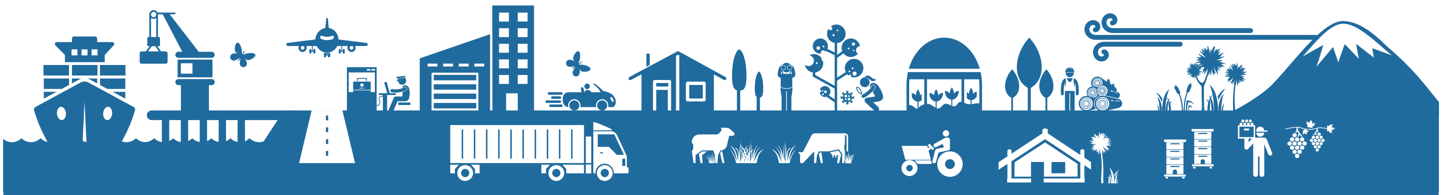
B3 Science Solutions for Better Border Biosecurity
AOTEAROA NEW ZEALAND



B3 Annual Report 2025

(Reporting period July 2024 to June 2025)

B3 at a glance

- Celebrating **20 years** of providing border biosecurity science to protect Aotearoa-New Zealand 's precious native, amenity and productive plants.
- Crucial new tools and knowledge developed to boost border biosecurity and better prepare for and manage incursions if they occur.
- Projects based on what government, industry, crown research institutes, iwi and community partners need.

Partners:

BIOECONOMY SCIENCE INSTITUTE

AgResearch, Manaaki Whenua Landcare Research, Plant & Food Research, Scion, Lincoln University, Environmental Protection Authority, Horticulture New Zealand, Federated Farmers of New Zealand, Ministry for Primary Industries, Department of Conservation, Forest Owners Association

- Supported rapid 'ōhi'a death, BMSB and Xylella preparation and response, to name a few, as well as developing new technologies such as AI, automation and eDNA to strengthen our borders.
- More than 100 of the country's best biosecurity scientists working on B3 projects at any one time.
- 26 projects in the 2024/25 financial year.
- Projects cover understanding risk; pathway risk management; and readiness and response.
- Mātauranga Māori and extensive engagement with iwi/Māori integral to all projects.

Visit b3.nz to find out more and see specific projects.

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MĀORI WORDS/NGĀ KUPU MĀORI

Hapū: sub-tribe
Hourua: double-hulled voyaging canoe, used to represent a collaborative and connected path forward
Hui: meeting
Kaihautū: director, leader
Kaitieki(tanga): guardian(ship)
Kātoa: all
Kaupapa: approach, principle
Kōrerorero: discussions
Mana whenua: people from the region/area
Mātauranga: knowledge
Pūrākau: story, narrative, legend, or myth
Rōpū: group
Taiao: environment
Tangata whenua: people of the land
Taonga: treasures/keepsakes, not necessarily Māori
Te Ao Māori: the Māori world view
Tiakitanga: taking care
Tikanga: customs and traditional values
Tiriti: treaty
Wānanga: discussion forum/workshop
Whakawhanaungatanga: establishing, building and maintaining relationships
Whenua: land

ABBREVIATIONS USED IN THIS REPORT

AGR: AgResearch
BCA: biological control agent
BMSB: brown marmorated stink bug
DOC: Department of Conservation
eDNA/eRNA: environmental DNA/RNA
EPA: Environmental Protection Authority
FOA: Forest Owners Association
IBRAM: Integrated Biosecurity Risk Assessment Model
LU: Lincoln University
MPI: Ministry for Primary Industries
MWLR: Manaaki Whenua Landcare Research
NTS: non-target species
PEQ: Post-entry quarantine
PFR: Plant & Food Research
PNRSV: prunus necrotic ringspot virus
QFF: Queensland fruit fly
ROD: Rapid 'ōhi'a death
XF: *Xylella fastidiosa*

From the Chair and ngā Kaihautū

E ngā mana, e ngā reo, e ngā karangaranga maha o te motu, tēnā koutou katoa.

This year marks 20 years since B3 was established. Two decades of collaborative, science-led biosecurity research dedicated to protecting Aotearoa-New Zealand 's precious productive plant species from invasive pests and diseases. That is something we can all be proud of. From our beginnings as a small research collaboration to today's national programme engaging over 100 of the country's top biosecurity minds, B3 has become a cornerstone of Aotearoa's biosecurity system.

We are immensely proud of the partnerships, research innovation, and resilience this network continues to demonstrate in an evolving biosecurity landscape.

2024–25 has been a year of both reflection and evolution. In response to the changing science system, including the Crown Research Institute mergers and establishment of the new Public Research Organisations, B3 has adapted its structure and sharpened its focus. We now operate under four themes: Understanding Risk, Pathway Risk Management, Readiness and Response, and Te Ao Māori.

This year, B3 supported 26 research projects, each co-developed to reflect the needs of government, industry, Māori, and communities, and to deliver solutions that are responsive, relevant, and future-ready. Our work ranged from developing rapid diagnostic tools for *Phytophthora* and *Xylella*, to AI-enabled pest detection and eDNA monitoring, as well as innovations in post-entry quarantine and risk modelling. Crucially, mātauranga Māori remains embedded across all themes, supporting biosecurity solutions that are holistic, inclusive, and future-focused.

As always, the strength of B3 lies in its people, and this year saw important leadership transitions. We sincerely thank Dr Fiona Carswell for her thoughtful contributions to the Collaboration Council and welcome Dr Chris Jones as her successor. We also acknowledge the valuable service of Professor Travis Glare on the Science Advisory Group, and warmly welcome Dr Mike Cripps as Lincoln University's new representative.

We are grateful to the Ministry for Primary Industries staff who served as Programme and Theme Representatives over the past year, and extend a warm welcome to Mike Ormsby, Matt Hayward, Dave Nendick, and Michelle McCulley, who have taken up these roles in 2025. A full list of contributors is available in the "Contributions of parties to B3" section.

Finally, we note the extension of the Kaihautū fixed terms to June 2026, ensuring continuity and stability in B3's leadership as we move into a new phase of transformation across the research and innovation system. We are confident that B3 is well-positioned to navigate these changes and embrace the opportunities they bring.

As we celebrate 20 years of border biosecurity science, we thank all those who have walked this journey with us, past and present. We remain resolute in our goal to strengthen biosecurity for all New Zealanders through good science, engagement, mātauranga, and partnership.

Finally, to those shaping our future, kia kaha, kia maia, kia manawanui.

Melanie Mark-Shadbolt
(B3 Collaboration Council Chair)

Alby Marsh
(B3 Kaihautū Māori)

Beccy Ganley
(B3 Kaihautū Tiriti)

Celebrating 20 Years of B3 Research

Twenty years ago, a group of visionary Aotearoa-New Zealand scientists submitted a proposal to the competitive Foundation for Research, Science and Technology (FRST) government fund. The proposal (OBI-10023-ECOS-CRF) was entitled “Better Border Biosecurity” and described:

“Actual and potentially harmful organisms are prevented from arriving, are intercepted, or are eradicated before they can establish or cause unacceptable damage to NZ’s economic, natural, recreational and cultural environments.”

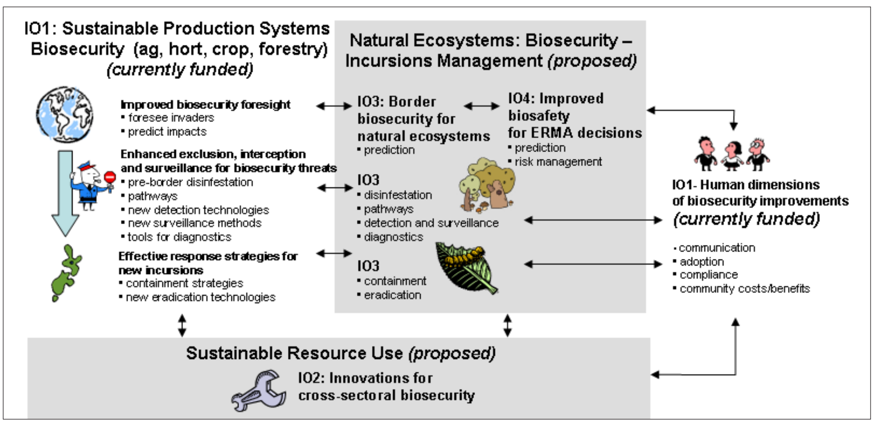
Led by Drs Craig Philips and Grant Smith, with Drs Matthew Cromey, Max Suckling, Darren Kriticos and Barbara Barratt as Intermediate Outcome Leaders, it listed Crop & Food Research, HortResearch, AgResearch, Forest Research, and Lincoln University as research providers, and DOC, ERMA, the Forest Biosecurity Research Council and MAF were named as end-user parties. The successful funding of this proposal saw the start of Better Border Biosecurity (B3).

