Joint Submission

National Food Security Strategy: Discussion Paper

Department of Agriculture, Fisheries & Forestry | September 2025

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Summary of key points

This submission has been prepared by the following partners:

- ANU Agrifood Innovation Institute
- Cellular Agriculture Australia
- ANU National Security College

Australia has a world-class agrifood system that provides a diverse range of high quality products to domestic and international markets. However, global food security is under pressure from climate change, geopolitical risks and input challenges. The Department of Agriculture, Fisheries and Forestry should be commended for starting the policy discussion around food security.

Food security is national security, and proactive investment by the Australian government to secure sovereign capability of agricultural production (including farm inputs) and accelerate food innovation will contribute to a food secure future.

New biotechnologies will fundamentally alter global food, manufacturing and health systems. Australia is uniquely positioned to take advantage of this once in a generation opportunity. By investing in biotechnologies in the agrifood system, Australia can improve food security, create new jobs (including in rural areas) and establish new export industries.

Australia should capitalise on its natural and competitive advantages to prioritise food produced using biotechnologies, either as part of conventional agricultural production and/or through brand new food manufacturing processes.

Such an approach would be a key step towards the creation of a bioeconomy strategy; i.e. development of an economic system which leverages renewable biological resources and technologies to offer more sustainable ways of producing goods, services and energy.

In practice, applications of the bioeconomy approach in the agrifood system (herein 'agrifood') will produce:

- An evolution in conventional cropping systems
- Value-added opportunities for traditional agriculture
- The development of brand new food production systems

Applied to agrifood, the benefits of biotechnologies are more resilient crops and new food production systems that are:

- Less vulnerable to external shocks

- Less reliant on imported inputs
- Adaptable to changing climatic and market conditions
- Less carbon-intensive

Australia is well-positioned to address food security through the bioeconomy approach outlined above, leveraging the following competitive advantages:

- Globally recognised for a high-quality, safe and reliable agrifood supply chain
- World-leading researchers and institutions across relevant STEM and HASS disciplines
- Abundant land, energy and feedstock
- Proximity and established trade relationships to markets with an interest in biomanufactured products
- A vibrant commercial sector emerging around the application of biotechnologies in agrifood industries

The key barriers to realising the potential of biotechnologies in agrifood include:

- Limited public investment in fundamental research, including research infrastructure, to advance the application of biotechnologies in agrifood systems
- Limited access to scale-up infrastructure to accelerate commercial outcomes
- A policy and regulatory system that is not keeping pace with technical advances

This submission's key recommendations centre around the need to design and implement the enabling conditions to grow the bioeconomy, linked to overt support for innovation that encompasses the policy settings, investment and infrastructure to scale applications of biotechnologies in agrifood.

Recommendations

Recommendation 1: Australia accelerates the development of a bioeconomy strategy that prioritises agricultural, food and nutritional security, to build a future-proof agrifood system that is efficient, equitable, resilient, and sustainable.

Recommendation 2: The implementation of the bioeconomy strategy should be supported by a joint government-industry body to coordinate the activities that will drive industry development.

Recommendation 3: The *Feeding Australia* Strategy include "Regulatory and Policy Agility" as a guiding principle, with associated actions to drive productivity.

Recommendation 4: The *Feeding Australia* Strategy should balance a need for immediate action with support for the development of industries that will produce longer-term, multigenerational outcomes.

Recommendation 5: Existing R&D structures and institutions should be tasked with supporting the emergence of new technologies, products or industries through explicit programs or simple changes to eligibility for funding.

Recommendation 6: The Australian government prioritises food as an output in future investments related to the bioeconomy.

Recommendation 7: The Australian government supports the development of a biomanufacturing infrastructure pipeline and supply chain to underpin the sustainability and security of Australia's food supply.

Recommendation 8: The Department of Agriculture, Fisheries and Forestry should incorporate the application of biotechnologies in the agrifood system as a climate mitigation and adaptation tool in the Agriculture and Land Sector Plan

Recommendation 9: The Australian government should undertake a coordinated process to identify key drivers, risks, threats, and vulnerabilities to Australia's agrifood system. This should be guided by a structured risk and threat assessment methodology to ensure a comprehensive analysis of potential weaknesses in Australia's current strategic context.

Recommendation 10: The *Feeding Australia* Strategy should include clear targets against which to measure the impact of Government's investment in food security, including progress towards integrating new technologies, including biotechnologies, into the agrifood supply chain.

Introduction

The Australian Government, through the Department of Agriculture, Fisheries and Forestry, should be commended for starting the policy discussion around food security.

Australia must shape a food system that is future-proof, resilient, sustainable and equitable. *Feeding Australia* has the potential to provide a coherent, national and regional response to coordinating food security, if it recognises that the future of food will include the adoption of biotechnologies from paddock to plate.

Australia's economy and supply chains are being reshaped by the convergence of physical, digital, and biological realms, meaning "the world is now better positioned than ever to accelerate the shift to a bio-based economy" [1]. We believe Australia is in a prime position to capitalise on this opportunity.

Our submission will demonstrate how supporting and facilitating the integration of biotechnologies into the supply chain will ensure the delivery of the Government's objectives to improve the productivity, resilience and security of our food system.

Biotechnologies also present a large economic opportunity for Australia, with the potential to create high-paying jobs in new industries, especially in rural and regional areas.

This submission is the work of three organisations, who recently partnered to convene *Made & Grown: The Future of Food,* a one-day event in Canberra on 21 August 2025 to showcase the use of biotechnologies in food:

- **ANU Agrifood Innovation Institute** - AFII aims to accelerate transformative innovation to future-proof the Australian agrifood system by connecting The Australian National University community with industry and entrepreneurs.
- **Cellular Agriculture Australia** - CAA is a registered Australian not-for-profit, funded by philanthropy, and the leading advocacy organisation for the cellular agriculture sector in Australia.
- **ANU National Security College** - NSC is a joint initiative of The Australian National University and the Commonwealth Government. NSC offers specialist graduate studies, professional and executive education, futures analysis, and a national platform for trusted and independent policy dialogue.

