



FINAL REPORT 2021 - 2025

cebra

Centre of Excellence for
Biosecurity Risk Analysis



CEBRA Final Report 2021-2025

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Definitions

Term	Definition
AADIS	Australian Animal Disease Spread Model
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ACIAR	Australian Centre for International Agricultural Research
AI	Artificial Intelligence
APL	Australian Pork Limited
APLC	Australian Plague Locust Commission
ARC	Australian Research Council
ARDC	Australian Research Data Commons
ASF	African swine fever
Board	CEBRA Board
BSE	Bovine spongiform encephalopathy
CBIS	Compliance-Based Intervention Scheme
CCEPP	Consultative Committee on Emergency Plant Pests
CEBRA	Centre of Excellence for Biosecurity Risk Analysis
CEBRAnar	CEBRA Research Webinar
CEBO	Chief Environmental Biosecurity Officer
DAFF	Department of Agriculture, Fisheries and Forestry
DEECA	Department of Energy, Environment and Climate Action
Deed projects	Projects entered into under the Deeds of Agreement between UoM and DAFF, and UoM and MPI.
DRISC	Data, Research and Intelligence Sub-Committee
FMD	Foot-and-mouth disease
FWPA	Forest and Wood Products Australia
GRDC	Grains Research and Development Corporation
IGB	Inspector-General of Biosecurity
ISS	International Standard Setting
LSD	Lumpy skin disease
M. bovis	<i>Mycoplasma bovis</i>
MPI	Ministry for Primary Industries, New Zealand
Non-Deed projects	Projects commissioned outside of the Deeds of Agreement between UoM and DAFF, and UoM and MPI.
NSW DPI	New South Wales Department of Primary Industries
PHA	Plant Health Australia
PIRSA	Department of Primary Industries and Regions South Australia
PLANTPLAN	Australian Emergency Plant Pest Response Plan
QCIF	Queensland Cyber Infrastructure Foundation
RIFA	Red Imported Fire Ant (<i>Solenopsis invicta</i>)
SRP	Scientific Review Panel
UoM	The University of Melbourne
USDA	United States Department of Agriculture
WOAH	World Organisation for Animal Health

CEO's Message

It is my pleasure and privilege to welcome readers to the 2021-25 Centre of Excellence for Biosecurity Risk Analysis (CEBRA) final report.

CEBRA, now celebrating two decades since its inception, continues to expand and strengthen its influence. I deeply thank our researchers and staff, partners, and stakeholders for their continued hard work, advice and leadership, and dedication to the cause of improving biosecurity systems locally and globally. In particular, I direct a huge thank you to our colleagues in the Department of Agriculture, Fisheries and Forestry (DAFF) and the Ministry for Primary Industries (MPI) New Zealand for their all-important engagement. All these contributions have enabled CEBRA to achieve an enormous amount during the funding period — much of which is summarised between these pages — and I am extremely proud of everyone's efforts and the work we have produced.

CEBRA supports DAFF and MPI in their vital biosecurity activities by providing evidence-based tools, analyses and advice on biosecurity risk science and management. In the past four years, our researchers have collectively completed 61 projects, both as Deed work for DAFF and MPI and as additional activities, with the great majority readily available on the CEBRA website and our [searchable database](#). Our researchers have also produced 137 publications, and given more than 226 presentations at workshops, conferences and other engagements.

These collective efforts manifest in a diverse portfolio of impactful research. Among these, a key highlight was the completion of our four-year incentives project, which pioneers a framework that can be used to proactively ensure policy design precisely interlocks with human behaviour to achieve better biosecurity outcomes (the interested reader should hunt down CEBRA project 21C).

Another significant project supports proactive risk management under evolving climate and international trade conditions by enabling biosecurity agencies to estimate and forecast changes in exposure to biosecurity threats linked to international trade (CEBRA 21B).

We also improved decision-support systems for biosecurity emergency responses with a project which established a tool for assessing eradication feasibility for the CCEPP

Our research delivers its most profound impact when it is translated into tangible biosecurity outcomes. We are particularly proud to be the new home of Biosecurity Commons – a significant biosecurity modelling platform that is already being used by biosecurity agencies as a decision-support tool – which hosts some of our most outstanding work.

Also, our work with Biosecurity Tasmania examined the efficiency of domestic border interventions and the benefits of detector dogs.

CEBRA's impact was felt further afield as the European Union adopted a version of the Australian Animal Disease Spread Model (AADIS) to simulate potential outbreaks of transboundary animal diseases, such as foot-and-mouth disease (FMD), and test response strategies.



These are just some examples of the incredible work CEBRA produces.

One of the highlights of this funding period is the publication of the CEBRA book, namely *Biosecurity: A Systems Perspective*, which is the result of more than 15 years of research by the CEBRA team in conjunction with industry and government partners. The book takes a whole-of-system perspective, guiding the reader through the latest thinking around building efficient, effective and resilient biosecurity systems, and champions an interdisciplinary approach to risk analysis and solving complex, multi-dimensional problems.

It is directed at biosecurity practitioners, generalist scientists, and students and is already being used by several universities across the globe as a teaching resource. The book certainly marks a significant milestone in CEBRA's history. Special thanks go to Associate Professor Susie Hester, Dr Lucie Bland, Dr Edith Arndt, Sana Bau, Dr James Camac, Evelyn Mannix and Dr Raphaël Trouvé for their contributions.

I would like to mention our graduate course at the University of Melbourne (UoM) - *Biosecurity: Managing Invasive Species*. The course has been a huge success with more than 240 student enrolments over the past four years.

I express my profound gratitude to the Board, UoM, the Faculty of Science, and the School of BioSciences for their support.

It is an honour to steer CEBRA as CEO and the greatest validation we can receive for our research is to be given the opportunity to continue.

The \$8.6 million Australian Government grant for the next four years, coupled with very welcome support from MPI and UoM, will allow us to continue collaborative biosecurity research to protect the nation's agricultural, fisheries and forestry industries, environment, and way of life.

The Centre will consolidate and advance its research themes, including evaluating biosecurity systems, modelling outcomes of policy during animal disease outbreaks, designing efficient and effective border intervention activities and getting research-grade tools into the hands of practitioners.

Biosecurity is an incredibly important undertaking that touches everyone. It helps protect the things we value from the potentially disastrous impacts of invasive species.

I am very proud to be part of the CEBRA team, which serves the national and international biosecurity communities, and we are thrilled to continue and build upon this wonderful legacy.

Professor Andrew Robinson

CEO, CEBRA

Chair's Report



It gives me great pleasure to look back on the last four years and reflect on the amazing achievements of CEBRA. A large part of our success has been supported by carefully considered maturation of the governance arrangements, and I would like to say thank you to everyone involved for their vital input.

CEBRA commenced this four-year Grant Agreement (Agreement) with DAFF, covering the period 1 July 2021 - 30 June 2025, in the context of increased Commonwealth focus and funding on biosecurity. I was appointed as the new Chair and Professor Andrew Robinson, from the Schools of BioSciences and Mathematics and Statistics, was appointed as the CEO.

This new Agreement required CEBRA to provide more regular strategic feedback and advice to DAFF and to ensure a best practice corporate governance framework. The new Agreement also empowered the Board to reach out to other key stakeholders to provide advice and research expertise to enhance the application of best-practice biosecurity policies and practices. Throughout the period of this Agreement, Biosecurity New Zealand was CEBRA's second very significant partner.

Governance

With attention on governance and ensuring the new framework was most appropriate to meet DAFF's expectations, the CEO and the Chair restructured the Board with a focus on core and advisory functions enhancing its overall accountability, efficiency and effectiveness but staying streamlined in the process. CEBRA importantly remained an entity of UoM with its concomitant policies and practices.

Board members focused on key biosecurity discipline areas, research expertise and the corporate governance required to conduct the contracted project work. Core board members had the primary accountability and decision-making role for CEBRA, and advisory members enabled CEBRA to draw upon a wider range of knowledge, skills, and experiences to enhance its overall operation and effectiveness. At each of the Board's quarterly meetings, it examined a research area in depth and took the opportunity to gain experience from current activity including the COVID-19 experience. The full Board was supported by the very experienced and highly valued staff of CEBRA and partners.

The Board introduced a modern governance framework that aligned CEBRA's research priorities with DAFF's 2030 priorities outlined in its Biosecurity 2030 Roadmap and DAFF's expectations as a key customer. It considered recommendations of several high-level national biosecurity reports and revisited the way the Scientific Review Panel (SRP) linked into the Board. Most recently CEBRA undertook strategic visioning workshop exercises drawing on the regular extensive environmental scanning processes undertaken by the Chair and CEO. This work highlighted the challenge for CEBRA to manage resourcing and prioritisation of project load to ensure sufficient agility.

Core Board members included continuing and very experienced board members:

- Professor Ute Roessner (at the time, Head of School of BioSciences, UoM) was succeeded by UoM's new Head of School of BioSciences, Professor Margie Mayfield. Subsequently, Professor Theresa Jones replaced Professor Margie Mayfield as the representative from the School of Biosciences in May 2023.
- Professor Anna Meredith (Melbourne Veterinary School) also resigned, to move overseas in February 2022. Ms Sarah Corcoran (CEO, Plant Health Australia (PHA), a non-Commonwealth Advisory Board Member joined as a core member in July 2022, replacing Professor Anna Meredith.
- Independent Mr Terry Charlton joined the core group in May 2022, stepping down in August 2023, and was replaced by former Chief Biosecurity Officer, MPI, Stu Hutchings.
- Professor Jodie McVernon (the Doherty Institute) stepped down in February 2025 after long and welcome service.

Commonwealth Advisory Board members included two DAFF Executives:

- Dr Robyn Martin (Biosecurity Animal Division) who retired in 2022, was replaced by Dr Robyn Cleland, Chief Environmental Biosecurity Officer (CEBO). With the retirement of Dr Robyn Cleland in 2023, the new CEBO, Dr Bertie Hennecke, filled the advisory member position.
- Mr Peter Gooday (ABARES) stepped down in August 2023 and was replaced by Dr Tony Arthur (Chief Biosecurity Scientist, ABARES).

Non-Commonwealth Advisory Board members included:

- Dr Michael Ormsby (MPI) stepped down in November 2023, and was replaced by Mr Peter Thomson (Chief Biosecurity Officer, MPI) in February 2024
- Professor Peter Taylor (Mathematics and Statistics, UoM)
- Professor Michael McCarthy (School of Agriculture, Food and Ecosystem Sciences, UoM)
- Independent Professor Ian Robertson (School of Veterinary Science, Murdoch University) who chairs the SRP
- Independent Dr Bruce Christie who was chair of the Centre for Invasive Species Solutions board at the time.

The CEO and I thank all Board members for their contribution, time, and commitment to CEBRA.

Strategy

The second area of emphasis in the Agreement was on strategy. DAFF sought CEBRA to provide strategic advice and guidance on:

- Biosecurity trends and risks
- Priority areas for research investment, including innovative approaches and technologies
- To report on the overall progress and performance of CEBRA.

To help strategically inform CEBRA's direction, and to align current and historical CEBRA work with the DAFF Biosecurity 2030 Roadmap, CEBRA reviewed the following four reviews completed over the previous two years and met with both Inspector-Generals of Biosecurity (IGB) in that process:

- ACIL Allen review of CEBRA
- IGB review of department's operational model
- Australian National Audit Office (ANAO) review of department response to biosecurity non-compliance
- Commonwealth Biosecurity 2030 strategy.

Having Commonwealth Advisory members on the Board enabled us to keep DAFF senior executives directly informed about CEBRA's work and emerging issues. In addition, CEBRA regularly engaged with DAFF senior executives to gain an understanding of their priorities and opportunities, ensuring alignment with the DAFF Biosecurity 2030 Roadmap and the National Biosecurity Strategy.

DAFF also encouraged CEBRA to reach out more broadly to other jurisdictions and industry. Therefore, CEBRA engaged productively with all States and Territories and undertook a range of contracted work for many jurisdictions and several industry bodies.

With the extraordinary demand on biosecurity professionals as global changes and risks in the biosecurity environment evolve and increase, I want to finish on a note of recognition for the team in CEBRA. It was clear in our environmental scanning interviews how highly valued CEBRA team members are, and I know that readers will join me in acknowledging how fortunate we are to have such a skilled, professional, and highly committed team led by Andrew Robinson. I also acknowledge and thank UoM for their very strong support and the many capable people we interacted with that enabled CEBRA to contribute to Australia's biosecurity system so positively.

Lindy Hyam

Chair, CEBRA Board



Overview

Program performance

CEBRA is committed to delivering timely, on-budget research. During 2021 to 2025, CEBRA performed strongly against the program's milestone and reporting schedules.



Timely



Within budget



**All milestones
approved from
2021 - 2024**



**90% of milestones
completed by 30 June 2025,
in agreement with DAFF**

Who we are

CEBRA is a longstanding biosecurity research initiative of the Australian Government to support strategic advancement of biosecurity risk analysis.

We lead with insight and create practical solutions to complex biosecurity challenges by applying robust scientific tools and methodologies across the entire biosecurity continuum.

Our aim is to be the first-choice research partner for developing efficient, transparent, and resilient risk management outcomes that safeguard industry sectors, systems and communities.

CEBRA is based at, and supported by, UoM, with additional funding support from DAFF and MPI.

What we do

CEBRA plays a vital role in assisting the Australian and New Zealand governments to remain at the forefront of managing biosecurity risks. Our close relationship with government stakeholders enables us to work on topics that are policy relevant and scientifically groundbreaking.

Our interdisciplinary research informs decision-making across the biosecurity continuum. It supports regulators in anticipating and preventing threats before they reach our borders, conducting effective screening at the border and detecting incursions and guiding appropriate response strategies post-border.

By combining expertise from economics, ecology, mathematics, and statistics, our collaborative and solution-focused research delivers innovative and practical outcomes.

Through these shared research efforts, we connect stakeholders to a wealth of diverse expertise to help drive global progress in biosecurity.

Achievement of CEBRA objectives

CEBRA's objectives are to deliver practical, rigorous solutions and strategic advice related to biosecurity risk analysis, encompassing the assessment, management, and communication of biosecurity risk. Over the past four years, the activities undertaken by CEBRA – as detailed in this report – clearly demonstrate our success in fulfilling the objectives outlined in the Agreement and advancing our mission to deliver strategic insight and practical solutions.

Here, we directly align our achievements with each objective, highlighting the tangible ways in which they have been met.

Provide strategic advice and guidance on biosecurity trends and risks, and priority areas for research investment (including new approaches or technologies)

CEBRA provided strategic advice and guidance to DAFF during this grant period, informing DAFF's approach to managing emerging biosecurity challenges and resource prioritisation. Our ongoing horizon scanning activities and research have identified global and regional drivers of biosecurity risk arising from increased globalisation, changing and expanding patterns of trade and human movement, and climate change. This strategic guidance supports more efficient allocation of biosecurity funding, a process that is enhanced through the ongoing collaboration we foster across government, industry, and research sectors.