B3 has evolved over the past 20 years and many of the organisational names have changed but despite this, B3 still continues to be a multi-partner, cooperative science collaboration that researches ways to reduce the entry and establishment of new plant pests and diseases in Aotearoa-New Zealand. Manaaki Whenua Landcare Research joined in 2013, and Horticulture New Zealand and Federated Farmers of New Zealand have also formally joined the collaboration. With the shift to Strategic Science Investment Funding (SSIF), the five research partners as they are currently known, Plant & Food Research, AgResearch, Scion, Manaaki Whenua Landcare Research and Lincoln University made the commitment to continue this collaboration, recognizing the long-term impact and value it held for Aotearoa-New Zealand.

We believe that B3 is the most successful and impactful competitive government-funded research program, delivering well beyond the 5- or 10-year programme impacts expected. We are unaware of any other competitively funded research programme that has endured for 20 years and has produced the number and quality of science outputs that B3 has (see B3 Annual Reports **www.b3nz.org.nz/annual-reports/** for our publications and outcomes). In Aotearoa-New Zealand ’s science reform white paper submissions, B3 was regularly highlighted by the science community as an exemplar science collaboration model.

By working collaboratively with our partners, which include government agencies and industry, our research has added measurable value to Aotearoa-New Zealand ’s biosecurity system through minimising the entry and establishment of invasive pests (arthropods, pathogens and weeds) that threaten our plant-based primary industries and our native flora.

From July 2025, four of B3’s research partners, Plant & Food Research, AgResearch, Scion, Manaaki Whenua Landcare Research, are merging into the New Zealand Institute of Bioeconomy Science, trading as the Bioeconomy Science Institute. Whilst significant changes lie ahead, biosecurity remains critical for the protection of our primary industries, urban areas and native estate. Underpinning Aotearoa-New Zealand’s successful biosecurity system is robust, high-quality biosecurity research.



A figure from the original Better Border Biosecurity proposal describing the four Intermediate Outcome (IO) areas and their linkages. The IOs reflected FRST’s funding structure at the time, these were subsequently replaced with B3’s theme structure.

Theme 1: Understanding Risk

Improved tools and methodologies for identifying hazards, assessing risk, predicting impacts, and ascertaining where in the system mitigation measures are best targeted for intentional and unintentional introductions.

Testing the Toolbox: Reducing uncertainty around non-target impacts

In this 3-year project, a team of researchers conducted tests to validate a set of B3-developed tools and models that predict the risk posed by new biological control agents (BCAs) to non-target species (NTS).

The team used four case studies, each of which has aimed to test one or more of the tools in the 'Toolbox' using selected BCAs already released into Aotearoa-New Zealand. For each case study, they "stepped back in time" and used the tools to predict the risk posed to one or more non-target species from the BCA as if it had not yet been released in Aotearoa-New Zealand. They then conducted field assessments to determine the accuracy of those predictions. The field component of all four case studies has been completed, but each one faced unexpected challenges. In two cases, it was difficult to find populations of the BCAs and NTS even in areas where they have historically been abundant. In another case, the release of an additional BCA into the same ecosystem as the focal BCA changed the food web of that ecosystem, making it impossible to repeat experiments that were conducted on the same BCA in the 1990s.

These difficulties have made it more challenging to validate the tool predictions. The results of the analyses will be used to inform what prediction tools are used for future BCA assessments.

Field assessment for two of the Toolbox case studies involved presenting sentinel non-target leafroller species in artificial "houses". Several species of leafroller larvae were presented in artificial leafrolls for *Dolichogenidea tasmanica*, and parasitoid that targets leafroller larvae (left), and *Ctenopseustis obliquana* pupae were presented in artificial pupation chambers for the pupal parasitoid, *Mastrus ridens* (right).

Contact: Jacqui.Todd@plantandfood.co.nz
Project research partners: PFR, AGR, Scion and MWLR

Building bridges to impact from risk analysis research

Working alongside both researchers and end-users, this 1-year project assessed 22 biosecurity risk analysis tools developed in B3, the Biological Heritage National Science Challenge and MPI, to better understand which tools could be advanced within a wider context and to overcome barriers to adoption.

The first step involved working with key B3 researchers to understand the development and purpose of their tool(s): why a user would want to use it; what is required to make it more widely usable; involvement of Māori in the development; awareness of use by target audience; and what they would like to see in terms of future research, development and uptake. This resulted in 1-page summaries of each tool that were then used by end-users to further prioritise which tools would be of interest to them.

Concerns and barriers to adoption were identified. These included useability and user interfaces, funding continuity, updates and maintenance, cybersecurity, hosting, the shift towards public access of databases, the need for more examples to improve modelling (e.g., species, climate scenarios), awareness among biosecurity decision-makers, and better advertisement of the tools.

In conjunction with representatives of end-user organisations, this information was used to discuss the tools and determine which were of the highest priority for further development/ improved adoption. This resulted in a short-list of five prioritised tools. With the aim of overcoming identified barriers, a new B3 project will see at least two of the prioritised tools developed for improved end-user adoption.

Building Bridges to impact involved workshops with researchers and end-users to understand the models developed and the barriers to adoption.

Contact: Waka.Paul@plantandfood.co.nz; Murray Fea, mfea@doc.govt.nz
Project research partners: PFR, DOC, AGR and MWLR

Xylella fastidiosa and its vectors in the native estate

The plant pathogenic bacterium *Xylella fastidiosa* (Xf) has a broad host range including high value crops and non-crop hosts. Accidental introduction of Xf to Aotearoa-New Zealand has the potential to negatively affect a range of plant species, including taonga species, cultivated crops, and ornamentals. The pathogen is spread from plant to plant by insects in the order Hemiptera that are obligate xylem feeders, including sharpshooter leafhoppers (Cicadellidae) and spittlebugs (Aphrophoridae and Cercopidae). The meadow spittlebug *Philaenus spumarius* has been shown to effectively transmit Xf internationally.

The goal of this project was to deliver critical, currently unavailable, knowledge on the distribution of exotic and endemic spittlebugs, their host plants, seasonality, and movement between the productive estate and adjacent natural vegetation, as well as producing risk maps for stakeholders. This was achieved through field surveys in different regions in Aotearoa-New Zealand, citizen science, and spread and distribution modelling. Throughout the project, the team has co-developed the research with end-users and stakeholders.

The project team found that the exotic meadow spittlebug was present throughout the country south of the Kerikeri–Hokianga Harbour line and were present for a longer period over summer than previously thought. They were found to move between the productive estate and adjacent natural areas and to share taonga host plant species with endemic spittlebugs. The cross-over between native and exotic vectors on shared host plants will increase the risk of spread of Xf into the native estate, particularly early on in a Xf incursion. The collected data also showed that the exotic spittlebug *Bathyllus albicinctus* has a wider geographical spread than previously known, and new host plant information was collected. The endemic *Carystoterpa* spittlebug species were confined to remnant native areas and were not collected from the productive estate. Morphological and molecular barcoding identification of the *Carystoterpa* species collected was difficult, with an ambiguous key and great genetic variability with the clades identified. This information will be used to improve our readiness and response to any incursion of Xf.


An adult meadow spittlebug, *Philaenus spumarius*. *Photo credit: Nash Turley*

Contact: Jessica.Vereijssen@plantandfood.co.nz
Project research partners: PFR and MWLR

Tackling the threat of invasive *Ceratocystis* species to Aotearoa-New Zealand

Ceratocystis fungi are globally significant pathogens, responsible for wilt diseases in native and cultivated trees. This project builds on previous research into rapid ʻōhiʻa death (ROD) and expands the scope to assess the threat of *Ceratocystis* species to Aotearoa-New Zealand and the South Pacific. Key activities include host susceptibility testing, beetle surveillance, species identification, and climate risk mapping.

