SUBMISSION

Submission to the Department of Agriculture, Fisheries and Forestry

Submission on the National Biosecurity Reforms

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The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together Australia's leading thinkers in applied science, technology and engineering, ATSE provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.

Australia's biosecurity system plays a central role in protecting the country's economy, environment and food systems, providing a comprehensive framework to prevent, detect and respond to pests and diseases. While the system has been designed with a strong focus on border control and primary production, there remain opportunities to strengthen its effectiveness in managing increasingly complex supply chains, evolving production systems and climate-driven risk. Enhancing national biosecurity capability will require improved data integration, stronger coordination across jurisdictions and sectors, and greater alignment with the full agricultural value chain. Strengthening the system will depend on building an interoperable data infrastructure, integrating multidisciplinary expertise and expanding workforce capability. Embedding more inclusive and collaborative approaches, including with Aboriginal and Torres Strait Islander communities, will also be vital. By advancing these reforms and targeting areas of emerging risk and underinvestment, Australia's biosecurity system can improve early detection, response and eradication, and ensure it remains resilient and adaptive in a shifting global environment.

ATSE makes the following recommendations:

Recommendation 1: Increase investment in R&D, including in biosecurity technologies and artificial intelligence adoption.

Recommendation 2: Establish a nationally interoperable biosecurity data platform, supported by consistent data standards and privacy frameworks.

Recommendation 3: Establish a strengthened national biosecurity coordination model with clear end-to-end accountability, building on existing partnership structures and aligned to a One Health framework.

Recommendation 4: Develop a cross-disciplinary biosecurity workforce strategy that integrates digital capability, expands educational pathways, and embeds First Nations communities as formal partners in formative biosecurity systems.

Recommendation 5: Expand the national biosecurity framework to explicitly include food manufacturing, processing, and supply chain logistics, with defined surveillance and response roles across the full value chain.

Recommendation 6: Strengthen integration between agricultural biosecurity and food safety systems, including formal recognition of food manufacturing professionals within the biosecurity workforce.

Ensuring technology keeps pace with a shifting biosecurity environment

Biosecurity threats are rapidly evolving, driven by shifts in supply chains, increasingly complex geopolitical dynamics, and the impacts of climate change. Ensuring Australia's biosecurity system remains fit-for-purpose will require sustained investment in research, development and technology adoption (CSIRO 2020). Targeted research and development (R&D) underpin the development of vaccines, diagnostics, technology and agricultural chemicals necessary to respond to emerging and re-emerging biosecurity threats. Early investment in prevention and preparedness significantly reduces the economic and operational costs of large-scale incursions. Investment in biosecurity is particularly economically valuable, with Australia's biosecurity system boasting a net return on investment of $30 for each dollar spent (Dodd et al. 2020).

Technology will play a central role in enhancing system capability, including advances in data analytics, diagnostics, remote sensing and artificial intelligence. While some advances (e.g., remote sensing and next-generation vaccines) have delivered incremental improvements, the most significant opportunity lies in the application of artificial intelligence (AI). AI is increasingly recognised as a core enabler of next-generation biosecurity systems with potential applications across risk prediction, preparedness and response. These applications may include improved modelling of incursion pathways, more efficient resource allocation, and faster, more precise eradication efforts (CSIRO 2020). Promising AI-enabled approaches for biosecurity systems include quarantine weed seed detection, machine-learning approaches for fruit fly detection in traded horticultural products, AI-assisted targeting of border inspections, and integration of eDNA approaches with AI-based classification systems (Qiang et al. 2025; Yazdani et al. 2025; Trellis Data 2025; Kestel et al. 2022). Additional early applications of AI in workforce planning and service delivery, including predictive workforce modelling, real-time resource allocation, and automated screening of biosecurity risks, also present immediate opportunities to improve the capability of the biosecurity workforce. However, due to the nascent nature of AI technology, limited assessments of AI system efficacy in the biosecurity sector have been conducted. It will also be critical to employ evaluation frameworks alongside technology deployment to ensure a robust and secure system.