We have also delivered new approaches to mitigating biosecurity risk. Among these are various proof-of-concept tools: a resource allocation tool that can be used to improve investment into risk controls at the border; a tool to diagnose and avoid potential incentive problems in policies prior to roll-out, and a tool to aid decision-making around the technical feasibility of eradication. We've also expanded the innovative 'Value Model' with active co-investment and application by other key biosecurity partners.

Deliver a balanced portfolio of research and develop new, and improve existing, methods relevant to biosecurity risk analysis

CEBRA is dedicated to delivering a balanced research portfolio that comprehensively addresses the full spectrum of biosecurity risk challenges. This balance ensures coverage across strategic, operational, and tactical research priorities, and spans the entire biosecurity continuum: pre-border, border, and post-border. For example, in the pre-border context, CEBRA's work analysed Competent Authority (CA) certification effectiveness and incentives, providing guidance to inform Australian border policy improvements. At the border, we developed a proof-of-concept model to prioritise audits for low-risk Approved Arrangements. In the post-border context, two new decision-support tools enhance decision making — one assists with understanding eradication feasibility; and another assists with determining the costs and benefits of community surveillance activities.

Engage a range of disciplinary skills relevant to contemporary risk analysis to ensure governments remain at the forefront of biosecurity risk analysis

CEBRA effectively integrates the skills of its interdisciplinary researchers — skills that span mathematics, statistics, economics, ecology, computer science, modelling and social science — to provide governments with advanced biosecurity risk analysis capabilities.

This expertise contributed to several research innovations, including the ongoing application and international adoption of AADIS; automated image processing techniques for assessing vessel biofouling; a decision-support prototype tool for enhancing understanding of eradication feasibility; and models for predicting Australian plague locust nymph presence and developmental stages to enhance real-time forecasting and resource allocation for agricultural protection. Our capability in economic analysis continues to inform improved biosecurity investment across the biosecurity system — we developed a framework, grounded in incentive theory, that allows governments to achieve desired biosecurity behaviours efficiently and effectively; and we also delivered a proof-of-concept resource allocation tool that can be used to optimise investment into risk controls at the border.

Assist in developing Australia's biosecurity risk analysis research capability, including its collaboration with and connectedness to capabilities overseas

CEBRA works closely with international partners to strengthen Australia's biosecurity research capability. We have examined the value of pre-border capacity building in the Asia-Pacific region, proposing a structured framework to improve strategic planning and investment in Australia's pre-border biosecurity.

Building on the success of valuing the Australian biosecurity system, CEBRA has extended this work to value New Zealand's biosecurity system. The results will provide a comprehensive understanding of the benefits of New Zealand's national biosecurity system, reinforcing the case for sustained investment and international cooperation.

Our evaluation of the Australian Government's investment in international standard setting (ISS) and global animal health policy and program activities demonstrated that the return on investment in engagement for BSE standard setting was significant.

In close collaboration with B3 scientists in New Zealand, CEBRA helped to design an industry-level surveillance system comprising multiple sensors for six diverse and significant biosecurity threats for the kiwifruit industry.

Beyond these strategic initiatives and collaborative projects, CEBRA actively strengthens Australia and New Zealand's biosecurity risk analysis research capability through continuous international engagement. This includes maintaining regular contact with overseas research agencies, securing invitations to present at key international forums, and holding memberships in crucial global biosecurity institutions. Furthermore, targeted initiatives such as joint PhD supervision with international partners directly develop future expertise and foster enduring collaborative links in biosecurity risk analysis.

Engage governments, biosecurity decision makers and the broader biosecurity community in its research findings and outputs

CEBRA actively connects with the biosecurity community through a diverse range of outreach and engagement activities. Our flagship initiative in collaboration with DAFF, the CEBRA research webinar series (CEBRAnars), offers a window into our work. In this Agreement period, we delivered 29 webinars, attracting more than 10,000 views on YouTube. Beyond this, we have contributed to more than 220 workshops, conferences and other stakeholder events, alongside over 30 media engagements, as well as publishing articles in *The Conversation* and *Pursuit*.

Our newly published book, *Biosecurity: A Systems Perspective* has reached a global audience, with over 195 paperbacks and hardbacks sold, as well as 385 ebook downloads, to institutions and individuals worldwide. Several educational institutions in Australia and New Zealand are using the book as a resource in biosecurity-focused units. Additionally, our expertise has strengthened DAFF's capability to commission, deliver and support cost-effective community engagement programs in biosecurity.

Work to promote excellence in biosecurity risk analysis, including collaborating with end users and other research institutions to increase the adoption and impact of research findings and outputs

We have created a robust project development and delivery system. Development of the annual work plan begins with extensive collaboration involving the department secretariat, Senior Executive, and department

and ministry project leaders. Annually, the CEO and relevant researchers also meet with state and territory biosecurity leaders, with Animal Health Australia and Plant Health Australia, and with the Inspector General of Biosecurity, to identify priority areas for research investment.

Research ideas emerging from these consultations are distilled into pre-proposals, co-designed by project managers and department project leads. These pre-proposals are discussed with the department secretariat and presented to the Board and department Senior Executive leading to a proposed prioritisation based on alignment with the National Biosecurity Strategy, strategic implications, operational benefits, CEBRA's remit, and skill coverage.

Project reports undergo rigorous external review by independent domain experts, complemented by internal agency review to ensure recommendations for policy and operational change are fit-for-purpose. This robust review process, coupled with ongoing engagement and strategic communication, directly ensures that our research findings and outputs are not only scientifically sound but also actionable and adoptable by end-users, thereby maximising their impact on biosecurity outcomes.

Impact of CEBRA research

CEBRA is dedicated to delivering research that makes a difference. Recent achievements include:



People

Our people

Comprising skilled professionals with diverse expertise, the CEBRA team fosters a dynamic research environment that encourages cross-pollination of ideas, rigorous inquiry, and impactful outcomes. Our team ensures research activities are conducted ethically, efficiently, and in alignment with the Centre's objectives under the Agreement.

The following is a list of everyone who has worked for CEBRA during this Agreement period. The list is in alphabetical order after the CEO and Deputy CEO.

Chief Investigators

Professor Andrew Robinson
CEO



PhD, MSc, BSc (Hons)

Definition and statistical properties of performance indicators for inspectorates, use of applied statistics and risk analysis to support biosecurity management

Associate Professor Susie Hester
Deputy CEO



PhD, BEc (Hons)

Biosecurity economics, incentive-compatible biosecurity policy, post-border surveillance, knowledge management and passive surveillance

Associate Professor Richard Bradhurst
Principal Research Fellow



PhD, MCompSc, BSc, DipEd

Mathematical computing, computational epidemiology, emergency animal disease modelling, AADIS

Dr James Camac
Senior Research Fellow



PhD, BBioSC (Hons)

Ecological modelling, climate change and fire impacts on biodiversity, invasive species risk mapping, surveillance

Associate Professor Anca Hanea
Principal Research Fellow



PhD, MSc, BSc

Probabilistic modelling, decision making under uncertainty, structured expert judgement

Professor Tom Kompas
Professor Environmental Economics and Biosecurity



PhD, MSc, BSc

Economic dynamics, agricultural economics, natural resource economics and environmental economics

Research Fellows

Dr Edith Arndt
Senior Research Fellow



PhD, MSc

Monitoring and evaluation, risk analysis, spatial data analysis, resilience thinking

Dr Chris Baker
Senior Research Fellow



PhD, MSc, BSc

Applied mathematics, ecology, epidemiology, invasive species, optimisation

Sana Bao
Research Assistant



BSc

Mathematical computing, computational epidemiology, emergency animal disease modelling, AADIS

Dr John Baumgartner
Scientific Programmer



PhD, BSc (Hons)

Biosecurity hazard incursion/impact modelling, quantitative ecology, habitat suitability modelling

Dr Matthew Cantele
Research Fellow



PhD

Computable General Equilibrium modelling, spatial spread modelling, scientific programming, scenario analysis, data visualisation

Dr Sean Haythorne
Research Software Engineer



PhD, MCompSc, BEd, BAppSc

Biosecurity population, spread, impact, surveillance, and management resource modelling. Platform development for cloud-based model deployment. Model and use case co-design and workshop facilitation.

Les Kneebone
Research Fellow



MArts, GDip, BSoc

Information architect

Dr Thao P. Le
Research Fellow in Data Science



PhD, MRes, MSc, BSc (Hons)

Mathematical epidemiology and biosecurity modelling, modelling for decision-making

Christine Li
Research Fellow



BCom (Hons), DipLang (Arabic)

Ecological economics, data analysis and meta-science, spatial data mapping, economic decision support and system valuation, climate impact modelling

Dr Evelyn Mannix
Research Fellow



PhD

Machine learning and AI

Dr Nicholas Moran
Research Fellow



PhD, BSc (Hons), LLB (Hons)

Quantitative ecology, data analysis and meta-science, invasive species, biosecurity analytics and risk modelling

Dr Madalene Oberin
Research Fellow



PhD, BSc (Hons)

Veterinary epidemiology, disease modelling, pest management and risk analysis

Dr Esti Palma
Research Fellow, Biosecurity Risk Analysis



PhD, MSc, BSc

Plant ecology, functional ecology, biodiversity conservation, invasion ecology, data analysis, citizen science

Dr Julia Polak
Research Fellow



PhD

Complicated system evaluation, data science and statistical education

Dr Shumoos Al-Riyami
Postdoctoral Research Fellow



PhD, MSc, BSc

Epidemiology, vector-borne disease, emergency animal disease modelling, AADIS

Dr David A Rolls
Senior Research Fellow in Biosecurity Analytics



PhD (Mathematics)

Estimation, sampling, computational statistics, stochastic modelling, health analytics

Hanzhang Sun
Research Fellow



MDS, BSc

Data science

Dr Meryl Theng
Research Fellow



PhD

Biosecurity modelling, quantitative ecology

Lu-Yi Wang
Research Fellow



PhD

Evolutionary ecology and impact evaluation

Graduate Researchers

Gouri Mondal
PhD Researcher



Olaolu Joseph Odewole
PhD Researcher



Professional staff

Erica Kecorius
Administrator



Rupert Marquand
Communications Manager



Sue Lynn Tan
Business Manager



Cassie Watts
Business Manager



Visitors

Dr Martine Barons

Reader in Statistics and Director of the Applied
Statistics and Risk Unit

University of Warwick

Professor Mark Burgman

Director, School of Life Sciences

University of Hawai'i at Mānoa

Dr Annemarie Christophersen

Hazard and Risk Scientist

Earth Sciences New Zealand

Professor Mark Ducey

Natural Resources and the Environment

University of New Hampshire

Professor Philip Hulme

Distinguished Professor, Department of Pest-
Management and Conservation

Lincoln University, New Zealand

Dr Michael Ormsby

Principal Adviser, Biosecurity New Zealand, MPI

Deed activities

Deed research themes

CEBRA's projects under the Agreement span four themes:



**BETTER ANTICIPATE
BIOSECURITY RISK**



**BETTER ALLOCATE
RESOURCES TO
BIOSECURITY RISK**



**SYSTEM DESIGN
AND REGULATORY
INCENTIVES**



**SYSTEM
ENHANCEMENTS**

Projects during the 2021-25 period covered a number of key focus areas:

- **Plant biosecurity** – research aimed at protecting Australia's agricultural and natural ecosystems from invasive plant pests and diseases.
- **Animal biosecurity** – development of decision support tools and frameworks that help Australia prepare for, and respond effectively to emergency animal diseases.
- **Environmental biosecurity** – efforts to safeguard Australia's unique biodiversity from invasive species and pathogens that threaten native flora and fauna.
- **Regulatory incentives** – research into embedding effective incentives within regulatory frameworks to encourage compliance and proactive biosecurity practices.
- **Value of biosecurity** – economic analysis to estimate both average and marginal rates of return on investments in biosecurity measures.
- **Pre-border biosecurity** – Exploring collaboration with regional partners to strengthen biosecurity measures before goods and organisms reach Australian borders.
- **Mathematical modelling** – application of rigorous representation of complex relationships and dynamics in the biosecurity system.
- **Structured Expert Judgement** – use of formal elicitation methods to capture the quantitative judgements and insights of experts.
- **Statistical modelling** – leveraging advanced statistical expertise to enhance efficiency and accuracy in biosecurity decision-making.
- **Efficient intervention** – research focused on improving the efficiency of biosecurity interventions under resource constraints.

Deed research project summaries

The following 18 projects represent Deed work supported by funding received from DAFF and MPI under their respective Deeds of Agreement.

Better anticipate biosecurity risk

21B: Biosecurity risk from changes in climate, trade and pest and disease pathways

Project leads: James Camac and Tom Kompas

Sponsor: Bertie Hennecke, CEBO

DAFF lead: Shalan Schofield, Principal Director, Environmental Biosecurity

Project date and budget: 2021-23: \$692,682

[Final report available](#)

Climate change, globalisation, and expanding trade are increasing countries' vulnerability to pests and diseases that can have devastating economic, environmental and social impacts.

This project strengthened biosecurity risk forecasting by integrating trade flow models via the Global Trade Analysis Project (GTAP) with an existing trading partner biosecurity threat exposure model. The enhanced platform enables users to estimate and forecast changes in exposure of significant biosecurity threats linked to international trade under evolving climate and international trade conditions, supporting proactive risk management.

This project delivered major advancements including:

- Extending and improving 'damage functions' to quantify climate-driven economic losses and their influence on trade flows.
- Projecting future international trade patterns under multiple climate scenarios for over 120 countries, including all of Australia's trading partners.
- Integrating border screening data and climate suitability modelling to estimate contamination rates by country and commodity hitting Australian borders. Using these insights to forecast temporal changes in threat exposure for Australia and 120 other countries.

This integrated modelling capability equips agencies to anticipate biosecurity risks and adapt border screening and surveillance strategies effectively. Its role in projecting trade shifts under global warming is recognised in the National Climate Risk Assessment, underscoring its strategic importance for Australia's biosecurity resilience. The project also attracted exceptional interest, becoming the [best performing CEBRAnar](#) to date with over 420 registrations, highlighting its relevance and impact across the biosecurity and climate risk community.

23A: Short-term population forecasting of Australian Plague Locust (*Chortoicetes terminifera*)

Project lead: James Camac

Sponsor: Bertie Hennecke, CEBO

DAFF lead: Con Goletsos, Director and Allan Spessa, Entomologist, APLC

Project date and budget: 2023-24: \$148,000

[Final report available](#)

The Australian plague locust (*Chortoicetes terminifera*) is Australia's most damaging locust species, capable of forming massive swarms that migrate over large areas and quickly destroy pastures, crops, and green spaces. Predicting outbreaks is challenging due to complex life cycles and environmental interactions.