Preliminary artificial inoculation trials in Hawaiʻi have shown that pōhutukawa (*Metrosideros excelsa*), and two rātā species, *M. perforata* and *M. fulgens*, are susceptible to *C. lukuohia*, one of the pathogens causing ROD. These findings elevate the risk posed by an incursion, and inform surveillance and incursion readiness planning. To understand potential pathways for spread, the team has initiated targeted trapping of ambrosia beetles, which are known vectors of *Ceratocystis* overseas. The majority of ambrosia beetles trapped have been *Xyleborinus saxesenii*, a confirmed vector of both ROD pathogens. Metabarcoding of beetle-associated fungi present in frass and wood samples is also underway. Climate modelling is being used to identify regions across Aotearoa-New Zealand and the South Pacific where environmental conditions could support invasive *Ceratocystis* spp. establishment. These data are being developed into an interactive tool to support surveillance and readiness.

The methodologies and insights gained from this project have created a robust framework for assessing and managing the risk of invasive *Ceratocystis* species, and can be adapted to assess other biosecurity threats, ensuring the ongoing protection of Aotearoa-New Zealand 's native and productive ecosystems.

Artificial inoculation trials, done in Hawai'i, have shown that pōhutukawa (*Metrosideros excelsa*) is susceptible to *Ceratocystis lukuohia*, one of the pathogens causing rapid 'ōhi'a death.

Contact: Virginia.Marroni@plantandfood.co.nz
Research partners: PFR, AGR and Scion

Predicting the spillover of pests and pathogens into natural ecosystems

Various end-users have expressed a need to understand which exotic pests and pathogens are most likely to affect Aotearoa-New Zealand's natural ecosystems. However, predicting these threats is challenging. The goal of this project is to support risk assessments by accurately predicting the traits of exotic herbivore pests and pathogen species that establish themselves and adversely affect native ecosystems.

Contact: wardda@landcareresearch.co.nz

Further development of the Integrated Biosecurity Risk Assessment Model (IBRAM) for pathogens

An Integrated Biosecurity Risk Assessment Model (IBRAM) has previously been developed for insect pests on import pathways (B3 project B17.5) and has proven useful for risk assessors and managers to run 'what if?' scenarios. This project aims to modify and extend IBRAM to make it suitable for assessing the risk of plant pathogens.

Contact: Nari.Williams@plantandfood.co.nz

Risks from pathogens, pests and weeds in a changing climate

Pressures from pests, weeds and plant pathogens at Aotearoa's border will become increasingly dynamic and intense in a changing climate. This project is contributing new knowledge and tools to help predict when and how biosecurity pressures will change at our border, track changes in areas of vulnerability, evaluate the adequacy of risk mitigations already in place, and determine when extra mitigations should be considered.

Contact: Craig.Phillips@agresearch.co.nz

Get more details about current and completed Theme 1 projects at **B3.nz**.

Theme 2: Pathway Risk Management

Fit-for-purpose tools and methodologies for reducing risks along importation pathways

Rapid screening method for optimising commodity treatments

Rapid phase-out of methyl bromide has created an urgent need to develop new, standardised, safe, and effective phytosanitary treatments against biosecurity pest organisms on their associated entry pathways. In this project a novel methodology, the Physiological Response Matrix, is being developed to rapidly evaluate and optimise disinfestation treatments to control biosecurity pests on import pathways and to protect Aotearoa-New Zealand's primary production and native estates from the invasions of unwanted pest organisms.

The B3 research team is working with researchers from Cornell University Ithaca, USA, and MPI. Collaboratively they have selected 10 high-risk international pest species and a range of non-chemical treatment parameters (e.g. temperature, controlled atmosphere, humidity, pressure) to focus on in this project. Data for the parameters have been collected and reviewed for the 10 key high-risk species. The datasets for brown marmorated stink bug and spotted wing drosophila, species that were considered to have plentiful temperature and controlled atmosphere data available, will be used to test the predictive capability of the Physiological Response Matrix.

Spotted wing drosophila, *Drosophila suzukii*, is one of the high-risk international pest species being used to test the predictivity capability of the Physiological Response Matrix

Contact: Jessica.Vereijssen@plantandfood.co.nz
Project research partners: PFR

Accelerated ageing of plants to shorten post-entry quarantine testing periods

The importation of novel plant genetics into Aotearoa-New Zealand is essential to develop new cultivars keeping the country at the forefront of innovation that meets consumer demands and changing climate. The goal of this 5-year project is to develop a model post-entry quarantine (PEQ) system for high-value crops where the time in PEQ can be halved and target pathogens can still be reliably detected. This new model system accelerates the ageing of plants to effectively reduce the growing season by manipulating the plants' environmental growing conditions. This enables the plant life cycle to be completed in a shorter period.

Sweet and sour cherry trees have been grown in the Lincoln University Biotron unit under the accelerated growth regimes and standard Aotearoa-New Zealand growing conditions. Trees have been propagated and grown to comply with the MPI PEQ operational procedures. Studies are underway to compare the overall tree health and phenotype of trees under the two different growth regimes, to ensure the accelerated growth regime does not negatively affect the trees' health and phenotype.

The current import health standard requires imported plants to be screened for the presence of unwanted viruses, fungi and bacteria under specified seasonal and growing conditions. Research to date has demonstrated that the virus Prunus necrotic ringspot virus (PNRSV) could be detected in the cherry trees grown under spring conditions in both the standard PEQ growth regime and the accelerated growth regime, and confirmed that PNRSV can be consistently detected after just 5 weeks under the accelerated regime, compared with approximately 3 months under the standard regime. Analysis is underway for the fungus *Monilinia fructicola* and the bacterium *Pseudomonas syringae* pv. *syringae*.

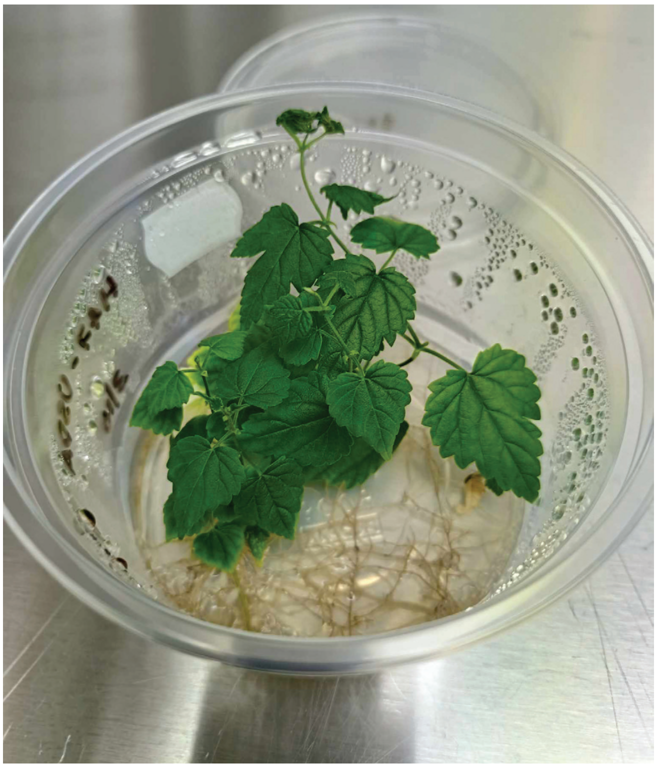
The research has already shown virus detection was equally effective under both regimes, with the accelerated approach offering a faster, more cost-effective option for PEQ. Ongoing work with fungal and bacterial pathogens will further determine whether the accelerated system maintains its reliability without an increased biosecurity risk to the horticultural industry. If successful, this new system will result in a faster, cost-effective throughput of cherry plants through PEQ, and could be developed for other horticultural crops.

Sweet and sour cherry trees are being grown in the Lincoln University Biotron unit under the accelerated growth regimes and standard Aotearoa-New Zealand growing conditions.

Contact: Virginia.Marroni@plantandfood.co.nz
Research partners: PFR and LU

De-risking the tissue-culture import pathway

Access to new plant genetics is critical to support the continued success of Aotearoa-New Zealand's primary sector. However, importation of plant material can be a pathway for the potential co-importation of pathogens as asymptomatic passengers on or in the plant material. This biosecurity risk is currently managed through robust quarantine procedures. Importation of plants as tissue culture is seen to meet high health status requirements, as these have historically been considered free of microbes. In the last decade, improved understanding of plant microbiomes has shown that plants harbour a high diversity and abundance of microorganisms and that these microorganisms are critical to the growth, development and resilience of plants. The frequency of established, asymptomatic tissue-cultured plants carrying endophytes, including pathogens, beneficials or benign taxa, is not well understood. The aim of this project is to produce experimental data that could strengthen the tissue-culture importation pathway by understanding the frequency with which asymptomatic tissue-cultured plants carry endophytes.