Recommendation 1: Increase investment in R&D, including in biosecurity technologies and artificial intelligence adoption.

Supporting the biosecurity system with robust data infrastructure

Fragmented responsibility is a primary risk within Australia's biosecurity system. Governance is distributed across federal, state and territory governments, food safety regulators and industry bodies, with no single entity holding end-to-end accountability for system performance (Rawluk et al. 2021). As a result, reforms implemented across multiple jurisdictions without clear ownership may be uneven, reducing overall effectiveness. National biosecurity risks require a coordinated, whole-of-system approach. While the Australian Government is well-positioned to provide national leadership, effective coordination depends on structured partnerships with states, territories and industry. Existing mechanisms demonstrate the value of shared governance models. For example, Animal Health Australia and Plant Health Australia provide effective platforms for collaboration. However, their mandates, scope and resourcing are not currently sufficient to support a fully integrated, cross-sectoral biosecurity system (Baker et al. 2025). This limitation is particularly evident in areas that depend on interoperability and real-time collaboration, such as data sharing infrastructure.

Fragmentation of Australia's biosecurity system is exemplified by a lack of data integration and data sharing difficulties between border, on-farm and broader delayed responses blind spots. The introduction of mandatory digital traceability for high-risk categories, including fresh produce, premium protein exports, and live animal movements, is a potential short-term reform that can support existing robust biosecurity measures. A single interoperable data platform would require the development of consistent national data standards, agreed privacy frameworks and high participation rates across government and industry. Participation may increase significantly as stakeholders observe the benefits of this system, such as faster border clearance, reduced testing requirements and improved market access. ATSE's report, Australia's Data-Enabled Research Future: Technology and Engineering, provides an example of a federated framework paired with robust standards, offering a model for tracking sensitive health, agriculture and environmental data, and may be applicable to Australia's biosecurity system.

There is also an opportunity to expand co-design approaches across government, industry and research organisations. Existing partnerships, including those of the Department of Agriculture, Fisheries and Forestry and CSIRO, demonstrate the benefits of co-design for investment in the delivery of innovative technologies and digital solutions for biosecurity. Expanding these models to explicitly incorporate environmental and human health considerations would support alignment with a One Health framework. ATSE supports the National Biosecurity Strategy to continue to leverage a One Health approach. ATSE has long advocated for a One Health approach, and ATSE's report, Curbing Antimicrobial Resistance, explores the benefits, challenges and implications of integrating human, animal and environmental health perspectives. Institutional capability can also evolve alongside these reforms, including through national assets such as the Australian Centre for Disease Control and the Australian Centre for Biosecurity Preparedness.

Recommendation 2: Establish a nationally interoperable biosecurity data platform, supported by consistent data standards and privacy frameworks.

Recommendation 3: Establish a strengthened national biosecurity coordination model with clear end-to-end accountability, building on existing partnership structures and aligned to a One Health framework.

Strengthening biosecurity workforce capability and inclusion

Biosecurity management relies heavily on skilled inspectors, researchers and field officers, but workforce shortages, ageing expertise and limited capacity during major outbreaks present ongoing challenges to Australia's health, economy and environment (Australian National Audit Office 2025). To ensure Australia's future biosecurity system remains adaptable, robust and sustainable, a strong and skilled workforce will be required. A critical gap in current reforms is the limited integration of biosecurity science and digital

capability. Australia has strong expertise in disciplines such as plant pathology, veterinary science, and entomology, as well as a growing number of data and technology specialists (CSIRO 2020). However, there is only a small number of experts with the ability to work across both sectors. Addressing this challenge will require several approaches, including the deployment of digital technology to reduce reliance on physical inspections. The biosecurity sector is also facing an ageing workforce and a declining pipeline of graduates in agricultural and veterinary sciences. Staff shortages of the Department of Agriculture, Fisheries and Forestry's Biosecurity Operations Division were 16% lower than the budgeted levels in 2024 (Australian National Audit Office 2025). Increasing education opportunities in the biosecurity sector can also greatly assist in reducing this gap. Expanding vocational education and training pathways to enable agricultural workers to transition into biosecurity roles and stronger pipelines from university agrifood and data science programs into biosecurity careers may reduce current skill gaps and future worker shortages. Further supporting existing resources and centres, such as the Biosecurity Training Centre delivered by the Department of Agriculture, Fisheries and Forestry and Charles Sturt University, may help ensure the timely delivery of courses that remain relevant and adaptable as the biosecurity landscape evolves.