The core of this submission will be drawn from the insights and outcomes of *Made & Grown*, with additional commentary provided where relevant.

[1] World Economic Forum (2024) "Accelerating the Tech Driven Bioeconomy," Insight Report, June 2024. Accessed on 29 September 2025 from: https://www3.weforum.org/docs/WEF_Accelerating_the_Tech_Driven_Bioeconomy_2024.pdf

Key terminology in this report

Agrifood is a term that encompasses all operations within the food supply chain, including farmers, food manufacturing, food retail, wholesale, food service, as well as their suppliers of inputs and services such as seeds, pesticides, fertilisers, machinery, packaging, repair, transport, finance, advice, and logistics.

Bioeconomy is an economic system that leverages renewable biological resources and technologies to offer more sustainable ways of producing goods, services and energy. This may involve the use of crops, forests, fish, microorganisms, and biological waste streams to produce food, materials, chemicals, and energy.

Biomanufacturing is the use of living systems, such as microorganisms, to produce food, fuels, fibres (and more) at a commercial scale. It involves the use of processes like precision fermentation, cell cultivation, and plant molecular farming to produce these products. In this way, biomanufacturing translates advances in biotechnology into scalable, commercially viable production systems.

- **Food biomanufacturing** refers to the use of biomanufacturing specifically applied to the production of food, ingredients and agricultural products.

Food biotechnology is the application of scientific technologies to living organisms and biological systems (such as plants, animals, and microorganisms) to produce, modify, or improve food products and agricultural processes. These productsmay or may not be genetically modified.

Examples of food biotechnology that will be examined through this report include:

- **Precision fermentation** harnesses microorganisms (yeast, bacteria, fungi) to produce specific ingredients that can be used in various food and agricultural products. The ingredients produced can include egg and dairy proteins as well as specific enzymes, flavours, colours, fats, and oils.

- **Cell cultivation** involves isolating and cultivating cells from an animal to make products such as meat, seafood, leather and fat; or from plants to make products like coffee and chocolate. Products produced using this technology may be referred to by a variety of terms, including cultivated, cultured, or cell-cultured/cell-cultivated/cell-based.

- **Plant molecular farming** is an emerging biotechnology that uses plants and the power of photosynthesis to produce specific ingredients. A common application is the use of agricultural crops to produce dairy proteins like whey and casein.

- **Synthetic biology** (also referred to colloquially as 'SynBio') is the application of engineering principles and gene technologies to biological engineering. It seeks to build programmable DNA-encoded parts that behave in a reproducible manner and can be used to engineer bio-based solutions to specific problems (source). It provides the platform for technologies like precision fermentation and plant molecular farming.
    - One subset of this is **plant synthetic biology**, which applies this science to modify plant systems for various purposes e.g. improving traits, creating new bioproducts.

The bioeconomy - an opportunity for Australia

The bioeconomy brings together industries such as:

- **Agriculture and forestry** – producing future-ready crops, biomass and renewable feedstocks.
- **Food and beverages** – using biological raw materials and processing innovations to secure existing production systems or in the creation of brand new products.
- **Industrial Manufacturing** – developing enzymes, microbes, or cell cultures for industrial use, for example, to create bioplastics, biochemicals, or advanced materials from biological sources.
- **Energy and fuel** – turning plants or waste material into energy, a key input for agricultural and food production, including bioethanol and biodiesel, as well as biogas, bio-oil, biochar, and sustainable aviation fuels.

Applied to food, biotechnology and biomanufacturing strengthen sovereign capability by reducing dependence on foreign imports, diversifying production systems, and embedding resilience across critical supply chains. This includes:

- **Resilient crops** – modified and enhanced varieties to remove seasonal variability, increase tolerance to climate extremes, reduce the amounts of inputs like water, pesticides and fertiliser, and potentially decrease vulnerability to spoilage and transport delays.

- **New food production systems,** such as precision fermentation and cell cultivation, can provide additional sources of domestic protein and ingredients that can complement existing supply chains. Key benefits relevant to food security include:

    - **Less vulnerable to external shocks** - production occurs in controlled environments largely independent of, and less vulnerable to, changing environmental conditions and animal pathogens.

    - **Onshoring production** - these production methods will shorten or even replace supply chains by enabling localised, biomanufacturing, reducing the reliance on imported inputs.

    - **Adaptability** – common-use biomanufacturing facilities can pivot production in response to changing demands, embedding flexibility into national preparedness.

    - **Decarbonised processes** – facilities are less reliant on petrochemicals and can operate on renewable energy. Production also likely requires significantly less land, water and inputs.

Hence, food biomanufacturing represents both a necessity and an opportunity: a way to embed resilience and protect national security whilst simultaneously positioning Australia as a leader in a high-value, strategically significant sector.

McKinsey estimates that by 2040, biology could supply up to 60% of the world's physical inputs[2], representing a staggering opportunity for nations ready to lead. Recognising the opportunity of the bioeconomy, the UN's Food & Agriculture Organization (FAO) has made it a strategic priority to address food security, biodiversity and rural futures.[3] The FAO asserts that the bioeconomy is the mechanism to protect global food security and nutrition, while building more resilient and sustainable food systems, resistant to crises and shocks.

At the same time, biomanufacturing has the potential to create significant economic opportunities in food innovation. The Boston Consulting Group projects this market could be worth USD $100 billion by 2040[4], surpassing that of other emerging biomanufacturing industries like specialty chemicals and chemical precursors.