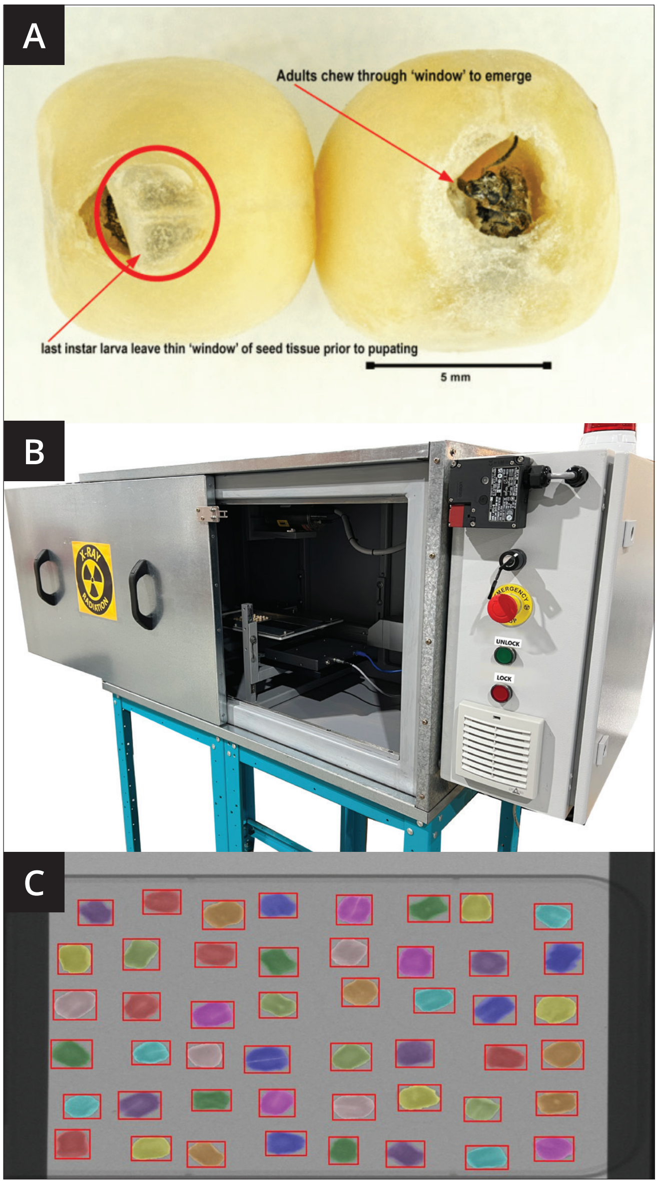
Explant-derived, tissue-cultured material of hops (*Humulus lupulus*).

The research examined 108, 1-year-old, explant-derived tissue-cultured material of hops (*Humulus lupulus*) and blueberry (*Vaccinium spp.*) cultivars using metabarcoding (a culture-independent process) and culturing of macerated tissue onto agar media. The microbial load in these plants was low overall, with 15% of samples positive for detection by metabarcoding, and only 4% confirmed by recovery of live cultures. Overall, few of the tested tissue-cultured plants had detectable microbial colonisation. The results highlight the potential use of metabarcoding as a tool to detect low rates of microbial contamination in tissue-cultured plants and identified specific taxa that can persist in well-established, asymptomatic tissue-cultured material. An aligned MSc student, Malina Hargreaves (Lincoln University), is utilising the collection of "passenger taxa" to determine if these microbes can be reintroduced to clean tissue-culture lines and to understand their subsequent distribution patterns in planta. Current work is also focused on understanding when and how the microbiome of mother plants is lost in tissue culture, and whether explant source material has a significant impact on this. This knowledge supports our understanding of the magnitude of risk in the tissue-culture import pathway, and identifies ways in which the persistence of asymptomatic microbial colonisers can be eliminated.

Contact: Hayley.Ridgway@plantandfood.co.nz
Project research partners: PFR and Scion

Automated sensing technologies to detect concealed invertebrates

Invertebrates concealed inside biological media such as seeds are difficult to detect without slow, labour-intensive, and often destructive, sampling of imported products at the border. New technology that increases the probability of detection and/or reduces the time needed for screening reduces the risk of unwanted pest incursions and protects Aotearoa-New Zealand's primary industries and natural ecosystems. This project will test new technologies and automated analytics for non-destructive detection of concealed pests, using pea weevil as a case study to demonstrate proof of concept. Pea weevil has already been eradicated once from Aotearoa-New Zealand and remains a biosecurity risk. Technology developed in this project will have strong potential to be adapted for detection of other concealed pests in future, either at the border or on-farm.



A) Pea weevil, *Bruchus pisorum*, infesting peas (photo credit: MPI); B) Low power X-ray scanner; C) Peas identified and labelled using a FastRCNN model.

During this 1-year pilot study, a prototype screening device to conduct low power X-ray scanning technology has been constructed and tested using pea seeds with pea weevil damage. The images produced from scanning pea samples indicated that detection of infested peas is plausible, but only a small proportion of peas in the sample were infested. This constrained data generation from the pilot study. As an alternative, 'artificial' infestation was created by drilling small holes in fresh pea seed then scanning 'damaged' (i.e. drilled) and undamaged peas. This also showed promising results, suggesting that this type of scanning is likely to detect pea weevil infestation. Further validation, testing and software development are needed to develop this novel technology.

Contact: Sarah.Mansfield@agresearch.co.nz
Project research partners: AGR

The risk of egg diapause on pathways to Aotearoa-New Zealand

This project is delivering critical, currently unavailable, knowledge on the risk of diapausing high-risk pest insects on pathways to Aotearoa-New Zealand, and how climate change predictions may affect this risk. The information will support future risk assessments of diapausing high-risk pest insects.

Contact: Jessica.Vereijssen@plantandfood.co.nz

AI technology to improve biosecurity at seaports in Aotearoa-New Zealand

Shipping containers with external contaminants, including soil, pose a significant risk to Aotearoa-New Zealand. AI technology is being developed to allow for rapid scanning and detection of external contaminants arriving on sea containers at seaports, using camera imagery combined with AI-driven automated detection and laser-based topology scanning.

Contact: Mark.McNeill@agresearch.co.nz

Get more details about current and completed Theme 2 projects at **B3.nz**.

Theme 3: Readiness & Response

Tools and strategies for preparedness for and response to incursions of invasive plant pest species, including diagnostic methods and tools to enable informed biosecurity decisions

The potential of mass spectral fingerprinting for solving tricky biosecurity issues

The increasing diversity of biosecurity threats makes diagnostics a complicated and evolving area, requiring moving beyond traditional taxonomic species identification. Metabolomics is a novel approach being explored, where metabolites signify useful biological characteristics of intercepted organisms such as age, reproductive status, geographic origin, or pathogen status. Mass spectral fingerprinting technology substantially reduces time taken for metabolomic measurements from days to seconds.

Laser-based sampling of insect larvae used in mass spectral fingerprinting.

Following on from promising results from an initial study, we are further investigating the potential of mass spectral fingerprinting for detailed diagnostics in insects and plants. An initial study on detecting host plant in green vegetable bugs as a proxy for brown marmorated stink bugs found that differences due to host are only evident during feeding life stages and are not clearly carried over to eggs. In an adjacent study on black soldier fly larvae, minor differences in host were not detectable as differences in the larvae, but large differences were clearly reflected in the black soldier fly larvae fingerprint.

A new study to determine if mass spectral fingerprinting can find differences between closely related Lepidoptera species, including fall armyworm, is underway, as are collaborations with Macquarie University, Australia and MPI to investigate mass spectral fingerprinting on Queensland fruit flies. Whether mass spectral fingerprinting can detect pathogen and insect attack on plants using a cabbage model is currently being investigated in parallel to the insect work.

