate for variances from this date to 30 June 2023. The related provision is included in Note 10.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

Note	GROUP	
	2023	2022
	\$000	\$000
4. COMMERCIAL SCIENCE RESEARCH CONTRACTS		
Royalties	63,605	63,200
Other commercial science research contracts	58,259	58,620
Total commercial science research contracts	121,864	121,820

The table below details how much of the revenue recognised in the current report period relates to carried-forward revenue-in-advance.

Revenue recognised that was included in revenue-in-advance at the beginning of the period		
Commercial science research contracts	11,125	11,159

4A. OPERATING COSTS

Includes:

Auditors' remuneration

Audit fees for financial statement audit

Parent (PWC)

Joint operation (KPMG)

Agreed upon procedures for a royalty agreement

Parent (PWC)

Severance payments*

Directors fees

Parent

Joint operation

Employer contributions to defined contribution plans

Unrealised foreign exchange (gains)

	191	175
	18	23
	12	-
	264	309
	267	276
	109	95
	1,720	1,641
	(122)	(136)

* Payments were made to 6 employees in 2023 (2022: 9 employees).

5. DEPRECIATION AND AMORTISATION

Depreciation

Buildings

Plant and equipment

Motor vehicles

Total depreciation on property, plant and equipment

(12)

Total depreciation on right-of-use assets

(13)

Amortisation

Software and databases

Patents, trademarks and licences

Total amortisation of intangible assets

(14)

	4,213	3,918
	8,269	8,474
	565	610
	13,047	13,002
	1,523	1,275
	2,282	2,207
	-	-
	2,282	2,207

6. OTHER OPERATING EXPENSES

Other operating expenses

Materials

Research & services contracts

Property expenses

Travel

Other general operating costs

Total other operating expenses

	5,144	5,433
	26,321	23,875
	8,452	8,034
	5,297	2,084
	22,116	17,605
	67,330	57,031

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

	Note	GROUP	
		2023 \$000	2022 \$000
7. TAXATION			
(Loss)/profit before taxation		(7,510)	5,435
Prima facie taxation @ 28%		(2,103)	1,522
Plus/(less) taxation effect:			
Non-assessable income		69	(118)
Non-deductible expenditure		101	323
Prior period adjustment		42	18
Imputation credits on dividends received		(127)	(67)
Overseas taxes not utilisable		960	
Utilisation of tax losses		(62)	(102)
		(1,120)	1,576
The taxation charge is represented by:			
Current taxation		979	3,091
Deferred tax benefit	(16)	(2,099)	(1,515)
		(1,120)	1,576

The Company is not required to maintain an Imputation Credit Account pursuant to section OB1(2)(d) of the Income Tax Act 2007.

8. CASH AND BORROWINGS

Cash on hand and at bank	11,746	12,997
Short-term deposits	-	-
Cash and short-term deposits	11,746	12,997

The carrying value of short-term deposits with maturity dates of three months or less approximates their fair value.

Current portion of borrowings	-	-
Borrowings	-	-

The Group has the following borrowing facilities at 30 June 2023:

	Expiry	Facility	Drawdown
Multi option credit facility No. 1	30 September 2024	6,000	-
Multi option credit facility No. 2	30 June 2026	9,000	-

The borrowings are secured by a first ranking general security agreement over the Group's assets and subject to two financial covenants. The general security agreement means that the Group may not grant a security interest greater than 5% of total tangible assets to another party or dispose of assets greater than \$1,000,000 without the consent of the bank.

The Group is required to ensure that the following financial ratios are met:
 (i) Shareholder funds of not less than 50% of adjusted tangible assets; and
 (ii) Earnings for the year not less than 3.00 times its consolidated funding costs.

The Group complied with these ratios during the year ended 30 June 2023 (2022: complied).

The interest rate for borrowings was 5.8% in 2023. As at 30 June 2023 and 2022 there were no facilities drawn down.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

9. RECEIVABLES AND PREPAYMENTS

Trade receivables

Loss allowance

Accrued income

Prepayments and other receivables

GROUP

2023
\$000

2022
\$000

31,153	29,943
(353)	(353)
30,800	29,590
11,193	12,627
4,512	3,395
46,505	45,612

The carrying value of receivables approximates their fair value. The carrying amount of receivables that would otherwise be past due, but not impaired, whose terms have been renegotiated is \$1,491,000 (2022: \$1,213,000).