Embracing the bioeconomy, with agrifood at the centre, could be a critical lever for futureproofing Australia's agrifood systems and economy.

Australia's competitive advantages include:

- Successful, global consumer goods companies based on high-quality agricultural production systems and outputs
- World-leading researchers and institutions in plant science, animal science, and agricultural science
- Existing feedstock supply chains can be transformed into vital end products like food ingredients, materials, chemicals, and fuel
- A robust biofuels feedstock industry that can support Australia's transition to net zero
- Well-established government investment vehicles for investment in agriculture and food innovation eg, Research and Development Corporations, Cooperative Research Centres, Australian Research Council
- Renowned world-leading cell biology and tissue engineering expertise

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[2] McKinsey (2020) "The Bio Revolution: Innovations transforming economies, societies, and our lives", Accessed on 29 September 2025 from:
https://www.mckinsey.com/industries/life-sciences/our-insights/the-bio-revolution-innovations-transforming-economies-societies-and-our-lives

[3] FAO (2024) " Bioeconomy for sustainable food and agriculture: a global opportunity - Position paper" Food and Agriculture Organization of the United Nations, Rome.
Accessed on 29 September 2025 from:
https://openknowledge.fao.org/items/08505fa1-4cca-49ec-8019-3d320479cfb5

[4] BCG (2024) "Breaking the Cost Barrier in Biomanufacturing," Boston Consulting Group, February 2024. Accessed on 29 September 2025 from:
https://web-assets.bcg.com/b6/15/6a10d22c481e8bebaf0c2fab8294/bcg-breaking-the-cost-barrier-on-biomanufacturing-rev.pdf

- World-leading bioprocessing and bioengineering expertise
- A strong reputation for high food safety standards
- The potential to co-locate domestic biomanufacturing with strategic feedstock supply, creating the ability to localise product and address existing supply chain vulnerabilities
- Proximity to markets with established trade relationships that are seeking additional protein, particularly Asia, where Australia has existing agricultural and food markets
- A diverse and vibrant sector that includes startup and scale-up companies, researcher interest and venture funding
- Emerging leadership in training and workforce development activities to support the sector.

The FAO report lists 23 countries with a bioeconomy strategy [5] including the United States of America, China, Brazil, France, the Netherlands, Thailand and Malaysia. Notably, Australia does not have a similar strategy. Whether we can realise the opportunities presented by a successful bioeconomy will depend on Australia's ability to: build familiarity and trust in the technologies; grow public and private investment; and ensure the right policy environment.

Recommendation 1: Australia accelerates the development of a bioeconomy strategy that prioritises agricultural, food and nutritional security, to build a future-proof agrifood system that is efficient, equitable, resilient, and sustainable.

Recommendation 2: The development and implementation of the bioeconomy strategy should be supported by a joint government-industry body to coordinate the activities that will drive industry development

[5] https://openknowledge.fao.org/server/api/core/bitstreams/0f899546-cf10-4588-a788-5df6d5ee2330/content pg 48

Biotechnologies in the food system

The promise of the bioeconomy goes beyond food systems; however, for the purposes of this submission, we seek to promote the prioritisation of food produced using biotechnologies, either as part of conventional agricultural production and/or in brand new food manufacturing processes, which will:

- Underpin agricultural production by removing seasonal variability through the development of crops with advanced traits
- Improve crop resilience in a changing climate, and create additional flexibility in farm planning
- Underpin the development of future-ready crops that have the capacity to alter - mid-season - the products they produce (e.g. switching carbohydrate-accumulating plants to being oil-accumulating plants) in response to changes in market and environmental conditions
- Create onshore value-adding opportunities for critical feed stocks
- Provide bio-based replacements for petrochemical and fossil fuel-based farm inputs, like fuel and pesticides, with the benefits of reducing our reliance on imports, reducing environmental and public health impacts, and reducing emissions
- Create whole new rural industries based on new crops and ingredients, processing and production systems that are close to population centres
- Shorten or even replace supply chains by onshoring production of bio-based products, and therefore creating resilience in the food system
- Complement the variable and/or diminishing supply of existing agricultural systems, to build resilience in conventional agriculture
- Create brand new foods that require less land, water and inputs, supplementing existing food supply chains
- Create products in response to global demand for more protein
- Create products that respond to consumer demands for fortified and functional foods, noting CSIRO estimates demand for fortified and functional foods is expected to reach $9.7 billion by 2030 at around 3% per annum growth[6]
- Create high-paying STEM jobs, noting CSIRO estimates that precision fermentation could generate direct revenue for Australia of up to A$1.1 billion and create up to 2,020 jobs by 2030[7]

[6] Wynn, K., & Sebastian, B. (2019). Growth opportunities for Australian food and agribusiness – Economic analysis and market sizing. CSIRO Futures.
https://research.csiro.au/foodag/health-and-wellbeing/fortified-and-functional-foods/

[7] CSIRO Futures (2022),” Protein - A Roadmap for unlocking technology-led growth opportunities for Australia,” CSIRO. Accessed 29 September 2025 from:
https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/csiro-futures/agriculture-and-food/australias-protein-roadmap#:~:text=Developed%20with%20government%20and%20industry,products%20from%20various%20different%20sources.

- Build sovereign capability and economic resilience, which will underpin Australia's national and regional security.

Evolution of traditional cropping

Biotechnologies are already creating crops that can reduce the use of chemical pesticides, improve nutrition and promote better health outcomes. The FAO cites "hundreds of biofortified varieties of twelve staple crops have been released for planting in over 60 countries, with more than 86 million people in farming households eating biofortified foods." [8]

CSIRO developed Omega-3 canola in response to rising consumer demand for this "healthy oil" traditionally harvested from wild-caught fish stocks, which were increasingly under pressure from over-fishing. Australian scientists discovered the Omega-3 oils were a result of fish consuming a particular marine microalgae. Using synthetic biology, they transferred the ability to produce omega-3 oils from the microalgae into canola, Australia's largest oilseed crop. Omega-3 canola is one of the most high-profile uses of biotechnology in Australia, and has been commercialised globally by NuSeed.