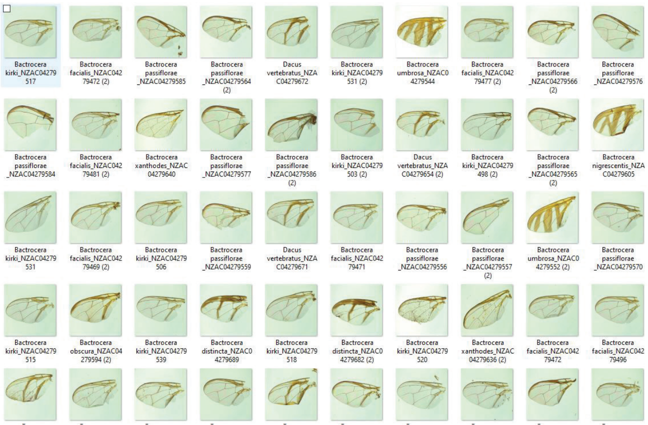
Contact: Alastair.Ross@agresearch.co.nz
Project research partners: AGR, PFR, LU and UC

Using images and deep learning for the identification of high-risk insect species

Images are essential to modern biosecurity, especially for diagnosing and detecting threats. Deep learning—a form of machine learning—is rapidly transforming species identification by enabling accurate, fast, image-based recognition. This technology will also drive future automation in entomology, from fieldwork and lab processing to species delimitation and description.

This B3 project focuses on image-based identification of high-risk insect pests, starting with the Queensland fruit fly (QFF) and the brown marmorated stink bug (BMSB). It advances two key objectives. Firstly, we are developing the capability to build deep learning models tailored to Aotearoa-New Zealand's biosecurity needs. Models trained overseas will perform poorly here owing to differences in local insect fauna. The B3 research team are using resources from the New Zealand Arthropod Collection and collaborating with researchers in the University of Auckland's Department of Biological Sciences and the Department of Computer Science, as well as building research partnerships in Australia and Europe. The second objective is to build image libraries of target and related species, using both taxonomic collections and field-collected images. Effective models typically require hundreds of correctly identified, labelled images per species, making the development of local, high-quality image libraries a priority.

So far, the team have developed a fruit fly model that extends beyond QFF and incorporates a range of unwanted pest fruit fly species. They also have a preliminary BMSB model based on images taken from the field as part of MPI's surveillance for BMSB, ImageNet, and iNaturalist. Together, these case studies demonstrate the automated recognition could play valuable roles within the biosecurity system, especially screening large numbers of samples.



Effective models typically require hundreds of correctly identified, labelled images per species. This image shows the morphological similarity of wings from a range of different species of fruit flies (*Bactrocera*).

Contact: wardda@landcareresearch.co.nz
Project research partners: MWLR and PFR

Beyond soil baiting: toward application of an eRNA diagnostic tool for *Phytophthora*

B3 scientists are leading the study to advance environmental RNA (eRNA) sequencing techniques for the rapid identification of live, soil-borne plant pathogens. This project focuses on *Phytophthora* species, which cause severe disease in a number of important plant and tree species and affect both productive sectors and natural ecosystems.

Researchers are developing a new *Phytophthora* testing procedure as an alternative to soil-baiting, which is the current 'go-to' method for surveillance of *Phytophthora* in soil. Soil baiting is a time-consuming method and does not pick up *Phytophthora* spp. that are not culturable, introducing the risk of missing some species that could be biosecurity threats.

The testing procedure under development uses eRNA that can be directly extracted from soil and used to identify *Phytophthora* present. RNA is less stable than DNA, degrading more rapidly, in days or weeks compared with years for DNA. Therefore, its detection can give a more biologically relevant snapshot of 'viable' populations in an environment. It is expected to significantly reduce the time to identify *Phytophthora* in samples, as well as giving an increased amount of information, such as the presence of multiple species within a sample, as well as excellent taxonomic resolution by using long-read DNA sequencing technology. The testing procedure has required a large number of validation steps and much trial-and-error, but is closer to demonstrating the value of these technologies for high-throughput diagnostics.

Phytophthora are typically detected in soil using soil-baiting methods, where test soil is flooded with water. The water allows any *Phytophthora* in the soil to swim and infect leaf baits placed on top of the water.

Contact: Rebecca.McDougal@scionresearch.com
Project research partners: Scion and PFR

Bacterial metabolites to enhance detection of plant diseases

New genetics and varieties of high-value crops are tested for unwanted pathogens before their release within New Zealand. This process is carried out in a high-security, post-entry quarantine (PEQ) facility, which incurs fees to the importers for utilising the space. In this project, a new way to expedite the quarantine period was investigated.

Imported live plant material may contain low titres of plant pathogens such as bacteria, fungi, viruses, and viroids, necessitating a long PEQ period. Furthermore, the pathogens often need several growing seasons to replicate for the titre to reach detectable levels. This can increase the cost to importers, but also can result in a backlog for use of PEQ facilities. To speed up the growth of pathogens and disease expression while in PEQ, crude extracts from 28 anaerobic spore-forming bacteria, isolated from different farm environments, were tested to determine if they could boost growth of *Pseudomonas viridiflava*, a plant-pathogenic bacterium that causes various economically significant plant diseases across a broad host range, including tomatoes and beans. The extracts were tested both in vitro and *in planta*, to see if they could enhance expression of disease symptoms. Of 28 extracts, five were found to produce growth-promoting biomolecules. Notably, extract from one anaerobic spore-forming bacterium was found to enhance the growth of *P. viridiflava* by 1.5-fold after 20 hours of incubation. Bacterial extracts outperformed essential amino acids as growth promoters for *P. viridiflava*, suggesting their potential use to accelerate pathogen detection.

This is the first study that presents an innovative strategy leveraging microbial-derived biomolecules to accelerate pathogen growth, offering a novel means to enhance the sensitivity and rapidness of plant pathogen detection in the PEQ facility.

Pseudomonas viridiflava, a plant-pathogenic bacterium, growing on medium.

Contact: Tanushree.Gupta@agresearch.co.nz
Project research partners: AGR and PFR

Metatranscriptomics informing the relevance of pathogen disease biomarkers in plants

Building on a previous B3 project, researchers are using nanopore sequencing to identify key pathogens (including *Xylella*) in taonga sentinel plants overseas and develop pipelines to identify pathogen's biomarkers in bacterial and fungal model pathosystems using metatranscriptomics.

The end result will be a diagnostic package that includes biological risk information, mātauranga Māori of taonga plants growing overseas, and advances in nanopore sequencing.

Contact: Sandra.Visnovsky@plantandfood.co.nz

eDNA for terrestrial biosecurity monitoring

This project focuses on advancing biosecurity through the use of environmental DNA (eDNA) technology, with a specific emphasis on terrestrial biosecurity monitoring. The goal is to develop and implement efficient eDNA methodologies for detecting plant pests and diseases, enhancing biosecurity decision-making.

Contact: Andrew.Cridge@scionresearch.com

The impact of heatwaves on surveillance programme for high-risk pests in Aotearoa-New Zealand

This project is investigating how increasingly common climate events, such as extreme heat or heatwaves, could alter the longevity and stability of commercial pheromone-based lures or affect male response after development. This work will be used to inform operation deployment of lures for surveillance.

Contact:
Adriana.Najar-Rodriguez@plantandfood.co.nz

How big is the eDNA operability gap?

This research will test where and how environmental DNA (eDNA) for biosecurity detection might be implemented on orchards/farms. Research will be split into two aspects: eDNA detection from fruit in postharvest, and eDNA detection from plant leaves in the orchard. A focus will be calibration and validation of untargeted, broad taxon eDNA data against secondary measures of organism presence.

Contact: Simon.Bulman@plantandfood.co.nz

Get more details about current and completed Theme 3 projects at **B3.nz**.

Theme 4: Te Ao Māori

Kaupapa Māori research with the view to embedding mātauranga into biosecurity outcomes that ensure tiakitanga of the whenua, taiao, ngahere and Aotearoa kātoa

He waka hourua: Mātauranga and Western science navigate a safe course for future biocontrol

This kaupapa Māori research explored a culturally grounded and scientifically robust framework for evaluating the introduction of biocontrol agents (BCAs) into Aotearoa-New Zealand. By integrating mātauranga Māori and Western science within the Environmental Protection Authority (EPA)'s regulatory processes, the project aimed to improve the inclusivity, safety, and legitimacy of biocontrol decision-making.

The research began with building trust-based relationships between Māori researchers, kaitieki, and biocontrol scientists, enabling shared priorities and co-designed protocols to emerge. Through this process, the project identified key operational gaps in the EPA's mātauranga Māori framework and the need for broader uptake to enable meaningful evaluation. These insights strengthen the evidence base for incorporating mātauranga into regulatory science and support future improvements in bicultural biosecurity practices.