The Group applies the NZ IFRS 9 simplified approach to providing for expected credit losses, which uses the lifetime expected loss allowance for all trade receivables.

To measure the expected credit losses trade receivables have been grouped based on days past due. The expected loss rates are based on our historical credit losses since 2010, adjusted for any significant known amounts that are not receivable. Forward looking information has also been incorporated as appropriate.

On this basis, the loss allowance at 30 June 2023 is as follows:

	Expected loss rate	Gross carrying amount	Loss allowance provision
Not past due	0.40%	29,425	(116)
Past due 1 - 30 days	0.75%	1,137	(9)
Past due 31 - 60 days	1.50%	185	(3)
Past due 61 - 90 days	5.00%	191	(10)
Past due > 91 days	100.0%	215	(215)
Total		31,153	(353)

Movements in the loss allowance provision for receivables are as follows:

GROUP

2023
\$000

2022
\$000

Balance at 01 July

Additional provisions during the year

Receivables written-off during the year

Balance at end of year

(353)	(353)
-	-
-	-
(353)	(353)

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

GROUP

2023 2022
\$000 \$000

10. ACCOUNTS PAYABLE AND ACCRUALS

Trade payables
Other payables and accruals
Revenue in advance

13,705	12,450
6,858	6,394
12,283	11,478
32,846	30,322

Accounts payable and accruals are non-interest bearing and are normally settled on 30-day terms, therefore the carrying value of accounts payable and accruals approximates their fair value.

11. EMPLOYEE ENTITLEMENTS

Annual leave
Retirement leave
Service leave
Other leave and accruals

7,540	7,352
3,742	3,120
1,162	1,465
3,982	3,390
16,426	15,327
14,714	13,830
1,712	1,497
16,426	15,327

Total employee entitlements

Comprising:

Current
Non-current

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

12. PROPERTY, PLANT AND EQUIPMENT

	GROUP				
	Land	Buildings	Plant and Equipment	Motor Vehicles	Total
	\$000	\$000	\$000	\$000	\$000
Cost					
Opening balance 01 July 21	13,763	109,631	148,993	7,245	279,632
Additions	-	3,063	10,695	812	14,570
Disposals	-	-	(317)	(317)	(634)
Transfers	-	959	(959)	-	-
Foreign exchange movement	-	-	1	-	1
Closing balance 30 June 22	13,763	113,653	158,413	7,740	293,569
Accumulated depreciation					
Opening balance 01 July 21	-	43,955	114,671	4,684	163,310
Depreciation	-	3,918	8,474	610	13,002
Disposals	-	-	(314)	(275)	(589)
Transfers	-	-	-	-	-
Closing balance 30 June 22	-	47,873	122,831	5,019	175,723
Net book value	13,763	65,780	35,582	2,721	117,846

	GROUP				
	Land	Buildings	Plant and Equipment	Motor Vehicles	Total
	\$000	\$000	\$000	\$000	\$000
Cost					
Opening balance 01 July 22	13,763	113,653	158,413	7,740	293,569
Additions	-	7,086	9,564	413	17,063
Disposals	-	(1)	(265)	(512)	(778)
Transfers	-	48	(48)	-	-
Foreign exchange movement	-	-	(3)	-	(3)
Closing balance 30 June 23	13,763	120,786	167,661	7,641	309,851
Accumulated depreciation					
Opening balance 01 July 22	-	47,873	122,831	5,019	175,723
Depreciation	-	4,213	8,269	565	13,047
Disposals	-	(1)	(115)	(424)	(540)
Transfers	-	-	-	-	-
Closing balance 30 June 23	-	52,085	130,985	5,160	188,230
Net book value	13,763	68,701	36,676	2,481	121,621

The Company holds numerous germplasm collections of horticultural material for research purposes. Due to the nature of the collections their value can not be measured reliably for financial purposes, however they have a fundamental importance to the Company's research.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

13. LEASES

The Group reports all leases on the balance sheet where it has the right to obtain substantially all of the economic benefits from the use of the asset throughout the period, with the exception of low value leases and leases with a duration of less than 12 months.