The Australian National University and its partners are seeking to drive convergence of diverse technologies (synthetic biology, genetic engineering, big data, artificial intelligence, satellite imagery) to breed cereal crops capable of fixing nitrogen from the air, instead of relying on fertiliser. Imported nitrogen fertilisers represent one of the biggest input costs for Australian farmers, with their production contributing to climate change. The Haber-Bosch process - used to produce inorganic nitrogen fertilisers - consumes approximately 50 per cent of the energy used by agriculture. Moreover, more than 50 per cent of the inorganic fertiliser applied to crops is lost, either as runoff into groundwater or by conversion into nitrous oxide, which has a greenhouse gas potential about 300 times that of carbon dioxide. [9]

Major new investments in plant synthetic biology and advanced breeding technologies are opening up powerful tools to accelerate innovation. The Australian government's $60m step-change investment in synthetic biology infrastructure, through Bioplatforms Australia ($20m of which has been invested in Plant SynBio Australia, providing researchers and industry with the opportunity to modify gene expression in crops), will accelerate these technologies to scale. This will enable faster development and deployment of new and stacked traits in crops - such as higher yields, greater resilience, stronger disease resistance, and improved nutrition - all of which directly strengthen the security of our food supply chains. Looking ahead, we can expect the emergence of

[8] FAO (2024) pg 10
[9] Smil V (1999) "Nitrogen in crop production: An account of global flows," Global Biogeochemical Cycles 13: 647–662

'programmable plants' that can sense and respond to their environment, or even shift outputs in response to farmer control; for example, switching grain crops to produce high-value animal feed. This added adaptability will be instrumental in building a more resilient and sustainable food system.

Value-add opportunities in traditional agriculture

Food biotechnologies and biomanufacturing can be portrayed as competing with traditional agriculture, but in reality, the two sectors are complementary and interdependent. Emerging biotechnologies rely on established agricultural supply chains for feedstocks, infrastructure, and skills, while offering new avenues for value-creation and economic diversification in regional Australia. As such, food biotechnologies represent not only a pathway to national economic security but also a strategy to generate "gross regional product" and revitalise regional economies. New approaches are also using plants as 'biofactories' to produce valuable proteins and compounds.

NZ-based startup Miruku, is working with CSIRO to use plant molecular farming technology to produce dairy proteins in the seeds of oilseed crops like canola and safflower, complementing the existing supply of dairy proteins while leveraging existing agricultural systems. This approach allows for 'revenue-stacking' whereby the biomanufactured product (e.g. dairy proteins) can be separated and serve as an additional revenue source to the crop itself - thereby creating a clear value-add opportunity in traditional agriculture. This approach is also advantageous because the plants act as self-powered bioreactors, avoiding both the infrastructure and energy requirements of technologies like precision fermentation.

Sydney-based horticultural producer Phyllome is applying similar principles to develop plants that can produce medicinal compounds for pharmaceutical and nutraceutical use. In partnership with Pharmacare, they are testing target cyclotides with health and medicinal properties in fresh produce, like spinach. By eating the spinach, the peptide is consumed directly, rather than through a pill or powder. The plant is not transformed into something else - the microdose of engineered peptides with health properties are in the spinach leaves. Phyllome is also testing this technique in enriched camomile tea. Products could range from health benefits to prescription nutraceuticals, pending the dose.

There is growing evidence of a consumer shift towards healthier products with robust nutritional profiles,[10] presenting a promising opportunity for biotechnologies to fortify existing agricultural crops. If food security is expanded to include nutritional security, where all people have consistent access to foods that promote overall well-being and prevent disease, then biotechnologies will play a critical role in adding value to agricultural and food production to meet consumer demand.

[10] GFI APAC (2023) "Alternative proteins in APAC - State of the Industry Report.". The Good Food Institute APAC.

New Food Production Systems

CSIRO projects a significant increase in domestic and export demand (8.5 million tonnes additional demand) for Australian protein products by 2030, with a market opportunity of $13 billion for Australia to grow and diversify protein products from a variety of sources.[11] [12] This demand can only be met through a combination of animal and plant proteins, and novel biotechnology protein production systems[13] such as cell cultivation and precision fermentation. The Asia-Pacific region, particularly Southeast Asia, represents a significant export opportunity, where consumers are seeking protein diversity.

Cultivated meat companies such as Magic Valley and Vow are producing pork, lamb, and quail directly from animal cells. Melbourne-based Magic Valley's products are designed to create an indistinguishable taste, texture, and sensory experience compared to traditional lamb and pork. Meanwhile, Sydney-based Vow is seeking to create an entirely new taste experience with innovative products like cultured quail foie gras and parfait. With the demand for animal protein increasing, these companies are positioning themselves to complement existing supply chains and help meet this growing demand. It should be noted that these companies are focussed on driving down production costs, which will open new market opportunities with the added benefit for reducing inputs like water and power.

