Bioprotection Aotearoa

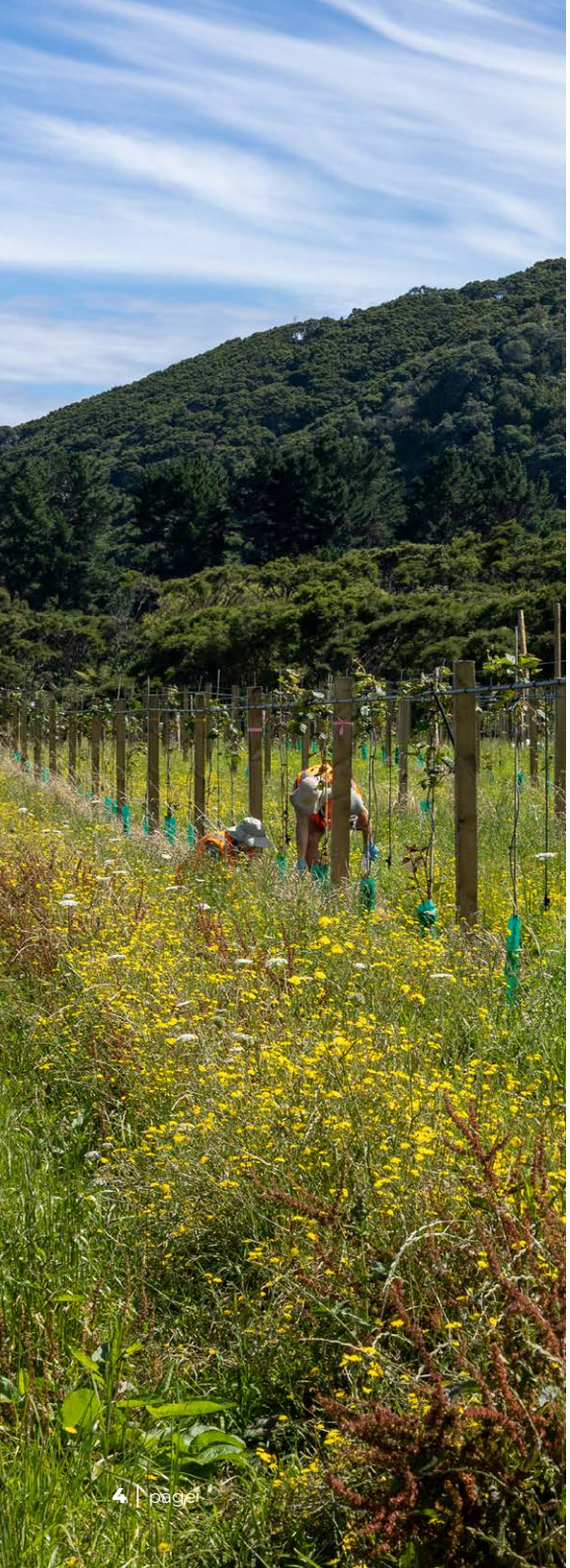
Annual Report

2025

I orea te tuatara, ka puta ki waho

When the tuatara is provoked, it emerges from its shelter.

This whakataukī reflects where Bioprotection Aotearoa stands now. This is not about waiting or just preparing, a huge amount of mahi has already been done. As a Centre of Research Excellence (CoRE), we have grown, developed, and matured, testing new approaches and kaupapa while continuing to support the outstanding mahi of our team, our researchers, our students, and our wider whānau. That work has been real, visible, and impactful. What this moment represents is a shift. As the challenges in our taiao become more immediate and complex, we are stepping forward with greater presence and intent. Not as a reaction, but as a natural progression, grounded in experience, strengthened by what we have already achieved, and ready to contribute even more alongside those committed to protecting our environment for generations to come.



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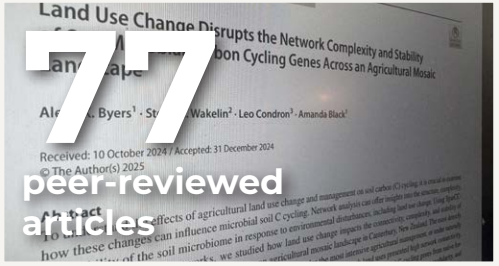
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Preparing for unusual threats to our biosecurity

When I think about training those who will one day take over in the bioprotection space, I can see the skills they will need multiplying and becoming increasingly complex.

Professor Amanda Black
(*Tūhoe, Whakatōhea, Te Whānau ā Apanui*)
Director of Bioprotection Aotearoa

A fundamental truth of Aotearoa New Zealand is that we will always be defending against biosecurity threats. Incursions by weeds and other pests are a fact of life here, where our unique, sensitive island ecosystems are constantly caught off guard by intruders.

Our job at Bioprotection Aotearoa is to contribute to the mitigation of impacts from pests that slip through security and establish themselves in our whenua. We are a team of experts and early career researchers, who are being trained to ensure bioprotection expertise is carried into the future. After all, our country will always need a team of collaborative researchers working to protect our whenua.

Something this year has reminded me of is that not all biosecurity threats are the pests themselves. Biosecurity can also be threatened by the drying up of funding streams, the shifting of political priorities, and the breaking down of communication.

Biosecurity and biodiversity have always been threatened by the extractive rather than protective approaches of capitalism (hello coal mining, goodbye giant native snails!), but the surprise this year was how the advent of new technology can pose a threat.

In 2025, we saw 'de-extinction' tools rise, with millions spent on 'resurrecting' long extinct species. What would be even better is if we could spend some of that money protecting what we have rather than inviting extinct species back into declining ecosystems.

When I think about training those who will one day take over in the bioprotection space, I can see the skills they will need multiplying and becoming increasingly complex.

On top of being experts in their chosen fields, researchers will have to be convincing writers capable of winning funding for the cause, savvy navigators of political and institutional priorities, excellent communicators able to promote the uptake of bioprotection tools to the public and to the government, and confident advocates of what resources bioprotection needs.

This annual report highlights the steps we have taken this year to train our early career researchers for the future. From technical training in the lab to communication

opportunities through our webinar series, I see so many of our researchers growing into the bioprotection practitioners Aotearoa needs.

I see evidence of this in the number of Tranche 1 postdocs who have stepped into co-leadership positions in Tranche 2, signalling their preparedness for tackling the challenges ahead.

I hope you enjoy reading about their journeys, and all the other wonderful work underway, in this annual report.

Message from our Board

Mate atu he tētē kura, ara mai he tētē kura – when the fern frond dies, another rises in its place.

Dr James Ataria
(*Rongomaiwahine*, *Ngāti Kahungunu*, *Raukawa*)
Strategic Advisory Board Member,
Bioprotection Aotearoa

We are living in an era when climate change and increasing globalisation is strongly affecting the environments of Aotearoa New Zealand and the Pacific. Our natural and productive landscapes face growing challenges that need new and innovative solutions – and the skilled people to carry out this important work to protect them.

Bioprotection Aotearoa continues its strong tradition of bioprotection leadership and developing the next generation of researchers and managers through world-class science and strategic collaborations.

This annual report marks the successful completion of the first year of Tranche 2 funding (2025–2028). It signals a new wave of early career researchers and a refreshed research stream exploring existing and emerging bioprotection challenges across Aotearoa New Zealand and the Pacific.