The Group leases relate to land and buildings. Right-of-use assets are measured at cost, comprising the amount of the initial measurement of the lease liability. These assets are subsequently depreciated using the straight-line method from the commencement date to the end of the lease term. Lease liabilities represent the net present value of fixed payments.

The following table details leases where the Group is a lessee:

	GROUP	
	2023	2022
	\$'000	\$'000
Right-of-use lease assets		
Opening balance	18,980	19,537
Additions and modifications	2,396	718
Depreciation	(1,523)	(1,275)
Closing balance	19,853	18,980
Represented by:		
Cost	25,002	22,606
Accumulated depreciation	(5,149)	(3,626)
	19,853	18,980
Lease liabilities		
Current	1,245	978
Non-current	19,985	19,021
	21,230	19,999
The movements for the year are as follows:		
Opening balance	19,999	20,203
Additions and modifications	2,396	718
Lease payments	(2,215)	(1,904)
Interest of leases	1,050	982
Closing balance	21,230	19,999
Amounts payable under leases		
Less than one year	1,245	978
Two to five years	4,068	3,628
More than five years	15,917	15,393
Total	21,230	19,999

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

14. INTANGIBLE ASSETS

	GROUP			
	Software, Databases \$000	Patents, Trademarks \$000	Goodwill \$000	Total \$000
Cost				
Opening balance 01 July 21	17,866	467	19	18,352
Additions	1,860	-	-	1,860
Disposals	(50)	-	-	(50)
Transfers	-	-	-	-
Closing balance 30 June 22	19,676	467	19	20,162
Accumulated amortisation				
Opening balance 01 July 21	13,221	467	19	13,707
Amortisation	2,207	-	-	2,207
Disposals	(25)	-	-	(25)
Transfers	-	-	-	-
Closing balance 30 June 22	15,403	467	19	15,889
Net book value	4,273	-	-	4,273

	GROUP			
	Software, Databases \$000	Patents, Trademarks \$000	Goodwill \$000	Total \$000
Cost				
Opening balance 01 July 22	19,676	467	19	20,162
Additions	3,654	-	-	3,654
Disposals	-	-	-	-
Transfers	-	-	-	-
Closing balance 30 June 23	23,330	467	19	23,816
Accumulated amortisation				
Opening balance 01 July 22	15,403	467	19	15,889
Amortisation	2,282	-	-	2,282
Disposals	-	-	-	-
Transfers	-	-	-	-
Closing balance 30 June 23	17,685	467	19	18,171
Net book value	5,645	-	-	5,645

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

15. INVESTMENTS

(i) Subsidiaries	Principal Activity	Balance Date	Interest Held %
CropSeed Limited	Seed growing services	30 June	100
Berryfruit Holdings Limited	IP holding company	30 June	100
Plant & Food Research (USA) Corporation	Marketing and consultancy services in the USA	30 June	100
Plant & Food Research Australia Pty Limited	Science, marketing and consultancy services in Australia	30 June	100

Plant & Food Research Australia Pty Limited is incorporated in Australia. Plant & Food Research (USA) Corporation is incorporated in the USA. All other subsidiaries are incorporated in New Zealand.

(ii) Joint operations

Plant & Food Research and Zespri has a 50/50 joint operation The Kiwifruit Breeding Centre Limited, dedicated to breeding new kiwifruit cultivars. The joint operation commenced operations on 1 October 2021 and its principal place of business is Te Puke.

Significant judgement classification of joint arrangements

The joint venture agreements in relation to The Kiwifruit Breeding Centre Limited require unanimous consent from all parties for all relevant activities. The two shareholders have direct rights to the assets of the venture and are jointly and severally liable for the liabilities incurred by the venture. All output generated is only for the two shareholders, Plant & Food Research and Zespri. This entity is therefore classified as a joint operation and the Group recognises its direct right to the jointly held assets, liabilities, revenues and expenses.

There was no material impact on the Group financial statements from the formation of the new joint operation.