Fermented novel proteins (including blends) could make up 4 per cent of total protein production by 2050, an annual market of USD$100 billion to USD$140 billion, with cultivated proteins could contribute a further USD$130 billion to USD$180 billion.[14]

Alongside final food products, many companies are focusing on producing high-value ingredients that address immediate supply challenges and consumer health drivers. A prominent example is lactoferrin, a protein with antiviral and antimicrobial properties that is highly valued in infant formula and nutraceutical applications. Global demand for lactoferrin significantly exceeds supply: conventional production requires milk from approximately 1,000 cows over the course of a year to yield just one tonne.[15] By comparison, precision fermentation has the potential to produce the same volume in a single week using a 125,000-litre bioreactor. Australian companies All G and Eclipse, along with NZ-based Daisy Lab, are leading in this space, producing both bovine and human variants of the protein. Beyond lactoferrin, other novel ingredient approaches are also

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[11] CSIRO (2022) "Australia's Protein Roadmap." CSIRO.
[12] Agrifutures (2020) "The Changing Landscape of Protein Production.". Agrifutures Australia.
[13] CSIRO (2022)
[14] McKinsey (2025) "Ingredients for the future: Bringing the biotech revolution to food," 13 March 2025. Accessed on 29 September 2025 from :
https://www.mckinsey.com/industries/agriculture/our-insights/ingredients-for-the-future-bringing-the-biotech-revolution-to-food
[15] Whittaker, Mark (2024) "The Australian dairy farmers trying to make cows obsolete," Forbes Australia 27 February 2024. Accessed on 29 September 2025 from:
https://www.forbes.com.au/covers/entrepreneurs/precision-fermentation-fake-milk-making-cows-obsolete/

advancing. For example, Melbourne's Eden Brew is pioneering a casein micelle delivery system, a novel method to increase the bioavailability of key nutrients like iron, as well as improving dairy sensory properties and functionality. These companies are responding to shifting consumer drivers around health and nutrition, making these considerations central to both product development and market positioning.

Other applications of precision fermentation technology are emerging in functional ingredients. Fats are another critical area of innovation, where Canberra-based Nourish Ingredients is producing specialty lipids designed to replace those found in dairy and animal fats; the approach taken by Nourish is addressing current supply bottlenecks in the dairy industry while enhancing the taste and sensory experience of both plant-based and conventional products.

Responses to Consultation questions

Principles

1) What other principles should government, industry and community prioritise to support the development of the strategy and why are these important?

We agree with the Discussion Paper's assertion that "a strong, trusted and future-ready regulatory framework for food production trade and biosecurity is central to Australia's productivity growth."[16]

In their report "Sustaining Australia: Food and Grocery Manufacturing 2030"[17] the Australian Food and Grocery Council (AFGC), states that Australia's food safety regulatory system is no longer fit-for-purpose, claiming that it does not deliver "on its core objectives whilst imposing greater costs on the sector and inhibiting consumer-led innovation."[18]

By way of illustration, Food Standards Australia New Zealand (FSANZ) recently released their Corporate Plan[19] outlining its priority work for 2025-2026. While FSANZ will develop some guidance relating to its new cell-cultured food standard[20] and Code updates associated with Proposal P1055 - Definitions for gene technology and new breeding

[16] DAFF (2025), National Food Security Strategy: discussion paper, Department of Agriculture, Fisheries and Forestry, Canberra. CC BY 4.0.pg 8

[17] AFGC "Sustaining Australia: Food and Grocery Manufacturing 2030, Australian Food and Grocery Council , Canberra. Accessed on 29 September 2025 from: https://www.afgc.org.au/industry-resources/sustaining-australia-food-and-grocery-manufacturing-2030

[18] DAFF (2025) pg 37

[19] FSANZ (2025) "Corporate Plan 2025-26," Food Standards Australia New Zealand, Canberra. Accessed on 29 September 2025 from : https://www.foodstandards.gov.au/sites/default/files/2025-08/Corporate%20Plan%202025-26.pdf

[20] Australia New Zealand Food Standards Code – Standard 1.5.4 – Cell-cultured foods Accessed 29 September 2025 from: https://www.legislation.gov.au/F2025L00686/latest/text

techniques,[21] it has not prioritised the progression of Proposal P1024 - Revision of the Regulation of Nutritive Substances & Novel Foods[22] which commenced in 2012 and has been stalled since 2017. Further, greater consideration by FSANZ of overseas safety assessment outcomes for cellular agriculture products from other trusted regulatory agencies can't be made without changes to the Food Standards Australia New Zealand Act 1991. The timing for the conclusion of the FSANZ Act review (commenced in July 2020) remains uncertain.

Therefore, we submit an additional principle for consideration:

Regulatory and policy agility

In the adoption of new technologies, regulatory and policy lag is not unique to agriculture and food (nor unique to Australia). However, when this lag is combined with cost recovery by Australian regulators and compliance agencies, it creates a barrier to innovation.

We support the need for regulatory and safety assessments on biotechnologies entering the agrifood system; crucially, policy and regulatory approaches need to be future-proofed. Currently, the system is too slow and too expensive compared to our trading partners. There are also inconsistencies in how different government regulators define and consider the use of biotechnologies in the agrifood system.

In 2024, the Australian Pesticides and Veterinary Medicines Authority (APVMA) performance statistics showed that over one in four new plant product assessments are no longer completed within legislated timeframes. In a media release, CropLife stated the delays added yet another hurdle to the ability of Australia's farmers to compete globally, as they have fewer options available to protect crop yields, resulting in higher costs from damage caused by insects, weeds, and diseases.[23] Australian farmers are waiting longer for access to new technologies that are already available overseas, thus further hindering competitiveness and productivity.

