



Made & Grown

The future of food biotechnology
& biomanufacturing in Australia

October 2025



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We would also like to extend our gratitude to the following individuals for reviewing and providing insights for this report: Jennifer Morton, Wasamon Nutakul, Maanasa Ravikumar and Patricia Neves (The Good Food Institute APAC), Jason Whitfield and Phil Morle (Main Sequence Ventures), Kylie Porter (Greater Whitsundays Alliance), and Nicholas Chilton (Venture Affairs).

Cover Image provided by Nourish Ingredients.

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Cellular Agriculture Australia (CAA) – is a registered Australian not-for-profit and the leading advocacy organisation for the cellular agriculture sector in Australia.

ANU Agrifood Innovation Institute (AFII) – aims to accelerate transformative innovation to future-proof the Australian agrifood system by connecting The Australian National University (ANU) with industry and entrepreneurs.

Australian Strategic Policy Institute (ASPI) – is an independent, non-partisan think tank that delivers expert analysis and practical advice on defence, national security, and strategic policy. Established to inform government, industry, and the public, ASPI provides rigorous, evidence-based insights that shape Australia's understanding of its strategic environment.

ANU National Security College (NSC) – as a joint initiative of the Commonwealth Government and the ANU, the ANU National Security College plays a key role in advancing Australia's preparedness for emerging risks, including food system shocks.

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Executive Summary

Australia stands at a pivotal moment in the future of food. Mounting climate, biosecurity, and geopolitical risks are converging to expose the vulnerability of our food and agricultural systems and globalised supply chains.

A resilient, sovereign food system is essential to safeguarding economic prosperity, stability, and Australia's place in the region. In essence, food security is a matter of national security.

To meet these challenges, Australia has a once-in-a-generation opportunity to build sovereign capability in food biotechnology, either as part of conventional agricultural production and/or through new food manufacturing processes. Food biotechnologies and biomanufacturing – such as precision fermentation, plant molecular farming, plant synthetic biology and cell cultivation – can play a significant role in strengthening food system resilience. **These technologies are increasingly being applied across the food system to drive:**

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

These technologies have the potential to diversify production systems, reduce reliance on imports, embed adaptability into supply chains, and decarbonise production.

The Indo-Pacific region is defined by strategic competition and accelerating investment in bio-based industries. As such, building capability to produce, process, and innovate domestically is not merely an economic advantage – it is a safeguard against supply disruption (e.g. price shocks), intellectual property loss, external dependency and possible coercion.

Beyond national security, emerging food biotechnologies can complement traditional agricultural supply chains, support regional economies, create jobs and new export opportunities.

Australia is well-positioned to capture a share of the food biomanufacturing market, estimated to be worth **USD \$100 billion by 2040**, with **key competitive advantages such as:**

- Globally recognised food safety and quality standards, including a food safety regulatory framework capable of assessing new food ingredients produced using biotechnologies;
- Abundant high-quality feedstock supply (e.g. sugarcane), a critical input for food biomanufacturing;
- Robust cross-disciplinary research capability;
- Proximity and established trade links to rapidly growing Asian protein markets.

Coupled with an early mover advantage, these strengths position Australia to become a regional, or global, hub for food biotechnology and biomanufacturing. We are already seeing strong signals: commercial partnerships extending beyond the sector, an uptick in regulatory approvals, technical progress towards cost parity, and a maturing ecosystem.

By investing now, the Australian government could ensure national resilience while creating economic value across domestic industries and regional communities for generations to come.

Despite progress by leading Australian companies, food biotechnology and biomanufacturing remains under-invested relative to other bioeconomy domains such as biofuels. Meanwhile, global competitors are moving quickly, investing heavily in infrastructure, and embedding biotechnology within national priorities. Without urgent action, Australia risks losing its early-mover advantages and seeing domestic capability shift offshore.

A coherent national approach to food biotechnology and biomanufacturing, coupled with significant and sustained investment, is needed to ensure Australia capitalises on this immense opportunity.

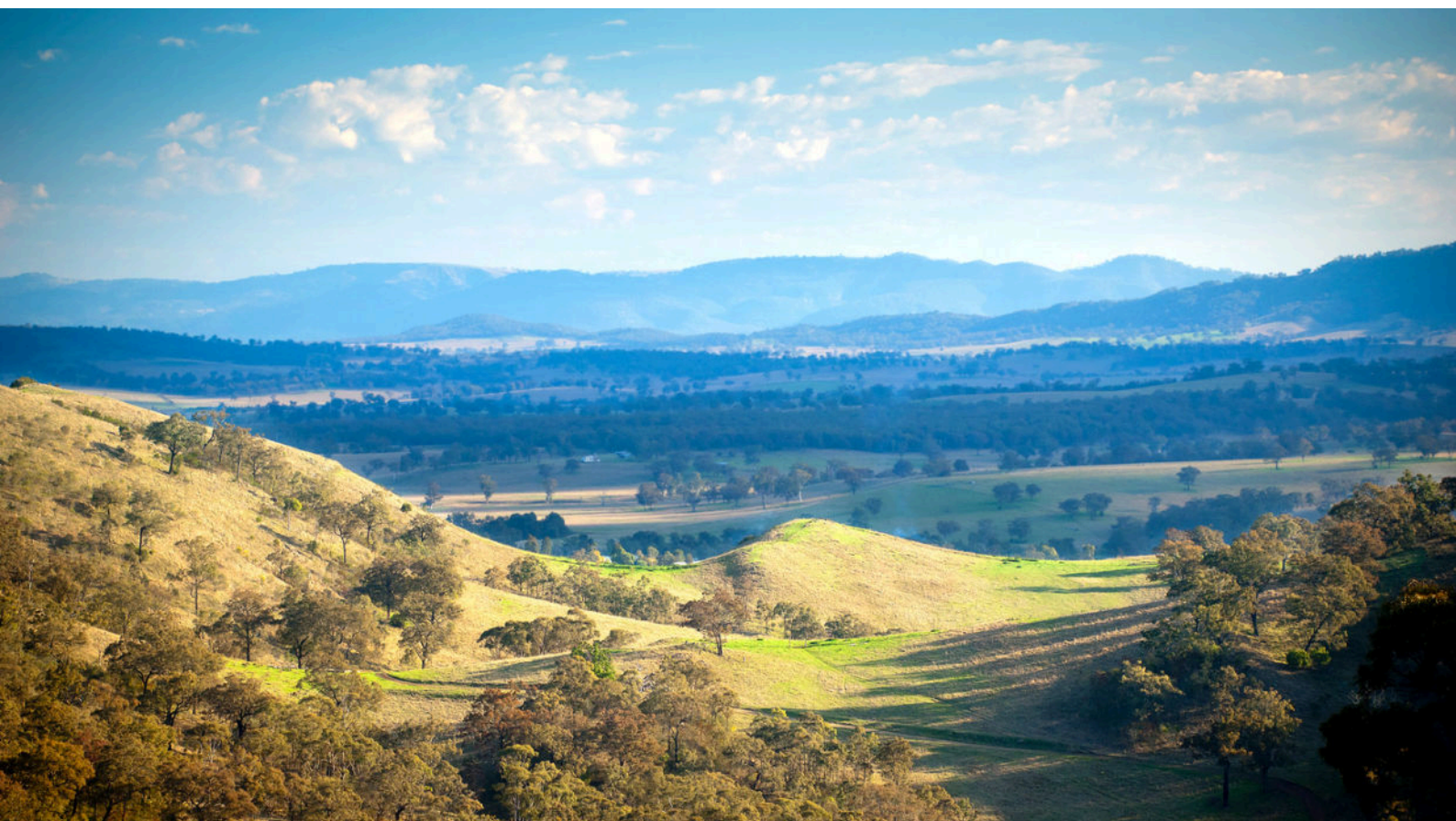
In pursuit of this goal, this white paper sets out **25 recommendations** for the Australian Government and sector representatives across **five priority areas**:

- **National security** – It is essential to recognise food security within national security priorities to address vulnerabilities in Australia's food system.
- **Policy alignment** – Current settings are fragmented, outdated, and fail to recognise the role of emerging food biotechnologies. Australia needs both incremental reform and purpose-built policies that position biotechnology as a driver of food and national security. A unified *Feeding Australia* strategy and a national bioeconomy strategy must explicitly prioritise, and set actionable targets around building sovereign capability in food biotechnology and biomanufacturing in order to drive investment and elevate the industry as a cross-portfolio priority.
- **Research and innovation** – Despite significant cost reductions achieved by local companies, further cross-disciplinary, open-access foundational research is essential to close the gap to cost parity with conventionally-produced products. Increased R&D funding allocations and increased eligibility in existing programs is critical.

- **Regulation** – Australia's regulatory system is robust and trusted, but under-resourced and reactive. FSANZ requires additional funding, as well as a clear and forward-looking mandate to streamline approvals and maintain global competitiveness.
- **Infrastructure** – Access to fit-for-purpose infrastructure is the most immediate barrier facing Australia's food biotechnology and biomanufacturing industry. Shared pilot-scale facilities are scarce and costly to access, and there are no large-scale commercial facilities, forcing Australian companies to seek scale-up opportunities offshore. The government should underwrite access to existing infrastructure, invest in new multi-user scale-up hubs, and align public funding instruments to capital needs.

Australia has the building blocks to lead, but we are losing ground to global competitors, and the window of opportunity is closing. Building sovereign capability in food biotechnology and biomanufacturing will require bold action, policy clarity, and catalytic investment.

If Australia acts now, emerging biotechnologies can enhance national resilience, secure food supplies, and foster a globally competitive bioeconomy.



Recommendations

The following recommendations provide a pathway towards the widespread adoption and commercialisation of food biotechnologies and biomanufacturing in Australia.

National security

Federal Government:

1. Food security should be formally recognised by the Australian Government as a core domain of national security.

Doing so would ensure that national security policies, capabilities, and risk assessments explicitly address vulnerabilities in Australia's agricultural systems and food supply chains.

The Australian Strategic Policy Institute (ASPI's) National Food Security Preparedness Green Paper sets out 14 recommendations to the Australian Government, focused on embedding food security more broadly within national security frameworks, strengthening coordination, and addressing vulnerabilities in critical inputs ([see page 5](#)). It should be noted that whilst these recommendations are valuable, they are not tailored to the specific opportunities and challenges of food biotechnology and biomanufacturing.

2. Each node in the food security ecosystem should engage in a coordinated process to identify key drivers, risks, threats, and vulnerabilities.

This process should be guided by a structured risk and threat assessment methodology, tailored to the specific technologies, supply chains, regulatory environments, and strategic contexts of Australia's food biotechnology sector. Such an approach would provide the government with the comprehensive data needed to strengthen national resilience and safeguard critical food and technology supply chains.

Policy

Federal Government:

3. The Department of Agriculture, Forestry & Fisheries' (DAFF's) Feeding Australia plan should acknowledge that the future of food will be underpinned by the adoption of biotechnologies and biomanufacturing from paddock to plate.

Recognition of biotechnologies will enable diversification of Australia's highly concentrated food system, which is currently reliant on a narrow range of commodities and supply chains vulnerable to climate and geopolitical shocks. Additionally, Feeding Australia should recognise that food security is a cross-portfolio priority that will need to address national security, sovereign manufacturing capability and regional resilience.

3.1. Linked to the implementation of Feeding Australia, DAFF, the Department of Industry, Science and Resources (DISR), and Treasury should establish a joint working group with industry representatives to set clear, measurable targets for diversifying Australia's food system and accelerating the integration of emerging technologies, including biotechnologies and biomanufacturing, into agrifood supply chains. Future public funding for the sector should be linked to progress against these targets. Following this, a formal government–industry body should be established to oversee and deliver on these targets.

4. Existing R&D policy frameworks should be tasked with supporting the emergence of new technologies, products or industries through explicit funding programs or simple changes to purpose and definitions.

Current government priorities, as reflected in existing policies and programs, are not well aligned with the needs of food biotechnology and biomanufacturing with several critical gaps illustrating this misalignment. Specifically:

4.1. The Department of Education (DoE) should prioritise food and other crop-derived products as an output in future NCRIS infrastructure investments related to the bioeconomy.

4.2. The National Science and Research Priorities and National Research Infrastructure Roadmap should explicitly prioritise biotechnologies and biomanufacturing in the production of food.

5. DISR should prioritise the prompt development of a bioeconomy strategy that explicitly includes food biotechnologies & biomanufacturing as a core pillar. The strategy should recognise the role of biotechnology in agricultural and food security to build a future-proof agrifood system that is efficient and resilient.

A coordinated national approach would provide a clear framework and trajectory for building Australia's bioeconomy, enabling strategic planning for the public and private investments needed to accelerate the transition to a sovereign, innovation-led bioeconomy.

Sector representatives:

6. Cellular Agriculture Australia (CAA) will establish an Industry Working Group to develop policy solutions that are grounded in industry needs and opportunities. This will enable CAA to effectively advocate to government on behalf of industry.

Additionally, CAA, along with AFII and NSC will explore opportunities for further collaboration to drive science-backed advocacy and government engagement to mitigate policy barriers affecting the sector.

Research & Technical Innovation

Federal and State Governments:

7. Government should commit to additional National Collaborative Research Infrastructure (NCRIS) funding for research infrastructure beyond the current 2024–2028 period, particularly through investment in agrifood-related facilities of Bioplatforms Australia and the Australian Plant Phenomics Network (APPN).

Ongoing and additional funding for NCRIS is essential to maintain continuity in foundational biotechnology research. It will ensure adequate funding is available to address the ongoing and evolving research needs as the sector scales.

8. State and Federal governments should expand support for cross-disciplinary, open-access research in critical areas linked to the advancement of food biotechnology and biomanufacturing. This requires ensuring that foundational food biotechnology research is explicitly eligible for, and prioritised within, relevant government funding mechanisms (e.g. university block grants).

8.1. As a part of this, at least **30% of Federal & State R&D funding allocated to the agrifood sector over the next funding cycle should explicitly prioritise food biotechnologies and biomanufacturing.**

Advancing Australia's food biotechnology and biomanufacturing sector requires foundational research in critical areas including: strain and cell line development, bioprocess optimisation, and facility design. Currently, investment in this foundational research is limited, and much of the existing knowledge is proprietary and restricted within private companies (1) – which hinders innovation and creates a strategic risk for sector growth.

9. DISR, in consultation with Innovation and Science Australia (ISA) and the Cooperative Research Centre (CRC) Advisory Committee, should review current CRC allocations to determine whether existing Cooperative Research Centres could expand their mandates to include biotechnology and biomanufacturing in food production, or whether a new CRC is required.