(iii) Associates

The Group's share of profit/(loss) in its associated companies and joint ventures for the year was \$180,000 (2022: \$414,000).

30 June 2023	Principal Activity	Interest Held	Total Assets	Total Liabilities	Revenue	Profit/(Loss)
Pacific Berries LLC	Developing & commercialising IP	50.0%	1,582	38	2,016	864
Forage Innovations Limited	Developing & commercialising IP	49.0%	1,681	121	2,193	198
Biopolymer Network Limited	Developing & commercialising IP	42.7%	436	64	444	(348)
Prevar Limited	Developing & commercialising IP	29.0%	3,525	1,367	5,509	396
Precision Seafood Harvesting Limited	Developing & commercialising IP	25.0%	3,613	193	407	(534)

30 June 2022

Pacific Berries LLC	Developing & commercialising IP	50.0%	1,507	39	1,581	566
Forage Innovations Limited	Developing & commercialising IP	49.0%	2,024	163	2,396	540
Biopolymer Network Limited	Developing & commercialising IP	42.7%	801	80	186	(538)
Prevar Limited	Developing & commercialising IP	29.0%	3,369	1,504	4,643	814

	GROUP	
	2023 \$'000	2022 \$'000
Prevar Limited	1,560	1,445
Precision Seafood Harvesting Limited	841	-
Forage Innovations Limited	750	898
Pacific Berries LLC	694	720
Biopolymer Network Limited	375	524
2before Performance Nutrition Limited	-	244
Other associates & joint ventures	6	8
Total associate and joint venture investments	4,226	3,839

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

16. DEFERRED TAX ASSET/(LIABILITY)

	Property, plant equipment	Investments- associates	Derivative financial instruments	Employee entitlements	Other provisions	Tax losses	Total
	\$000	\$000	\$000	\$000	\$000	\$000	\$000
GROUP							
Balance at 30 June 2021	1,411	145	(16)	2,983	(1,129)	-	3,394
Charged to statement of comprehensive income	744	(25)	(57)	799	54	-	1,515
Balance at 30 June 2022	2,155	120	(73)	3,782	(1,075)	-	4,909
Charged to statement of comprehensive income	821	54	79	(168)	491	822	2,099
Balance at 30 June 2023	2,976	174	6	3,614	(584)	822	7,008

17. SHARE CAPITAL & RESERVES

Ordinary shares

On issue opening balance

Issued for cash

On issue at closing balance 30 June

GROUP	
2023	2022
\$000	\$000
17,436	17,436
11,000	-
28,436	17,436

Share capital consists of 28,436,000 fully paid ordinary shares of \$1 each (2022: 17,436,000 ordinary shares of \$1 each).

The Group's shareholders contributed \$11,000,000 in new equity in June 2023.

The holders of ordinary shares are entitled to receive dividends as declared from time to time and are entitled to one vote per share at meetings of the Company.

All shares rank equally with regard to the Company's residual assets.

18. CASH FLOW HEDGE RESERVE

Opening balance at 01 July

Transferred to cost of sales

Revaluations

Closing balance at 30 June

(261)	(58)
281	(203)
-	-
20	(261)

The hedge reserve is used to record fair value gains or losses on foreign exchange forward contracts that qualify as cash flow hedges.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

19. COMMITMENTS

The following amounts have been committed to by the Group, but are not recognised in the financial statements:

a) Capital commitments

Property, plant and equipment

b) Operating commitments (excluding leases recognised on the balance sheet)

c) Operating lease income

Lease income under non-cancellable operating leases are as follows:

Not later than one year

Later than one year and not later than five years

Later than five years

GROUP

2023 2022
\$000 \$000

	5,166	7,439
	111	163
	1,414	1,522
	1,279	1,533
	-	-
	2,693	3,055

The Group received rental income of \$1,748,000 during the year (2022: \$1,375,000). Rental income is included within Other income in the Statement of Comprehensive Income.