To address this, CEBRA partnered with the Australian Plague Locust Commission (APLC) to develop advanced forecasting tools using machine learning models, parameterised with over 400,000 survey observations collected since the 1980s, alongside publicly available land use, vegetation, and climate data.

This project delivered a transformative suite of resources that will significantly enhance locust management in Australia including a three-tier modelling process developed for accurately predicting nymph presence, stage and density class; temporal animations of surveillance effort and detections over time; a clean and comprehensive database of APLC monitoring and control surveys conducted between 1986 and 2023; spatiotemporal environmental datasets; an updated suitability layer for monitoring; and a coded workflow for regular updates by APLC staff.

These innovations enable more accurate outbreak forecasts, better-targeted pesticide use, and more efficient field survey design, strengthening Australia's capacity to manage locust threats.

The project's outcomes were highlighted in the [May 2025 CEBRAnar](#), illustrating its value and practicality to locust management. This innovative work has also recently featured in Australian Public Service Commission (APSC)'s State of the Service Report 2024-25, showcasing ways the Australian Public Service are working with AI to enhance service delivery, improve data-driven decision-making and optimise use of resources.

The work derived from this project is now being operationalised through a partnership with the APLC to develop a new monitoring dashboard, hosted on Biosecurity Commons, enabling real-time visualisation and forecasting of locust dynamics.



Picture credit: Australian Plague Locust (*Chortoicetes terminifera*) fifth instar nymph, Dr Gordon Berg, Vic APLC Commissioner (ret)

23F: Assessing the potential role of feral pigs in an outbreak of foot-and-mouth disease in Australia

Project lead: Richard Bradhurst

Sponsor: Narelle Clegg, Assistant Secretary, Animal Health Policy

DAFF lead: Emily Sellens, Senior Veterinary Officer, Epidemiology Surveillance and Laboratory

Project date and budget: 2023-25: \$251,848

[Final report available](#)

Foot-and-mouth disease (FMD) is a major biosecurity concern for Australia, with a large outbreak potentially costing up to A\$80 billion, primarily from the loss of livestock export markets reliant on FMD-free status.

Feral pigs, numbering 3 to 4 million, could act as potential hosts and transmitters of FMD if it establishes, yet their role in disease dynamics is poorly understood.

To address this, CEBRA extended the national AADIS-FMD model to incorporate feral pig population estimates and disease spread pathways, creating a decision-support tool to assess their influence on outbreak size, duration, and variability under different regional and seasonal conditions, along with the potential benefits of feral pig culling as part of an FMD control program.

Initial findings show that feral pigs can substantially amplify outbreaks, particularly in cooler climates and seasons, and in high-density farming areas with large feral pig populations. Spillover transmission between livestock and feral pigs depends on regional factors, seasonality, feral pig population density, farm type, and on-farm biosecurity practices.

In the absence of feral pig control, outbreaks could become significantly larger and harder to contain, while integrating feral pig management into domestic response strategies markedly reduces the likelihood of severe outbreaks. The effectiveness of feral pig control measures varies regionally and seasonally, providing critical insights for tailoring interventions. These simulation results align with both international FMD experiences and local expectations, reinforcing confidence in the model's applicability for strategic planning and strengthening Australia's preparedness for exotic disease incursions such as FMD.



Better allocate resources to biosecurity risk

21D: Value added – modelling the marginal return on investment within and across pathways

Project lead: Edith Arndt and Andrew Robinson

Sponsor: Bronwen Jagers, A/g First Assistant Secretary, Biosecurity Strategy and Reform

DAFF lead: Pip Griffin, Director, Biosecurity System Modelling

Project date and budget: 2021-23: \$508,000

[Final report available](#)

This project created an innovative proof-of-concept resource allocation tool to improve investment decisions relating to Australia's borders. Using two pilot pathways – sea containers, cut flowers and foliage – the tool integrates pathway simulation models with an enhanced version of CEBRA's bio-economic 'Value model' to calculate the consequences of different resource allocation strategies in dollar terms. Delivered as an interactive app, it enables departmental decision makers to compare the relative benefits of different investment strategies in a test-bed environment, without implementation.

The improvements to the Value Model have been adopted by DAFF and are now being integrated into the departmental data analytics platform. This project created valuable engagement opportunities, including an invitation from the International Plant Protection Convention (IPPC) to present this project at their global workshop on sea container and cargo pest risk mitigation and international trade facilitation, and a request from the General Manager for trade policy and operations at the Freight and Trade Alliance - Australia's leading supply chain representative body - to showcase the project in an online meeting. These invitations reflect strong recognition and interest in the project's innovative approach to biosecurity investment planning.

21G: Import policy 'health check' framework and tools

Project lead: Susie Hester

Sponsor: Robyn Martin, First Assistant Secretary, Biosecurity Animal

DAFF lead: Peter Finnin, Assistant Secretary, Animal Biosecurity

Project date and budget: 2021-22: \$216,000

[Final report available](#)

Many Australian import policies are based on risk analyses that were conducted some period prior to the current time. In some cases, those analyses date back decades. Any such analysis may become out of date, representing a strategic risk to stakeholders.

To achieve the consistent level of assurance required by DAFF, and to demonstrate confidence to stakeholders that risk analyses remain contemporary, a strengthened process for continual review of risk analyses is critical.

This project developed a framework designed to strengthen the department's confidence in identifying risk analysis requiring review. The framework enabled a more transparent, repeatable, and robust assessment of changes in biosecurity risk by pinpointing critical assumptions underpinning decisions, determining when these should be shared with stakeholders, and analysing the sensitivity of conclusions to changes in information.

In practice, the framework has the ability to identify key factors most sensitive to environmental and process changes, significantly improving the department's capacity to manage evolving biosecurity threats.

22C: Improving DAFF's effectiveness in engaging the community about general surveillance

Project lead: Susie Hester

Sponsor: Bertie Hennecke, CEBO

DAFF lead: Andrew Pearce, Director, Invasive Species Research and Development and Heleen Kruger, Social Science, ABARES

Project date and budget: 2022-25: \$423,680

Final report ([phase one](#) and [phase two](#)) and [decision support tool](#) available

Effectively engaging the community in the detection, reporting and monitoring of biosecurity threats — known as 'general', 'community' or 'passive' surveillance — is essential to achieving shared responsibility within Australia's biosecurity system. This project strengthened DAFF's ability to commission, undertake and support cost-effective biosecurity community engagement.

The project was conducted in two distinct phases. Phase One comprised a collaboration between the ABARES Social Science team and CEBRA, with ABARES Social Science leading the qualitative analysis of stakeholder interviews. These interviews, conducted with DAFF staff and general surveillance collaborators, complemented by a comprehensive review of previous and current engagement activities, provided a foundational understanding of challenges faced by these groups in designing, delivering, and evaluating general surveillance activities. Building directly on these insights, the CEBRA team adapted an existing UK-developed decision-support tool for biosecurity to the Australian context. The tool provides a practical framework for planning, implementing, monitoring, and evaluating general surveillance programs.

Delivered as a series of structured spreadsheets, the tool enables consistent and robust evaluation, improving program design, implementation, and funding decisions, while assisting in meeting public accountability requirements.

The framework equips DAFF and biosecurity stakeholders with a systematic approach to implementing 'shared responsibility'. It also enhances transparency, optimises resource allocation, and increases community participation in biosecurity surveillance. The project's outcomes were showcased in the [May 2024 CEBRAnar](#), highlighting the tool's potential to transform community involvement in threat detection and reporting. By enabling early detection of emerging risks, the framework significantly enhances Australia's biosecurity resilience and advances shared responsibility goals.

23D: Quantitative model for assurance-based auditing of approved arrangements

Project lead: Andrew Robinson

Sponsor: Caroline Gibson, Principal Director, Approved Arrangements Program

DAFF lead: Nick Small, Director, Approved Arrangements Program

Project date and budget: 2023-24: \$141,840

[Final report available](#)

In Australia, managing biosecurity risks associated with imports is a shared responsibility between government and industry, with activities such as storage of shipping containers or fumigation of consignments conducted under 'approved arrangements' regulated by the *Biosecurity Act 2015*.

While frequent audits are assumed to improve compliance, in reality the relationship between audit frequency and compliance may not be so clear.

This project leveraged CEBRA's advanced statistical expertise to develop a robust framework to guide how often approved arrangements should be audited, improving the efficiency and effectiveness of the audit program.

The framework strengthens DAFF's risk-based regulatory approach by enabling data-driven decisions on audit scheduling. This ensures resources are targeted where they deliver the greatest compliance benefit, reducing unnecessary costs while maintaining strong biosecurity protections for Australia's agriculture, environment, and trade.

To share insights and foster collaboration, the project was showcased in the [November 2024 CEBRAnar](#), highlighting its innovative approach and practical impact on Australia's biosecurity system.

24D: Quantitative risk-based prioritisation model for compliance monitoring activities

Project lead: Andrew Robinson

Sponsor: Martin Moseley, Assistant Secretary, Audit and Assurance

DAFF lead: Jeremy Walton, Director and Kara Taylor, Assistant Director, Audit and Assurance

Project date and budget: 2024-25: \$150,000

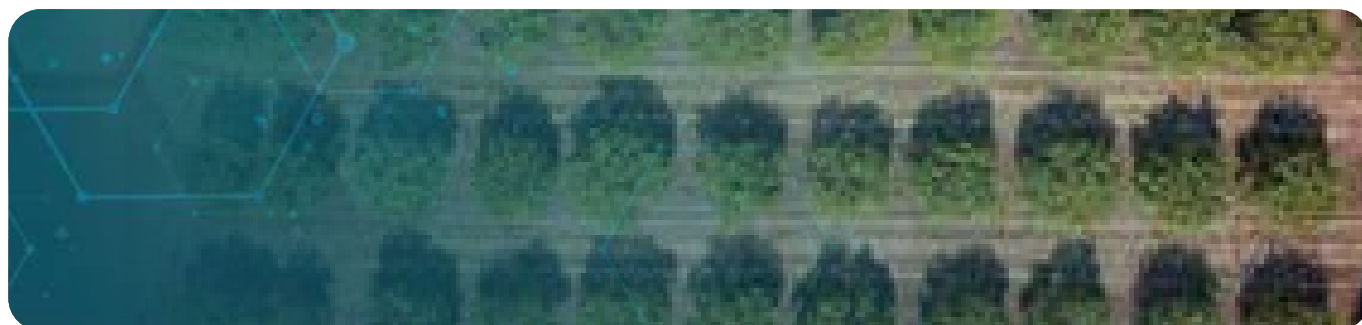
[Final report available](#)

The application of CEBRA's advanced statistical expertise has significantly strengthened DAFF's approach to biosecurity compliance monitoring at the border. Linked with project 23D - *Quantitative model for assurance-based auditing of approved arrangements* (highlighted above), this project produced a quantitative risk-based model to enable DAFF to prioritise audit activities, ensuring that audit resources are directed to areas of greatest biosecurity risk, improving both efficiency and effectiveness.

This work has made improvements to DAFF's audit strategy, including:

- Unannounced audit guidelines implemented across both import and export audit spaces, increasing deterrence and reinforcing compliance.
- Targeted auditing using Compliance Case Management System (CCMS) data to focus on Approved Arrangements with the highest risk of noncompliance.
- Integration of the Priority 4 (lower priority) framework and risk triggers into the Audit Strategy, supported by CEBRA's modelling, providing a robust foundation for prioritising audits.
- The innovations enhance DAFF's ability to detect, deter and disrupt non-compliant activities, while optimising resources and maintaining robust biosecurity protections. This project marks a major advancement in modernising regulatory practices by embedding evidence-based decision-making at the core of compliance programs.

The outcomes of projects 23D and 24D are under active consideration by MPI at the time of writing.



24E: Technical feasibility of eradication

Project lead: James Camac

Sponsor: Susie Collins, Assistant Secretary, Plant Health Policy

DAFF lead: Liesl Taylor, Director, Preparedness and Response

Project date and budget: 2024-25: \$205,000

[Final report available](#)

This project focused on improving decision-support systems for biosecurity emergency responses, particularly for the Consultative Committee on Emergency Plant Pests (CCEPP). Effective decision-making during pest incursions requires tools that balance technical feasibility with social, legal, and economic considerations. To address this need, CEBRA evaluated two existing tools - a qualitative Microsoft Excel-based tool developed by DAFF and CCEPP, and a quantitative web-based tool from the Centre for Invasive Species Solutions (CISS).

Building on stakeholder feedback from a dedicated workshop, the project designed a new decision-support prototype tool to facilitate structured, transparent CCEPP discussions. The tool prioritises technical feasibility while incorporating contextual questions addressing social, legal, and economic constraints. It also introduces features that improve clarity and collaboration, including:

- A simplified user experience with 28 evaluation criteria across six thematic modules.
- Structured stakeholder input through an intuitive online platform.
- Visual summaries that highlight consensus and evidence gaps, available as downloadable reports.
- Iterative evaluation capabilities with options for private notes and shared comments.
- Flexible hosting options, supporting deployment on internal DAFF systems or external platforms such as Amazon Web Services (AWS), PHA or Biosecurity Commons.

The prototype was successfully trialled on retrospective case studies, demonstrating improved clarity and utility for evidence-based decision-making. Future enhancements may include a staged decision-making framework, comparative analysis of eradication strategies, tailored user access, refined criteria questions to further reduce subjectivity, extension into animal health domain, and expanded socio-political modules.

By establishing a more robust, transparent, and adaptable system for assessing eradication feasibility, this project strengthens CCEPP's capacity to make nationally consistent decisions aligned with standards such as the Australian Emergency Plant Pest Response Plan (PLANTPLAN).

This project has received considerable interest from both government and industry within and outside of Australia and was recently presented at the Emergency Plant Pest Response Deed (EPPRD) 42nd signatories meeting.

Due to this interest, the tool is now being integrated onto the Biosecurity analytics platform – Biosecurity Commons – to ensure it is accessible to all CCEPP members and other biosecurity stakeholders.

System design and regulatory incentives

21C: Incentive-compatible biosecurity policies – a framework for regulatory design

Project lead: Susie Hester

Sponsor: Christie Sawczuk, First Assistant Secretary, Biosecurity Strategy and Reform

DAFF lead: Dan Passer, Director, Compliance Strategy and Policy

Project date and budget: 2021-25: \$960,000

[Final report](#)

This project emphasised the critical role of incentives in shaping biosecurity outcomes, recognising that Australia's exposure to pest and diseases depends not only on technical interventions but also on human behaviour within import supply chains. It aimed to equip DAFF staff with practical skills to identify incentive-related issues in existing and planned interventions and develop strategies to address them, ultimately improving the efficiency of pathway risk management.

Two major outputs were delivered:

- **The Incentive Diagnostic Tool** was designed to check and refine incentives in interventions prior to roll-out. Tested on several pathways, including biofouling, the tool reveals how to find misaligned incentives and guides the user through corrective measures.
- **A biofouling case study** demonstrates how 'incentive-compatible' mechanisms can be embedded into a biosecurity system based on modern risk management principles.