Several CRCs already address aspects of the agrifood system (Future Food Systems CRC, Food Agility CRC, End Food Waste CRC, and the ZNE-Ag CRC). CRCs have historically broadened their research scope mid-cycle in response to emerging priorities; for example, the Food Agility CRC expanded its remit to include carbon and natural capital in 2021 (2). Drawing on this precedent, a targeted review would identify opportunities to align existing research investments with emerging areas of strategic importance for Australia's agrifood sector.

Sector representatives:

10. The sector should clearly identify and document high-priority research areas and technical innovations needed to support the transition to large-scale production and commercialisation in Australia.

Whilst the sector is aware of high-level areas of research required (outlined in this report), there is currently no coordinated and aligned understanding of the highest-priority research questions for the Australian industry. By mapping critical research and technical gaps, the sector will be able to make more effective and targeted funding requests, ensuring investment is directed where it can most accelerate scale-up and technology adoption.

Regulation

Federal Government:

11. DAFF should add 'regulatory and policy agility' as a key guiding principle in the formation of Feeding Australia.

In order to embed a future-focussed approach to the integration and adoption of biotechnologies in agricultural and food production, Feeding Australia should explicitly focus on building an enabling policy and regulatory environment.

12. The next Federal Budget should allocate additional funding to Food Standards Australia New Zealand (FSANZ) to enable it to accelerate assessment timelines.

FSANZ is currently not sufficiently resourced to deliver its current regulatory functions (3) and completes assessments more slowly than other comparable jurisdictions. Additional funding would enable faster assessments of novel foods, including precision-fermented ingredients, without compromising safety. This funding should be championed by the Minister for Health & Ageing and in coordination with the Department of Health and Aged Care.

13. Federal Government departments (e.g. DAFF, DISR) should provide earmarked funding to FSANZ to raise a Proposal to review and update the Food Standards Code to ensure it keeps pace with new and emerging industries and technologies. Specifically, the Proposal should focus on the use of biotechnologies and biomanufacturing to create new food ingredients.

Current frameworks are not fit-for-purpose or future-proofed for emerging technologies, in particular with relation to food ingredients produced using precision fermentation. However, FSANZ is currently significantly under-resourced, which necessitates a focus on its statutory obligations rather than proactive and forward-looking projects. Precedents exist where the federal government has provided earmarked funding to FSANZ to address emerging industry needs, for example, DAFF supporting FSANZ to review labelling of plant-based foods with funding of \$1.5 million in the 2024-25 Budget (4).

14. The FSANZ Act should be amended to introduce a comparable overseas regulator (COR) regime.

This would empower FSANZ to accept dossiers and assessment outcomes from trusted international regulators to streamline local approvals.

Regulators:

15. The FSANZ workplan should be amended to include a formal Proposal related to the use of biotechnologies in food production,

particularly precision-fermented ingredients, to ensure the Food Standards Code is fit-for-purpose and future-proof.

The FSANZ workplan is currently focused on fulfilling its statutory obligations including assessing applications, and progressing current Proposals.

16. FSANZ should promptly develop clear guidance documents to inform companies of what must be included in regulatory dossiers

for novel food products (e.g. cultivated meat) and foods produced using gene technology (e.g. precision-fermented ingredients) before submission for approval.

Industry feedback has suggested that the FSANZ Application Handbook does not provide sufficient details on the relevant tests and data that would underpin a successful application, creating additional costs and delays in submitting a dossier.

17. Establish a cross-agency working group between FSANZ, Office of the Gene Technology Regulator (OGTR) and Therapeutic Goods Administration (TGA) tasked with improving domestic harmonisation between regulators to reduce overlap and inconsistency.

This should include, but not be limited to, standardisation of currently diverging definitions for genetically modified organisms (GMOs).

Sector representatives:

18. Continue to leverage CAA's Regulatory Industry Working Group to identify industry challenges and advocate for reform through submissions to public consultations and direct engagement with regulators. CAA is currently working to expand membership and industry engagement.

Shared scale-up infrastructure

Federal Government:

19. DISR should endorse and implement CAA's proposal for a Co-Pilot Manufacturing Scheme (CPMS),

which proposes that the Government underwrite subsidised access to existing Australian research and commercial-scale infrastructure for food biomanufacturing companies to undertake key commercialisation steps.

The construction of new facilities takes time, so CAA has designed the CPMS scheme as an interim measure to accelerate company progress through enabling widespread access to commercial, shared and research facilities that already exist.

20. State and Federal co-funding should be administered to develop shared scale-up facilities for food biotechnology and biomanufacturing.

Existing infrastructure (e.g. QUT's Pioneer BioPilot, planned upgrade to CSIRO's Werribee facility) should be assessed as potential recipients of future investment and/or as models for the establishment of additional facilities.

Access to share scale-up infrastructure is a critical stepping stone to commercialisation, however such facilities suited to food production remains scarce in Australia.

21. The Federal Government should commit to extending the Food and Beverage Accelerator (FaBA) funding beyond 2026.

This extension should align with, and be informed by, the ongoing Trailblazer Universities Program funding cycle (currently allocated through 2025–26) to ensure continuity of support for the food biotechnology industry in accelerating scale-up and commercialisation outcomes.

Commercial Infrastructure Finance

Federal Government:

The Australian Government should support the development of infrastructure to underpin a commercial biomanufacturing supply chain to underpin the sustainability and security of Australia's food supply chain. As a starting point, this should include:

22. Direct the Treasury, under the Future Made in Australia framework, to undertake a sector assessment of the food biotechnology and biomanufacturing sector.

In accordance with the Future Made in Australia Act 2024, this assessment should identify investment priorities, barriers to private capital, and clarify which public instruments (e.g. tax exemptions, grants, blended finance, strategic procurement, and government-backed volume guarantees) are viable based on expected returns and sovereign benefits.

This would enable the government to map capital needs and match them to appropriate financial instruments, helping to address the current challenges in securing a viable funding mix for first-of-a-kind (FOAK) facilities.

22.1. To support this, a sub-working group of the proposed *Feeding Australia* government-industry working group (see 4.a) should assess the current funding landscape and recommend priority actions. This should include representation from DISR, Treasury, DAFF, NRF, and relevant industry bodies and representatives.

23. DISR should establish a dedicated ARENA-style agency for the Australian biomanufacturing industries (inclusive of food, biofuels, chemicals, textiles, materials, biopharmaceuticals, etc.). This agency would define the critical strategic priorities for the bioeconomy and administer funding across the entire sector, including debt-free funding for pilot studies and first-of-a-kind (FOAK) facilities, as well as the consolidation of existing government grant streams under a single, sector-specific body.

The Australian Renewable Energy Agency (ARENA) provides a proven model for administering large-scale, targeted funding programs that accelerate commercialisation, build investor confidence, and support strategic national priorities.

24. The Minister for Industry, Innovation and Science & Minister for Finance should work with the National Reconstruction Fund (NRF) Board to **ensure the risk tolerance and investment guidelines of the NRF are aligned with the catalytic nature of funding required to support nascent industries – specifically food biotechnologies and biomanufacturing.** This could be achieved through:

24.1. Releasing investment guidance for the Enabling Capabilities NRF priority area to provide guidance on investments. Guidance should include clear eligibility for food as an application of biotechnology and biomanufacturing, and define technology readiness levels (TRLs) and investment thresholds at which the NRF would invest.

Alternatively;

24.2. Establishing a dedicated fund within the NRF to support novel or nascent industries that drive diversification of the Australian economy. The sub-fund should incorporate adjusted risk parameters to account for the nascency of the sector and the challenges of demonstrating early commercial demand, and include food biotechnologies and biomanufacturing clearly in scope. The \$5 billion Net Zero fund, administered by the NRF, provides a precedent for this approach.