Te Taiao-a-Rangi, our unique research framework, continues to frame our research focus, guide the use of Indigenous knowledge alongside our science and innovation, and be the foundation of our positive and supportive organisational culture for our community – especially our early career researchers.

Mate atu he tētē kura, ara mai he tētē kura – when the fern frond dies, another rises in its place. Last year we farewelled longstanding board members John Rodwell, Henare Edwards, Richard Blaikie, and Tana Luke. We thank them for their dedication and service during their tenure on the Strategic Advisory Board.

We are excited to welcome three new board members, Georgina Morrison, Shaun Neely and Donna Field, who bring new expertise, experience, and networks to a refreshed Centre and research focus.

We thank Lincoln University for its continued support as host for Bioprotection Aotearoa. We also acknowledge the contribution of our eight trusted research partner organisations and our extensive network of Aotearoa New Zealand and Pacific collaborating organisations who lie at the heart of the successes of Bioprotection Aotearoa.

Ka muri ka mua – looking to the past to inform the future. Building on over a decade of research and capacity building, Bioprotection Aotearoa is well positioned to continue this momentum.

We look forward to another year of discovery, strengthened relationships, and research excellence to meet the ongoing challenges to our terrestrial environments.

Vision

Healthy and resilient environments across Aotearoa New Zealand and the Pacific, where people and nature can flourish for generations to come.

Mission

As a National Centre of Research Excellence, Bioprotection Aotearoa develops future bioprotection leaders through pioneering, multi-disciplinary research. Working collaboratively across the research sector, we advance knowledge and develop innovative solutions to protect natural and productive ecosystems from biological threats in a changing environment.

Purpose

Bioprotection Aotearoa exists to safeguard the lands of Papatūānuku, the oceans of Tangaroa, and communities connected by the waters of Te Moananui-a-Kiwa. By bringing together scientific and social understanding with Indigenous knowledge, we strengthen environments across Aotearoa New Zealand and the wider Pacific to adapt and thrive.


C82 Dream

Research

The lab, a different kind of environment

What does fruit fly evolution have in common with phage-bacterial interactions?

Two things actually: one, they are research projects supported by Bioprotection Aotearoa. Two, these projects rely on lab work. And they aren't the only ones. Bioprotection research focuses on diverse landscapes – from native forests to agricultural landscapes – and often, to make sense of what we observe, we bring our subjects into the lab to study them more closely.

For our 2025 annual report, we asked four lab-based researchers who supervise Bioprotection Aotearoa students how lab work is used to collaboratively untangle the mysteries of complex systems.

Biological controls for bioprotection

One sphere of bioprotection research involves protecting cultivated and natural environments from pests.

“We have wicked problems with pests,” says Peter Dearden, Professor in the Department of Biochemistry at the University of Otago.

Broad range, environmentally damaging chemicals are frequently used to control pests. Biological control, also called biocontrol, is a nifty way to sidestep the damage caused by chemicals. With biocontrol, a predator or parasite is used to target a specific pest species to control their population, spread, and impact.

Early career researchers supported by Bioprotection Aotearoa are building new knowledge in biocontrol, with much of this work happening in the lab. For example, a postdoctoral candidate in Dearden’s lab is studying the biocontrol system of the Argentine stem weevil, a pest in Aotearoa New Zealand. This weevil is controlled by a tiny parasitic wasp.

Recently, that control has started to fail.

“When we imported the wasp, we accidentally imported a virus with it,” says Dearden.

The virus was only discovered because of lab-based genome sequencing techniques. Continuing to study this system in the lab – from the success of the wasp at controlling the weevil to the success of the virus at slowing down or killing the wasp – will provide useful information for how to make biocontrol systems more effective and long-lasting.

Control, the hallmark of lab work

Natural environments are a chaotic mix of variables and factors, which can make it difficult to know the cause of an observed change.

“Lab work is good at filtering out noise,” says Jason Tylianakis, Professor in the School of Biological Science at the University of Canterbury. In Tylianakis’s lab, students supported by Bioprotection Aotearoa have been seeking to answer questions like how climate extremes shift the balance in who wins in pest-biocontrol arms races.

“When a pest is subjected to a biocontrol, both pest and biocontrol agent adapt and evolve to better defend in the pest’s case and better attack in the biocontrol agent’s case,” says Tylianakis. “Pest adaptations make it possible for them to evolve resistance.”

While evolutionary changes can be detected in field samples, it becomes difficult to know what exact factor is driving a particular change. Is it the biocontrol agent or is it the weather, climate, or elevation?

Conducting studies in controlled lab conditions allows researchers to detect the true causes of change.

“In the lab, we can control background conditions and even the pest-control populations,” says Tylianakis.

In his lab, Tylianakis currently has a Master’s student and a PhD student funded by Bioprotection Aotearoa studying fruit fly species and two parasitoid species. Fruit flies go through a whole generation in about two weeks – in just a few months, many generations will have evolved.

“Because of their short generations, we can put genetically identical populations of both pest and enemy under different conditions and see how each condition impacts that arms race,” says Tylianakis.

Seeing evolutionary changes as they occur helps build understanding of how climate change could disrupt the natural balance between pests and their biological controls.

Problem solving and contingency planning

Another pest being targeted by Bioprotection Aotearoa students is *Venturia inaequalis*, the fungus that causes apple scab disease.

“In the field, we might see an apple cultivar that is diseased or one that’s completely resistant to disease,” says Carl Mesarich, Associate Professor of Plant Pathology at Massey University in Palmerston North. “We’ve been trying to understand the molecular basis underpinning that susceptibility and resistance, often using lab-based experiments.”

Mesarich, who has supervised students in the field and the lab, knows that both environments have their challenges.

“In the field, you can’t dictate how hot or wet the summer will be, you have to work with what you get,” says Mesarich. “By working in the lab, you can often more easily set and maintain the conditions you require. However, making sure your results accurately reflect what is really happening in the field can sometimes be challenging.”

Getting it right often requires trying a new method or approaching the problem from another angle. Problem solving is a skill all lab researchers must develop.

“I think our lab group has been quite good at contingency planning and knowing when to pivot to an alternative approach,” says Mesarich.

Putting the ‘lab’ in ‘collaboration’

Mesarich is collaborating with Peter Fineran, Professor in the Department of Microbiology and Immunology at University of Otago, to develop CRISPR-based tools to disrupt the apple scab fungus. Fineran and his lab developed expertise in CRISPR tools from applying these techniques to ongoing studies of phage interactions.

“Phages are viruses that can infect bacteria,” says Fineran. “My group is interested in what phages are out there, how they infect bacteria, and how bacteria can resist phages.”

Fineran hopes phages will one day be used as biocontrol agents.

“Rather than using agrochemicals that kill all bacteria, we are trying to find specific phages that will only kill the target pathogen,” says Fineran.

When conducting research on smaller-than-microscopic phages, lab work is essential.

“In the lab, we can get clear-cut answers right down to the molecular details of exactly how a system works,” says Fineran.

Singular, definitive answers are illuminating, but they are only part of a much bigger picture.