20. RECONCILIATION OF (LOSS)/PROFIT AFTER TAX WITH CASH FLOW FROM OPERATING ACTIVITIES

(Loss)/profit after tax

Add/(less) non-cash items:

Share of retained (profit)/loss of associates and joint ventures

Depreciation and amortisation

Other non cash movements

Add/(less) items classified as investing activities:

(Gain) on sale of property, plant and equipment

Dividends received from joint venture

Movements in working capital and other movements:

(Increase) in receivables and prepayments

(Increase)/decrease in inventory

Increase in trade payables and accruals

(Decrease) in taxation payable

Decrease in future tax liability

Increase in employee entitlements

Net cash flow from operating activities

(6,390)	3,859
(180)	(414)
16,852	16,484
58	(22)
16,730	16,048
(2,678)	(359)
399	110
(644)	(4,629)
(90)	(61)
3,579	6,665
(1,456)	(90)
(2,099)	(1,515)
1,099	962
389	1,332
8,450	20,990

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

21. RELATED PARTY TRANSACTIONS

The Company is a wholly owned entity of the Crown. The government significantly influences the role of the Company in addition to being a major source of revenue.

The Group enters into transactions with government departments, state-owned enterprises and other Crown entities.

These transactions occur within a normal customer / supplier relationship on terms and conditions no more or less favourable than those which it is reasonable to expect the Group would have adopted if dealing with that entity at arm's length in the same circumstances. Such transactions have not been disclosed as related party transactions.

Strategic funding amounting to \$43,162,000 was received from MBIE (a government department) during the year to 30 June 2023 (2022: \$43,162,000).

Strategic funding is disclosed on the face of the Statement of Comprehensive Income.

	Revenue earned		Due from	
	2023	2022	2023	2022
	\$000	\$000	\$000	\$000
Transactions with:				
Associates	7,332	7,212	2,460	1,918

For the year ended 30 June 2023, the Group has not impaired any related party receivables (2022: \$0).

Executive remuneration

Plant & Food Research's remuneration policy has four objectives:

- (i) Establish and maintain fair and competitive salaries;
- (ii) Recognise and reward difference in individual ability and performance;
- (iii) Enable positions to be assessed to both internal and external value; and
- (iv) Provide appropriate pay ranges for positions requiring different levels of responsibility, experience, skill and knowledge.

Executive remuneration is set having regard to:

- Prevailing market and economic conditions
- Organisational performance and individual experience and contribution;
- Internal equity and pay parity
- Accurate benchmark position and job size
- Market benchmark survey results

	GROUP	
	2023	2022
	\$000	\$000
Salaries and other short term employee benefits of the Chief Executive and other members of the Senior Leadership Team	3,045	2,845

Total executive remuneration detailed above includes other benefits (employer contributions to superannuation and health insurance) totalling \$86,000 (2022: \$74,000).

There were 8 members of the Senior Leadership Team (including the Chief Executive) during the twelve months ending 30 June 2023 (2022: 8).

From 1 July 2019 executive remuneration consists of base salary and employer contributions to superannuation and health insurance.

A number of key management personnel provide directorship services to subsidiaries and other entities as part of their employment without receiving any additional remuneration.

The Group purchases directors and officers insurance for the benefit of key management personnel in relation to the services they provide to the Group.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

21. RELATED PARTY TRANSACTIONS (CONTINUED)

Chief Executive remuneration

The departed Chief Executive's remuneration is approved by the Board on the recommendation of the Remuneration Committee on an annual basis.

		Salary	Benefits	Total
The Chief Executive's remuneration for 2023 and 2022 was:				
	2023	614,461	-	\$614,461
	2022	576,954	-	\$576,954

The Chief Executive resigned during the year and departed on 2 June 2023.

The 2023 remuneration includes payment of accrued annual leave entitlements owing at departure

		Salary	Benefits	Total
The new Chief Executive's remuneration for 2023 (commenced 1 May) was:				
	2023	79,435	-	\$79,435

22. FINANCIAL INSTRUMENTS

The Group's activities expose it to a variety of financial instrument risks, including market risk, credit risk and liquidity risk. The Group has a series of policies to manage the risks associated with financial instruments and seeks to minimise exposure from financial instruments. These policies do not allow any transactions that are speculative in nature.