The NRF has recognised that current investment parameters and competing funding asks make it challenging to justify funding for higher-risk, nascent industries. Food biotechnology and biomanufacturing currently appear to straddle multiple NRF priority areas (e.g. enabling capabilities, value-add in agriculture, forestry and fisheries), which can result in these sectors being overlooked. A co-investment plan would provide clarity for the industry, whilst a dedicated fund would ensure sufficient flexibility and risk appetite to catalyse the growth.

Sector representatives

25. Undertake robust economic modelling to quantify the commercial, employment, and export potential of Australia's food and agricultural biomanufacturing sector.

This evidence base will support a clear, unified vision, demonstrating the sector's value and strengthening the investment case to government and the public.

Introduction

Our economies are being reshaped and must evolve in response to the combined pressures of climate change, petrochemical dependence, fragile global supply chains, and geopolitical volatility.

At the heart of this transition lies the emergence of a global bioeconomy: an economic system which leverages renewable biological resources and biomanufacturing technologies to offer more sustainable ways of producing goods, services and energy. Rather than forming a separate part of the economy, the bioeconomy builds on and accelerates existing bio-based industries. Biomanufacturing is the engine that will power various industries within the bioeconomy – harnessing living systems, such as microorganisms, to produce food, fuels, fibres and a range of other products at commercial scale.

Australia has long been recognised for its strengths across agriculture and food systems. Yet these systems are increasingly exposed to challenges and vulnerabilities, from climate impacts to supply chain disruptions. The transition to a sustainable bioeconomy presents a transformative opportunity to reshape Australia's food system. This shift calls for an evolution in how food is produced, both within traditional agricultural sectors and through emerging industries. By embracing this change, Australia can not only strengthen the resilience of its domestic food system but also build sovereign capability and position itself as a global leader in the application of emerging food biotechnologies and biomanufacturing.

The biotechnologies central to this opportunity include precision fermentation, synthetic biology, plant molecular farming and cell cultivation.

Globally, Boston Consulting Group (BCG) estimates that the market for biomanufactured food products could be worth USD \$100 billion by 2040 – surpassing estimates for other emerging biomanufacturing industries (5). With coordinated effort, Australia has the potential to capitalise on a multi-billion dollar opportunity and become a global food biotechnology & biomanufacturing leader. Despite this opportunity, the sector has so far received comparatively little attention or investment relative to other sectors within the bioeconomy (e.g. biofuels, biopharmaceuticals).

This white paper, developed by Cellular Agriculture Australia (CAA), ANU Agrifood Innovation Institute (AFII), ANU National Security College (NSC), and the Australian Strategic Policy Institute (ASPI), highlights the strategic role of emerging biotechnologies in the future of Australia's food system. It situates biotechnology within the dual contexts of food and national security, evaluates the sector's current progress, and provides clear recommendations for the government and the food biotechnology and biomanufacturing sectors (hereby referred to as 'the sector').

The white paper draws directly on insights captured from Made & Grown – The Future of Food, a conference jointly hosted by CAA, AFII, and NSC on August 21, 2025, in Canberra. The event convened more than 150 delegates from across Australia's food biotechnology sector, alongside government and policy representatives. Designed as a catalyst for action, Made & Grown aimed to accelerate industry momentum and strengthen collaboration between government and key stakeholders, building the future of food biomanufacturing in Australia. This report continues that work by combining the outcomes of the conference, alongside additional desktop research, to produce clear insights and recommendations.



Left: Panel at Made & Grown
– The Future of Food

Key terminology in this report

Sovereign capability refers to the ability to independently secure and control critical goods and services essential for resilience. In food, this extends beyond traditional agriculture to include the domestic capacity to produce key ingredients and products that are otherwise vulnerable to climate, trade, or supply chain shocks

Bioeconomy is an economic system which 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, pharmaceuticals (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 and ingredients.

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.

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. The products produced may or may not be genetically modified.

Examples of food biotechnology which 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 (6). 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.

Part 1: Food, The National Security Imperative

1.1 Food security is national security

National security has been increasingly recognised as extending beyond defence and border protection. It encompasses the stability and resilience of the systems that sustain Australia's sovereignty, prosperity, and way of life – including economic strength, critical infrastructure, and societal wellbeing. In the context of interconnected risks, safeguarding national security requires an integrated approach that anticipates threats, strengthens institutional capacity, and ensures the nation can withstand and recover from disruption.

Disruptions to food systems and food insecurity constitute a direct national security risk. Food security should not be viewed as solely an agricultural or humanitarian concern. In an era of growing strategic and political uncertainty, supply chain fragility, and climate risk, it must be treated as a matter of national security (7).

Furthermore, it is important to distinguish between agricultural security and food security. Agricultural security focuses on securing one major, and historically dominant part of the supply side of food production – agriculture – including its inputs, production capacity, and trade routes. This framing overlooks the growing role of food biotechnologies and biomanufacturing as part of the supply system. Food security, by contrast, seeks to ensure that food is available, accessible, safe, and affordable for people – and increasingly intersects with national resilience, supply chain sovereignty and regional diplomacy. Both food security and agricultural security are under pressure and must be addressed if Australia is to build resilience.

Australia has historically produced more food than it consumes. While this is an important aspect of Australia being considered a food-secure nation, this does not paint the full picture and does not guarantee this in the future.

As such, it is misleading to present Australia as a food-secure nation without acknowledging the vulnerabilities embedded in our supply chains.

One key lever available to government to increase resilience is diversification of domestic production mechanisms through investing in novel and emerging biotechnologies for food production.

Current and emerging vulnerabilities in our agricultural supply chains

Although Australia's agricultural production and productivity continue to grow (8), this trajectory cannot be taken for granted. Productivity growth has slowed since 2000 (9), and our system is already experiencing disruptions that expose its underlying vulnerability – illustrating that food and agricultural insecurity is not a distant risk. As such, food supply chains need to be equipped to manage present and future risks and vulnerabilities, including the following:

Climate change and extreme weather

It is well known that the emerging threat of climate change is already placing significant pressure on Australia's food and agricultural systems – and this will only serve to worsen over time. Under current policies, global warming is projected to reach around 2.7°C by the end of the century, increasing the severity and frequency of extreme weather events and compounding risks to food production (10).

Multi-year droughts are already having significant impacts on both crops and livestock.



Above: The Australian Millennium drought. Credit: The Source Magazine.

In 2023–24, for instance, grain exports fell sharply and overall agricultural production declined due to drier conditions (11, 12). Droughts are expected to become more frequent and prolonged across most of the country in the coming decades (13). And according to the 2025 National Climate Risk Assessment, these pressures will be compounded by extreme heatwaves, which are expected to at least double in frequency if warming reaches +2.0°C (14). Heatwaves will create landscape-scale shocks that sharply reduce crop yields and disrupt supply chains from producers through to consumers (15).

Heat and drought also shift market dynamics. Grain, for example, often gets diverted to meet domestic livestock demand, where higher prices are paid, rather than being exported (16). This creates a dual challenge: the risk of permanently losing valuable export markets, which are difficult to re-establish once disrupted, and higher domestic food prices that disproportionately impact lower socioeconomic groups and undermine food security. Together, these dynamics create a growing tension between meeting domestic food needs and maintaining Australia's reputation as a reliable agricultural exporter.