These outputs generated significant new insights into sustainable funding models and strategies for engineering incentive structures that encourage risk-creators to share critical information in order to manage risk. This approach provides a practical pathway for designing fair and efficient systems that align stakeholder behaviour with national objectives, ensuring stronger compliance and more effective protection against biosecurity threats.

The insurance component of this project work was featured in the [September 2022 CEBRAnar](#), including its potential to transform funding of the biosecurity system. This aspect was explained further in the [June 2024 CEBRAnar](#).



System enhancements

21E: A biosecurity risk research portal to inform decision-making

Project leads: Les Kneebone and Andrew Robinson

Sponsors: Christie Sawczuk, First Assistant Secretary, Biosecurity Strategy and Reform and Peter Thomson, Chief Biosecurity Officer, MPI

DAFF and MPI lead: Jessica May, Director, Research and Innovation, DAFF and Michael Ormsby, Principal Adviser, Biosecurity New Zealand

Project date and budget: 2021-24: \$767,957 (DAFF and MPI combined funding)

[Final report available](#)

This project saw CEBRA develop a proof-of-concept digital research portal to improve access to biosecurity knowledge and support evidence-based decision-making.

The portal aggregates and connects research from multiple sources – including grey literature from government, industry, and research institutions – into a single searchable interface. By harvesting metadata and applying controlled vocabularies, the portal demonstrated its potential to address three key challenges: limited access to unpublished or inconsistently published research, terminology differences across disciplines, and difficulty identifying gaps and overlaps in research programs.

This proof-of-concept project marks an important advancement in modernising biosecurity research management. The portal enhances evidence-based decision-making, minimising duplication, and improves agencies' ability to strategically prioritise research investments. With continued development, the Portal has the potential to become a cornerstone platform for biosecurity research governance, ensuring long-term sustainability and alignment with national biosecurity objectives.

21K: Automated image analysis for identifying biofouling risk of vessels - exploring deployment strategies and analysing video footage

Project leads: Evelyn Mannix and Andrew Robinson

Sponsor: Brant Smith, First Assistant Secretary, Biosecurity Animal

DAFF lead: Bart Woodham, Assistant Director, Marine Biosecurity Unit

Project date and budget: 2021-24: \$219,567

Final report will not be published due to regulatory sensitivities. Other CEBRA reports can be found on our [searchable database](#).

CEBRA developed an advanced image analysis tool to automatically identify biofouling of ship hulls from underwater photos, improving the accuracy and efficiency of marine biosecurity inspections.

Biofouling — the accumulation of organisms on the surfaces of oceangoing vessels — is a major pathway for the introduction of non-indigenous marine species, which can cause severe social, environmental, and economic impacts. Current practice to manage biofouling risk relies on costly, time consuming in-water inspections.

Building on earlier work demonstrating the effectiveness of image analysis for biofouling detection, the project introduced innovations to streamline dataset labelling, analyse video footage, and develop a practical user-interface for marine biosecurity agency staff.

This project advances marine biosecurity by introducing automation into biofouling risk assessment.

By enabling consistent evaluation of underwater imagery and video, the tool supports timely decision-making and strengthens capacity to manage biofouling risks.

The project has provided opportunities for targeted engagement activities including the [April 2022 CEBRAnar](#) and a paper, 'Automating the assessment of biofouling in images using expert agreement as a gold standard', which was published in the journal [Scientific Reports](#).

There have been four requests from various researchers and private industry to access the models and datasets from the project.

23B: Return on investment in international standard setting engagement – A case study on bovine spongiform encephalopathy (BSE) status

Project lead: Susie Hester

Sponsor: Beth Cookson, Australian Chief Veterinary Officer (ACVO)

DAFF lead: Gary He, Senior Veterinary Officer, International Strategy and Regionalisation

Project date and budget: 2023-25: \$194,113

[Final report available](#)

Engagement in international standard setting (ISS) is a critical component of Australia's biosecurity system, underpinning agricultural productivity and enabling safe trade and market access through science-based biosecurity risk management.

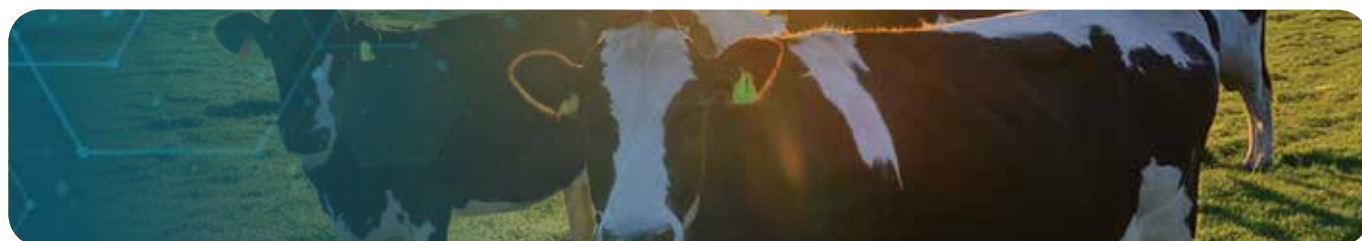
The Australian Government invests in ISS and global animal health policy and program activities through the World Organisation for Animal Health (WOAH). This project assessed the value of that investment by examining Australia's involvement in WOAH's 2018-2023 revision of BSE standards. It was found that without effective engagement, there was potential Australia would lose its official risk status, putting more than AUD \$15 billion of annual export income at stake. The Australian government's funding of engagement ensured Australia's scientific positions were robustly represented, resulting in the retention of its official status under the revised standards.

The project adopted a mixed-methods approach, combining a qualitative analysis of stakeholder interviews with quantitative analysis of the potential financial impacts on the Australian livestock and rendering industries from several hypothetical, yet plausible, negative scenarios.

Australia's engagement in ISS through WOAH proved critical in safeguarding national biosecurity and trade interests. Included in the findings are that:

- WOAH's democratic processes effectively deliver science-based standards that reduce sanitary risks while avoiding unnecessary trade barriers.
- The Australian Government's funding of its engagement with WOAH enabled it to deliver science-based positions, international partnerships, and research and industry collaboration necessary to help prevent a revision to WOAH's BSE standards that would have been highly unfavourable to Australia's agriculture trade and production practices.

This project was showcased in the [September 2025 CEBRAnar](#), reinforcing the importance of sustained engagement in ISS.



23C: Developing a comprehensive approach to consequence estimation

24C: Estimating pest/disease consequence to agriculture: a system-wide review

Project leads: Chris Baker and Tom Kompas

Sponsor: Sam Wells, Assistant Secretary, Risk, Intelligence and Strategy

DAFF lead: Pip Griffin, Director, Biosecurity System Modelling

Project date and budget: 2023-25: \$462,993

[23C Final report available](#)

[24C Final report available](#)

Consequence estimates — robust, evidence-backed assessments of the potential impact of the establishment and spread of pests and diseases — are essential for valuing Australia's biosecurity system and guiding investment decisions.

As part of project 23C, *Developing a comprehensive approach to consequence estimation*, the original list of functional pest groups from 2020 was updated by shifting from a functional group approach to a species-specific focus and incorporating parameter inputs for 12 new pests, particularly those with significant environmental impacts. This project, highlighted in the [October 2024 CEBRAnar](#), delivered a partial update to the CEBRA Value Model, focusing on environmental consequence estimation and a case study on non-market impacts of myrtle rust, resulting in a revised net present value of Australia's biosecurity system at AUD \$381 billion, an increase from the 2020 estimate of AUD \$347 billion.

New pests and diseases

Based on various national priority pest lists and the feedback from DAFF and DCCEEW subject matter experts, we added new individual pests and diseases, including more pests of environmental concern:

- | New pests and diseases |
|--|
| 1 Brown marmorated stink bug |
| 2 Myrtle rust (exotic strains) |
| 3 Didymo |
| 4 Karnal bunt |
| 5 Grape phylloxera |
| 6 Xylella and its vectors |
| 7 Asian honeybee |
| 8 Huanglongbing/citrus green, Psyllids |
| 9 Spotting wing drosophila |
| 10 Polyphagous shot hole borer |
| 11 Lumpy skin disease |
| 12 Boa constrictor |



Grape phylloxera.
Beatriz Moisset, Wikimedia Commons



Didymo covered rock.
Biosecurity New Zealand, DAFF

Work completed under 24C, *Estimating pest/disease consequence to agriculture: a system-wide review*, built on 23C, updating the agricultural impact on 23C, estimates for the 35 key pests retained from the original list of pest functional groups and documenting data sources and processes to ensure future updates are systematic and reliable, strengthening preparedness against emerging threats. This project represented the most comprehensive update to pest parameter estimates for the Value Model to date.

Together, these updates enable more precise modelling to improve evidence-based biosecurity planning and investment. Beyond immediate benefits, the documented processes establish a framework for ongoing updates, ensuring the system remains responsive to emerging threats and future challenges.

24B: Value of pre-border capacity building

Project leads: Tom Kompas, Anca Hanea and Lu-Yi Wang

Sponsor: Sam Hamilton, Deputy Chief Veterinary Officer

DAFF lead: Tiffanie Huynh, Program Manager, Office of the Deputy Chief Veterinary Officer

Theme: System enhancements

Project date and budget: 2024-25: \$180,000

Final report awaiting approval

This project developed a structured, comprehensive framework to improve strategic planning and investment in Australia's pre-border biosecurity by assessing and monitoring the effectiveness of such investments. Using a case study approach, the framework was refined and validated to quantify benefits, compare 'what-if' scenarios, and classify impacts across economic, environmental, societal, and cultural domains, both within the involved countries, and in Australia. A mixed-methods approach combined quantitative analysis (such as economic and statistical data) with qualitative insights to capture both measurable outcomes and the often intangible but crucial benefits, including relationship-building, trust development, and contributions to in-country wellbeing.

Findings from the case studies demonstrated that DAFF's pre-border investments are not only cost-effective but also strategically valuable in reducing outbreak risks and enhancing regional capacity. This research was showcased in the [July 2025 CEBRAnar](#), highlighting the importance for long-term investment strategies and interdisciplinary approaches to fully capture the value of proactive biosecurity interventions.



MPI New Zealand projects

21L: Streamlining the risk analysis process

Project lead: Tim van Gelder

Sponsor: Michael Ormsby, Principal Adviser, Biosecurity New Zealand

MPI New Zealand lead: Michael Ormsby, Principal Adviser, Biosecurity New Zealand

Project date and budget: 2021-22: NZD \$100,000

[Final report available](#)

Import risk analyses assess the risks posed by pests or diseases associated with commodities a country might import but developing them takes considerable time and resources. Like many similar organisations, MPI faced a backlog of analyses. To address this, CEBRA developed systems and technology to streamline the process of searching, compiling, assessing, and documenting information for risk assessments. The work began with a survey of biosecurity analysts and managers at MPI and DAFF to understand current practices and identify opportunities for improvement.

MPI implemented project recommendations, testing revised risk assessment delivery on avocado nursery stock and hops tissue culture. MPI reports that the time to complete full risk assessments has fallen from approximately 77 hours to 50 hours, with further reductions to 20-30 hours expected as experience grows.

This project demonstrated significant efficiency gains from employing technology to streamline the development of risk analyses. With the rapid development of generative AI systems, future efforts will focus on integrating these tools to complement existing systems and further accelerate delivery.

21M: The Health and Value of the New Zealand Biosecurity System

Project lead: Tom Kompas and Julia Polak

Sponsor: Peter Thomson, Chief Biosecurity Officer, MPI

MPI New Zealand lead: Michael Ormsby, Principal Adviser, Biosecurity New Zealand

Project date and budget: 2021-25: NZD \$1,330,000

Final reports are awaiting approval

This project applied a systematic, bio-economic simulation approach to estimate the value protected by New Zealand's biosecurity system, drawing from the influential CEBRA Value Model developed for Australia. It assessed the values of 14 major terrestrial asset groups of biological, ecological, social and economic importance and identified 39 terrestrial pests and diseases (hereafter 'hazards') of economic concern to New Zealand. A spatially explicit simulation model was constructed to analyse the arrival, spread, and effects of these hazards on the selected asset groups over time.

Final valuation results will be released by MPI in due course. In addition, the project developed the ValueMAX model, designed to answer the critical question: *where should new investment be directed to achieve the highest return?* The model evaluates which biosecurity measures - such as pre-border, border, and post-border interventions - and which hazards should be prioritised to maximise impact and efficiency. This project and its outputs are central to ensuring appropriate resource allocation for the biosecurity system that protects New Zealand's primary industries, native biodiversity, and economic growth.

Statement on 24A - Better and faster: learning from risk assessment methods and approaches in other fields

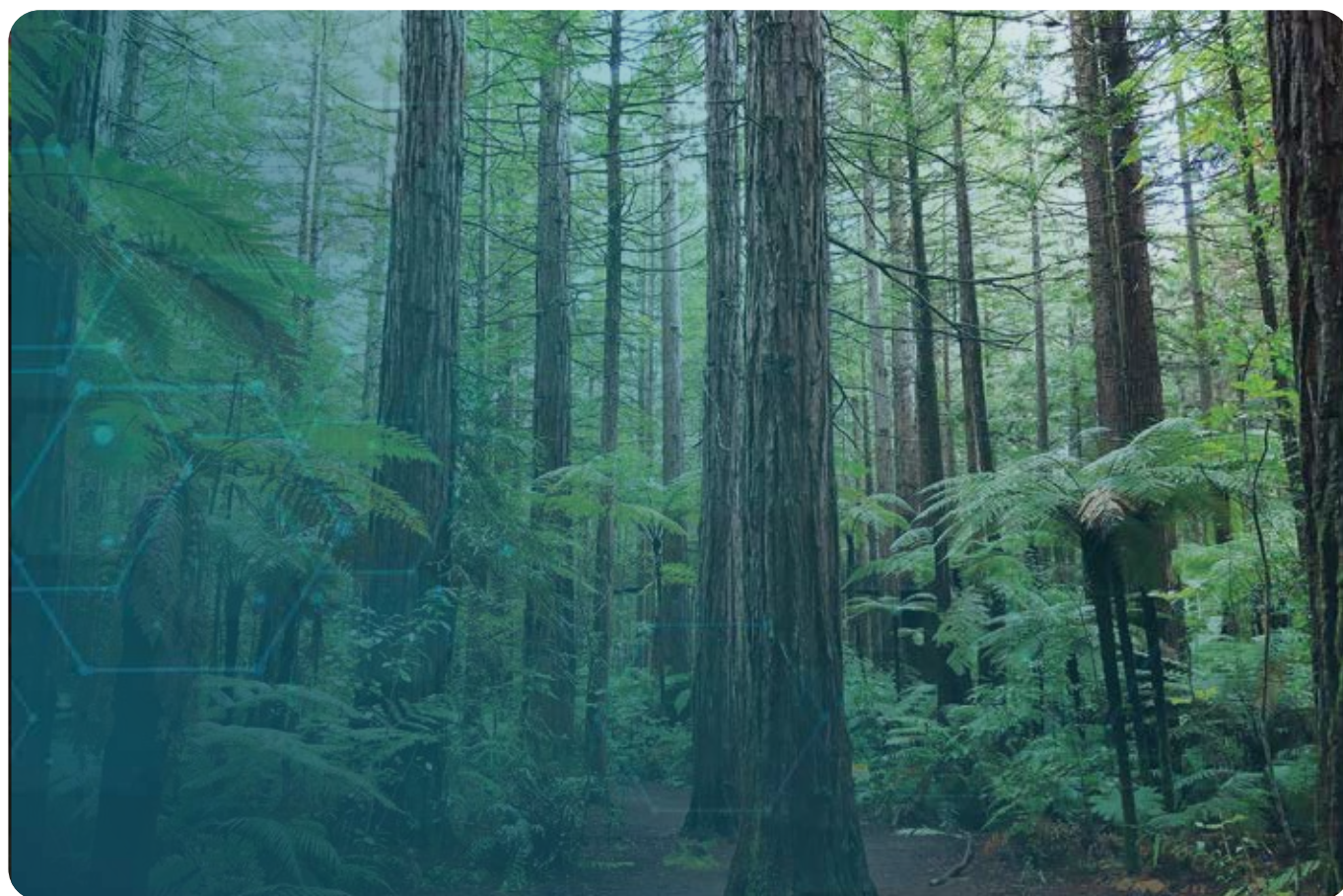
After joint consideration, and noting project complexities, DAFF and CEBRA mutually agreed not to proceed with endorsement of the Final Report for project 24A. Draft findings from the project will be used internally by both organisations to inform relevant future work. The project is now closed and no report or summary will be published.