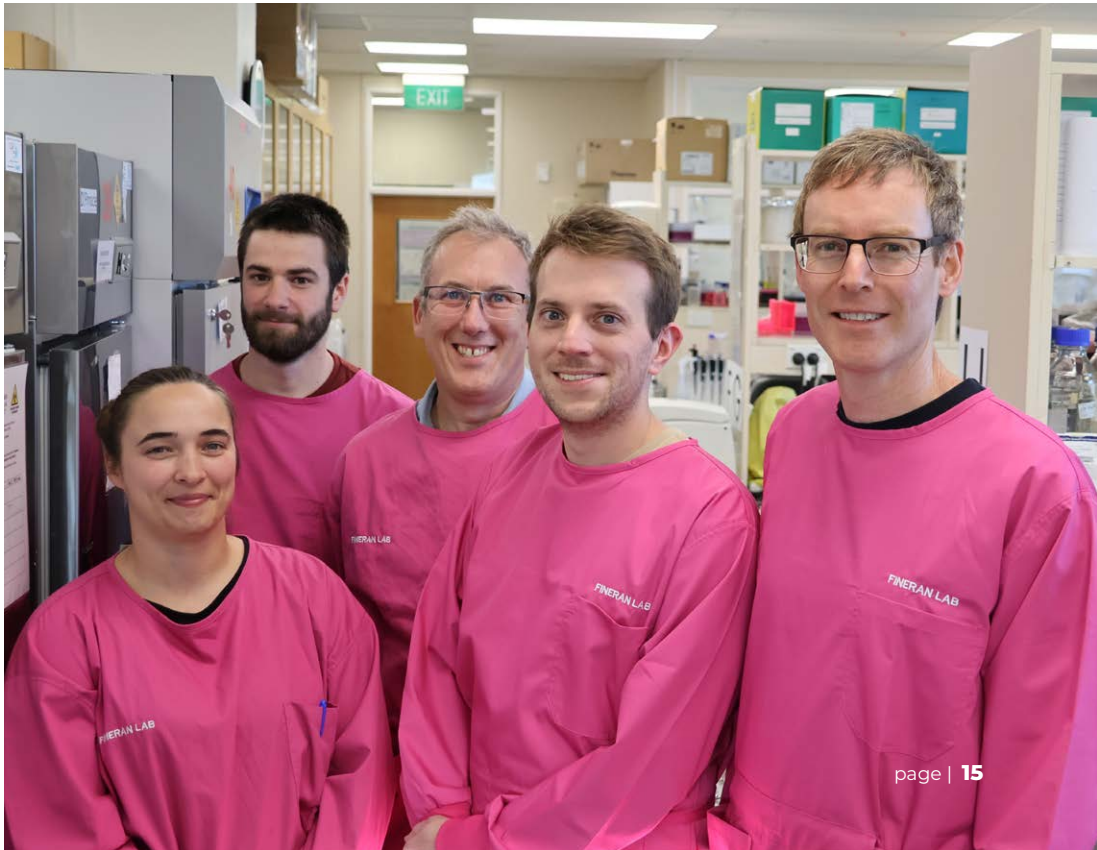
“Lab work has to be part of a partnership and collaboration with other fields,” says Fineran. “It’s an important building block to the research endeavour, but you also need the plant pathologists, the ecologists, and the molecular biologists to understand how everything fits together in the environment.”

Collaborative partnerships, like the one between the Fineran and Mesarich labs, are key to developing new tools for bioprotection.

“In Bioprotection Aotearoa, we’ve got many people addressing similar questions, but from different directions,” says Jason Tylianakis. “It’s a collective of people working together on the same problems.”

For Bioprotection Aotearoa, collaboration is like a special sauce.

“You’ve got more reach and can have more impact when you are collaborating with people,” says Peter Dearden. “I’ve really enjoyed getting to know all the science that is done through Bioprotection Aotearoa, which is very refreshing and a joy of broad, collaborative programmes like this one.”



Emerging leaders

From early career researcher to emerging research co-lead

Developing researchers takes more than opportunity. It takes support, experience, and the chance to lead.

As Tranche 2 (2025 – 2028) began, five postdoctoral fellows from Tranche 1 stepped into new roles, co-leading research projects alongside senior researchers while mentoring postgraduate students. One year on, we sat down with these emerging co-leads to reflect on how this transition is shaping their development as researchers.

Shifting seats to the other side of the desk

Stepping into a co-lead role brings a different perspective. Instead of focusing on their own projects, these scientists are now helping to shape research outcomes and supporting students to develop their own research questions.

Now on the other side of the desk as a co-lead, Dr Laureline Rossignaud says she is experiencing science in a whole different way.

“We provide the framework and support the students to develop their own ideas and research projects,” says Laureline. “I have really enjoyed the experience of trying to find the middle ground – between helping and supporting them but not doing too much so they can still learn.”

The shift in dynamic takes a bit of getting used to. Dr Alexa Byers says she got a bit nervous at first when she realised, she had to let go of her vision of what the project should look like.

“But it’s amazing,” she says, “to see a student go away, spend a week thinking and reading, and come back to you with something you never even thought of.”

Having done a lot of solitary field work, Dr Hanareia Ehau-Taumaunu acknowledges that moving into a leadership role has thankfully allowed her to spend more time collaborating with others and less time in her own head.

“I’m really enjoying the reciprocal aspect of being a co-lead,” says Hanareia. “Some things I’m learning for the first time, which is amazing that even in a leadership role I’m always learning about the science, how we do the science and how we work together.”

Building confidence to lead

Having the right support structures in place has helped these emerging research co-leads build confidence and step into their roles with greater independence.

Looking back on her PhD, Dr Sarah Inwood reflects on the shift from being guided by her supervisor to now helping to shape the direction of research herself. That same supervisor is now her co-lead, continuing to provide support and mentorship as she grows into her leadership role.

“I went from being guided in my research to helping shape its direction over time, which really built my confidence,” says Sarah. “It’s helped to be in an environment where I could grow that independence and know that if I have any issues, I have plenty of support and don’t have to face them independently.”

Sharing this sentiment, Dr John Ramana reflects on writing his first proposal to host a summer scholar.

“I had just finished my PhD and started my postdoc that summer. I wrote up the proposal and sent it to my supervisor, Professor Ian Dickie, to ask, ‘Do you think it’s any good?’”

The response was encouraging, with his supervisor noting that it had a strong theoretical framework.

“To me, that was a small win that told me I know what I’m doing. It gave me more confidence with coming up with novel ideas in Tranche 2.”

For John, being given opportunities to develop ideas and write proposals is one of the most empowering aspects of co-leadership. The process has allowed him to begin thinking about the direction of his own career over the next five years and how he might work towards that.

“If you’re talking about capability development in younger scientists,” he says, “then what better way than to give them the keys to the car? Put them in a position to really define their own boundaries, success, and set them up for where they want to go.”

Communication is key

Reflecting on their progress, these emerging leaders all highlighted science communication as key to their development as researchers.

Laureline says the opportunities she had to develop these skills during her Postdoctoral Fellowship with Bioprotection Aotearoa continue to shape the way she approaches her work today.