Other climate hazards compound these risks. The dairy industry is particularly vulnerable, with unpredictable weather patterns coupled with extreme weather like floods and droughts already impacting the quantity, quality and timing of supply (17). Livestock are expected to face greater heat stress in the coming years, reducing productivity and animal welfare (18). These challenges are expected to intensify in the years to come, with global estimates suggesting up to a 30 million ton global milk shortage by 2030 (19).

Beyond production, climate change also threatens the transport and distribution networks on which food security depends. With limited road and rail networks, especially in regional areas, Australia is uniquely exposed when critical infrastructure and supplies are cut off (20). Climate-related events like floods, cyclones and heat-induced road melt have already compromised critical transport infrastructure and disrupted food production and distribution. These interruptions isolate communities, delay critical supplies, and magnify vulnerabilities in an already fragile, just-in-time system. As climate impacts intensify, ensuring resilience in national transport and storage infrastructure will be as important to food security as securing the inputs that drive production.

Looking ahead, global decarbonisation efforts will expose deep dependencies within food and agricultural systems that have long relied on petrochemical inputs. Transitioning from fossil-based fertilisers, plastics, and fuel to biological and renewable alternatives will not only reduce emissions but also mitigate supply-chain risks tied to volatile oil markets and geopolitical disruptions. Emerging biomanufacturing technologies offer viable pathways to replace petrochemical inputs with locally sourced, biologically-derived compounds, lowering emissions while strengthening supply-chain sovereignty and reducing exposure to global supply chain volatility.

Furthermore, to meet Australia's 2035 emissions reduction target of 62–70% below 2005 levels, significant action is required across all sectors, including agriculture (21). As both domestic and international pressures on emissions intensify from regulators, markets, and private-sector actors, Australia's agricultural producers and food manufacturers face rising expectations to innovate and adapt. This creates a critical opportunity for the agrifood system to adopt biotechnology-enabled production methods/systems with lower emissions and less reliance on petrochemicals – helping the sector progress toward net-zero targets while alleviating the burden on farmers to reduce on-farm emissions.

Reliance on international supply chains for key inputs

We are in an era of growing strategic uncertainty. Geopolitical tensions are rising in the Indo-Pacific Region, and thus our reliance on imported products becomes a key risk and vulnerability if our supply chains become weaponised (22). Many imported inputs depend on contested trade routes, leaving Australia exposed to shortages and price spikes. Disruptions to global shipping – as seen during COVID-19 or the recent 2021 Suez Canal blockage (23) – highlight how quickly international events can ripple through the national economy and food system. Critically, the defence force is driving enhanced preparedness activity, but to date, this hasn't been replicated across the agriculture sector and food system in a coordinated manner (24).

A key concern is Australia's reliance on imported fuel, fertilisers, chemicals and other agricultural inputs situated within vulnerable just-in-time supply chains. Fuel is a critical risk: 90 per cent of Australia's fuel is imported, with reserves covering only a matter of days (25). To build sovereign capability in low-carbon liquid fuels, the Australian Government is investing AUD \$1.1 billion in domestic biofuel production, announced in September 2025 (26). Additionally, shortages of critical inputs like AdBlue (diesel exhaust fluid) can cause immediate and cascading disruption to the freight and logistics systems underpinning our food system (27).



Our supply chains are fragile, and this makes them vulnerable to weaponisation. If supply chains are disrupted, domestic food production essentially becomes a form of strategic defence.

Biosecurity threats

Livestock-related diseases are an increasingly significant risk to global food security, with recent events highlighting the scale of potential disruption. The 2024–25 outbreaks of avian influenza demonstrated how quickly animal diseases can destabilise supply chains. In Australia, widespread outbreaks received significant media attention as egg shortages and sharp price increases emerged (28). Globally, the United Nations Food & Agriculture Organisation (FAO) declared in March 2025 that avian influenza had reached an unprecedented scale, with hundreds of millions of birds lost worldwide and growing concerns about potential transmission to humans (29, 30). These events provide a stark illustration of how rapidly biosecurity threats like animal disease outbreaks can generate uncontrollable supply shocks.

The pressures outlined above are set to intensify in the coming years, underscoring why organisations such as ASPI and NSC recognise food and agricultural security as critical enablers of national security. These risks demand proactive adaptation across farming systems and food production to protect Australia's long-term food security. Building sovereign capability in biotechnology and biomanufacturing offers one important pathway forward by supporting the development of more resilient crops and creating new ways of producing food and ingredients.

Below: 2021 Suez Canal Blockage. Credit: Maxar Technologies, via Agence France-Presse — Getty Images



Key recommendations

Federal Government:

1. Food security should be formally recognised by the Australian Government as a core domain of national security.

Doing so would ensure that national security policies, capabilities, and risk assessments explicitly address vulnerabilities in Australia's agricultural systems and food supply chains.

The Australian Strategic Policy Institute (ASPI's) National Food Security Preparedness Green Paper sets out 14 recommendations to the Australian Government, focused on embedding food security more broadly within national security frameworks, strengthening coordination, and addressing vulnerabilities in critical inputs ([see page 5](#)).

It should be noted that whilst these recommendations are valuable, they are not tailored to the specific opportunities and challenges of food biotechnology and biomanufacturing.

2. Each node in the food security ecosystem should engage in a coordinated process to identify key drivers, risks, threats, and vulnerabilities.

This process should be guided by a structured risk and threat assessment methodology, tailored to the specific technologies, supply chains, regulatory environments, and strategic contexts of Australia's food biotechnology sector. Such an approach would provide the government with the comprehensive data needed to strengthen national resilience and safeguard critical food and technology supply chains.

Below: Cultivated pork dumplings by Magic Valley, served at Made & Grown.



1.2 A case for building sovereign capability in food biotechnology & biomanufacturing

There is growing global recognition of the role of biotechnologies in enabling national security. In April 2025, for example, the US National Security Commission on Emerging Biotechnology (NSCEB) released a report emphasising the central role of biotechnologies in safeguarding economic prosperity and national resilience (31). This reflects a broader shift in security thinking: emerging biotechnologies are no longer seen simply as scientific advances, but as foundations of global influence, strategic competitiveness, and preparedness for future shocks.

While a complete transition away from existing supply chains is neither realistic nor desirable, biotechnology and biomanufacturing applied to food offer a unique opportunity to strengthen and complement existing supply chains. This can occur through, for example:

Resilient crops

Modified and enhanced crop varieties can: remove seasonal variability, increase tolerance to climate extremes, reduce input requirements (e.g. water, pesticides and inorganic fertilisers), and decrease vulnerability to spoilage and transport delays.

New food production systems

New food production systems, such as precision fermentation and cell cultivation, can provide additional sources of domestic protein and ingredients and reduce dependence on fragile imports.

Key benefits relevant to food security include:

Onshoring production – these production methods will shorten or even replace supply chains by enabling localised biomanufacturing, whilst also reducing the reliance on imported inputs. Additionally, biomanufactured ingredients are often substantially equivalent to their conventional counterparts, creating opportunities for straightforward integration into existing supply chains.

Less vulnerable to external shocks –

production occurs in controlled environments largely independent of, and less vulnerable to, changing environmental conditions and biosecurity threats. Whilst food biomanufacturing is reliant on traditional supply chains (e.g. sugarcane as feedstock), the scale of dependency is far less.

Adaptability – common-use

biomanufacturing facilities can pivot production to numerous bio-based products 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 will also likely require 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.