FSANZ did not meet its legislated timeline in the assessment of Vow's cultured quail, taking more than two years instead of the mandated one year. This was twice as long as the assessment in Singapore, started around the same time, meaning this Australian company had product on sale overseas before it could be sold domestically. The frustration at this delay is compounded by the fact that the application fee, under FSANZ'

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21 https://www.foodstandards.gov.au/food-standards-code/proposals/p1055-definitions-for-gene-technology-and-new-breeding-techniques

22 https://www.foodstandards.gov.au/food-standards-code/proposals/P1024

23 Croplife (2024) "Ongoing declines in APVMA performance taxing an overburdened farming sector" Media Release, 18 November 2024. Accessed 29 September 2025 from: https://www.croplife.org.au/media/media-releases/ongoing-declines-in-apvma-performance-taxing-an-overburdened-farming-sector/

Major Procedure requirements, cost Vow approximately $200,000, in addition to the costs of preparing a regulatory dossier with the requisite testing. At the time of approval in Australia, Vow was explicit in stating Singapore was their first preference market because it provided "clear regulatory pathways."[24]

During the ongoing review of the *Food Standards Australia New Zealand Act 1991* (FSANZ Act),[25] consultants, Nous Group, estimated that for FSANZ to deliver its current regulatory functions, it would require an additional $6.5 million per annum ($26 million up from $19.5 million) in appropriations from the Australian and New Zealand Governments.[26]

Comparable international bodies invest significant resources to support the work of their food standard-setting bodies. There is some variation in the investment made, and some regulators have a wider remit than FSANZ, but the difference in per capita funding is stark, with Scotland and Ireland investing $7.00 per capita, England investing $3.60 per capita, while Australia only invests 0.70c per capita.[27]

At an ANU workshop exploring the lessons for plant breeding from COVID-19 vaccine development, Katherine Delbridge, the CEO of the Australian Seeds Federation, said Australian producers and consumers are missing out on new plant varieties due to Australia's high barriers to entry. Using the example of biosecurity requirements for imported tomato seeds, she shared that Australia's requirements were 6-7 times more expensive than those in New Zealand.[28] We are not questioning the need for strong biosecurity, rather we ask the Government to consider that the cost-recovery of agencies related to agriculture and food may be hindering innovation.

Another concern is the misalignment and risk of duplication between the Office of the Gene Technology Regulator (OGTR) and FSANZ in regulating genetically modified organisms. Agrifood companies using biotechnologies are being asked to engage with two regulators that define the technology and products differently, even though both agencies sit within the same Commonwealth Department (Health, Disability and Ageing).

Clear regulation and policy approaches are an important signal for investor and consumer confidence. The *Feeding Australia* strategy should recognise the importance of appropriately resourced, science-based regulation of new technologies, in conjunction

[24] ABC (2024) "Australian lab-grown meat cultured from quail cells hits the market in Singapore," 4 April 2024 Accessed 29 Septmber 2025 from: https://www.abc.net.au/news/2024-04-04/australian-lab-grown-meat-from-quail-cells-in-singapore/103667178

[25] https://consultations.health.gov.au/chronic-disease-and-food-policy-branch/fsanz-act-review-consultation-on-impact-analysis/

[26] Nous Group (2024) "Modernising the Food Standards Australia New Zealand Act 1991 - Impact Analysis pg 10

[27] Nous Group (2024) pg 24

[28] AFII (2024) "What if seed were vaccines? 11 July 2024. Accessed on 29 September 2025 from https://agrifood.anu.edu.au/news-events/news/what-if-seeds-were-vaccines

with a policy environment that supports the integration and adoption of biotechnologies in agricultural and food production.

Recommendation 3: The *Feeding Australia Strategy* include "Regulatory and Policy Agility" as a guiding principle, with associated actions to drive productivity

Timeframe

2) What timeframe should the strategy work towards – short (1 to 2 years), medium (5 to 10 years) or long (10-plus years) term, and why?

The *Feeding Australia* Strategy's timeframe should see immediate action taken (1-2 years) to produce longer-term outcomes (10+ years). The complexity and uncertainty facing agriculture and food production require urgent, systemic transformation that delivers multi-generational benefits.

Recommendation 4: The *Feeding Australia* Strategy should balance a need for immediate action with support for the development of industries that will produce longer-term, multigenerational outcomes.

Key priority areas

4) Do the proposed key priority areas and whole of system considerations adequately represent the actions needed for an effective food security strategy? If not, what is missing?

We consider that two priority areas are missing from the Discussion Paper:

- Investment in research and development, and
- Infrastructure

Research and Development (R&D)
The Discussion Paper rightly points out that technological advances will drive opportunities for increasing efficiency and productivity, and we are pleased to see a specific reference to the potential of emerging technologies to "strengthen resilience in a resource-constrained production environment."[29]

Therefore, we believe there needs to be a corresponding link to an R&D system that strengthens food security through investment in emerging biotechnologies.

[29] DAFF (2025) pg 8

The Strategic Examination of Research and Development underway by the Department of Industry, Science and Resources recommends that Australia will need targeted R&D efforts "to catalyse change, grow capability across the system and build scale in areas of national need and global opportunity."[30] This would include public investment focussed on cross-sectoral and cross-jurisdictional collaborations at scale; a reform that has the potential to drive accelerated adoption of biotechnologies in the agriculture and food system. In addition, the bioeconomy would be a perfect candidate for the proposed 10-year mission-style approach to research and innovation investment, as it relates to agriculture, food, health, energy, and more.

A sustainable, national R&D system is also one that is well-funded. While we do not have a view on the optimal amount of investment, it is certainly more than the current gross expenditure on R&D at 1.68% of GDP.[31] Beyond an uplift in national research effort, a sustainably funded system also has the benefit of supporting long-term research visions independent of political cycles.

We accept that the government must continue to support historical investment priority areas, but an R&D system must be able to underpin the development of new industries. This will build sovereign capability and support economic activity; including business creation, jobs and exports. This includes investing in discovery research that may drive the development of new industries.