“In my position with the Bioeconomy Science Institute, we work a lot with international researchers, and not everyone has English as their first language,” she says. “So, it’s very important at the end of a meeting, for instance, to make sure we’re all on the same page.”

Alexa agrees that communicating science clearly has been an important skill developed, which is serving her well as she begins a new role at the University of Aberdeen.

“At Bioprotection Aotearoa, there’s a lot of emphasis on communication of our projects with a more generalist audience,” she says, “so I learnt to explain the importance of my research”.

Alexa says that being able to clearly explain her research and why it matters, particularly to those who are unfamiliar with the topic, has improved her ability to collaborate with people from different backgrounds and within interdisciplinary teams.

Introducing networks to the next generation

A recurring theme in Bioprotection Aotearoa is the value of networks. Reflecting on her own career so far, Hanareia says she is grateful to the supervisors who introduced her to people and helped her begin building her own network.

“But now, its switched, and I’m the one actually introducing students to those networks,” she says. “I had fabulous mentors who did that for me, and now I’m able to do that for others.”

Reflecting on the networks she built, Hanareia says they now span local and international connections across institutions and stages of her career.

“I know I could easily email all the people in this kōrero and get some help if I needed it,” Hanareia continues. “It could just be a random spurious email saying, ‘hey I’ve got this kaupapa going on, do you want to be involved?’ I have these people to do that with, which not everyone gets to do.”

As these emerging research co-leads establish themselves in their careers, we are proud to see them become part of the wider network of professionals contributing to the research system in Aotearoa New Zealand. In doing so, they are supporting the next generation of emerging researchers and carrying the work of Bioprotection Aotearoa forward.

Dr Alexa Byers

Research Fellow, University of Aberdeen (Scotland)

Tranche 1: Postdoctoral research looking at how to enhance the resilience of soil carbon across agricultural landscapes.

Tranche 2: Former co-lead of ‘Farming for Resilience’ with Dr Nicola Day.

Dr Hanareia Ehau-Taumaunu

Senior Scientist, Bioeconomy Science Institute

Tranche 1: Postdoctoral research in maire tāwake resilience using the plant microbiome.

Tranche 2: Co-lead of ‘Biocontrol Against Microbial Threats’ with Professor Peter Fineran.

Dr Sarah Inwood

Research Fellow, University of Otago

Tranche 1: Postdoctoral research in genetic and genomic approaches to pest and pathogen control.

Tranche 2: Co-lead of ‘Future Biocontrol’ with Professor Peter Dearden.

Dr John Ramana

Postdoctoral Fellow, University of Canterbury

Tranche 1: Postdoctoral research in the drivers of forest health.

Tranche 2: Co-lead of ‘Identifying New and Emerging Microbial Threats’ with Professor Ian Dickie.

Dr Laureline Rosignaud

Forest Ecology Researcher, Bioeconomy Science Institute

Tranche 1: Postdoctoral research in non-native plant invasions in native forests and shrublands.

Tranche 2: Co-lead of ‘Critical Pathways of Weed Invasion’ with Distinguished Professor Phillip Hulme.

Community

Connecting people with bioprotection

Scientific discovery alone does not lead to action. Connection does.

Through conversation, Bioprotection Aotearoa creates spaces for people to engage with research. We also support our early career researchers to develop the skills to communicate science and contribute to the bioprotection conversation. Across a range of initiatives, conversations around bioprotection are taking place in different ways. Our hope is that they act as a catalyst for uptake, application, and inspiration across communities who are dedicated to protecting the whenua of Aotearoa New Zealand.

Horomaka Banks Peninsula Community Hui

Hosting community hui at the heart of our research locations is a priority for us. In April 2025, we held our second event for the community of Horomaka Banks Peninsula.

Under the observation of a white-faced heron perched on the tekoteko of Wairewa Marae, the day-long event was attended by around 45 people and included researchers, local community members, conservation group representatives, and iwi representatives.

The hui included presentations, panel discussions, kai, and plenty of conversation. Researchers shared progress and emerging data from work taking place across the peninsula and attendees were invited to offer their perspectives and observations.

The discussions were complex and thoughtful. Questions emerged naturally as people reflected on the research in the context of their own experiences and knowledge of the landscape.

How can communities be more involved in shaping future research? What role might mana whenua, landowners, and environmental groups play in feeding the future research?

These open discussions challenged our early career researchers to reflect on how we might strengthen connections with communities and ensure the knowledge we are building remains relevant and valuable, even when it's not yet at the stage of direct application.

New ways to open conversation

Bioprotection Aotearoa has been exploring new spaces that open up channels of conversation beyond events and hui. *Under the Lens* is a podcast series born from a desire to bring real scientific conversations into a studio setting and made available via YouTube and podcast platforms.

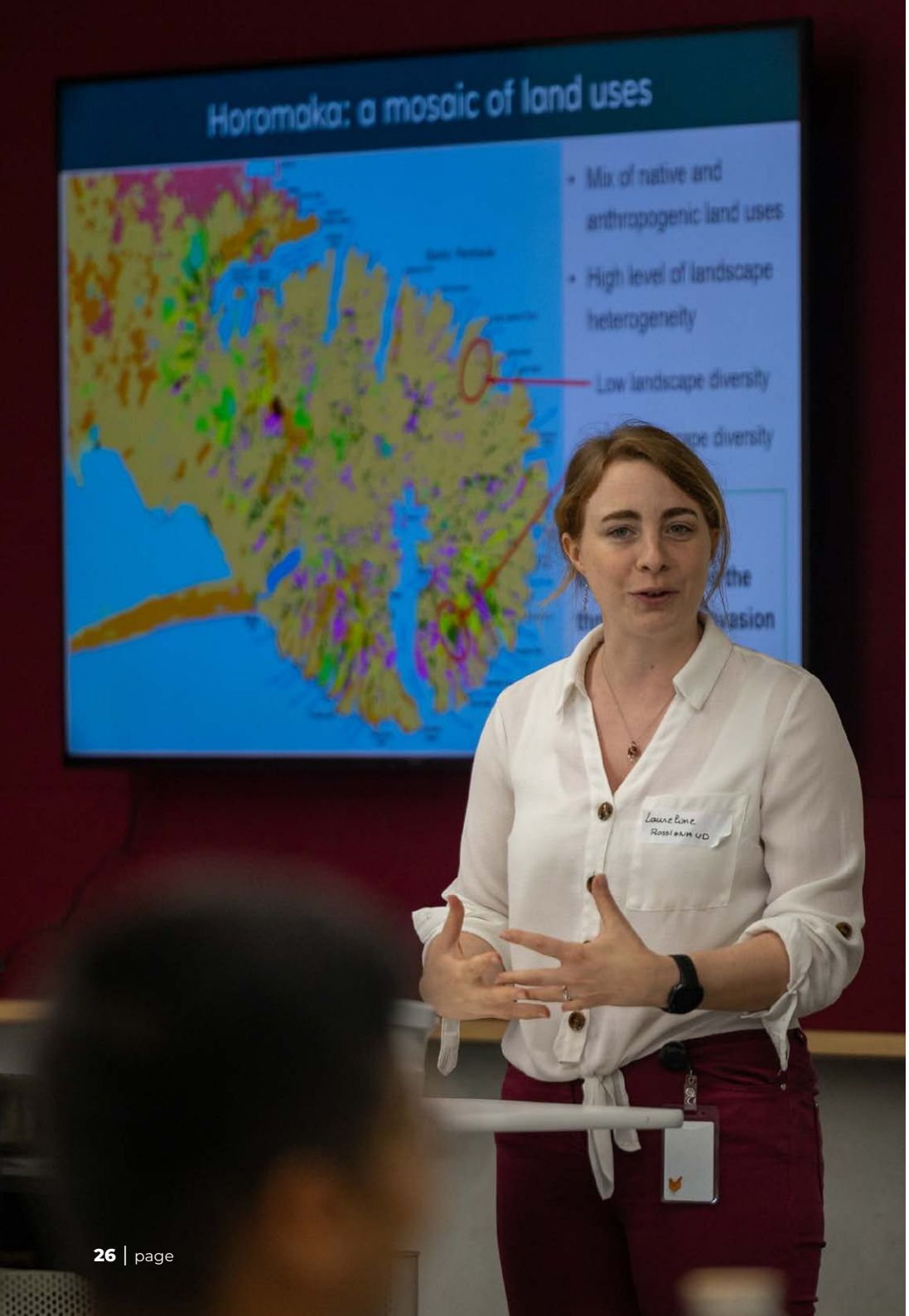
Co-hosts Dr Nick Waipara and Professors Amanda Black and Peter Dearden explore real-world impacts of bioprotection through different lenses. With five episodes produced in 2025, they discussed topics such as kauri dieback, PSA in kiwifruit, invasive weeds, and gene technologies.