Concurrently, Aboriginal and Torres Strait Islander communities represent a critical but underrepresented source of biosecurity intelligence. Multi-generational knowledge of land, species behaviour and environmental change provides a valuable foundation for early detection that formal surveillance systems often struggle to replicate at scale. The Indigenous Rangers Program currently supports over 320 ranger groups through 159 organisations across Australia and aims to employ over 3,800 First Nations positions by the end of the decade (NIAA 2026). This program supports the monitoring of remote northern Australia and hinterlands, coastal monitoring, and awareness of ecological baselines due to generational knowledge of native flora and fauna (Lockhorst and Martin 2025). However, current engagement models for Aboriginal and Torres Strait Islander peoples often remain consultative rather than embedded within formal decision-making structures. There is an opportunity to further integrate Aboriginal and Torres Strait Islander rangers and land managers into Australia's biosecurity surveillance system through sustained co-design, appropriate resourcing, data access and participation in governance processes. This includes recognising independent businesses that have been established by Aboriginal and Torres Strait Islander rangers. Formalising arrangements through sustained fee-for-service models and the reinstatement of the Ranger Capability Building Grants Program may also ensure cost-effective early detection in high-risk areas, such as remote northern Australia. Monitoring frameworks can be co-designed with communities, rather than adapted after the fact, to further elevate biosecurity as a shared national asset. International examples, including in New Zealand (Kuru et al. 2021), demonstrate the value of formalised partnerships with Indigenous agricultural communities in early detection of pest and disease risks. In the Australian context, successful integration will depend on recognising intellectual property rights, ensuring appropriate benefit sharing, and developing frameworks in partnership with peak First Nations bodies.

Recommendation 4: Develop a cross-disciplinary biosecurity workforce strategy that integrates digital capability, expands educational pathways, and embeds First Nations communities as formal partners in formative biosecurity systems.

Strengthening biosecurity across the food value chain

Australia's borders have historically prioritised border control and primary production, resulting in robust protections at these points. However, modern food systems extend well beyond these points. For example, both imported and domestic ingredients may move through food processing facilities, manufacturing plants, cold-chain logistics networks and retail distribution centres before reaching consumers, creating potential pathways for pests, pathogens and contaminants to enter or spread within the system. This has led to critical gaps throughout the supply chain (Kruger et al. 2020). Risks entering the supply chain midstream can persist undetected, with impacts comparable to those originating at the border or farm (Sarkar and Khan 2023). As climate change alters pest and disease distributions and endemic risks increase, domestic surveillance and response across the supply chain will become increasingly critical to managing these risks and maintaining Australia's competitiveness in premium export markets, where timely and verifiable assurance is increasingly expected. In 2024-25, almost 57% of funding for Australia's biosecurity activities was allocated to either pre-border or at-border protection activities, and only 15% was allocated for direct

post-border activities[1] (DAFF 2025). A more balanced investment and allocation of resources across the entire supply chain could address these gaps and support a more effective and resilient national biosecurity system.

This imbalance is reinforced by the limited integration of food manufacturing capability into the biosecurity system. Quality assurance and food safety professionals are often well-positioned to identify emerging risks within supply chains. Yet these professionals are not consistently integrated into formal surveillance and response networks. Current primary production modelling can underestimate this risk by excluding whole-of-chain exposure considerations (Kruger et al. 2020). Emerging production systems, including fermentation-derived and alternative proteins, may further create gaps in existing frameworks, which are not designed to assess these risks. These gaps leave a significant portion of the food system outside the core biosecurity system, despite increasing exposure through globally interconnected supply chains (Charlebois et al. 2024).