Evaluation

Each project proposal specifies desired outcomes and impacts along with project-specific metrics and evaluation measures for assessing success. Projects are evaluated once completed, to determine the path to achieving impact, and whether early adoption and implementation of the project's recommendations has taken place.

Biosecurity systems are complex, and knowledge developed by an outside party such as CEBRA may take time to become adopted as 'business as usual' in agency processes. Uptake of research outcomes, however, will lead to measurable improvements in the efficiency of biosecurity systems and their activities following adoption.

The impact of the projects highlighted in this report shows that CEBRA's rigorous research delivers tangible improvements in decision-making and the effectiveness of biosecurity policies and practices.



Additional activities

Non-Deed project highlights and impact

AADIS: The impact of Australian Animal Disease Spread (AADIS) Modelling

The AADIS model was first developed between 2012 and 2015 through a PhD project undertaken by Richard Bradhurst, working closely with DAFF.

The original model focused on FMD and has since evolved to cover other high-priority diseases. Current projects are extending AADIS decision support tools to include high pathogenicity avian influenza and Japanese encephalitis.

Beyond Australia, the AADIS framework has been adapted internationally. In Europe it underpins the EuFMDiS platform for modelling of transboundary diseases and the model core has been adopted by animal health authorities in over 20 countries. These adaptations have expanded its application to diseases such as classical swine fever, *Mycoplasma bovis* (*M. bovis*), peste des petits ruminants, and sheep/goat pox. By incorporating the dynamics of feral pigs through Deed project 23F, *Assessing the potential role of feral pigs in an outbreak of foot-and-mouth disease in Australia*, AADIS also supports other countries facing similar challenges with wild boar and livestock interactions.



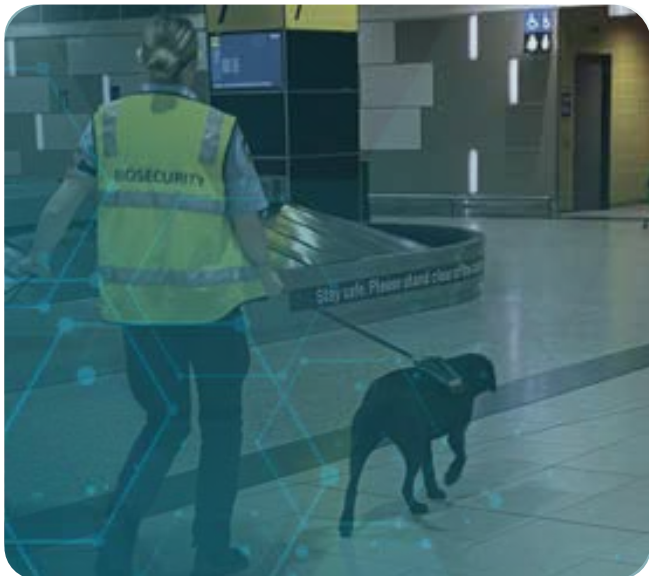
Over the years, AADIS has been used to model invasive species, insect-borne disease-spread, and disease in wild populations. A collaboration with Murdoch Children's Research Institute and the Peter Doherty Institute for Infection and Immunity added new capability to model the spread of human disease and experiment with vaccination strategies. This cross-sector adaptability demonstrates the model's versatility across animal, environmental and human health domains.

From humble beginnings, AADIS continues to evolve incorporating new data and methods to strengthen both Australian and global preparedness. Find out more through [multiple CEBRAnars](#) or visit aadis.org.



Biosecurity Tasmania

Domestic border interventions are a key strategy used by Biosecurity Tasmania to manage the introduction risks of invasive species from the mainland. Measures include detector dogs screening incoming air passengers, inspections of fresh fruit and produce for fruit flies, and biosecurity officer checks of cruise and ferry passengers. These activities, and others, protect Tasmania's unique environment and economy from mainland biosecurity threats.



CEBRA partnered with Biosecurity Tasmania to evaluate the efficiency of such border intervention activities and recommend statistically valid and trade-defensible inspection procedures. The project applied biosecurity risk analysis using mathematical modelling and structured expert judgement to assess the benefits of – and identify potential improvements to – domestic border interventions. Four pathways were considered (air, cruise, ferry passengers and fresh produce) with a focus on five high-risk pests: Queensland fruit fly, Mediterranean fruit fly, Varroa mite, tomato potato psyllid, and grape phylloxera.

The findings, published in the journal [NeoBiota](#), revealed that air passengers pose a significant biosecurity risk, often carrying undeclared fruits, vegetables, and animal products which can harbour pest and disease. To combat this risk, border interventions using biosecurity inspectors and detector dogs were found to be highly effective, both by encouraging voluntary declarations by passengers and detecting risk items that passengers failed to declare.

Detector dogs are especially effective, detecting a higher rate of risk items and substantially increasing interception rates, including for items linked to the spread of the invasive fruit fly.

The project's recommendations were cited in a recent [biosecurity budget boost](#) announced by the Tasmanian Government, with researchers providing ongoing guidance as they start implementing CEBRA's recommendations.

Australian Centre for International Agricultural Research (ACIAR)

CEBRA, in collaboration with the Centre for Environmental and Economic Research (CEER), partnered closely with the Australian Centre for International Agricultural Research (ACIAR) to value its contribution to biosecurity in Australia and overseas.

This work established a robust methodology for evaluating ACIAR's activities in the Indo-Pacific region, focusing on enhancing biosecurity, improving food security, and adapting to the challenges of global warming. This initiative has laid the foundation for an enduring relationship between CEBRA and ACIAR to advance its biosecurity measures.

ACIAR has been a pioneer in biosecurity related research and capacity building in Australia and overseas since the 1980s. As part of this project, the team designed a draft methodology for ex-post impact evaluation, enabling retrospective analysis to ACIAR's biosecurity related portfolio. Results from the first case study on ACIAR's investment on mango crops in the Philippines and Australia was showcased in the [September 2024 CEBRAnar](#).

In another project, CEBRA is evaluating ACIAR's investment in biosecurity measures in the Asia-Pacific region to mitigate escalating risks in Australia's regional neighbourhood. Using CEBRA's established 'portfolio allocation' methodology, the evaluation measures the effectiveness and return on investment of ACIAR's biosecurity expenditures. The ultimate goal: identify the most strategic pre-border biosecurity investments to deliver maximum impact and returns on investment.

Biosecurity Commons

Biosecurity Commons is transforming Australia's biosecurity landscape. This cloud-based decision-support platform delivers powerful tools for modelling and analysing biosecurity risk and response – closing a critical infrastructure gap that has long hindered coordinated action.

Historically, governments and industry have often worked in silos to answer critical biosecurity questions: *Where should surveillance occur? How much is enough? When can an area be declared pest-free?*

As global trade and human movement accelerate, biosecurity regulators face the growing threats of new pests and diseases with limited resources, making smarter and more efficient approaches essential. Leveraging data and advanced analytics to prioritise surveillance and border screening is key to this transformation. Biosecurity Commons delivers exactly that - it provides standardised, shareable, and user-friendly tools that enable collaborative, data-driven decisions.

Since launching in 2023, Biosecurity Commons is emerging as a critical piece of infrastructure for Australia's national approach to biosecurity - informing policies, guiding operational decisions, and connecting key biosecurity stakeholders across government and industry.

The project is a joint initiative between CEBRA, the Australian and Queensland Governments, the Australian Research Data Commons (ARDC), Griffith University, EcoCommons Australia, and the CSIRO-hosted Atlas of Living Australia. In 2024, additional funds were secured from the ARDC, AUSVEG and Forest & Wood Products Australia (FWPA) to further accelerate development and expand its impact.

Find out more at biosecuritycommons.org.au



Non-Deed projects summary

CEBRA participated in the following grants and consultancy projects during the period of 1 July 2021 to 30 June 2025. Being involved in these projects expands CEBRA's knowledge and skill base, enhances engagement and build important relationships. The total budget for all the non-deed projects is \$14.8m.

Client/Project	Start	Duration
Cawthron Institute Trust Board	Nov-19	36 months
Aquatic Health Research Programme - Aquaculture health strategies to maximise productivity and security COMPLETED		
Australian Research Data Commons (ARDC)	Jan-21	2.5 years
Biosecurity Commons – cofounded by the ARDC, DAWE and Queensland Department of Agriculture, Water and Fisheries (QDAF) COMPLETED		
Victorian, Department of Environment, Land, Water and Planning (DELWP) & Victorian Marine and Coastal Council	Mar-21	7+ months
The economics of damages and the cost of adapting Victorian coastal communities to climate impacts The project focuses on the costs of projected damage from sea level rise and storm surge on coastal communities and coastal assets, and the relative costs of investment in adaptation measures for selected cases to mitigate that damage. COMPLETED		
NSW Dept. of Primary Industries – NSW Food Authority	Apr-21	14 months
Development of a Risk Estimation Tool, Fast Cost Benefit Analysis, and Consequence Measures to Manage Biosecurity and Food Safety Provides both an Excel and MATLAB tool to allow NSW BFS to estimate the risk of a pest incursion, conduct a cost-benefit analysis and establish sound consequence measures for a potential incursion. COMPLETED		
DAWE - Biosecurity Operations Division	Jun-21	6 months
21H: CBIS and HCI: an unholy union – research and analysis to evaluate an instance-based compliance-based inspection (CBIS) scheme Evaluate a more efficient way to implement CBIS within the department. Enhances impact of earlier CEBRA work. COMPLETED		
Queensland Cyber Infrastructure Foundation (QCIF)	Jun-21	8 months
EcoCommons - Development of infrastructure to host key biosecurity software, including outcomes from CEBRA projects COMPLETED		

Client/Project	Start	Duration
Dept. of Primary Industries and Regions (PIRSA), South Australian Research & Development Institute (SARDI)	Jun-21	6 months
Fruit Fly modelling Designed to assist PIRSA in developing an enhanced fruit fly risk management risk framework. Our contribution highlights the need for appropriate risk mapping and pathway analysis, suitable spread modelling of an incursion and optimal trapping programs. COMPLETED		
New Zealand's SCION	Jul-21	25 months
Climate Change - Trade and Biosecurity Analyses the potential impact of climate change on New Zealand and resulting changes in pest pathways through changes in international trade from the impacts of global warming. COMPLETED		
New Zealand's Ministry for Primary Industries	Aug-21	17 months (extended)
21Q: <i>M. bovis</i> predictive modelling Enhance the AADIS model for application to testing surveillance regimes for use by MPI upon <i>M. bovis</i> . Supports MPI in finalising world-first eradication of <i>M. bovis</i> . COMPLETED		
DAWE/DAFF - Biosecurity Operations Division	Oct-21	12 months (extended)
21N: Air cargo (non-commercial) assurance program survey models C07276 design endpoint / leakage survey to enable more efficient risk management in non-commercial air cargo. COMPLETED		
DAWE	Sep-21	10 months
Extend the scope of the AADIS-African Swine Fever model from a regional Queensland model to a national scale Australian model. Enhance the AADIS model to enable national-level simulation of African Swine Fever incursion scenarios, informing surveillance and post-detection responses. COMPLETED		
DAWE - Biosecurity Strategy and Reform Division	Sep-21	6 weeks
21P: Strategic research priorities Develop research project ideas for future funding. Identifies important gaps in existing research investment. COMPLETED		
ARC Discovery	Nov-21	48 months
Nature futures: mapping pathways to prosperity for people and nature (DP210103460) Utilising a novel modelling framework and high-performance computing we integrated economic, land use and biodiversity models to evaluate: (i) policies and incentives for increasing national vegetation cover for carbon sequestration and habitat, and (ii) global risks to nature posed by land use change under future geopolitical scenarios. COMPLETED		

Client/Project	Start	Duration
ARC Discovery	Jan-22	48 months
Is climate change altering the carrying capacity of the world's forests? (DP220103711) Planting trees at a global scale has been proposed as a key strategy to reduce global atmospheric CO2 levels. However, changing climatic conditions threaten the ability of forests to be net CO2 absorbers. In a warmer and drier future, forests may not be able to support as many trees. This project aims to identify how climate will alter forest carrying capacity across millions of hectares of the world's forests. By combining recent advances in forest modelling with large-scale and long-term forest inventory data, the project will develop a novel framework to forecast forest dynamics under climate change. It will provide specific guidelines to inform global reforestation strategies and foster climate-smart forest management.		
ARC Discovery	Jan-22	48 months
Remote sensing of biotic stress with hyperspectral-fluorescence imaging (DP220101495) This project aims to investigate new indicators of crop biotic stress using innovative airborne remote sensing and imaging spectroscopy for biosecurity applications. Current satellites used to monitor crops and forests do not meet the spectral and spatial details that are required for the early -previsual- detection of biotic and abiotic stress. Accordingly, this project's significance focuses on new insights to detect the alteration of photosynthetic indicators of plant functioning, building on recent breakthroughs with airborne hyperspectral imaging and remote sensing technologies. The outcomes will provide significant benefits to Australia in the detection of harmful diseases and improved water and nutrient monitoring methods.		
DAWE	Feb-22	4 months
Sea cargo postcode classification review Develop algorithms for risk-based classification of domestic locations to enhance management of the biosecurity risk presented by shipping containers. COMPLETED		
DAWE/DAFF	Feb-22	7 months
22A: Sea cargo postcode classification review C08809 Develop algorithms for risk-based classification of domestic locations to enhance management of the biosecurity risk presented by shipping containers. COMPLETED		
ACIAR	Mar-22	8 months (extended)
Valuing the contribution of ACIAR to biosecurity in Australia and Overseas Establishes a methodology to evaluate ACIAR's activity in the Indo Pacific region in terms to enhanced biosecurity, food security and adapting to the impacts of global warming. Will help establish an ongoing relationship with ACIAR and assist with their biosecurity measures. COMPLETED		
Defence	Mar-22	3 months
Attack path risk resolution - Structured expert judgment for Defence Posture (Posture Review Elicitation) Strategic risk: assist Defence in assessing the effects of actions upon risk. This project enhances CEBRA's national reputation and provides insight into new ways to think about risk management. These projects follow from an established relationship. COMPLETED		