Australia has already seen the consequences of acting too late in other industries. In areas such as solar photovoltaics and critical mineral refining, the nation is attempting to establish domestic capacity decades after other countries have secured market leadership (32, 33). Food biomanufacturing, by contrast, remains at an early stage globally. Considering Australia's strong underlying capabilities and competitive advantages (outlined below), the sector is a prime initial focus area for building sovereign capability. To avoid repeating past missteps, Australia must act decisively now to position itself as a leader in this emerging sector.

The next section explores how food biotechnology also represents one of the strongest opportunities to drive economic prosperity. A more prosperous Australia is also a more secure Australia – reinforcing the link between economic strength, national resilience, and long-term security.

Part 2: The economic opportunity & Australia's competitive advantage

2.1 Building new bioindustries: growing and diversifying our domestic economy

Beyond its role in strengthening resilience, food biotechnologies and biomanufacturing represent a once-in-a-generation economic opportunity, with McKinsey estimating that up to 60 per cent of the world's physical inputs could eventually be biomanufactured (34). As put by industry investor Anthony Chow, "the use cases of biomanufacturing in the future are going to absolutely dwarf anything that has happened historically in pharmaceuticals or other applications."

Globally, Boston Consulting Group (BCG) estimates that the market for biomanufactured food products could be worth USD \$100 billion by 2040 (35). Notably, this surpasses estimates for other emerging biomanufacturing industries, including specialty chemicals and chemical precursors.

For Australia, CSIRO estimates that precision fermentation alone could generate up to AUD \$1.1 billion in direct revenue and create more than 2,000 new jobs by 2030 (36).

Furthermore, Australia's proximity to the rapidly growing Asia-Pacific region, particularly Southeast Asia, positions it to establish and grow export industries in biomanufactured food ingredients, where rising demand for food, particularly protein (38), and strong consumer interest in novel, sustainable food products create significant opportunities (39). Food biomanufacturing companies are taking a strong interest in U.S. and European consumer markets, highlighting the global potential for Australian biomanufactured ingredients.

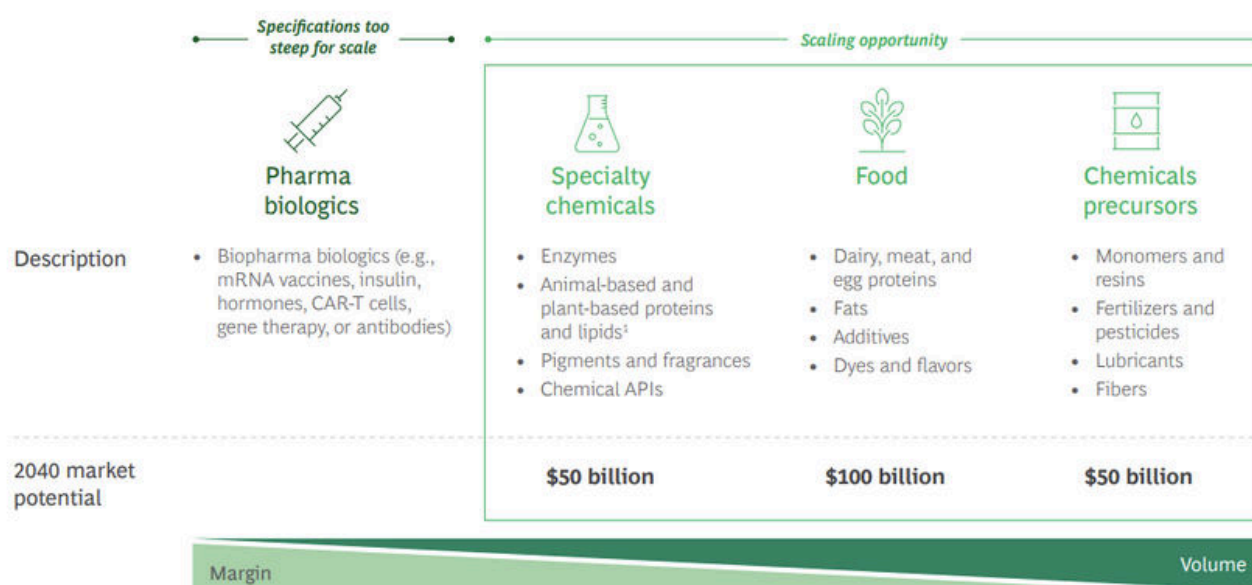


Figure 1. Reducing costs can unlock \$250 billion in demand. Sourced from: Bobier et al. (2024). Breaking the Cost Barrier in biomanufacturing. Boston Consulting Group.



2.2 Regional economic development opportunities

Food biotechnologies and biomanufacturing are often portrayed as competing with traditional agriculture, but in reality, the two sectors are increasingly complementary, and in many cases 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.

Biomanufacturing inputs and co-location

Sugarcane is a critical input (feedstock) for precision fermentation. Mackay, with its proximity to the Queensland sugar industry, which produces 95% of Australia’s sugar (80% of which is exported)(40), is an obvious first choice for a food biomanufacturing hub with a focus on precision fermentation (41). Mackay boasts high-quality sugarcane, five operational raw sugar mills and Australia’s largest sugar refinery, as well as existing food biomanufacturing capacity in the upgraded Mackay [QUT Pioneer BioPilot](#) which launched in September 2025.

Co-locating food biomanufacturing facilities with the sugar industry in Mackay would not only reduce costs, but also drive local job creation and economic growth in the region by creating an additional revenue source for sugar growers and millers.

This localised ecosystem opportunity in Mackay offers a replicable model that could be expanded in other regional communities proximate to key inputs.

Complementing existing regional industries

Food biomanufacturing also has the potential to complement the production capacity of established regional industries. For example, in regional Victoria, biotechnology companies are exploring methods to ‘plug and play’ biomanufacturing capability into existing dairy processing facilities, thus enabling them to diversify their supply of dairy proteins (42). This creates opportunities for conventional dairy producers to capture additional value, while supporting industry adaptation and diversification in a market under pressure.

Below: Racecourse Mill in Mackay. Credit: Mackay Sugar.





Left: GM Safflower. Credit: [ISAAA](#)

Adding value to traditional cropping

Synthetic biology technologies are increasingly being applied across a range of traditional crops, and one such example is plant molecular farming. Through this process, crops in both broadacre and protected cropping environments can be engineered to produce high-value proteins (such as dairy proteins), which can be extracted as an additional revenue stream.

This revenue-stacking model could not only add value to existing crops but also diversify farm incomes and strengthen the economic resilience of traditional agriculture (43). By enabling farmers – who are typically ‘price takers’ in global commodity markets – to participate in higher-value protein markets, plant molecular farming offers a pathway to increased revenue while also providing a hedge against commodity price volatility (44).

Job creation and skills transition

Developing regional food and agricultural biomanufacturing industries would generate a wide spectrum of skilled jobs spanning both STEM and non-STEM fields. Establishing hubs in regions such as Mackay will require a ‘just transition’ approach to ensure that workers from traditional sectors – such as mining and fossil fuels – are reskilled and supported into new opportunities.

The Mining Equipment, Technology and Services (METS) sector is currently one of the largest employers in Mackay and similar regions. It has a workforce experienced in trades such as boiler making, electrical, and fitter mechanics, as well as technical disciplines including design, engineering, and manufacturing (45).

These skills are highly transferable to food biomanufacturing, providing a strong foundation for building local capability. The Greater Whitsundays Alliance has already developed a workforce development model that validated cross-industry skilling pathways and identified tools to support worker transition (46). If managed effectively, this transition could not only safeguard existing employment but also create high-quality new jobs, diversify the regional economy, and contribute to long-term economic prosperity.