Through debate and curiosity, there is a genuine effort to break down the complexity behind how these issues are understood for an audience who are curious about how science and research connect to the places we live in and the decisions that shape them.

Listener comments reflect a range of perspectives on the topics discussed. Among them, some noted how their understanding of scientific concepts, particularly around genetic modification, has expanded. Another shared that the discussion on agapanthus prompted them to rethink how they manage weeds on their own property. There were also comments reflecting concern with aspects of the discussion, particularly around genetic modification.

The diversity of feedback reflects the complexity of these topics. Whether or not the audience agrees with what is being said, the tone and style of the series are helping audiences digest conversations grounded in research and reflect on how this connects to their own experiences.

> “…Rushed through all 5 episodes in one afternoon. I’m an oldie with no science background, but was mesmerised by the clarity of your explanations, particularly about genetic modification; Kauri was a little harder. (Also a sufferer of acute hay fever.) I must revise and rewatch soon. But for now, I’m speechless, other than a heartfelt, “Thank you!” - @user-***, YouTube, December 2024



Growing the next generation of science communicators

To create a space where our early career researchers can strengthen their science communication skills, Rangahau Rising was born. Launched midway through 2025, this monthly webinar series provides a platform for postdoctoral fellows to showcase their research in a keynote-style format.

Open to the public, five postdoctoral fellows presented their research. Topics ranged from carbon cycling to microbial communities supporting the health of kānuka and the spread of invasive weeds across Aotearoa New Zealand.

Over the course of the series, nearly 300 people registered to attend. Each webinar attracted an audience specific to the subject being explored, spanning councils, industry, academia, and community, reflecting the many ways bioprotection research connects into practice.

For many of the presenters, the most valuable conversations happened after the presentations. Dr Sarah Inwood (University of Otago) shared, “The questions I got during the Q&A were some of the best ones I’ve had after speaking. I suspect the audience I got with this talk was one of the most relevant I’ve had, which is great.”

Dr Hanareia Ehau-Taumaunu (Bioeconomy Science Institute) reflected on how the engagement extended beyond the session itself.

“Many people said they enjoyed my presentation and were keen to see the shotgun sequencing dataset that I hinted at at the end of my talk. A couple of people who attended from Auckland Council have also been in touch to discuss Myrtaceae protection in the region.”

Being SAVVY for media

Engagement is not only about connecting the public with research. It's also about helping our researchers build the confidence and leadership skills needed to communicate science clearly and effectively.

After hearing about a Science Media SAVVY workshop through the Bioprotection Aotearoa network, our PhD student Friederike Espinoza (Lincoln University) was successful in her application for a place in the Christchurch programme. During the two-day workshop, she gained practical strategies to help explain the complexity of her research, giving her the confidence to speak with a journalist from *The Spinoff*, who later featured her research in an article about the devastating Port Hills fire.

The article highlighted her work, showing how small kānuka patches in the Port Hills are especially vulnerable to weed invasions and why strategic reforestation could help reduce future fire risk. Supporting emerging researchers in gaining the tools to describe their research in an accessible way ensures their insights reach the public.

Pathways

Giving bioprotection research visibility for learners

The future of bioprotection depends on the next generation choosing it. However, they can only choose it if they know it exists.

From primary and secondary school students through to undergraduates who are considering their next steps in postgraduate studies, Bioprotection Aotearoa continues to invest in pathways that grow awareness and steer future scientists into bioprotection research.

Reaching the next generation

Our 10-week summer scholarship programme continues to run each year. Over the last four years, Bioprotection Aotearoa has placed nearly 30 undergraduates on internships supporting our research. Five of these scholars have continued on to Master's research funded by Bioprotection Aotearoa.

As this initiative continues, we have been thinking about how to foster experiences that grow awareness among younger learners of potential pathways in bioprotection. So, in December 2025, Bioprotection Aotearoa awarded Te Māhuri Scholarships to four high school students interested in science.

The students completed a two-week placement with Lincoln-based scientists from the Bioeconomy Science Institute. They spent time in the lab and the field exploring a range of bioprotection related activities.

Students presented their experiences back to a roomful of supporters. They shared their appreciation for the opportunity to meet with a variety of scientists and witness how they solve problems, collaborate, and apply analytical thinking.

Without this opportunity, the students agreed that high school alone may not have supported them to recognise that a variety of scientific pathways exist.

"The programme made me more interested in science and helped me think about it as something I could pursue in the future," said Owen Hulme, Te Māhuri Scholar.

Programmes like these help open the door for future scientists to enter the conversation around bioprotection. By engaging young people early, we help ensure they explore a future in this field.

Summer Scholarships

10-week research placements for undergraduate students.

Amie Cummack
University of Auckland
Shady characters: traits of recently naturalised plant species in Aotearoa

Harry Norris
University of Otago
The use of *Pheidole megacephala* as a genetic model for other Hymenoptera

Tim Thevenon
University of Canterbury
Ectomycorrhizal colonisation of kānuka trees in drought and flooding treatments

Autumn Lindsay
Victoria University of Wellington
Ectomycorrhizal morphological diversity in *Pinus radiata*

Katelyn Rose Young
University of Canterbury
Diversity of *Xanthomonas arboricola* pv. *pruni* (*Xap*): from DNA to disease

Jaymee Anahera Shadbolt
(*Ngāi Tahu, Ngāti Kahungunu, Ngāti Porou, Te Arawa*)
University of Canterbury
Kia whakatōmuri te haere whakamua: recognition without authority in biosecurity governance and decision-making in Aotearoa

Michael Riley
Toi Ohomai Institute of Technology
Screening novel agents for control of forest nursery pathogens

Rose Thompson
University of Otago
Sex determination using doublesex and transformer in *Polistes dominula*

Jessica Przychodzko
Lincoln University
The wrong pitch: is biosecurity information too complex to understand?