Market risk

Currency risk

Currency risk is the risk that the fair value or future cash flows will fluctuate due to changes in foreign exchange rates. The Group purchases goods and services overseas which require it to enter into transactions denominated in foreign currencies. The Group also holds small balances of AUD, EUR and USD at call in order to settle transactions denominated in foreign currencies. As a result of these activities, some limited exposure to currency risk arises.

It is the Group's policy to manage foreign currency risks arising from contractual commitments and liabilities by entering into foreign exchange forward contracts to hedge the foreign currency risk exposure. All of the forward exchange contracts have maturities of less than one year at the balance sheet date.

Sensitivity analysis

The Group's results are not sensitive to changes in foreign exchange rates.

Credit risk

Credit risk is the risk that a third party will default on its obligations to the Group, causing the Group to incur a loss.

Due to the timing of its cash inflows and outflows, the Group invests surplus cash with registered banks with a Standard & Poor's credit rating of A- or above. The Group's investment policy limits the amount of credit exposure to \$15M with any one institution. The largest credit exposure with any one institution at balance date is \$11.1M (2022: \$9.6M).

The Group's maximum credit exposure for each class of financial instrument is represented by the total carrying amount of cash and short-term deposits (note 8), net receivables (note 9) and derivative financial assets. There is no collateral held as security against these financial instruments.

Management has a credit policy in place under which each new customer is individually analysed for credit worthiness and assigned a credit limit before the standard payment and delivery terms and conditions are offered. Where available the Group reviews external ratings and references are obtained. Credit limits are reviewed on a regular basis.

Net receivables includes two customers who represent 64% (2022: 66%) of the total trade receivables at balance date. The Group is not exposed to any other concentrations of credit risk.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

22. FINANCIAL INSTRUMENTS (CONTINUED)

Liquidity risk

Liquidity risk is the risk that the Group will encounter difficulty raising liquid funds to meet commitments as they fall due. Prudent liquidity risk management implies maintaining sufficient cash, the availability of funding through an adequate amount of committed credit facilities and the ability to close out market positions. The Group aims to maintain flexibility in funding by keeping committed credit lines available. It is the Group's policy to provide credit and liquidity enhancement only to wholly owned subsidiaries.

The table below analyses the Group's derivative financial instruments and other financial liabilities that will be settled on a gross basis into relevant maturity groupings based on the remaining period at the balance sheet date to the contractual maturity date. The amounts disclosed are the contractual undiscounted cash flows.

	Carrying amount	Contractual cash flow	GROUP 2023		
			Up to 12 months	1-2 years	3 years +
Trade and other payables	18,320	18,320	18,320	-	-
Borrowings	-	-	-	-	-
	18,320	18,320	18,320	-	-
Forward exchange contracts					
Inflow	20	4,046	4,046	-	-
Outflow	-	-	-	-	-

	Carrying amount	Contractual cash flow	GROUP 2022		
			Up to 12 months	1-2 years	3 years +
Trade and other payables	16,428	16,428	16,428	-	-
Borrowings	-	-	-	-	-
	16,428	16,428	16,428	-	-
Forward exchange contracts					
Inflow	-	3,726	3,726	-	-
Outflow	(261)	-	-	-	-

Fair value estimation

The group uses various methods in estimating the fair value of a financial instrument.

- The fair value is calculated using quoted prices in active markets (Level 1)
- The fair value is estimated using inputs other than quoted prices included in Level 1 that observable for the asset or liability either directly (as prices) or indirectly (derived from prices) (Level 2); and
- The fair value is estimated using inputs for the asset or liability that are not based on observable market data (Level 3).

The Group's derivative financial instruments are all level 2 forward foreign exchange contracts with a fair value of \$20,000 (2022: (\$261,000)).

These have been fair valued using forward exchange rates that are quoted in an active market.

NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)

for the year ended 30 June 2023

23. CATEGORIES OF FINANCIAL ASSETS AND LIABILITIES

The carrying amounts of financial assets and liabilities by classification are as follows:

		GROUP	
	Note	2023 \$000	2022 \$000
<i>Financial assets measured at amortised cost</i>			
Cash and cash equivalents	(8)	11,746	12,997
Trade and other receivables	(9)	41,993	42,217
Total financial assets at amortised cost		53,739	55,214
<i>Financial liabilities measured at amortised cost</i>			
Accounts payable and accruals	(10)	18,320	16,428
Employee entitlements	(11)	14,714	13,830
Borrowings	(8)	-	-
Lease liabilities	(13)	1,245	978
Total financial liabilities at amortised cost		34,279	31,236

The fair value of the financial assets and liabilities approximate their carrying value.