The regional and domestic economic opportunities outlined above lay the foundation for Australia’s potential to be a leader in these emerging technologies.

Below: Workers at Mackay Aluminium.
Credit: Mackay Aluminium.



2.3 Australia's competitive advantage

Australia is uniquely positioned to build genuine sovereign capability and establish itself as a world leader in food biotechnologies and biomanufacturing. Some of our most valuable strengths include:

Robust cross-disciplinary research capability

Australia boasts globally recognised expertise in synthetic biology, bioprocessing, bioengineering, cell biology, tissue engineering, and agricultural science.

Strong workforce capability

Australia benefits from a highly skilled STEM workforce, alongside access to essential non-STEM skills such as tradespeople and facility operators. As previously explored, workers from adjacent industries, particularly the METS sector, could be readily cross-trained to support biomanufacturing. According to research by GFI APAC, Australia outperforms key Southeast Asian competitors in workforce readiness to build biomanufacturing capability (47).

Deep agricultural expertise & innovation

As a global agricultural powerhouse, Australia has centuries of expertise in food production across a wide range of crops and livestock systems. Australia's agricultural R&D capability ranks amongst the best in the world (48), and has included pioneering dryland farming techniques as well as advances in crop breeding, animal health, and precision agriculture (49). This provides a strong foundation for integrating biotechnology into existing agricultural value chains and for creating new, high-value opportunities.

Well-established government investment vehicles for investment in agriculture and food research and innovation e.g. Research and Development Corporations, Cooperative Research Centres, Australian Research Council.

Strong IP protection

Australia is a signatory to a number of international agreements that protect IP in other countries, and is ranked 11th in the world for IP security (50, 51).

Abundant high-quality feedstock supply

Feedstock is one of the most significant cost drivers for precision fermentation, and Australia's sugar industry provides a powerful differentiator. Australia is the world's third-largest raw sugar exporter (52), with highly competitive international pricing. This positions Australia to supply cost-effective feedstock at scale, particularly if production facilities are co-located with sugar producers to avoid additional transport costs, which, according to a study by The Good Food Institute Asia Pacific (GFI APAC), can increase feedstock costs by up to 50% (53).

Strong regulatory readiness

Australia (and New Zealand) (ANZ) benefits from a well-established, trusted, and tested food safety regulatory framework capable of assessing new food ingredients, including those produced using gene technology such as precision fermentation and plant molecular farming. This gives us a significant advantage over many countries in the Asia-Pacific region, where such frameworks are not yet in place. ANZ is the second jurisdiction, after the U.S., to grant approval through a dedicated regulatory pathway for cell-cultured foods, providing clarity for future applicants and potentially streamlining approvals.

Additionally, unlike some jurisdictions where products such as cultivated meat have faced political pushback or outright bans (e.g., the U.S. and Italy), Australia has so far taken a pragmatic, science-based approach to the regulation of biomanufactured foods.

Demand for Australian protein

CSIRO has estimated that domestic and export demand for Australian protein products is forecast to increase by 8.5 million tonnes by 2030 (54). Proximity to Asian markets, where protein demand is surging and the synthetic biology sector is among the fastest growing globally, amplifies this opportunity (55).

Proximity to key export markets and established trade partners

Australia benefits from established trade agreements and favourable geopolitical dynamics with a number of key partners across the Asia–Pacific region, giving it a natural advantage as a supplier of food and agricultural biotechnology products.

Globally recognised food safety and quality standards

Australian food production systems – and the way those systems are regulated – are internationally regarded as robust and trustworthy, helping to ensure that biomanufactured products from Australia will be well received by both domestic and global consumers. The reputation of “Brand Australia” in food – safe, clean, and high-quality – provides a strong market entry advantage.

In addition to these strengths, we also have an **early mover advantage**. As previously mentioned, the food biomanufacturing industry is at a relatively nascent stage globally, and Australia is already well-positioned with several leading companies and product approvals, which we’ll expand on later in this report. We have a window of opportunity to capitalise on our strengths and secure a leadership position before the sector matures internationally.

These combined strengths give Australia a genuine platform to build sovereign capability and lead globally in food biomanufacturing. As NRF Investment Director Griff Loughnan affirmed, “Australia’s got such a competitive advantage ... we have the building blocks.” These foundations are already driving the growth of a robust ecosystem of research, startups, and commercial partnerships – momentum we explore in the next section.



Part 3: State of Australia's food biotechnology & biomanufacturing industry

Australia is home to a vibrant and diverse food biotechnology and biomanufacturing ecosystem with several world-leading companies. These companies are increasingly applying emerging biotechnologies across the food system, expanding their use through a broad range of applications.

This section will explore these applications in greater depth and examine key trends that are shaping the sector



3.1 Applications of biotechnology across the food system

Food biotechnology is being applied in two broad and interconnected domains: to enhance existing agricultural systems, as well as create entirely new methods of production.

Re-designing biology to enhance existing agricultural systems

Evolution of traditional cropping systems

Biotechnology, particularly plant synthetic biology, is being used to enhance existing agricultural systems, evolving traditional cropping practices to deliver crops with improved resilience, nutrition, and functionality. Currently, there are multiple commercially grown genetically modified* crops authorised to be grown in Australia. These include:

- Canola and Indian mustard that are tolerant of certain herbicides (e.g. glyphosate, glufosinate). (56)
- Banana line QCAV-4, which is resistant to Panama disease, and the first GM banana approved in the world. (57)

- Super-high oleic acid (SHO) safflower with an increased level of oleic acid in its seed oil, which provides increased stability for food applications (58).
- Omega-3 canola, developed by CSIRO, GRDC and Nuseed, was developed to produce long-chain omega-3 fatty acids DHA and EPA. It offers a sustainable alternative to fish oil, which is traditionally sourced from wild-caught fish, thereby reducing pressure on marine ecosystems (59).

*It should be noted that not all applications of food biotechnology involve GM processes or result in the production of GM products.

Additionally, in 2024, the OGTR approved field trials of HB4 wheat that incorporates a gene from sunflower designed to increase drought tolerance and yields in dry years (60). Gene-editing technology is also providing opportunities for more productive, market-ready crops.



Gene-editing technology is also providing opportunities for more productive, market-ready crops. For example, Australian field trials have commenced for non-GM gene-edited crops with improvements to yield, developed through a partnership between Integrain and Inari (61).

Major new investments in plant synthetic biology and advanced breeding technologies (e.g. the Australian Government's \$60 million step-change investment in synthetic biology infrastructure, through Bioplatforms Australia (62)) are opening up powerful tools to accelerate innovation. These platforms 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 (63) – all of which directly strengthen the security of our food supply chains.

Looking ahead, we can expect the emergence of '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.

Plants as factories

New approaches are also using plants as 'biofactories' to produce valuable proteins and compounds. For example, NZ-based startup [Miruku](#) is using plant molecular farming technology to produce dairy proteins in the seeds of oilseed crops like canola and safflower (with up to 35% of the seed contributing to usable protein outputs).

This complements the existing supply of dairy proteins while leveraging existing agricultural systems (64). This approach is advantageous because the plants act as self-powered bioreactors, avoiding both the infrastructure and energy requirements of technologies like precision fermentation.

[Phyllome](#) is applying similar principles to develop plants that can produce medicinal compounds for pharmaceutical and nutraceutical use. In partnership with Pharmacare, Phyllome is developing plants that deliver functional health benefits when consumed directly, such as in teas or leafy greens, and thus reducing the need for pills or powders (65).