Translating an idea to impact (whether through adoption or commercialisation) requires a value chain of stakeholders playing their part in that success. The roles and responsibilities within this pipeline can be confusing and/or duplicative. Government incentives or policies can drive organisations into functions that are outside their specialisation, creating a lag in innovation. An important component at the beginning of any research pipeline is discovery research, often undertaken in universities. Ensuring there is space, time and funding for a deep and extended focus on solving the most pressing and complex issues is a critical enabler to the rest of the innovation pipeline. A failure to invest in discovery research will reduce the amount of translational research and economic outcomes.

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[30] DISR (2025) "National Coordination for RD&I Impact" Policy Paper, Deparment of Industry, Science and Resources, 27 August 2025. Accessed on 29 Septmber 2025 from: https://storage.googleapis.com/converlens-au-industry/industry/p/prj3708900aab024c1d7431f/page/serd_issues_paper_1_national_coordination_for_R_D_impact.pdf pg 1

[31] https://www.abs.gov.au/statistics/industry/technology-and-innovation/research-and-experimental-development-businesses-australia/2021-22#gross-expenditure-on-r-d-gerd-

Australia needs an R&D system that facilitates long-term multidisciplinary research collaboration. Biotechnologies will not get to market without STEM and HASS disciplines applied to them, but finding funding programs to support this research is challenging.

There is a lack of public funding for food system research, compared to agricultural research. There is a risk of RDC funding ending at the farm-gate, and no comparable mechanism to adopt research findings into the broader food system.

Recommendation 5: Existing R&D structures and institutions should be tasked with supporting the emergence of new technologies, products or industries through explicit programs or simple changes to eligibility for funding.

Infrastructure

To scale the bioeconomy, there are two infrastructure needs:

- Publicly-funded, shared access pilot and research infrastructure
- Commercial-scale infrastructure

Publicly funded research infrastructure

Publicly funded and accessible infrastructure to support research and development is a key requirement to advance biomanufacturing in Australia. For food, this includes infrastructure to support improvements in up- and downstream processing, the optimisation of equipment and production systems to reduce unit costs, and product viability assessments at a commercial scale.

There is limited critical research infrastructure available, particularly linked to precision fermentation and cell cultivation; it is not fit-for-purpose to support the sector to scale and therefore limits research translation opportunities.

The Australian Government, through its investment in the National Collaborative Research Infrastructure Strategy (NCRIS), funds and coordinates open access to research infrastructure. Food is not listed as a priority investment for NCRIS research infrastructure. The resulting AUD $60m step change investment in synthetic biology capability, through BioPlatforms Australia, is welcome and will advance precision fermentation and plant synthetic biology. A corresponding investment in food innovation is warranted, particularly as the current Roadmap's narrative focus is the creation of new bioindustries to contribute to national sovereignty. Food is central to this vision going forward.

Pilot and scale-up infrastructure

The sector's main research questions now coalesce around the transition from laboratory scale to commercial technology transfer and scale-up. While Australia excels in

early-stage research and development (TRL 1-4), there is a significant gap in accessible pilot and scale-up infrastructure and commercial/regulatory support for scaling up production from 25 litres to 2000L. This gap hinders:

- critical product testing and prototyping
- developing and optimising bioprocesses
- demonstrating feasibility to be able to engage with commercial facilities
- preparing for regulatory assessment.

In turn, this impacts the understanding of the economic viability of products and limits the ability to raise investment, potentially forcing companies to seek opportunities offshore or halt projects altogether.

Commercial-scale infrastructure

For Australia to compete internationally, governments will need to recognise their role in de-risking the high cost of doing business (capital, inputs, labour) to support medium- to large-scale commercial manufacturing capability. Companies are already going offshore to access scale-up infrastructure; therefore, government incentives are critical to building a domestic industry.

Ideally, the Australian government would follow the example of BioMADE[32] in the United States, which is investing in a strategic, multi-year effort to build pilot-scale infrastructure, or China, which is progressing towards its goal of building 20 pilot-scale biomanufacturing platforms by 2027.[33]

Construction takes time, and so in the interim, the Government could underwrite subsidised access to existing Australian infrastructure for companies to undertake key commercialisation steps, for example, supporting Cellular Agriculture Australia's concept for a Co-Pilot Manufacturing Scheme.

Building a pipeline of infrastructure to transition from core R&D to commercial scale will enable the development and onshoring of a biomanufacturing supply chain, which will secure the future sustainability and security of Australia's food supply.

Recommendation 6: The Australian government prioritises food as an output in future investments related to the bioeconomy.

Recommendation 7: The Australian government supports the development of a

[32] Learn more about BioMade here - https://www.biomade.org/infrastructure

[33] Van Der Kley, Dirk (2025) "China aims to build 20 pilot scale biomanufacturing platforms by 2027," Bio Brawl, 1 July 2025. Accessed on 29 September 2025 from: https://dirkvanderkley.substack.com/p/china-aims-to-build-20-pilot-scale

biomanufacturing infrastructure pipeline and supply chain to underpin the sustainability and security of Australia's food supply.

Whole-of-System Considerations

What actions could the strategy take to address challenges under each key priority area? What actions could the strategy take to address challenges under these whole-of-system considerations?

We make the following observations and recommendations in relation to whole-of-systems considerations.

Climate change and sustainability

The FAO states that making a transition to a sustainable bioeconomy will promote a low-carbon future, with less reliance on fuels and materials derived from non-renewable fossil and petrochemical resources. [34] Bio-based products also have the potential to support biodiversity through removing polluting items from the supply chain, like plastics and agricultural chemicals.

Australia also faces landscape-scale challenges from climate change, with agricultural productivity under threat from extreme weather events, including droughts and heatwaves. The Agriculture and Land Sector Plan[35] acknowledges that investments in productivity and sustainability are needed to maintain Australia's agricultural sector as the economy transitions to Net Zero.