While limited use of the EPA's mātauranga Māori framework restricted full evaluation, the project generated valuable insights into how Indigenous knowledge can complement scientific risk assessment. Success was reflected in stronger Māori leadership within regulatory processes, improved collaboration between Māori and scientific communities, and clear pathways for normalising mātauranga in environmental governance.

A samurai wasp emerging from a parasitised brown marmorated stink bug egg. Samurai wasp biocontrol was discussed at hui with Māori as part of this project. *Photo credit: Chris Hedstrom, Oregon Department of Agriculture*.

This work highlights a transformative shift in biosecurity science—towards bicultural, holistic approaches that improve ecological resilience, uphold tangata whenua rights, and support sustainable, community-led biosecurity practice across Aotearoa-New Zealand.

Contact:
Waipaina.Awarau-Morris@agresearch.co.nz
Project research partners: AGR and PFR

Improving Māori/Indigenous engagement within B3 programmes

Māori have been practicing biosecurity for generations and have much to offer in terms of managing biosecurity risks. Furthermore, Māori hold significant economic interests in the primary sector, along with cultural, social, and environmental interests. This research programme has focused on improving Māori/indigenous engagement with B3 programmes, specifically maintaining and strengthening relationships with mana whenua and communities developed from previous B3 investment, connecting new Māori rōpū to B3's growing network, holding wānanga to support indigenous knowledge exchange, and connecting B3 projects to this growing network, where appropriate.

The first phase of this kaupapa focused on engagement and initial data collection in partnership with hapū, community groups, and other Māori-led initiatives within B3. Through hui, wānanga, and focus groups, the research aimed to build relationships and co-develop methods to understand biosecurity priorities and experiences with the B3 system. In response to a preference for wānanga and kōrerorero over surveys or interviews, the project has adapted by focusing on whakawhanaungatanga and using discussion-based methods to surface early insights, with formal data collection now taking place in the second phase. This shift, while unplanned, reaffirmed the importance of flexible, kaupapa Māori-aligned approaches. Valuable baseline insights have been gathered regarding barriers to participation and community aspirations for biosecurity.

Collaboration with B3 Māori rōpū will strengthen alignment, support cross-project learning, and ensure that Māori-led perspectives inform future strategy and policy. This phase confirms the critical role of community-led methods in shaping inclusive, effective biosecurity responses.

Contact:
Waipaina.Awarau-Morris@agresearch.co.nz
Project research partners: AGR and PFR

Empowering Te Ao Māori responses to biosecurity

This kaupapa Māori research supports a range of interests around inclusivity of Te Ao Māori tikanga into programmes like B3. Through wānanga, fieldwork, and co-design processes, it has supported the development of a transferable, place-based biosecurity model that is embedded in mātauranga Māori, pūrākau, and kaitiekitanga. The integration of mātauranga Māori with Western science has led to a practical, place-based, and transferable model for community and hapū-led biosecurity.

The project team has responded to significant challenges that have affected engagement and other aspects of the research project. These have included Cyclone Gabrielle, post-COVID-19 disruptions, and evolving hapū priorities. To overcome these challenges, the team adopted a flexible, whanaungatanga approach grounded in tikanga and mātauranga Māori. While these disruptions necessitated changes to the original plans, they also deepened engagement and supported the impacts of community-led timing and response. Rather than treating challenges as obstacles, the kaupapa interwove them into the research journey, highlighting the extent of hapū-led adjustment and collective resilience.

Ultimately, this research has shown that by accepting disruption and recognising indigenous knowledge, biosecurity responses can become more inclusive, adaptive, and lasting, supporting both national systems and community resilience for generations to come.

Contact:
Waipaina.Awarau-Morris@agresearch.co.nz
Project research partners: AGR and PFRz

Get more details about current and completed Theme 4 projects at **B3.nz**.

Science outreach with Te Whānau-a-Apanui kura, providing hands-on learning experiences to raise awareness of the threats pests and pathogens pose to our native ecosystems, while inspiring and empowering rangatahi to be kaitiaki of their whenua.

New Projects

All new projects starting in 2025/26 involve high rates of engagement with mana whenua, communities, industry, and government agencies. They will provide tools and knowledge to protect against potentially seriously damaging threats to our primary industries and taonga plant species.

Could an alternative insect host be used in Aotearoa-New Zealand to rear the most promising biocontrol agent for the brown marmorated stink bug?

Rearing of parasitoid species using alternative hosts has been practised for years; however, this has never been attempted for Samurai wasps (*Trissolcus japonicus*), a biocontrol agent of brown marmorated stink bug (BMSB), anywhere in the world. This project will assess the feasibility to establish and maintain a colony of Samurai wasps on an established, exotic stink bug, enabling the production and supply of parasitoids within Aotearoa-New Zealand for a potential incursion response for BMSB.

Contact: Karina.Santos.Avila@plantandfood.co.nz

Tackling the complacent, the resistant, and the disengaged: fostering stronger biosecurity engagement and social licence to manage biosecurity risks

Biosecurity is a collective effort, requiring ongoing commitment from all stakeholders to maintain vigilance and readiness against potential threats. However, complacency and social licence to operate issues undermine shared responsibility and hinder timely, coordinated responses in the face of biosecurity risks. Drawing on prior social science work in biosecurity, this project takes a three-stage approach to investigate the underlying drivers of complacency, co-develop and test interventions with stakeholders, and facilitate the adoption and implementation of the tested interventions.

Contact: Ivy.Gan@plantandfood.co.nz

Coordinated biosecurity surveillance for Aotearoa-New Zealand's primary industries

This project will review current and emerging biosecurity surveillance tools and surveillance systems currently deployed in Aotearoa-New Zealand. Using this information, it will explore what emerging technologies could be adopted and where efficiencies within biosecurity surveillance could be gained. The aim of this review is to ensure that resources are coordinated and aligned with industry and government needs, and to recommend potential advancements for future surveillance activities.

Contact: Rachael.Horner@plantandfood.co.nz

Automated sensing technologies to detect concealed invertebrates

Invertebrates concealed inside biological media such as seeds are difficult to detect without slow, labour-intensive, and often destructive sampling of imported products at the border. This project is an extension of a 1-year scoping project that investigated the use of new technology and automated analytics for non-destructive detection of concealed pests and to reduce the time needed for screening. The project will continue to advance the technology for detection of pea weevil, but will also investigate its use for the detection of bark beetles.

Contact: Sarah.Mansfield@agresearch.co.nz

Crossing bridges – operationalising risk analysis tools

Crossing Bridges will build on work done in a 1-year scoping project, Building Bridges to Impact from Biosecurity Research, which identify which previously B3-, Biological Heritage National Science Challenge- and MPI-developed risk-analysis tools and models could be advanced, and any barriers to adoption to overcome. Crossing Bridges will look to better understand the tool adoption/validation processes of the relevant agencies, and work with the agencies to overcome identified barriers for at least two prioritised tools.

Contact: Waka.Paul@plantandfood.co.nz

Integrating novel multi-taxa lures with multisensory traps for surveillance of high-risk pests

This research addresses the critical challenge in detecting increasing numbers of biosecurity pests that threaten our native forests and primary industries. The team will assess the compatibility of different semiochemicals to simultaneously target key pests at single locations, and determine whether novel traps that integrate these chemicals with insect-attractive cues from other sensory modalities could enhance the effectiveness and specificity of the lures, while reducing the sensitivity to non-target species.

Contact:
Adriana.Najar-Rodriguez@plantandfood.co.nz

Modern technologies to assess environmental risk of introduced weed biocontrol agents

Current host-range testing for introduced biocontrol agents (BCAs) in Aotearoa-New Zealand is based on phylogenetic relatedness of the test species. For this 1-year scoping study, we will explore metabolite relatedness of test species using metabolomics approaches, as an additional and feasible tool to further strengthen BCA release applications to the EPA. Prediction of a more definitive host range is expected to minimize unintended damage to non-target species by the BCAs.

Contact: Arvind.Subbaraj@agresearch.co.nz

Enhancing biosecurity through indigenous collaborations

Major challenges for Pacific communities facing invasive species threats are inclusion in decision-making and access to relevant information. Often, information is presented in a way that excludes these communities, especially when new pests or diseases are introduced, leaving them unable to make informed decisions. To support Pacific biosecurity, this project will reconnect indigenous biosecurity researchers from Aotearoa-New Zealand with indigenous communities across the Pacific, to share insights on the impacts of invasive species and to empower biosecurity in communities.