Client/Project	Start	Duration
ACIAR	Mar-22	5 months
Valuing the contribution of ACIAR to biosecurity in Australia and Overseas Establishes a methodology to evaluate ACIAR's activity in the Indo Pacific region in terms to enhanced biosecurity, food security and adapting to the impacts of global warming. Will help establish an ongoing relationship with ACIAR and assist with their biosecurity measures. COMPLETED		
DAWE/DAFF	Apr-22	13 months (extended)
22B: Increase the efficiency and transparency of biosecurity risk management of sea containers and their cargoes C09476 Increase the efficiency and transparency of biosecurity risk management of sea containers and their cargoes by identifying appropriate intervention rates, providing a sustainable balance between heightened measures targeted to the highest risk pathway and reduced or streamlined measures for compliant/lower risk pathways. COMPLETED		
DAWE	Apr-22	15 months
Extend AADIS-ASF model incorporating indirect transmission C08655 Enhance the AADIS model to include indirect transmission of ASF associated with vehicles transporting pigs to and from abattoirs, improved tracking and reporting of infected animals going to non-farm destinations such as abattoirs and export facilities and expanded surveillance and control options for feral pigs to better align with AUS-VETPLAN. COMPLETED		
DAWE	Apr-22	8 months
22B: Increase the efficiency and transparency of biosecurity risk management of sea containers and their cargoes C09476 Increase the efficiency and transparency of biosecurity risk management of sea containers and their cargoes by identifying appropriate intervention rates, providing a sustainable balance between heightened measures targeted to the highest risk pathway and reduced or streamlined measures for compliant/lower risk pathways. COMPLETED		
Australian Pork Limited	Apr-22	Dec-24
Camera trap assessment of feral pigs; Understanding feral – domestic pig interactions The proximity of feral pigs to domestic piggeries presents a strong potential for transmission of exotic disease such as African swine fever (ASF) and foot-and-mouth disease (FMD), as well as endemic diseases of concern. There is limited Australian data on contact rates and the likelihood of disease transmission between feral pigs and domestic pigs. A directed study is required to better understand the direct and indirect interactions between feral pigs and domestic pigs that could lead to disease transmission. COMPLETED		
DAWE	May-22	1 month
FMD outbreak risk update In 2021, CEBRA undertook an SEJ exercise to estimate the probability of one of four potential animal-health outbreak scenarios within the next five years, namely foot-and-mouth disease, African horse sickness, African swine fever, and lumpy skin disease. This project used a short SEJ exercise to update the estimate for foot-and-mouth disease. COMPLETED		

Client/Project	Start	Duration
Zespri	Jul-22	
System-level surveillance for kiwifruit producers Support New Zealand kiwi fruit growers by developing a system-level surveillance system that focuses on supply chains and threat vectors. COMPLETED		
Biosecurity Tasmania	Sep-22	
21O: Review of border processes Strategic biosecurity risk: support Biosecurity Tasmania by assessing the policy and practice of border intervention across five key pathways. Outcomes will enhance CEBRA's impact among biosecurity system stakeholders. Learnings will prove valuable for other jurisdictions. COMPLETED		
DAFF	Sep-22	
Modelling the spread and control of lumpy skin disease (LSD) in Australia This project will adapt the AADIS model to simulate the spread and control of LSD in Australia to better understand the conditions under which LSD may, or may not, spread and establish in Australia. Additionally, AADIS-LSD will compare different control strategies, including vaccination, to assist and better inform LSD response policies and vaccination strategies. COMPLETED		
University of Canterbury	Jan-23	
Cell phone mobility data COMPLETED		
EMCDDA	Feb-23	
PEOPLE The European Monitoring Centre for Drugs and Drug Addiction - Opinion based expert elicitation techniques. COMPLETED		
Plant Health Australia	Mar-23	
Avocado Health - On Farm Biosecurity Economic consequence measures for pests/diseases that may impact the avocado industry. COMPLETED		
City of Melbourne	Mar 23	
Canopy growth modelling using changes in canopy area data The City of Melbourne seeks to use a recently derived dataset of canopy extent through time (a 20-year period) measured for 38,000 individual trees to generate species-specific growth curves. COMPLETED		
USDA	May-23	
Global container risk		

Client/Project	Start	Duration
AgVIC	May-23	2 months
Value of shared responsibility - Economic Analysis – project 1 Supply advice on the economic analysis of shared responsibility initiatives to the Data. Analytics Unit of Agriculture Victoria. COMPLETED		
AgVIC	May-23	
Value of shared responsibility - Methodology Design – project 2 Supply advice on the design of an evaluation methodology for assessing economic value of shared responsibility initiatives. COMPLETED		
Food Standards Australia New Zealand (FSANZ)	Jun-23	3 months
Expert elicitation for the attribution of food commodity/pathogen pairs The project seeks to estimate the attribution of foodborne illness costs to food commodity groups for Australia. The attribution of foodborne costs to food commodity groups is currently only partially understood for Australia. Such information, if available, could be used to prioritise resources for research, monitoring, and surveillance activities as well as standards development. COMPLETED		
Grains Research & Development Corp (GRDC)	Jun-23	Oct-24
Modelling the incursion and spread of hitchhiker and windborne plant pests in Australia Invasive agricultural pests such as khapra beetle, Brown Marmorated Stink Bug (BMSB), and Fall Army worm, pose major threats to Australia's agricultural sector (DAFF, 2022). It is challenging to form overarching surveillance and response policies for exotic agricultural pests given the diversity of species, arrival scenarios, and spread modalities. Models can provide useful decision support through the exploration of incursion points, spread pathways, detection scenarios, and response options, across time and space. COMPLETED		
ACIAR	Jul-23	Feb-25
Valuing the impact of ACIAR biosecurity research to Australia and the region (Stage 2) This is stage 2 of evaluating ACIAR's activity in the Indo Pacific region, in terms to enhanced biosecurity, food security and adapting to the impacts of global warming. COMPLETED		
DAFF	Aug-23	Oct-24
Biosecurity Commons Phase 2 Program stream: Plant Biosecurity Response Reform (PBRR). Development of infrastructure to host key biosecurity software, including outcomes from CEBRA projects. COMPLETED		
AUSVEG/DEECA	Sep-23	Aug-28
Vegetable industry biosecurity		
Environmental Defenders Office (EDO)	Dec-23	Nov-24
Develop a methodology that can adequately account for all values for subsistence lifestyles throughout the Pacific; valuing losses due to climate change and to other types of environmental damage causing impacts to subsistence lifestyles across the Pacific. COMPLETED		

Client/Project	Start	Duration
Sugar Research Australia (SRA)	Jan-24	6 months
Sugar Research Australia area freedom COMPLETED		
Euphresco		
Analyse Euphresco III survey data. COMPLETED		
NSW Department of Primary Industries (DPI)	Mar-24	Jun-27
Models to inform foot-and-mouth disease management in wild host populations in NSW The NSW Department of Primary Industries have funded a project to better understand transmission dynamics of FMD in wild populations and spillover transmission between livestock and feral pigs. While the focus will be FMD in feral pigs, the project will develop methodologies that can extend to other diseases and other wild host populations (such as feral deer and feral goats).		
Forest and Wood Products Australia (FWPA)	Mar-24	Jun-27
Forest and Wood Products Australia Biosecurity Commons project		
DAFF	Apr-24	Sep-24
24F: Cargo Compliance Verification review (CCV) COMPLETED		
PF2050 Ltd	May-24	Dec-25
Risk analysis supporting predator exclusion from Rakiura		
DAFF	May-24	Sep-24
SAC ACCV data analysis. Sea container hygiene scheme review. COMPLETED		
DAFF		Dec-25
UPE and SAC pathway risk management		
ARDC	May-24	May-26
Enhancing models for rapid decision-support in emergency animal disease outbreaks		
NSW Department of Primary Industries (DPI)	Jun-24	5 Years
Models to inform foot-and-mouth disease management in wild host populations in NSW		
ARDC	Jun-24	Jun-26
Biosecurity Commons – Development of infrastructure to host key biosecurity software, including outcomes from CEBRA projects		
GRDC/PIRSA/Adelaide Uni	Oct-24	Oct-25
Slug demographic modelling		
Kansas State University	2024	Sep-26
Modelling the transmission and control of Japanese encephalitis virus in Australia and the United States Assessing the risk of emergence, transmission and establishment of the Japanese Encephalitis virus in the United States.		
DAFF	Jan-25	Jun-25
SEAPEST treatment provider risk rating		
Agrifutures	Apr-25	Sep-27
Alleviating compounding flocking fears: Avian influenza and migratory birds The project will produce an AADIS-HPAI model of the potential spread and control of the H5N1 subtype in the Australian poultry sector.		

Students

CEBRA actively supports students by fostering the development of biosecurity skills and knowledge, building a strong foundation for future biosecurity leaders.

CEBRA supervised the following students during this Agreement period:

PhD students

Evelyn Mannix

Supervisors: Howard Bondell, Liam Hodgkinson, Andrew Robinson

Title: Robust computer vision through a directional framework

Vito Avakumović

Supervisors: Tom Kompas, Hermann Held, James Camac

Title: Towards an integration of global warming-induced impacts in cost-risk analysis

Gouri Mondal

Supervisors: Tom Kompas, James Camac

Title: Assessing extreme poverty reduction approaches: the case of the 'Graduation Approach' in Bangladesh fisheries

Olaolu Joseph Odewole

Supervisors: Andrew Robinson, Sarah Sapsford, Raphael Trouvé

Title: Modelling forest dynamics and tipping points under varying degrees of invasive species impact

Madalene Oberin

Supervisors: Simon Firestone (Melbourne Veterinary School), Mark Stevenson (Melbourne Veterinary School), Richard Bradhurst, and Victoria Brookes (University of Sydney)

Title: A camera trap study of feral pigs to better understand the risk of transmission of ASF between feral and domestic pigs

Erik Alonso Brust

Supervisors: James Camac, Emma Hudgins

Title: Biosecurity assessment of a novel industry: Insects as food and feed

Christine Li

Supervisors: Tom Kompas, James Camac, Ary Hoffmann

Title: Sustainable intensification of agriculture: understanding the potential and limitations of crop diversification strategies

Iris Hickman

Supervisors: James Camac, Peter Vesk and John Morgan

Title: Predicting vegetation dynamics and shrub encroachment in the Australian Alps: Integrating long-term field data, experimental data, and climate change projections

Masters Students

Iris Hickman

Supervisors: John Morgan, Susanna Venn, James Camac, Richard Williams

Title: Assessing long-term vegetation change on alpine summits to global drivers of change

Ezra Janetzki

Supervisors: Peter Vesk, James Camac

Title: Multi-species models of eucalypt survival rates and resprouting vigour following high severity fire in East Gippsland

Hannah Mikkelsen

Supervisors: Peter Vesk, James Camac

Title: Modelling canopy growth of trees in Melbourne's urban forest: do species traits explain variation?

Catherine Tharle

Supervisor: Richard Bradhurst, Simon Firestone (Melbourne Veterinary School) and Mark Stevenson (Melbourne Veterinary School)

Title: Modelling the spread of African swine fever in feral pig groups in Australia and the potential role of infectious carcass transmission

Visiting PhD students

David Chitan

Institution: University of Stavanger, Norway

Supervisors: Reidar Brumer Bratvold and Remus Hanea

Title: Structuring decision models

Kieran Drury

Institution: University of Warwick, UK

Supervisors: Martine Barons and Jim Smith

Title: Bayesian network modelling through expert judgement elicitation for decision support

Interns

Lin Naing

Supervisor: Richard Bradhurst

Co-supervised students

CEBRA staff co-supervised these students from other institutions during this Agreement period:

Trien Tran

(PhD; University of New England, Australia)

Supervisors: Fareed Ud Din, Ljiljana Brankovic, Susan Hester (UniMelb and Adjunct at UNE), Cesar Sanin

Title: Image classification of medicinal plants in Vietnam: A deep learning approach using crowd-sourced data from a newly developed Android app

Bodille Blomaard

(MSc; Delft University of Technology)

Supervisors: Tina Nane (TU Delft) and Anca Hanea

Title: Approaches to Reduce Expert Burden in Bayesian Network Parameterization

Communications and Engagement

Overview



137

Number of
publications



29

Number of
CEBRAnars



226+

Presentations,
workshops,
conferences
and other
engagements



32

Media
engagements



195

Number of
paperback and
hardbacks sold
of CEBRA book



385

Number of
ebook
downloads of
CEBRA book



7

Number of
newsletters



4

Number of
pursuit
articles



4

Number of
Conversation
articles



1

CEBRA
brochure
produced

Publications

As a leading research centre of excellence, CEBRA is dedicated to sharing its research findings through peer-reviewed research papers.

Across 2021-25, CEBRA staff published over 137 peer-reviewed publications, with all publications listed via our [searchable database](#). This ensures our contributions are accessible and subject to rigorous scrutiny by the academic community and a wide range of interested parties. In many cases, CEBRA outputs have underpinned the actionable advice and tools provided to stakeholders. This includes the following examples:

- The [National Climate Risk Assessment](#) and [The Commonwealth Treasury Intergenerational Report](#) highlighted measures of heat stress impacts in terms of losses in labour and agricultural productivity with global warming. These insights were drawn directly from CEBRA's 'Biosecurity risk from changes in climate, trade and pest and disease pathways' project.
- CEBRA undertook project evaluation work for ACIAR, assessing investments in pre-border biosecurity measures in Indonesia and the Philippines. This work provided valuable insights into the impact of these projects and helped inform decisions about where regional investment could deliver the greatest value. The evaluations focused on plant pests affecting mangoes in the Philippines, and on Highly Pathogenic Avian Influenza (HPAI), FMD and Classical Swine Fever in Eastern Indonesia, including their potential pathways to Australia. Findings from the work, particularly on the returns from project investment, were reported and discussed at Senate Estimates.
- Work by the CEER and CEBRA on the impacts of sea level rise and storm surge from global warming in Victoria across 88 land use classifications, including predicted agricultural losses, is being used by the Victorian government, the Victorian Marine and Coastal Council, and, especially so, by several local councils in Victoria for planning and possible adaptation measures.