Recommendation 5: Expand the national biosecurity framework to explicitly include food manufacturing, processing, and supply chain logistics, with defined surveillance and response roles across the full value chain.

Recommendation 6: Strengthen integration between agricultural biosecurity and food safety systems, including formal recognition of food manufacturing professionals within the biosecurity workforce.

ATSE thanks the Department of Agriculture, Fisheries and Forestry for the opportunity to respond to the national biosecurity reforms consultation. We would welcome the opportunity to connect you with our expert Fellows. For further information, please contact academypolicyteam@atse.org.au.

[1] The remaining 28% includes costs that can not be assigned to specific stages, including things such as whole-of-system strategy delivery and overhead costs (DAFF 2025).

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References

Australian National Audit Office (2025) *Delivery of the Biosecurity Workforce*, Department of Agriculture, Fisheries and Forestry, http://www.anao.gov.au.

Baker C, Cumming B, Firestone S, Le TP, Camac J and Graham K (2025) 'Australian biosecurity needs a whole-of government, whole-of-society approach', *Pursuit*.

Charlebois S, Latif N, Ilahi I, Sarker B, Music J and Vezeau J (2024) 'Digital Traceability in Agri-Food Supply Chains: A Comparative Analysis of OECD Member Countries', *Foods*, 13(7):1075, doi:10.3390/foods13071075.

CSIRO (2020) *Australia's Biosecurity Future: Unlocking the next decade of resilience (2020-2030)*.

Department of Agriculture, Fisheries and Forestry (DAFF) (2025) *Biosecurity funding and expenditure report 2024–25*, Canberra.

Dodd A, Stoeckl N, Baumgartner J and Kompas T (2020) *Key Result Summary: Valuing Australia's Biosecurity System*.

Kestel JH, Field DL, Bateman PW, White NE, Allentoft ME, Hopkins AJM, Gibberd M and Nevill P (2022) 'Applications of environmental DNA (eDNA) in agricultural systems: Current uses, limitations and future prospects', *Science of The Total Environment*, 847:157556, doi:10.1016/j.scitotenv.2022.157556.

Kruger H, El Hassan M, Stenekes N and Kancans R (2020) *Understanding general surveillance for biosecurity as a system*.

Kuru R, Marsh A and Ganley B (2021) 'Elevating and Recognising Knowledge of Indigenous Peoples to Improve Forest Biosecurity', *Frontiers in Forests and Global Change*, 4, doi:10.3389/ffgc.2021.719106.

Lockhorst R and Martin L (2025) 'Indigenous rangers: a national security asset hiding in plain sight', *The Strategist*.

Qiang J, Qiao X, Yu Y, Liu Z, Tian Z and Zhang S (2025) 'QseedNet: A lightweight deep-learning framework for detection of quarantine weed seeds in imported soybean inspection', *Industrial Crops and Products*, 238:122314, doi:10.1016/j.indcrop.2025.122314.

Rawluk A, Beilin R and Lavau S (2021) 'Enacting shared responsibility in biosecurity governance: insights from adaptive governance', *Ecology and Society*, 26(2):Art18, doi:10.5751/ES-12368-260218.

Sarkar PR and Khan MdK (2023) 'HACCP AND ISO FRAMEWORKS FOR ENHANCING BIOSECURITY IN GLOBAL FOOD DISTRIBUTION CHAINS', *American Journal of Scholarly Research and Innovation*, 02(01):314–356, doi:10.63125/9pbp4h37.

Trellis Data (2025) 'Advanced AI Biosecurity Screening for Australia's Agriculture Sector', https://trellisdata.com/newsroom/paving-the-way-for-advanced-ai-biosecurity-screening-for-australias-agriculture-sector-b6wl5, accessed 10 June 2026.

Yazdani M, Bao D, Zhou J, Wang A and van Klinken RD (2025) 'Single-wavelength near-infrared imaging and machine learning for detecting Queensland fruit fly damage in cherries', *Smart Agricultural Technology*, 12:101090, doi:10.1016/j.atech.2025.101090.