24. CAPITAL MANAGEMENT

The Company's capital is its equity, which comprises share capital and accumulated funds. Equity is represented by net assets.

The Company is subject to the financial management and accountability provisions of the Crown Research Institutes Act 1992.

The Company manages its equity as a by-product of prudently managing revenues, expenses, assets, liabilities and general financial dealings to ensure the Company effectively achieves its objectives and purpose, whilst remaining a going concern.

The Group's objectives when managing capital are to safeguard the Group's ability to continue as a going concern in order to provide returns for shareholders and benefits for other stakeholders and to maintain an optimal capital structure to reduce the cost of capital. The Group recognises the need to maintain a balance between the higher returns that might be possible with greater gearing and the advantages and security afforded by a sound capital position.

25. CONTINGENCIES

Contingent Liabilities

There were no material contingent liabilities known to exist at balance date (2022: \$0).

Contingent Assets

There were no material contingent assets known to exist at balance date (2022: \$0).

PERFORMANCE INDICATORS

for the year ended 30 June 2023

	2023 Actual	2022 Actual
RESEARCH COLLABORATION		
<i>Peer reviewed publications</i>	277	352
<i>Book chapters</i>	6	11
TECHNOLOGY & KNOWLEDGE TRANSFER		
Licences - new	11	44
Client reports	415	437
Plant variety rights		
Granted in NZ	3	1
Granted overseas	8	12
Patents	9	14
Trademarks		
Registered	-	10
<i>Requests for information from databases and collections</i>	17	33
SCIENCE QUALITY		
Science reviews	2	1
International awards	3	-
Invitations for international committees	22	18
Invitations for editorial boards	15	19

STATEMENT OF RESPONSIBILITY

for the year ended 30 June 2023

In the financial year ended 30 June 2023, the Board and management of The New Zealand Institute for Plant & Food Research Limited were responsible for:

- the preparation of the financial statements and the judgements used therein.
- establishing and maintaining a system of internal control designed to provide reasonable assurance as to the integrity and reliability of financial and non-financial performance reporting.

In the opinion of the Board and management of The New Zealand Institute for Plant & Food Research Limited, these financial statements fairly reflect the financial position and operations of The New Zealand Institute for Plant & Food Research Limited for the year ended 30 June 2023.



Nicola Shadbolt, Chair
25 August 2023



Wendy Venter, Director
25 August 2023

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Nicola Shadbolt
Chair

Colin Dawson
Deputy Chair

Justine Daw

Dean Moana

Nadine Tunley

Wendy Venter

Chief Executive Officer

Mark Piper

Senior Leadership Team

Kath Clarke
Group General Manager
People & Culture

Dr Jolon Dyer
Group General Manager
Science Services

Dr Kieran Elborough
Group General Manager
Technology Development

Professor Richard Newcomb
Chief Scientist

Dr Gavin Ross
Group General Manager
Marketing & Innovation

Quentin Smith
Group General Manager
Finance, Information & Infrastructure

Stacey Whitiora
Group General Manager
Māori

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Auditors

PricewaterhouseCoopers on behalf of
the Auditor-General

Bankers

ANZ Bank New Zealand Ltd

Westpac New Zealand Ltd

SCIENCE WORKING FOR AOTEAROA NEW ZEALAND

The Crown Research
Institutes (CRIs)
proudly work,
individually and
collectively, to create
a more prosperous,
sustainable and
innovative Aotearoa
New Zealand.



4,400
SMART AND
PASSIONATE PEOPLE

54
SITES ACROSS
AOTEAROA
NEW ZEALAND

6,000
SCIENCE PROJECTS
EACH YEAR

40
NATIONALLY
SIGNIFICANT DATABASES
& COLLECTIONS

A smart
green
future.
Together.

plantandfood.co.nz