Submission to the *National biosecurity strategy* initial consultation

Australian Academy of Science

The Australian Academy of Science welcomes the opportunity to provide a submission to the Department of Agriculture, Water and the Environment initial consultation on the *National biosecurity strategy*. This submission concentrates on the *Data and Analytics*, *Technology* and *Research* themes.

The scientific and technological underpinnings of the biosecurity strategy are crucial.

Discovering biodiversity: A decadal plan for taxonomy and biosystematics in Australia and New Zealand 2018-2027 (Australian Academy of Science, 2018) notes that in 2017, taxonomists and biosecurity diagnostics staff in Australia identified 32,744 specimens in 21,519 biosecurity incidents. These taxonomists seek to determine if shipments of goods and agricultural products contain exotic pests, diseases or other classified organisms that cannot be allowed through our borders. If undetected, many of these organisms can cause multibillion dollar losses to the economy and trade and immense damage to the environment. Slow or inaccurate identification of a suspect species can incur high costs through delayed or inappropriate action.

A cost-benefit analysis in investment in taxonomy by Deloitte Australia for the Academy found significant benefits in terms of reduced delays in biosecurity diagnostics of genuine and non-genuine threats.

Detection Technologies

A high priority is the development and deployment of detection technology to allow on-site detection and identification of biosecurity threats. Due to the time-critical nature of imports and exports and the need to eradicate invasive species before they take hold, technology can facilitate rapid, precise and specific identification of threats. Technical priorities for detection technology include:

- Observation technologies such as satellites, drones and sensors can be improved to provide more accurate data. These technologies can be linked with internet-of-things devices and cloud-based informatics capability to improve on-the-ground identification and response capability substantially. Coupled with artificial intelligence (AI) image recognition systems, observation technologies can be used to identify invasive species, feral animals, and signs of disease in crops and livestock.
- Environmental DNA (eDNA) analysis – collecting DNA from environmental samples for analysis by high-throughput sequencing – can provide positive and specific identification of target species and provide broad information on species present within an ecosystem.
- Citizen-level options, such as the Centre for Invasive Species Solutions (CISS) *FeralScan* and the in-development *WeedScan*, provide a readily accessible tool to identify and report invasive species. This data can be aggregated and analysed to provide a national-level survey of invasive species.

Taxonomic depth and capacity

The above technologies will be critical to the national biosecurity strategy. However, to be fit for purpose, they must be underpinned by robust documentation of native biota. In addition to capacity building in detection and protection technologies, there should be a parallel development of the taxonomic and ecological evidence base.

Discovering biodiversity presents an ambitious plan to significantly accelerate the rate of Australian and New Zealand species' discovery. The companion report, *Cost benefit analysis of a mission to discover and document Australia's species* (Deloitte, 2021) estimates a contribution to the Australian economy of $465 million to $660 million in avoided costs to producers and consumers. This is due to the reduced frequency of genuine biosecurity threats from one in five years to one in ten years and more accurately proving the absence of suspected threats.

For this reason, improved taxonomic depth and capacity should be a central pillar of a national biosecurity strategy.

Data and systems

For the above systems to be effective, they must be supported by gene and taxonomic libraries of sufficient detail and comprehensiveness. Biosecurity systems need to be readily accessible and able to operate across national and subnational boundaries. Biosecurity data should have the capacity to be shared internationally so that foreign species can be identified rapidly and precisely. International environmental data standards should be supported, and compatible national standards developed and implemented.

In particular, biosecurity data should be included within the Department's Shared Environmental Analytic Framework (SEAF), developed in collaboration with the Western Australian government. The 2019-20 review of the *Environment Protection and Biodiversity Conservation Act 1999* by Professor Graeme Samuel AC recommended significant improvement in Australian environmental data systems. The SEAF has a strong role in addressing these concerns. Biosecurity data has readily apparent applications in conservation actions undertaken by state and territory authorities. Invasive species are among the most significant threats to Australian species are ecosystems. The capacity to identify new invasive species before they become established is extremely valuable as it allows remedial interventions to be undertaken before such invasive species become established and hard to remediate.

Breeding and gene technologies

Early identification and eradication of biosecurity threats is the most cost-effective approach for protecting Australia's ecosystems. However, the biosecurity strategy should consider approaches to threats already present in Australia, including invasive species that have become established. Once an invasive species is established in Australia, it becomes considerably more expensive and difficult to control and eradicate, and in some cases, conventional techniques have proved ineffective. Innovation and technical development are required.

Breeding and gene technologies offer scope for such innovation. For example, agricultural crops can be bred or modified to pre-emptively protect against exotic, established and endemic pests and pathogens.

Gene technologies also have the potential to disrupt the breeding cycle of established pest species. These technologies introduce traits in a target population that deprecate survival, such as causing offspring in invasive populations to be only one sex. However, these technologies involve the release

of genetically modified species into the environment, which carries risks. The risks and possibilities of gene drives were explored in the Academy discussion paper *Synthetic gene drives in Australia* (2017).

To discuss or clarify any aspect of this submission, or to arrange further consultations with the Academy, its Fellowship or its National Committees, please contact Dr Stuart Barrow at stuart.barrow@science.org.au or 02 6201 9464.