Contact: Teresa.Wairiki@plantandfood.co.nz

Example of a panel trap with brown marmorated stink bug and beetle lures, which is an example of how multilure traps could be developed.

Building Biosecurity Capability: Students

Today's university students will be key to addressing the growing biosecurity challenges Aotearoa-New Zealand faces. Fostering the next generation of biosecurity experts is an important focus for B3.

Luna Hasna

Luna Hasna has completed a MSc at the University of Auckland. Luna's project focused on modelling the risk of establishment of rapid 'ōhi'a death in New Zealand, using global knowledge of *Ceratocystis* species. Luna's research has been a key component of the B3 project 'Assessing the risk of Rapid 'Ōhi'a Death to Aotearoa-New Zealand and the South Pacific'.

Luna Hasna

Malina Hargreaves

Malina Hargreaves is completing a MSc at Lincoln University. Her research is aligned to B3's 'De-risking the tissue culture import pathway' project. She is utilising the collection of "passenger taxa" to determine if these microbes can be reintroduced to clean tissue culture lines and to understand their subsequent distribution patterns in planta.

Muhammad Afaq

Ahmed Ahmed is working on using mass spectral fingerprinting to identify host plants in insects as part of the B3 project 'Use of mass spectral fingerprinting to solve tricky biosecurity diagnostics problems'. He is doing his PhD at the University of Canterbury, in collaboration with AgResearch and Plant & Food Research, and guidance from MPI.

Muhammad Afaq Ahmed processing samples.

Alice Benagli

Alice Benagli is a Master's student from the University of Bologna, Italy. She is currently undertaking a 6-month collaborative research internship at Plant & Food Research. Alice is studying microorganisms inhabiting kiwifruit seeds. She is inoculating isolates onto kiwifruit tissue culture plants to assess colonisation capability and persistence.

Research Publications, Outputs and Conferences

Peer-reviewed publications

Bedoya, C.L., Brockerhoff, E.G., Kirkendall, L.R. et al. 2024. Body size and sequence of host colonisation predict the presence of acoustic signalling in beetles. Sci Rep 14, 15532. **https://doi.org/10.1038/s41598-024-66108-8**

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Buddenhagen CE, Ngow Z, Wynne-Jones B, Rolston MP. Resistance to the herbicides haloxyfop and iodosulfuron is common in commercial ryegrass (*Lolium* seed lines. Pest Management Science. 2025; ps.8665. **doi:10.1002/ps.8665**

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Lee HW, Visnovsky SB, Hernandez L, Panda P, Pitman A, Toome M. 2025. Development of a real-time PCR assay to detect the kiwifruit pathogen *Pectobacterium actinidiae*. Plant Disease, PDIS-05-24-1092.

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Armstrong K, Holder P. 2024. Stable Isotopes: a Novel Tool to Determine Natal Origins for Border Biosecurity Diagnostics. Summary of outcomes from B3 and aligned research 2011-2022 outlining evolutionary development of the method. B3 Report, Lincoln University.

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Phillips C, Kean J, Saffer A, Fowler G, Takeuchi Y. 2025. Better climate matching methods for biosecurity risk analysis. B3 report to North Carolina State University and the USDA. Online electronic book.

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Invited presentations (significant international/national meetings/ seminars)

Buddenhagen C, Wynn-Jones B, Ngow Z, James T. 2024. Herbicide resistance in imported lines of ryegrass & seed biosecurity, Seed and Grain New Zealand (SGNZ) Conference, 4 November 2024, Christchurch.

Campbell R, Sharp J, Marroni V, Hasna L, Watkins L, Narouei-Khandan H, Vereijssen J. 2024. Climatic risk to New Zealand for *Xylella fastidiosa* and its New Zealand vectors. New Zealand Plant Protection, 13-15 August 2024, Auckland, New Zealand.

Carlin T, Turner R, Phillips CB, Dobbie KB. 2025. *Predicting pest and pathogen risks to Pinus radiata in New Zealand under climate change*. Forest Biosecurity Conference 2025, 10-11 April 2025, Christchurch.

Everett KR, Woodberry O, Ormsby M, Moore T, Jamieson LE, Williams N. 2025. Estimating the risk of an incursion by the grape pathogen, *Guignardia bidwellii*, using Bayesian networks. Australasian Plant Pathology Society, 25-28 May 2025, Sydney, Australia.

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Larrouy J, Meyalaghan M, Bulman S, Morgan E, Ridgway H. 2025. Investigating the presence of microbial endophytes in established asymptomatic tissue culture material. Australasian Plant Pathology Society Conference, Sydney , Australia, 26-28 May, oral presentation.

Larrouy J, Meyalaghan M, Bulman S, Morgan E and Ridgway H. 2024. Understanding the persistence of microorganisms in asymptomatic tissue culture material. New Zealand Plant Protection Society Conference, Auckland New Zealand 11-13 August, oral presentation.

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McNeill M, Awarau-Morris W, Tallon S, Waiariki T, Dickson G, Keith L, Luiz B, Marroni V. 2025. Pathways and vectors across the South Pacific and Aotearoa New Zealand: The threat of Rapid ʻŌhiʻa Death (ROD) to *Metrosideros spp*. South Pacific Community, Research Symposium, 22-23 May 2025. Nukuʻalofa, Kingdom of Tonga

Najar-Rodriguez, AJ, Avila G and Zhang, J. Effects of CO2 and heatwaves on trophic interactions mediating biological control systems. 3rd International Conference of Biocontrol. 24-27 June 2024, San Jose, Costa Rica.

Pugh A, Wardhaugh C, Mercier C, Larrouy J, Bulman S, and Cridge A. Using aerial eDNA for detection of invasive species. Forest Biosecurity Conference 2025, 10-11 April 2025, Christchurch, New Zealand.

Pugh A, Wardhaugh C, Mercier C, Larrouy J, Bulman S, and Cridge A. Advancing Terrestrial Biosecurity: Developing Air-Based eDNA Monitoring for Early Detection of Invasive Species. 2nd Australian & New Zealand Environmental DNA Conference, 18-21 February 2025, Wellington, New Zealand.

Vereijssen J, Teulon DAJ, Nielsen M, Ramoo D, Sinclair S 2024. Management and regulations for invasive vectors of plant diseases in Aotearoa-New Zealand. Invited presentation at the XXVI International Congress of Entomology, 25 - 30 August 2024, Kyoto, Japan.

Visnovsky SB. Molecular characterization of *Xylella fastidiosa* strains in New Zealand indigenous plants in a botanical garden overseas. New Zealand Plant Protection Society, 13-15 August 2024, Auckland, New Zealand.

Visnovsky SB. A real-time PCR assay to detect the unwanted bacterium *Pectobacterium actinidiae* New Zealand Plant Protection Society, 13-15 August 2024, Auckland, New Zealand.

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Watkins L, Poulton J, Colhoun K, Sharp J, Campbell R, Vereijssen J, Nielsen M. 2024. Understanding spittlebug distribution and host preferences to inform spatial risk mapping for *Xylella fastidiosa* in New Zealand. Presentation at the 72nd Entomological Society of New Zealand Conference, 28 - 30 August 2024, Ōtautahi Christchurch.

Presentation to stakeholders

Buddenhagen C, Wynn-Jones B, Ngow Z, James T. 2024. Herbicide resistance in imported lines of ryegrass. Presentation at the Annual General Meeting of the New Zealand Plant Breeding and Research Association, 17 September 2024, Christchurch.

Bulman S, Larrouy J. Ridgway HJ 2025. C23.2 De-risking the plant tissue culture import pathway - Update to Ministry for Primary Industries, Biosecurity Import & Export Standards Team. 7 May.

Bulman S. 2025. C23.2 De-risking the plant tissue culture import pathway. A meeting about enhanced engagement around mānuka (Horomaka-sourced) tissue culture and genomics has been held with Huata and Meikura Arahanga. A draft discussion document has been prepared for distribution to the relevant Wairewa Rūnanga.

Bulman S, Larrouy J. 2025. C23.2 De-risking the plant tissue culture import pathway. Presentation titled "Living with the Invisible: Plant MicrobesFriends, Foes, or Both?" for Māori STEM students from Te Kura Tuarua o Waihora Lincoln High School, held at Plant and Food Research-Lincoln, Christchurch, 17th June 2025.