Martina Kassandra Reinbach
University of Auckland
Reducing populations of invasive *Vespula* wasps in the Waitākere Ranges

Te Māhuri Scholarships

Introducing Year 12–13 students to bioprotection research.

Toby De Silva
(*Ngāi Tahu*)
Lincoln High School

Mannat Kaur
Rolleston College

Owen Hulme
(*Ngāti Mahanga, Ngāti Hourua o Tainui*)
Lincoln High School

Taisia Afanasyeva
Rolleston College

Research streams and expertise

The research of Bioprotection Aotearoa is organised across seven interconnected research streams. Each stream represents an area of leadership and expertise within the CoRE, bringing together senior researchers to address complex biological challenges across natural and productive ecosystems.

These research streams sit within our kaupapa-led research framework *Te Taiao-a-Rangi*.

Tranche 2 (2025–2028)

Pou Titirangi

PROJECT 01 Bioprotection Futures

PROJECT 02 Resilient Agroforestry for Pacific Communities

Pou Tokomanawa

PROJECT 03 Future Biocontrol

PROJECT 04 Biocontrol Against Microbial Threats

Pou Nuku-a-Rangi

PROJECT 05 Identifying New and Emerging Microbial Threats

PROJECT 06 Farming For Resilience

PROJECT 07 Critical Pathways of Weed Invasion

Project 01: Bioprotection Futures

Exploring how bioprotection is imagined and enacted in Aotearoa New Zealand to support more connected, future-ready responses.

Bioprotection responses are becoming increasingly complex. They involve many people and agencies, as well as fast-changing tools and technologies. Current approaches are often reactive, fragmented, and narrowly focused on individual species or specific locations, with responsibilities divided across institutions and property boundaries.

Expertise:

Dr Sylvia Nissen, Lincoln University, Project Co-lead
Dr Marc Tadaki, Lincoln University, Project Co-lead
Dr Raven Cretney, Lincoln University
Dr Ramzi Tubbeh, Lincoln University

Research areas:

Evaluating Aotearoa New Zealand's biosecurity system

Examining how Aotearoa New Zealand's biosecurity system operates across policies, organisations, and communities to identify strengths, vulnerabilities, and pathways toward a more connected and future-ready biosecurity system.

Dr Aline Carrara, Postdoctoral Fellow, Lincoln University

Learning from the past for bioprotection futures

Understanding the roots of Aotearoa New Zealand's biosecurity system through historical analysis of emerging concerns about agricultural pests and weeds.

Dr Salene Scholffel-Armstrong, Postdoctoral Fellow, Lincoln University

Community inclusion in pest management in Aotearoa New Zealand

Examining existing processes of community inclusion in the pest management system in Aotearoa New Zealand and how communities generate other contexts for inclusion outside of the system.

Jazmynn Hodder-Swain, PhD Student, Lincoln University

Invasion resistant landscapes in Aotearoa New Zealand

How could landscape-scale bioprotection be better integrated into the design of weed and pest management policy and practice?

Dr Ramzi Tubbeh, Reearcher, Lincoln University

Project 02: Resilient Agroforestry for Pacific Communities

Investigating how agroforestry can strengthen climate resilience and support Pacific communities through sustainable land use.

Agroforestry systems strengthen community resilience to climate change by providing food, fuel, fibre, medicine, and other essential ecosystem services. In Fiji, agroforestry is already recognised as a land management approach that supports both environmental conservation and the needs of communities.

Expertise:

Professor Amanda Black, Lincoln University, Project Co-lead

Dr Suliasi Vunibola, Lincoln University, Project Co-lead

Research areas:

Role of microbial communities in agrobiodiversity resilience

Exploring the diversity of soil microbial communities and understanding their role in supporting agrobiodiversity resilience and agroecosystem productivity.

Mesu Tora, PhD Student, Lincoln University

Resilience in indigenous Fijian food systems

Using Indigenous perspectives to investigate how climate stress and land-use change affect agroecological systems and community resilience in Fiji.

Patrick Fong, PhD Student, Lincoln University

Project 03: Future Biocontrol

Understanding how to strengthen and future-proof biocontrol strategies for invasive species management.

Biocontrol systems are widely valued for managing invasive species. They are self-sustaining, environmentally friendly, and generally avoid genetic modification. However, recent findings suggest that pests can evolve resistance to biocontrol agents, challenging assumptions that biocontrol systems are failproof.

Expertise:

Professor Peter Dearden, University of Otago, Project Co-Lead

Dr Sarah Inwood, University of Otago, Project Co-Lead

Professor Jason Tylianakis, University of Canterbury

Research areas:

Understanding spillover of pests and enemies between crops

Using a large dataset and Bayesian modelling to understand how the proximity of different crops drive dynamics of their pests and natural enemies.

Tim Logan, Master's Student, University of Canterbury

Heat shock impacts on host-parasitoid interactions

Climate change and the coevolutionary arms race: the responses of a fruit fly and a wasp to heat shock and the impact on their host-parasitoid coevolution.

Jessica Azevedo-Leader, Master's Student, University of Canterbury

Project 04: Biocontrol Against Microbial Threats

Exploring phage interactions to develop biocontrol tools against plant pathogens in a changing climate.

Research in this stream explores how hosts interact with microbes and pathogens across plant and ecological systems. By examining these relationships, researchers seek to better understand mechanisms of resistance, susceptibility, and disease suppression relevant to bioprotection.

Expertise:

Professor Peter Fineran, University of Otago, Project Co-Lead

Dr Hanareia Ehau-Taumaunu, Bioeconomy Science Institute, Project Co-lead

Dr Robert Fagerlund, University of Otago

Associate Professor Carl Mesarich, Massey University

Dr Virginia Marroni, Bioeconomy Science Institute

Dr Simon Jackson, University of Waikato

Research areas:

Molecular basis of the apple scab pathosystem

Understanding how the apple scab pathogen, *Venturia inaequalis*, promotes host susceptibility or resistance using new and existing genetic tools.

Ashleigh Mosen, PhD Student, Massey University

How apple scab outsmarts plant defences

Identification and functional characterisation of new host specificity genes in the apple scab pathogen.

Keith Thorburn, PhD Student, Massey University

Impacts of phage-phage interaction

Investigating if and how non-self phage competition takes place during co-infection of a shared host.

Rene Zschoche, PhD Student, University of Otago

How microbial communities affect virus biocontrol

Exploring how using bacteriophages to control bacterial infections might be influenced by the plant's microbial community.

Mada Triandala-Sibero, PhD Student, University of Otago

Project 05: Identifying New and Emerging Microbial Threats

Improving how we detect, monitor, and understand microbial threats across dynamic landscapes.

Pathogens are essential to ecosystem function, yet they can also pose significant risks when their roles shift or intensify. This project aims to improve how we detect and understand microbial threats across landscapes.