AADIS impact:

- The AADIS-LSD model was used by DAFF as part of [Exercise Waterhole 2023](#) to simulate potential outbreaks in northern Australia.
- The AADIS-FMD model was used by the [PIRSA](#), Agriculture Victoria, and in various locations in Queensland and New South Wales to simulate an FMD outbreak.
- The AADIS-FMD model was also used to [assess the benefits and costs of a livestock standstill](#) upon detection of an emergency animal disease.
- The AADIS model was adapted to simulate the spread and surveillance of *Mycoplasma bovis* to assist NZMPI to assess the sensitivity of their background surveillance system.

The CEBRA book :

Further demonstrating our commitment to disseminating expertise and building capability, CEBRA published *Biosecurity: A Systems Perspective* in 2024. Directed at both students and biosecurity practitioners, this book introduces the overall features of the biosecurity system and summarises current research and management strategies, significantly enhancing knowledge transfer beyond traditional academic channels. The book is currently being used to teach various biosecurity units at universities and other education institutions in Australia and New Zealand.

Events

CEBRA research is regularly shared and communicated at domestic and international conferences, symposiums, webinars and meetings. Across 2021-25, CEBRA researchers gave presentations in person and online, ran workshops, chaired sessions, and featured on panels at various events including:

2021

- Director of Biosecurity's Science Advisory Panel
- Australian Veterinary Association Conference
- *M. bovis* Science Conference, New Zealand
- National Biosecurity Forum

2022

- 2nd Australian Biosecurity Symposium
- CEBRA Horizon scanning workshop
- Plant Biosecurity Research Initiative Symposium
- SETAC Europe 32nd Annual Meeting, Copenhagen
- ISVEE Conference, Canada
- International Pest Risk Research Group Annual Meeting, Greece
- 1st CEBRA Regional Biosecurity Reference Group meeting
- Australian Agriculture and Resources Society Conference (AARES)
- 8th International Symposium on Environmental and Energy Finance Issues (ISEFI), Paris

2023

- International Conference on Biological Invasions, New Zealand
- International Pest Risk Research Group Annual Meeting, Kenya
- European and Mediterranean Plant Protection Organisation Conference, Switzerland
- National Feral Pig Conference
- The Future of Food: Melbourne's Dean's lecture series
- Visit to the Ministry of Agriculture, Animal and Plant Health Inspection Agency in Taipei, and to the National Chung Hsing University in Taichung, Taiwan
- B3 Conference in New Zealand
- IPPC Workshop on Pest Risk Mitigation of Sea Containers and Cargoes and the Facilitation of International Trade, Brisbane
- 2023 International Conference on Actuarial Science, Quantitative Finance and Risk Management, Beijing
- Presentation at Minnesota Invasive Terrestrial Plants and Pests Center
- Workshop at the USDA in Raleigh

2024

- Society for Risk Analysis ANZ Conference, New Zealand
- Quarantine Regulator's Meeting, Vietnam
- Biosecurity Data and Analytics Working Group Conference, New Zealand
- International Union of Forest Research Organisations World Congress, Sweden
- European Commission for the Control of FMD Open Session, Spain
- 2nd CEBRA Regional Biosecurity Reference Group meeting
- 3rd Australian Biosecurity Symposium
- AARES Conference
- PBRI Symposium
- European Safety and Reliability Conference (ESREL) 2024, Krakow, Poland
- IUFRO World Congress, Stockholm
- ISVEE17, Sydney
- Presentation at Stellenbosch University, South Africa

2025

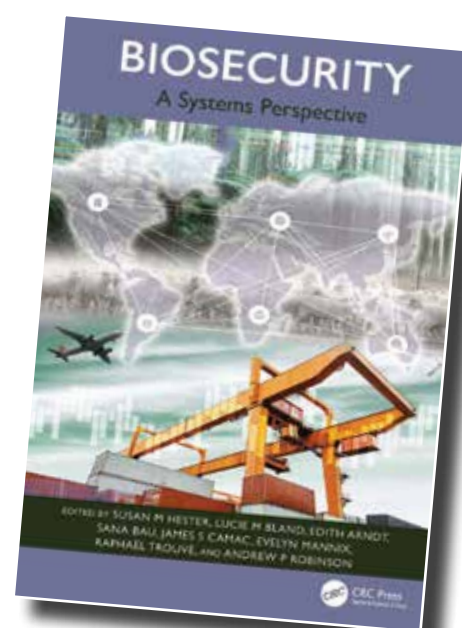
- Society for Risk Analysis ANZ Conference, Melbourne
- Quarantine Regulator's Meeting, Philippines
- National Biosecurity Summit, South Africa
- AARES Conference
- National Feral Pig Conference
- 16th Plant Health Australia (PHA) members forum
- European Safety and Reliability (ESREL) and Society for Risk Analysis Europe (SRA-E) combined conferences in Stavanger, Norway

Highlights

Biosecurity: A Systems Perspective

In July 2024, CEBRA researchers published the highly anticipated book, [*Biosecurity: A Systems Perspective*](#) - the first comprehensive overview of the entire biosecurity continuum in sequence – pre-border, border and post-border – alongside the latest research. Drawing on CEBRA's research expertise, the book incorporates economic and social aspects, as well as varied decision-making contexts, to foster a more systemic approach to biosecurity risk management.

Written in clear, accessible language, the book is designed for a broad audience, including students, biosecurity practitioners and researchers. Its multidisciplinary scope covers statistics, ecology, mathematics, economics, veterinary science, human medicine, and sociology, involving collaborators across government, academia and the private sector.



To date, the book has sold 175 paperbacks, 20 hardbacks and there have been 385 ebook downloads. It has already demonstrated strong international appeal, with nearly half of all sales in the first 12-months post-publication in the UK and Europe (46%), followed by Australia (29%), the US and Canada (24%), and Singapore (1%). Universities worldwide are adopting it as a core resource in their biosecurity-focused courses, reinforcing its role as a global reference for modern biosecurity systems.

2022 Australian Biosecurity Awards

Associate Professor Richard Bradhurst received the Dr Kim Ritman Award for Science and Innovation, which recognises outstanding ambassadors for science and innovation, for his significant contribution to Australian biosecurity through the development of the AADIS model.

Dr James Camac and CEBRA received the Education Award for delivering the graduate course 'Biosecurity: Managing Invasive Species (NRMT90002)' at UoM. The course, which has had more than 240 student enrolments over the past four years, provides a holistic, practical understanding of how Australia's biosecurity system manages risk across pre- border, border and post-border controls and activities.



RIFA public enquiry

Professor Andrew Robinson and Associate Professor Susie Hester spoke at a public hearing, held by the Senate Standing Committee on Rural and Regional Affairs and Transport in Newcastle, on the impact of the red imported fire ant (RIFA) if it were to become widespread in Australia.

Using CEBRA's Value Model, which estimates the financial damages that could result if invasive species establish and spread across Australia, the potential damage caused by RIFA could range from \$40 billion to over \$191 billion in assets over the next 30 years.

At the hearing, CEBRA presented evidence on the cost-saving benefits of community engagement in managing RIFA through passive surveillance, where pest sightings are reported by members of the public. A study conducted by Associate Professor Hester and colleagues showed that between 2006 and 2010, \$1 million invested in public engagement activities for RIFA saved \$60 million in active surveillance costs.



CEBRAnars

CEBRA, in conjunction with DAFF, launched a series of monthly online seminars in 2021 to introduce CEBRA researchers and showcase their research success with the department, MPI and other stakeholders.

This popular and highly successful seminar series has seen 29 CEBRAnars across the last four years and over 10,000 views on the [CEBRA YouTube channel](#).



Project work published in journals

Project title	Journal
Automated image analysis for identifying biofouling risk of vessels - exploring deployment strategies and analysing video footage (21K)	Scientific Reports
Biosecurity risk from changes in climate, trade and pest and disease pathways (21B)	Scientific Reports
Risk analysis of Tasmanian border inspection approaches and procedures (21O)	NeoBiota
Assessing the potential role of feral pigs in an outbreak of foot-and-mouth disease in Australia (23F)	Austral Ecology
A biosecurity risk research portal to inform decision-making (21E)	Journal of the Australian Library and Information Association
Biosecurity risk from changes in climate, trade and pest and disease pathways (21B)	EPPO Bulletin: Special Issue on Climate Change and Pest Risk Analysis
Incentive-compatible biosecurity policies – a framework for regulatory design (21C)	Risk Analysis
Value added – modelling the marginal return on investment within and across pathways (21D)	Methods in Ecology and Evolution

Governance

CEBRA Board

The CEBRA Board provides advice on the operations of the Centre to the CEO on the research and policy framework.

The Board also oversees the application of relevant professional standards, the progress and performance of research and outcomes, the dissemination of knowledge and the promotion of the Centre. The Board is representative of broad-ranging interests.

Chair	
Ms Lindy Hyam	Independent
CEO	
Prof Andrew Robinson	CEBRA, UoM
Core Members	
Ms Sarah Corcoran	PHA
Mr Stu Hutchings	Independent
Prof Therésa Jones	BioSciences, UoM
Mr Terry Charlton ¹	Independent
Prof Jodie McVernon ²	Doherty Institute, UoM
Prof Margaret Mayfield ³	Head of School, BioSciences, UoM
Prof Anna Meredith ⁴	Head of School, Melbourne Veterinary School, UoM
Prof Ute Roessner ⁵	Head of School, BioSciences, UoM
Advisory Members	
Dr Bruce Christie	Chair of the Centre for Invasive Species Solutions
Prof Michael McCarthy	Ecosystem and Forest Sciences, UoM
Prof Ian Robertson	SRP Chair, School of Veterinary Science, Murdoch University
Prof Peter Taylor	Mathematics and Statistics, UoM
DAFF Advisory Members	
Dr Tony Arthur	ABARES
Dr Bertie Hennecke	Chief Environmental Biosecurity Officer
Ms Julia Wells	Biosecurity Strategy and Reform Division
Dr Robyn Cleland ⁶	Chief Environmental Biosecurity Officer
Mr Peter Gooday ⁷	ABARES
Dr Robyn Martin ⁸	Biosecurity Animal Division
MPI New Zealand Advisory Members	
Mr Peter Thompson	Chief Biosecurity Officer, MPI
Dr Michael Ormsby ⁹	Biosecurity New Zealand, MPI

¹ Mr Terry Charlton stepped down from CEBRA Board in August 2023

² Prof Jodie McVernon stepped down from CEBRA Board in February 2025

³ Prof Margaret Mayfield stepped down from CEBRA Board in May 2023

⁴ Prof Anna Meredith stepped down from CEBRA Board in February 2022

⁵ Prof Ute Roessner stepped down from the CEBRA Board in March 2022

⁶ Dr Robyn Cleland stepped down from CEBRA Board in February 2023

⁷ Mr Peter Gooday stepped down from CEBRA Board in August 2023

⁸ Dr Robyn Martin stepped down from CEBRA Board in August 2022

⁹ Dr Michael Ormsby stepped down from CEBRA Board in November 2023

Scientific Review Panel (SRP) Terms of Reference

The SRP reviews and approves all draft project plans and provides an assessment of all final reports.

The role of the SRP is to:

- Assist the CEO in evaluating research proposals based on criteria of:
 - Scientific and practical merit for risk analysis
 - Capacity/capability to deliver; and
 - Budget viability.
- Obtain peer reviews of final reports prior to submission to DAFF or MPI for endorsement.
- Provide relevant advice to researchers conducting CEBRA projects, as requested by the CEO.

The composition of the SRP is:

- Chair: Professor Emeritus Ian Robertson
- A broad group of members covering relevant fields of Environmental, Animal and Plant Sciences, Biosecurity, Mathematical and Social Sciences, Psychology, Philosophy and Statistics.

The responsibilities of SRP members is:

- Chair will seek advice and peer reviews from suitable SRP members and other colleagues on proposals, interim and final reports, as appropriate. Reviews will be forwarded to investigators for their consideration.
- SRP members may be provided with copies of project proposals or interim reports, and may be invited, without obligation, to provide advice to researchers or the SRP.
- Chair will attend CEBRA Board meetings to report on SRP matters.

It is anticipated that most of the business of the SRP will be conducted electronically. Formal meetings may be called at the discretion of the Chair in consultation with the CEO. The SRP is supported by the administrative staff of CEBRA.

Key performance indicators

CEBRA measures activities against a range of key performance indicators to ensure we are on track to achieve our targets. During 2021-25, CEBRA performed strongly across all major measures:



Stakeholder engagement

Stakeholder engagement is important in identifying research, development and extension activities that are expected to benefit Australian and New Zealand biosecurity. It is also crucial for providing strategic advice on biosecurity trends and risks, and identifying priority areas for research investment (including new approaches and technologies).

Engaging with key stakeholders facilitates opportunities for DAFF, MPI, and UoM to contribute in an open, transparent and meaningful way in setting research, development and extension priorities and activities.

Outputs



Research, development and extension activities

CEBRA undertakes a diverse range of research, development and extension activities, including rapid response to critical biosecurity situations, which benefits Australian and New Zealand biosecurity.

CEBRA balances long-term, short-term, high-and low-risk, and strategic and adaptive research activities. This diversity improves efficiency, productivity and innovation for our stakeholders while ensuring capacity to respond rapidly to stakeholder needs.

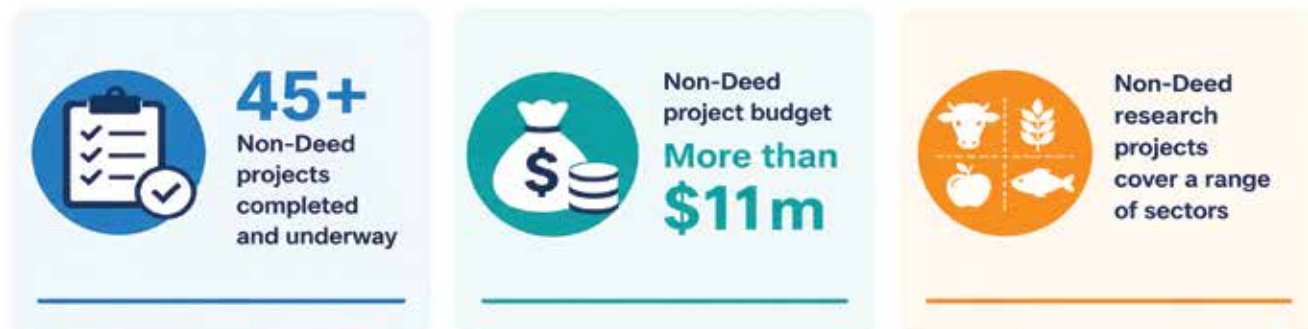
Outputs



Collaboration (non-Deed stakeholder engagement)

CEBRA maintains strategic and sustained collaborations with partners from different industries to address shared challenges and draw on experience from other sectors. This united approach supports transformational breakthroughs across the biosecurity system.