Dobbie K, Turner R, Carlin T, Bradford K-T, Tapuke S, Langer L, Phillips C. 2024. *B3: Border biosecurity risks from pathogens, pests and weeds in a changing climate*. Signing MOU between Scion and Mangaroa Inc.

Ganley B. 2024. Better Border Biosecurity (B3). Update to the Government Industry Agreement Plant Biosecurity Council. 25 November 2024, virtual meeting.

Ganley B. 2025. Better Border Biosecurity (B3). Update to the Government Industry Agreement Plant Biosecurity Council. 13 March 2025, virtual meeting.

Ganley B. 2025. Better Border Biosecurity (B3). Update to the Government Industry Agreement Plant Biosecurity Council. 9 June 2025, virtual meeting.

Gupta TB. 2024. Harnessing Bacterial Growth Promotion for Enhanced Biosecurity. Presentation to FERA, UK. December 2024.

Gupta, TB. 2025. Harnessing Bacterial Growth Promotion for Enhanced Biosecurity. Presentation to FERA, UK. June 2025

Kaiser C. 2025. Visit by Henri Lee Huddleston and Sarah Han from MPI (Post Entry Quarantine, Plant Health & Environment Laboratory) to the Lincoln University Biotron facilities to observe the technical setup for the Accelerated Aging project under post-entry quarantine conditions.

Larrouy J, Bulman S, Ridgway H. 2024. C23.2 De-risking the plant tissue culture import pathway discussion with Australian National University and the Department for Primary Industries regarding PhD internship as part of interaction with ARC Training Centre for Plant Biosecurity. 25 July 2024.

Larrouy J, Ridgway H 2025. C23.2 De-risking the plant tissue culture import pathway email correspondence with Wayne Blissett of Rangitāne o Manawatū regarding potential for kaitakitanga around the symbiotic relationships with microbes. 4 December 2024

Mansfield S, Sharifi M, Hitchman S. 2025. C24.08 Automated sensing technologies to detect concealed invertebrates. Progress update for stakeholders, 10 February 2025, virtual meeting.

Marroni VM. 2025. Accelerated aging for post entry quarantine. Progress update for stakeholders, 17 February 2025, virtual meeting.

Marroni MV. 2024. Industry and government representatives, discussion on tackling the threat of invasive *Ceratocystis* species to Aotearoa New Zealand. February 2025, virtual meeting.

McNeill M. 2025. Garden sentinels: New Zealand's contribution to future proofing UK plant species from insect pests and diseases. Presented to the Christchurch Botanic Gardens Staff and Friends. 28 April 2025, Christchurch Botanic Gardens.

Meiyalaghan S, Barrell P 2025. C23.2 De-risking the plant tissue culture import pathway. Presentation and practical lab demonstration titled "Inside the Plant Lab: Discovering Micropropagation" for Māori STEM students from Te Kura Tuarua o Waihora Lincoln High School, held at Plant and Food Research-Lincoln, Christchurch, 17th June 2025.

Tallon, S. A. (2025). How to find an invasive fungal pathogen: laboratory sample processing workflow. Presented to the Christchurch Botanic Gardens Staff and Friends on the B3 project Invasive *Ceratocystis* species. 28 April 2025, Christchurch Botanic Gardens.

Todd J, Barratt B, Pugh A, Peterson P, Page N. 2024. Testing the toolbox: progress update for stakeholders, 23 September 2024, virtual meeting.

Turner, R. 2024-2025 B3 23.4 Forestry Biosecurity Evaluation. Quarterly update on research findings to Forest Grower Reseach, August 2024, April 2025, May 2025, July 2025.

Vereijssen J. 2025. B20.3 *Xylella fastidiosa* and its NZ insect vectors. Update to Xylella Action group, 25 February 2025, virtual meeting.

Vereijssen J, Nielsen J, Watkins L, Palmer J, Horner R, Keena M, Walse S, Lourie A, Alvarez A, Kean J. 2025. C22.13 The risk of diapausing pest insects on pathways to New Zealand. Annual update to stakeholders and end-users, 12 June 2025, virtual meeting.

Vereijssen J, Watkins L, Palmer J, Page N, Nielsen M, Sinclair B. 2025. C22.09 Rapid Commodity Screening. Annual update to stakeholders and end-users, 25 June 2025, virtual meeting.

Visnovsky SB, Panda P, Rigano L. 2025. D22.16 Metatranscriptomics informing the relevance of pathogen disease biomarkers in plants. Annual update on research findings, 24 October 2024, virtual meeting.

Other

Marroni V. 2025. Popular article. Reducing quarantine time with accelerated aging. Plant Production Science (Issue 5), New Zealand Plant Producers Inc.

Hasna L. was a finalist in the 2025 International Day of Plant Health video competition, organized by the Euphresco III. Her video "Modelling the Risk" featured her B3 research. www.euphresco.net/contest

McNeill M. 2024. Unlocking the Power of Botanic Gardens: Assessing Pest Pathogen Risks and Protecting Plant Health in Aotearoa New Zealand. Botanic Gardens Conservation International Blog. December 2024.

Visnovsky SB. B3-developed diagnostic qPCR for use in post-entry quarantine to detect the pathogen that causes summer canker in kiwifruit is now being used by MPI's Plant Health and Environment Laboratory.

Contributions of parties to B3

Collaboration Council	Leadership Group	End-user/Theme Representatives
CHAIR (IND.) Melanie Mark-Shadbolt **MEMBERS** Jolon Dyer (PFR) Marie Bradley (AGR) Tara Strand (Scion) Fiona Carswell (MWLR until May 2025) Chris Jones (MWLR from May 2025) Chad Hewitt (LU) Fleur Francois (MPI) Clare Stringer (DOC) Brendan Gould (FOA) Leanne Stewart (HortNZ) Holden Hohaia (Te Ara Pūtaiao) Chris Hill (EPA) (obs.) **SCIENCE ADVISORY GROUP** Andrew Cridge (Scion) Aubanie Rayanal (EPA) Axel Heiser (AGR) Eve Pleydell (HortNZ) Geoff Ridley (MWLR) Jeremy Thompson (MPI) Murray Fea (DOC) Paul Adams (FOA) Richard Newcomb (PFR) Simon Lambert (TTW)* Travis Glare (LU) * Supported by Te Tira Whakamātaki	**KAIHAUTŪ TIRITI** (Director Treaty) Beccy Ganley **KAIHAUTŪ MĀORI** (Director Māori) Alby Marsh **THEME 1** John Kean (AGR) **THEME 2** Nicolas Meurisse (Scion) **THEME 3** Jessica Vereijssen (PFR) **THEME 4** Alby Marsh (PFR) **MWLR REPRESENTATIVE** Mahajabeen Padamsee **LU REPRESENTATIVE** Mike Cripps (from May 2025)	**PROGRAMME LEVEL** Murray Fea (DOC) Mike Ormsby (MPI) Sathish Puthigae (MPI until Nov 2024) **THEME 1** Matt Hayward (MPI from Feb 2025) Miriam Robertson (EPA) Te Mauri Apiata (EPA) Helen Harman (MPI until Jan 2025) Madeline Marshall (MPI until Jan 2025) **THEME 2** Dave Nendick (MPI from Feb 2025) Hoda Ghazalibiglar (MPI until Jan 2025) Chris Denny (MPI until Jan 2025) Sina Waghorn (MPI until Jan 2025) Jessica Devitt (MPI until Jan 2025) **THEME 3** Michelle McCulley (MPI from Feb 2025) Luciano Rigano (MPI until Jan 2025) Lia Liefting (MPI until Jan 2025) Rebijith Kayattukandy Balan (MPI until Jan 2025) George Gill (MPI until Jan 2025) Scott Sinclair (MPI until Jan 2025) Paul Stevens (MPI until Jan 2025) **THEME 4** Mike Ormsby (MPI)

Project leaders		
Alastair Ross (AGR) Alby Marsh (PFR) Andrew Cridge (Scion) Adriana Najar-Rodriguez (PFR) Craig Phillips (AGR) Darren Ward (MWLR) David Teulon (PFR)	Hayley Ridgway (PFR) Jacqui Todd (PFR) Jessica Vereijssen (PFR) Mark McNeill (AGR) Murray Fea (DOC) Nari Williams (PFR) Rebecca McDougal (Scion)	Sandra Visnovsky (PFR) Sarah Mansfield (AGR) Simon Bulman (PFR) Virginia Maroni (PFR) Waipaina Awarau-Morris (AGR) Waka Paul (PFR)

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