Expertise:

Professor Ian Dickie, University of Canterbury, Project Co-Lead

Dr John Ramana, University of Canterbury, Project Co-Lead

Dr Kate Orwin, Bioeconomy Science Institute

Dr Matiu Prebble, University of Canterbury

Dr Rebecca McDougal, Bioeconomy Science Institute

Research areas:

Oomycetes as hidden drivers of forest succession

Understanding the influence of oomycete communities in kānuka stands and adjacent grasslands on seedling establishment, sapling competition, and forest succession.

Melvin Cubian, PhD student, University of Canterbury

How soil microbes influence the success of land restoration

Investigating whether plant pathogens hitchhike with nursery-raised kānuka plants, how long they persist after planting, and their effects on ecosystem health and forest restoration success.

Deborah Dimayacyac, PhD student, University of Canterbury,

Fungal pathogens as ecosystem drivers

Understanding how past fungal populations have impacted current pre-logged forest environments, focusing on introduced species and the environmental impacts of human activities, particularly human settlement.

Anna Camara, PhD student, University of Canterbury

Project 06: Farming For Resilience

Understanding how land use and cover crops influence deep soil carbon and climate resilience.

Soils hold more carbon than the atmosphere, playing a vital role in regulating climate. By increasing carbon storage and stability in soils, we can build resilience to climate change while enhancing ecosystem health.

Expertise:

Dr Nicola Day, Victoria University of Wellington, Project Co-Lead

Dr Alexa Byers, Lincoln University, Project Co-Lead (until December 2025)

Professor Jim Moir, Lincoln University, Project Co-Lead (from December 2025)

Distinguished Professor Leo Condron, Lincoln University

Dr Shengjing Shi, Bioeconomy Science Institute

Research areas:

Impacts of long-term phosphorus fertilisation on soil microbial dynamics

Understanding the influence that contrasting long-term phosphorus fertilization treatments have exerted on soil microbial communities and how this affects microbially driven carbon dynamics and storage in grazed hill country pastures.

Jordan Espenshade, Postdoctoral Fellow, Lincoln University

Impacts of land-use management on soil carbon storage

Exploring how afforestation, grassland management, and seasonal change shape soil carbon stabilisation, sequestration, and soil microbial communities.

Samantha Mills, PhD student, Lincoln University

How soil microbes influence the success of land restoration

Understanding the influence plants have on soil microbes and how this affects carbon dynamics and storage in soils.

Emma Applegate, PhD student, Victoria University of Wellington

Project 07: Critical Pathways of Weed Invasion

Mapping the landscape drivers of weed spread to improve early detection and response strategies.

Aotearoa New Zealand's approach to weed management has been fragmented, often targeting single species or locations without addressing larger landscape patterns. This project aims to shift the focus by studying how weeds move across varied landscapes and what features enable their spread.

Expertise:

Distinguished Professor Philip Hulme, Lincoln University, Project Co-Lead

Dr Laureline Rossignaud, Bioeconomy Science Institute, Project Co-Lead

Professor Margaret Stanley, University of Auckland

Research areas:

From garden to forest: spread and detection of bird-dispersed weeds

Assessing the spread patterns of bird-dispersed weeds and evaluating surveillance techniques for detecting emerging weeds.

Keiko Hashiba, PhD student, University of Auckland

How landscape influences the spread of bird-dispersed weeds

Exploring how birds and landscapes interact to promote the spread of invasive woody weeds and use this knowledge to better inform future weed management strategies.

Oluwagbeminiyi Bangboye, PhD student, Lincoln University

The role of linear landscape features in rural weed invasion

Investigating how invasive plant species disperse in the landscape, focusing on the spread along roadsides.

Viktor Josefsson, PhD student, Lincoln Universit

Riparian weed invasions on Horomaka Banks Peninsula

Assessing how hydrology, habitat, and surrounding landscapes influence invasive plant distributions through riparian corridors and evaluating different methods for monitoring riparian weed invasions.

Blair Galvin, PhD student, Lincoln University

PhD research programme

Tranche 1 (2021–2024)

These projects are in their final stage of completion.

Pou Titirangi

Understanding *Phytophthora cinnamomi* from within

Using systems biology to quantify and qualify transcriptomic and proteomic changes within *Phytophthora cinnamomi* infection and survival mechanisms during exposure to drought stress.

Leann Vinson, PhD student, University of Canterbury

The impact of the microbiome on plant resistance and resilience

Investigating the role of the microbiome in ecosystem and plant resistance and resilience.

Ilaria La Bianca, PhD student, University of Canterbury

Eco-evo dynamics of a pest-parasitoid community

Investigating how biological control of pests by parasitoids will respond to climate change in the long term.

Li Wang, PhD student, University of Canterbury

Predicting the state of Aotearoa New Zealand's forests in the 22nd century

Understanding and predicting where, why, and how forests react to climate change.

Ilya Shabanov, PhD student, Victoria University of Wellington

Pou Tokomanawa

Interactions between bacteria on kiwi fruit leaves

Exploring interactions between kiwi leaf colonising bacteria and their potential role in the pathogen resistance of the plant.

Polina Idelchick, PhD student, Victoria University of Wellington

Understanding the antagonistic fungus–microbe interactions of apple scab

Understanding apple scab fungus interactions with leaf phyllosphere microbiota and the role of *Venturia inaequalis* secreted effector proteins in these interactions.

Kara Pendavingh, PhD student, Massey University

Pou Nuku-a-Rangi

Microbial communities and their relationships to soil resistance and resilience

Investigating soil microbial communities in an agricultural landscape to understand their role in soil function and resilience to climate change.

Alana Thurston, PhD student, Lincoln University

Mycorrhizal fungi in resilient plant-soil ecosystems

Investigating the impact of land management on arbuscular mycorrhizal fungi and the role these fungi play in plant resilience to rising temperatures.

Fionnuala Bulman, PhD student, Lincoln University

The interactions of co-occurring weeds and their impacts on native plants

Investigating the impacts that co-occurring woody weeds have on native restoration plantings.

Diana Borse, University of Auckland PhD student

Weed invasions in New Zealand shrublands

Assessing the drivers behind failure and success of establishment of alien weed species in kānuka shrubland on Banks Peninsula.

Friederike Espinoza, PhD student, Lincoln University

Recloaking Papatūānuku

Characterisation of traditional kūmara and taewa in Aotearoa as an insurance policy for food security

Prioritising crop diversity, global food security, and unique characterisation of kūmara and taewa accessions to create a formal, culturally inclusive collection.