However, there is no recognition of the role biotechnologies can play to underpin the improvement of crop resilience to a changing climate, or in the creation of new food manufacturing industries.

Recommendation 8: The Department of Agriculture, Fisheries and Forestry should incorporate the application of biotechnologies in the agrifood system as a climate mitigation and adaptation tool in the Agriculture and Land Sector Plan

Trade and market access

Australia has the potential to be a first-mover in enabling global trade of biomanufactured products. The inclusion of biomanufactured products in existing Free Trade Agreements (FTA) presents an opportunity for Australian innovators to export their

[34] FAO (2024) pg 12

[35] DAFF 2025, "Agriculture and Land Sector Plan," Department of Agriculture, Fisheries and Forestry, Canberra. CC BY 4.0.
Accessed 29 September 2025 from:
https://www.agriculture.gov.au/agriculture-land/farm-food-drought/climatechange/ag-and-land-sector-plan

products, attract international investment in domestic biomanufacturing and position Australia as an early-mover in setting the global standards for biomanufactured products, particularly foods. The current effective exclusion of this sector from Australia's FTA's therefore acts not only as a brake on Australian industry, but also as a brake on inbound investment.

We are pleased to see the Final Report of the Joint Standing Committee on Trade and Investment Growth's Inquiry into the understanding and utilisation of benefits under Free Trade Agreements recognise the need to diversify Australia's exports.[36] The Committee agreed that diversification of Australia's exports is necessary to mitigate against changes in the global trade environment, and recommended an expansion of markets and their depth. Importantly, they recommended broadening existing relationships to cover additional goods and services, including emerging areas of economic activity. This is a platform for the government to consider how to include biomanufactured goods in exciting and new trade agreements.

In addition, there is no Harmonized System (HS) Code for many biomanufactured exports, making it difficult to understand the global trade flows. It also means companies in countries with which we have Free Trade Agreements cannot activate the benefits for investment in Australia. For companies wanting to import products into Australia (post-FSANZ approval), there are no import conditions (BICON) or inspection rules.

National and regional security

We are pleased to see a recognition of Australia's dependence on free and open trade - in both a policy and geopolitical sense - in the Discussion Paper.

Australia's "just-in-time" food supply chain is highly vulnerable to external shocks, including the reliance on imported fuel, fertilisers and other inputs, weather events impacting critical road and rail transport corridors, and geopolitical actions impacting trade. It is critical that food security is considered through the lens of a strategic issue, not just a social issue.

The *Feeding Australia* strategy should be overt in addressing food security as national security, and recognising that food security and resilience begin with agricultural security. The *National Food Security Preparedness Green Paper,* developed by the Australian Strategic Policy Institute (*Green Paper*), succinctly defined Australia's vulnerability in being reliant on imported inputs for agricultural and food production, as well as needing to access trade routes for exports. They quoted Defence Minister, Richard Marles as stating

[36] JSCTIG (2025) "Final report: Inquiry into the understanding and utilisation of benefits under free trade agreements," Joint Standing Committee on Trade and Investment Growth, February 2025, Canberra. Accessed on 29 September 2025 from https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Joint_Standing_Committee_on_Trade_and_Investment_Growth/Utilising_FTAs/Report

> *"Our national security and our national prosperity are based on a stable, peaceful region where the global rules-based order is preeminent and respected. Indeed, the rules of the road at sea are everything for us. When the rules-based order is under pressure, Australia is under pressure."*[37]

Rising geopolitical tensions in the Indo-Pacific should be the strongest signifier of the need to onshore production of key inputs into agricultural and food production. Building production resilience in Australia has spillover benefits to regional security, where our Pacific neighbours will benefit from a stable, prosperous and local food supply.

In April 2025, the US National Security Commission on Emerging Biotechnology (NSCEB) released a comprehensive report on the strategic centrality of biomanufacturing to the United States' national security and economic prosperity.[38] The report reflects an increasingly vocal shift in U.S. national security thinking, where emerging biotechnologies (inclusive of biomanufacturing) are no longer viewed solely as scientific milestones, but as foundations of national security, global influence, economic power and resilience. It challenges narrow, defence-focused definitions of national security, instead recognising its relevance across every strategic sector, including food. This shift presents both a serious question and an opportunity for Australian policymakers: by failing to prioritise the development of a diverse and sovereign biomanufacturing sector, are we passively creating a deep vulnerability in a time of rising geopolitical tensions?

Building a strong biomanufacturing industry is critical to securing current and future supply chains to protect from external shocks. It will also provide the foundation for transforming the economy away from petrochemical and fossil fuel-based products to address a range of other government priorities.

Recommendation 9: The Australian government should undertake a coordinated process to identify key drivers, risks, threats, and vulnerabilities to Australia's agrifood system. This should be guided by a structured risk and threat assessment methodology to ensure a comprehensive analysis of potential weaknesses in Australia's current strategic context.

[37] The Australian Strategic Policy Institute Limited (2025)," National Food Security Preparedness Green Paper", Canberra, Pg 9

[38] NSCEB (2025) "Charting the Future of Biotechnology: An action plan for American security and prosperity," National Security Commission on Emerging Biotechnology, April 2025. Accessed on 29 September 2025 from: https://www.biotech.senate.gov/final-report/chapters/

Evaluation of the Strategy

In order to ensure there is a meaningful and timely implementation of the *Feeding Australia* strategy, there should be clear targets against which to measure the impact of any investment in food security. This should include metrics that reflect the Government's progress towards diversifying the food supply system, securing agricultural production and supporting the integration of new technologies, including biotechnologies, along the agrifood supply chain.

Recommendation 10: The *Feeding Australia* Strategy should include clear targets against which to measure the impact of Government's investment in food security, including progress towards integrating new technologies, including biotechnologies, into the agrifood supply chain.

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September 2025