Outputs



Stakeholders:

- **Australian government:** ACIAR, ARC, ARDC, CSIRO, DAFF, Food Standards Australia New Zealand, Australian Aid, Department of Defence
- **State government:** Agriculture Victoria, Victorian DEECA, Victorian Department of Jobs, Skills, Industry and Regions (DJSIR), NSW DPI, PIRSA, Biosecurity Tasmania, Victorian Marine and Coastal Council, QLD DPI, Victorian Department of Environment, Land, Water and Planning, Victorian Department of Jobs, Precincts and Region, NSW DPI Biosecurity and Food Safety
- **Local government:** City of Melbourne
- **Industry:** Animal Health Australia (AHA), APL, AUSVEG, Avocado Health, FWPA, GRDC, PHA, Sugar Research Australia
- **International:** European Food Safety, USDA, Scion New Zealand, Zespri International Limited, Cawthron
- **Non-government organisations:** Environmental Defenders Office (EDO), QCIF
- **Universities:** University of Adelaide, University of Canterbury

Excellence

CEBRA demonstrates excellence in a range of undertakings, domestically and internationally. The Centre is recognised for delivering high-quality research that contributes positively to the scientific culture, capability building and management in biosecurity risk analysis.

Outputs



Governance

CEBRA upholds transparent governance practices, ensuring stakeholders have confidence in its effective operations, clear roles and responsibilities, appropriate management of funds and delivery of outcomes against strategic priorities. CEBRA is responsible for having structures in place to add value, act ethically and responsibly, and provide leadership to industry.

Outputs



Monitoring and evaluation

CEBRA has appropriate procedures to demonstrate the impact of investments, including positive outcomes from research. This is essential to evaluate how CEBRA's activities benefit stakeholders and the Australian community, which can be used to inform and improve future activities that benefit biosecurity and society.

Outputs



Financials

Financial summary

CEBRA is primarily funded by DAFF, MPI, and our host, UoM.

During the period 2021–25, our total income was \$9,408,703, while expenditure totalled \$9,309,975.

Breakdown of expenditure for 1 July 2021 to 30 June 2025

Research projects: **\$6,333,461**

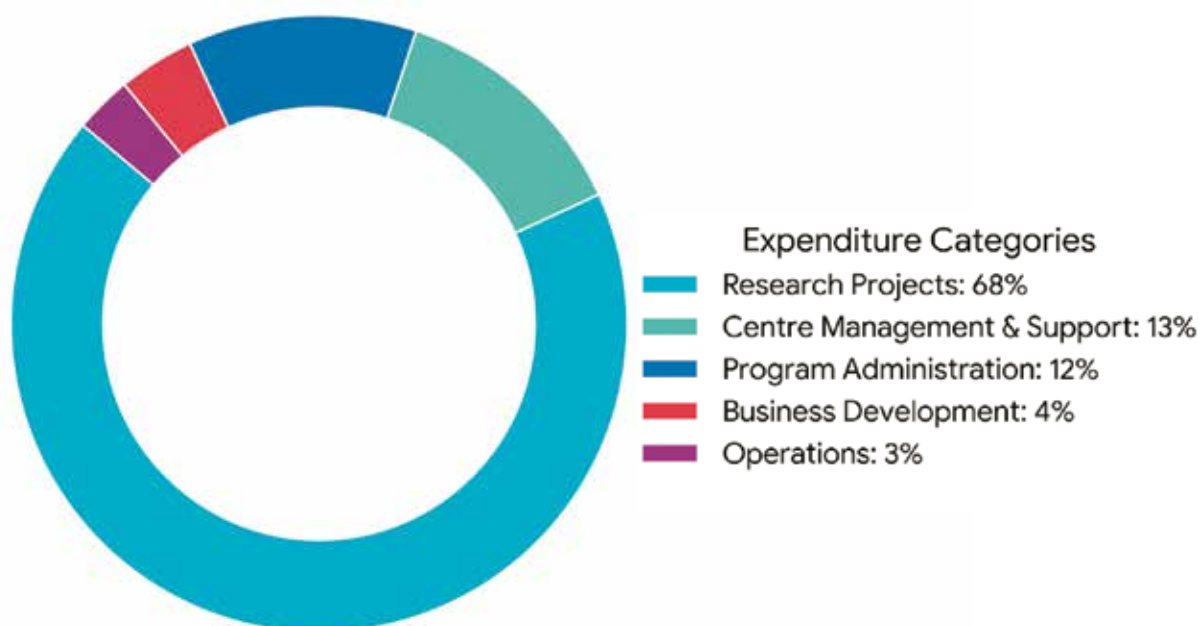
Program administration: **\$1,150,996**

Centre management and support: **\$1,173,323**

Business development: **\$355,766**

Operations: **\$296,429**

CEBRA 2021 - 2025 Expenditure By Category



Non-Deed Institutional grants, contracts and consultancies

CEBRA's important work is recognised and supported by a range of stakeholders and funding bodies. During the period 1-Jul-2021 to 30-Jun-2025, we were awarded a number of grants, contracts and consultancies totalling approximately \$9 million.

This additional non-Deed funding was used for knowledge-building, for the benefit of biosecurity, across Australia, New Zealand and internationally. Our ability to attract this funding indicates the value that many organisations place in CEBRA.

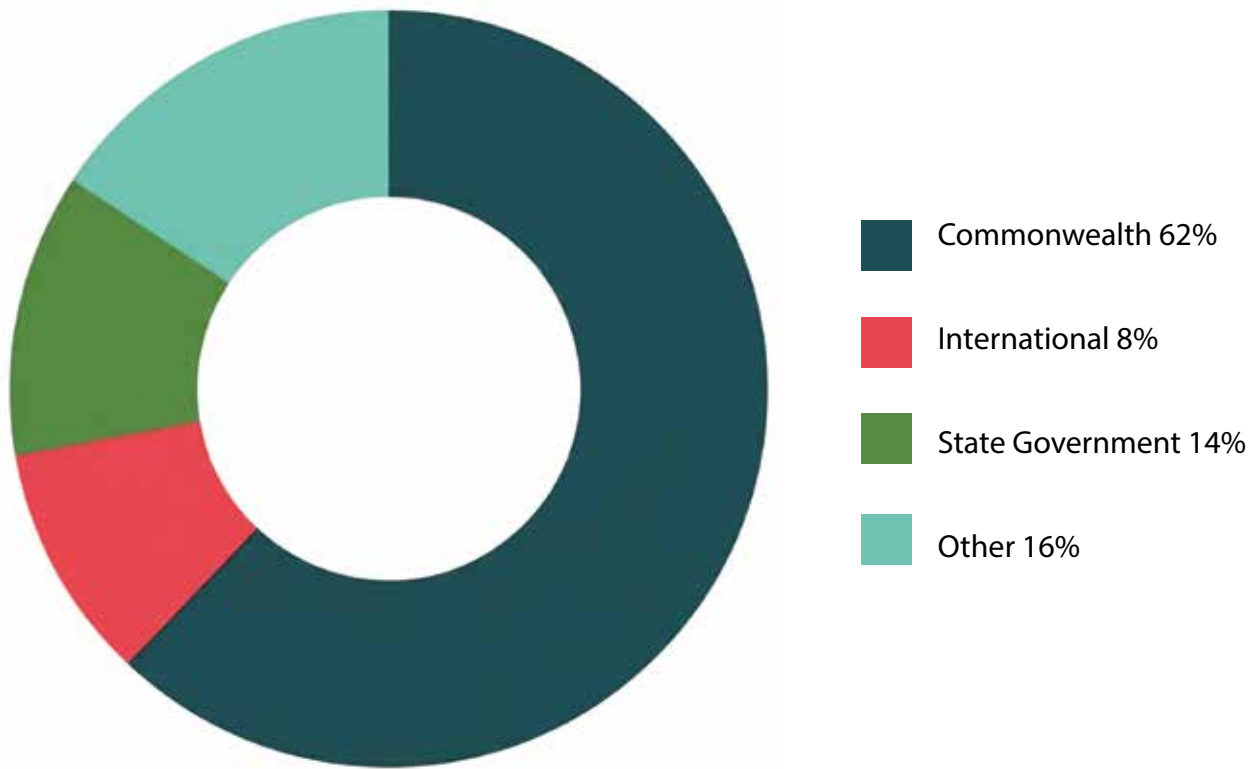


Figure : Non-Deed institutional grants, contracts and consultancies awarded during the period 2021–25

* Funding income is reported on non-Deed research projects and excludes funding provided under the respective DAFF and MPI Deeds of Agreement.



Auditor's Report



INDEPENDENT AUDIT REPORT

TO COMMONWEALTH OF AUSTRALIA - DEPARTMENT OF AGRICULTURE, WATER AND THE ENVIRONMENT (DAWE) IN RELATION TO THE CENTRE OF EXCELLENCE FOR BIOSECURITY RISK ANALYSIS (CEBRA) GRANT PROGRAM

I advise that an audit has been conducted of the Financial Statement and In-kind Support Statement for the Centre of Excellence for Biosecurity Risk Analysis (CEBRA) grant program for the period 1 July 2024 to 30 June 2025.

AUDIT OBJECTIVE

The objective of the audit was to provide an auditor's report in accordance with clause 6.12 of the Grant Agreement dated 25 June 2021. Specifically, this includes forming an opinion on whether the financial reports provided under this clause are true and fair and the University of Melbourne has complied with its obligations to expend grant payments in accordance with the Agreement.

AUDIT SCOPE

The audit was conducted in accordance with Australian Auditing Standards to provide reasonable assurance as to whether the financial statements are free of material misstatement. The audit procedures included an examination, on a test basis, of evidence supporting the amounts in the financial statements. The funds form part of the University's overall accounts, which have been audited and signed off by the Victorian Auditor-General's Office.

The prevention and detection of fraudulent activity is the responsibility of University of Melbourne management. Our audit procedures were conducted with a focus on addressing specific objectives from a control systems design perspective. We did not examine all transactions over the defined review period, and while an outcome of these procedures may be the detection of fraud, this was not the objective of the review. As a consequence, we do not provide a guarantee that all errors or omissions, whether intentional or otherwise were detected.

AUDIT OPINION

In my opinion:

- the University has incurred \$2,318,570.63 expenditure on the Project; and
- the contributions of the University are \$112,500 in cash and \$2,494,441.25 in-kind in accordance with the terms of the Agreement; and
- the project Balance as at 30 June 2025 is \$98,727.24.

The Financial Statement of Income and Expenditure and In-kind Contributions Statement signed by the Chief Executive Officer of the Centre of Excellence for Biosecurity Risk Analysis (CEBRA), in accordance with the Agreement are attached.

LBW CHARTERED ACCOUNTANTS

SRIPATHY SARMA

Principal

Dated: 29th of September 2025



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Outlook

The profound and ongoing impacts of the global COVID-19 pandemic were a defining context in July 2021 when CEBRA commenced this Agreement period. At the time, the pandemic brought into sharp focus the complex issues that are tackled by those who manage biosecurity risks and reminded us of the interconnectedness of people across the globe, via trade and travel. The pandemic's enduring lessons on the critical importance of preparedness, rapid response, and robust biosecurity systems continue to resonate. As the 2021-25 Agreement concluded, international traveller numbers largely recovered to their pre-COVID levels¹, while global supply chains were facing disruptions from geopolitical conflicts and emerging trade policy shifts. And contemporary challenges are no less significant, for example, the robustness and resilience of biosecurity systems are now being tested by the unprecedented global spread of Highly Pathogenic Avian Influenza (HPAI) H5N1, accompanied by the untimely arrivals of FMD and LSD in Indonesia and closer to home, *Varroa destructor* and polyphagous shot-hole borer.

Beyond these immediate pressures, the Australian biosecurity system will continue to be tested by shifts in global trade dynamics, accelerating climate change, urbanisation and population growth — these factors conspire to ensure that threats will arrive at the Australian border in novel and unexpected ways, and our biosecurity system needs to be ready to innovate and adapt.

What factors lie in our favour? Geographical isolation and vast deserts provide some resilience. Beyond them, Artificial Intelligence (AI) presents biosecurity agencies and their collaborators with a significant opportunity to improve capabilities across the biosecurity continuum, informing solutions such as advanced digital passenger card processing, automated surveillance systems, and sophisticated analytical algorithms for risk assessment. Effectively navigating this complex and dynamic landscape will require agile, multidisciplinary, and systemic solutions.

Australia's National Biosecurity Strategy², supported by the National Biosecurity Strategy Action Plan guides the continuous evolution of the national biosecurity system, uniting stakeholders behind a collective vision to enhance its significant capabilities and navigate this challenging environment. Since 2022, the Australian Government has invested over \$2 billion in additional funding to boost biosecurity preparedness and response capabilities nationally. This investment boosts productivity and market access across agricultural, fisheries and forestry sectors and contributes to building momentum toward the shared goal of a \$100 billion industry by 2030.

Safeguarding a national biosecurity system valued at approximately \$314 billion in avoided damages over 50 years is no leisurely undertaking. Our ability to help decision-makers determine how best to maximise investment in biosecurity activities across the system is critical as we navigate an increasingly complex risk environment. Utilising tools like the CEBRA Value Model provides a consistent, credible framework for confident decision-making, supporting proactive responses and ensuring investment decisions are proportionate to risk and aligned with national priorities.

With the contributions of CEBRA 2021-2025 cemented through an audit of our activities, we are looking ahead. A new Agreement between UoM and DAFF is now in place for the period 2025–29. Additionally, our companion arrangement with MPI has been continued. This ensures that CEBRA can continue to provide quality research and excellence in biosecurity risk analysis into the future.

At the time of writing, CEBRA and its forebear have been working with the Australian Government for close to 20 years. In this time, we have become better partners, better scientists, and more passionate about biosecurity and identifying the aspects of biosecurity in which we can have the highest impact. Our goal for the next tranche is to try to develop legacy-setting activities that will influence the carriage of biosecurity to the greatest possible positive extent into the future. We look forward to this outstanding opportunity.

¹ <https://www.abs.gov.au/statistics/industry/tourism-and-transport/overseas-arrivals-and-departures-australia/latest-release>

² [DAFF 2022, National Biosecurity Strategy, Department of Agriculture, Fisheries and Forestry, Canberra, August, CC BY 4.0.](#)



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Australian Government
Department of Agriculture,
Fisheries and Forestry



Ministry for Primary Industries
Manatū Ahu Matua



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