Simon (Apang) Semese, PhD student, Massey University

Senior leadership

Director

Professor Amanda Black (*Tuhoe*, *Whakatōhea*, *Te Whānau ā Apanui*), Lincoln University

Deputy Director(s)

Professor Peter Dearden, University of Otago

Distinguished Professor Philip Hulme, Lincoln University

Dr Sylvia Nissen, Lincoln University

Dr Nick Waipara (*Rongawhakaata* and *Ngāti Ruapani ki Turanga*), Bioeconomy Science Institute

Operations and administration

Operations and administration team

Meikura Arahanga (*Ngāpuhi*, *Pare Hauraki*, *Tainui*, *Tuhoe*, *Ngāti Rongomai*, *Ngāti Kahungunu*, *Ngāti Tuwharetoa*, *Te Ati Haunui-a-Pāpārangi*, *Ngāi Tahu*, *Waitaha*, *Ngāti Māmoe*), Lincoln University, Research and Outreach Coordinator

Elena Johnson, Lincoln University, Executive Assistant to the Director

Zohar Marshall, Lincoln University, Communications and Engagement Manager

Fiona Newcombe, Lincoln University, Research Centre Manager

Anna Tier, Lincoln University, Project and Events Coordinator

Operations support

Huata Arahanga (*Ngārauru-kii-tahi*), Pou Whirinaki

Stacey Bryan, Science Communicator

Jenny Leonard, Science Communicator

Donna Gibson, Designer

Strategic Advisory Board

Outgoing Board members (until June 2025)

Co-Chairs

Matua Henare Edwards (*Te Rawara*, *Te Aupouri*, *Ngā Puhi*), Independent Representative

John Rodwell, Independent Representative

Board Members

Dr James Ataria (*Rongomaiwahine*, *Ngāti Kahungunu*, *Raukawa*), Cawthron Institute, New Zealand Food Safety Science and Research Centre, Independent Representative

Professor Richard Blakie, University of Otago, Partner Representative

Professor Chad Hewitt, Lincoln University, Host Representative

Tana Luke (*Ngāti Rārua*, *Ngāi Tahu*, *Te Rarawa*), Fonterra, Independent Representative

Stacey Whitiora (*Ngāti Mahuta ki te Hauāuru*, *Waikato*), Bioeconomy Science Institute, Partner Representative

Incoming Board members (from July 2025)

Dr James Ataria (*Rongomaiwahine*, *Ngāti Kahungunu*, *Raukawa*), Cawthron Institute, New Zealand Food Safety Science and Research Centre, Independent Representative

Donna Field, Cleardale Station, Independent Representative

Professor Chad Hewitt, Lincoln University, Host Representative

Georgina Morrison, Every Bite, Independent Representative

Shaun Neeley (*Ngāi Tahu*), Pāmu Landcorp Farming Ltd, Independent Representative

Stacey Whitiora (*Ngāti Mahuta ki te Hauāuru*, *Waikato*), Bioeconomy Science Institute, Partner Representative

Capability overview

FTEs by category

Total: 30.10

Principal Investigators	3.95
Associate Investigators	1.00
Postdoctoral Fellows	1.14
Research Technicians	–
Administrative/Support	3.85
Research Students	20.16

Headcounts by category

Total: 82

Principal Investigators	17
Associate Investigators	11
Postdoctoral Fellows	4
Research Technicians	–
Administrative/Support	8
Research Students	42

Students studying at CoRE by level

Total: 42

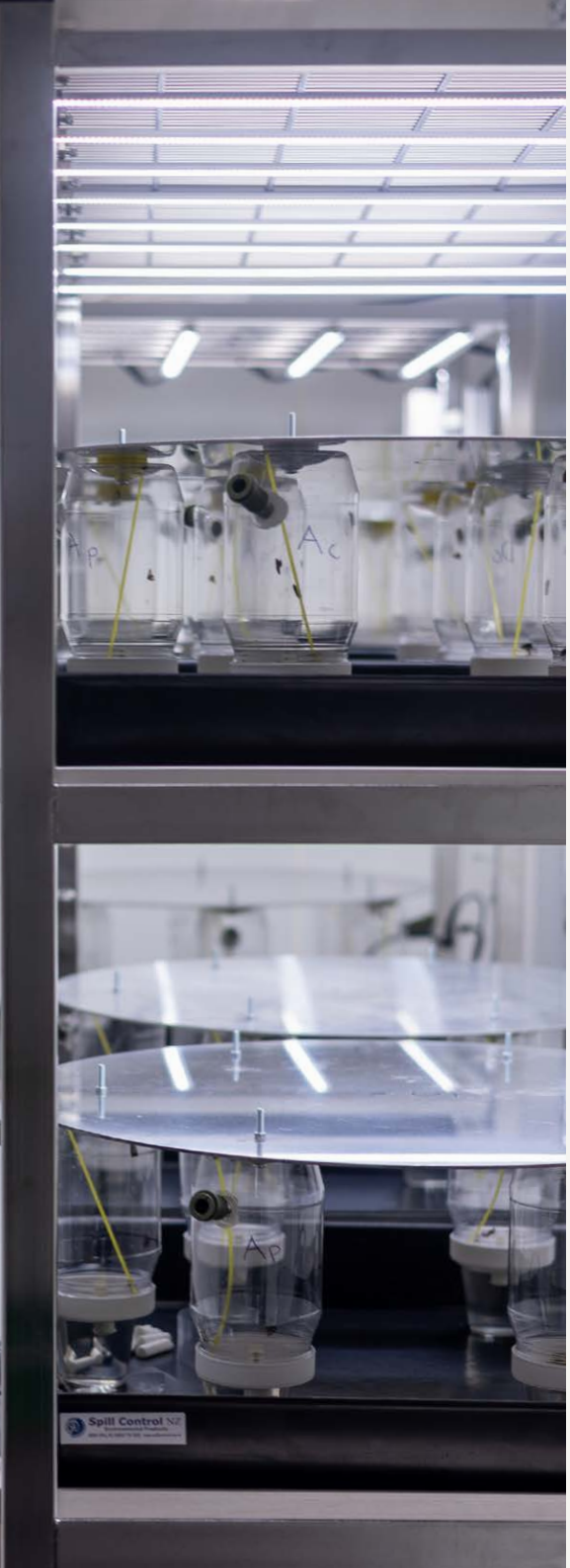
Doctoral Degree	28
Master's	5
Other	9

Peer-reviewed research outputs by type

Total: 94

Books	–
Book Chapters	1
Journal Articles	77
Conference Presentations	16

Link to 2025 outputs



Investment overview

Category	Total $ '000
TEC CoRE funding	4,300
Surplus/(Deficit) carried forward	1,306
Total CoRE Funding	**5,606**
Salaries & salary-related costs	1,271
Total Salaries & Salary-Related Costs	**1,271**
Overheads	1,345
Project costs	430
Travel	149
Postgraduate students	530
Equipment depreciation/rental	–
Subcontractor(s) specified	160
Total Other Costs	**2,615**
Total Expenditure	**3,886**
Net Surplus/(Deficit)	**1,720**

Acknowledgements and partners

Bioprotection Aotearoa is a collaborative Centre of Research Excellence, and our work is made possible through the commitment and support of many individuals and organisations. We acknowledge the researchers, students, partners, communities, and funders who contribute their time, expertise, and trust to this programme.

We are grateful for the partnerships that enable Bioprotection Aotearoa to operate across institutions, disciplines, and regions, and for the shared commitment to safeguarding the environments we depend on.

CoRE partners

Lincoln University
Te Whare Wānaka o Aoraki

The University of Auckland
Te Whare Wānanga o Tāmaki Makaurau
New Zealand

The University of Waikato
Te Whare Wānanga o Waikato

Massey University
Te Kunenga ki Pūrehuroa
University of New Zealand

Victoria University of Wellington
Te Herenga Waka

UC University of Canterbury
Te Whare Wānanga o Waitaha
Christchurch New Zealand

University of Otago
Ōtākou Whakaihu Waka

Bioeconomy Science Institute
Maiangi Taiao

How to find us

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