Using biotechnology to produce alternatives to fossil-fuel derived nitrogen fertiliser

Reliance on imported inorganic nitrogen fertilisers present a critical risk to our agricultural security. They are also one of the biggest input costs for Australian farmers (66), with their production contributing to climate change. The solution to this vulnerability is not simply to build fertiliser plants. The ANU 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 (noting that nitrogen is 78% of the atmosphere), instead of relying on inorganic fertilisers (67).



Right: Miruku's Dairy Seed System, powered by molecular farming

Unlocking value from agricultural by-products

Biotechnology is increasingly enabling agricultural systems to capture more value from waste and by-products. For example, black soldier fly (BSF) larvae can transform organic residues into animal feed and fertiliser. EntoZyme is using synthetic biology to transform the BSF into an 'insect-based biomanufacturing platform' producing high-value outputs such as industrial enzymes, omega-3 oils, and bioremediation agents. This signals how biomanufacturing approaches can expand agricultural output in non-competing ways, enhancing circularity and resilience.



New food production systems

New production systems are being developed that operate largely independently of traditional agriculture. Cultivated meat companies such as Magic Valley and Vow are producing pork, lamb, and quail directly from cells. Magic Valley's products are designed to create an indistinguishable taste, texture, and sensory experience compared to traditional lamb and pork. Meanwhile, Vow is seeking to create an entirely new taste experience with innovative products like quail foie gras and parfait. With the demand for animal protein expected to increase drastically in the coming years (68), these companies are positioning themselves to complement existing supply chains and help meet this growing demand, sustainably.

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, nutraceutical and cosmetic applications (69). 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 – the result being that global production is capped at around 500 tonnes per year (70).

By comparison, precision fermentation has the potential to produce the same volume in a single week using a 125,000-litre bioreactor. Companies such as All G, Daisy Lab, and Eclipse Ingredients are leading in this space locally, producing both bovine and human variants of the protein.

Beyond lactoferrin, other novel ingredient approaches are also advancing. For example, Eden Brew is pioneering a casein micelle delivery system, a novel method of fortification to increase the bioavailability of key nutrients like iron.

Fats are another critical area of innovation, where Nourish Ingredients is producing specialty lipids designed to replace those found in dairy and animal fats. This approach aims to address current lipid supply bottlenecks in the dairy industry (71) while enhancing the taste and sensory experience of both plant-based and conventional products. Their products, Creamilux® and Tastilux®, have also demonstrated potential in reducing both the number and percentage of 'unfavourable' ingredients in a product, such as additives, flavours and emulsifiers (72).

Through these examples, we can see that companies are responding to shifting consumer drivers around health and nutrition, making these considerations central to both product development and market positioning.



Right: Nourish Ingredients' product samples

Non-food biomanufacturing opportunities

There are a number of non-food applications of biotechnology and biomanufacturing within the broader agriculture sector; several Australian examples include:

- Membrane Transporter Engineers (MTE) are harnessing plant transporter proteins, produced in yeast systems, to create filtration membranes capable of recovering nutrients, metals, and minerals from complex waste streams. These filters are then applied in industries such as aquaculture and mining.
- Levur uses precision fermentation to produce oils that can be used in a variety of cosmetic, food and nutraceutical products.
- Uluu is using microbes fed with sugars extracted from farmed seaweed to produce 'PHAs', a petrochemical-free alternative to plastic.
- Samsara Eco uses enzymatic biorecycling to break down and infinitely recycle plastics using precision enzyme engineering.
- MicroBioGen is developing new yeast strains for the biofuels industry.
- NewEra Bio uses precision fermentation to produce natural fabric dyes.

3.2 Notable trends

An expanding B2B ecosystem

No single company can own the entire food biomanufacturing value chain, making specialisation both necessary and inevitable. A robust business-to-business supply chain is already beginning to take shape, signalling the growing maturity of the sector.

Specialist providers are emerging to supply critical inputs such as cell lines (e.g. NZ-based Opo Bio) and media formulations (e.g. Media City Scientific), which are increasingly in demand across the industry. Commercial-off-the-shelf equipment (e.g. bioreactors) optimised for food production are also on the horizon, with industrial automation companies such as Rockwell Automation identifying food biomanufacturing as a long-term growth vertical.

The increasing availability of dedicated B2B service providers and solutions is helping to reduce costs, accelerate scale-up, and enable new entrants to focus on their core areas of expertise.

Growing commercial interest

The growing engagement between food biotechnology companies and established sectors such as dairy, wine, and pharmaceuticals reflects the increasing breadth of commercial interest in the field.

For example, Nourish Ingredients is working with Fonterra on dairy applications of its specialty fat Creamilux®, the Australian Wine Research Institute (AWRI) is actively integrating biotechnology approaches to enhance wine production, quality, and sustainability, and Phyllome is collaborating with Pharmacare to produce nutraceutical products. Meanwhile, dairy and plant-based beverage company Noumi have diversified into precision fermentation.

Increasingly, companies in this space are positioning themselves as complementary to existing industries and supply chains rather than in opposition to them - and these partnerships and broadening of commercial interest are a clear demonstration of that approach.

Increasing regulatory approvals

Pre-market approval is essential for many food biomanufacturing companies to sell products in Australia and globally, particularly for companies producing novel foods or foods produced using gene technology. In 2024-2025, there was an uptick in approvals received by Australian-based companies: Vow received approval to sell cultivated meat in both Singapore and Australia (Australia's first approval) (73, 74) and Nourish Ingredients secured FEMA approval in the US for its specialty fat Tastilux® (75).

Additionally, All G has gained regulatory clearance for its bovine lactoferrin for cosmetic applications in China (76). Additionally, several more companies are expected to submit regulatory dossiers in the near future. These approvals signal growing momentum and the increasing maturity of the sector.

Progress towards commercial viability

The unit economics of biomanufactured food products, relative to traditional products, provide a key signal for both government and investors. Developing viable business models and reducing production costs, therefore, remains a central priority for the industry.

While these technologies have demonstrated technical feasibility and commercial viability in high-value, low-volume applications (e.g. pharmaceutical biomanufacturing), the primary challenge for food biomanufacturing companies lies in transitioning to the low-value, high-volume production required for food. This section highlights how leading industry players are approaching this transition and the strategies being employed to make biomanufactured foods commercially competitive.

Product development & market entry strategies

To overcome the initial high costs of production, as well as the absence of large-scale commercial infrastructure, we are increasingly seeing companies targeting high-value, low-volume food applications as their first point of market entry to achieve commercial viability.

As previously mentioned, several Australasian companies (e.g. [All G](#), [Eclipse Ingredients](#), [Noumi](#), [Daisy Lab](#)) are pursuing bovine and human variants of the protein lactoferrin as their first product, targeting premium applications in infant formula and nutraceuticals where there is a clear and immediate path to financial returns.

Meanwhile, [Eden Brew](#) is taking a similar approach, targeting the nutraceuticals industry for the launch of its casein micelle delivery system.



Over the longer term, a number of these companies intend to scale into commodity dairy proteins such as casein and whey once revenue streams and production capacity are established.

We are also seeing the rise of 'CAPEX-light' business models, which reduce infrastructure requirements and accelerate market entry - allowing companies to scale more efficiently and de-risk early-stage development. For instance, [Daisy Lab](#) is seeking to leverage existing dairy industry processing facilities, whereas [Eclipse Ingredients](#) is utilising shared university infrastructure and equipment through the [FaBA](#) program. Facilities such as [CoLabs](#) are providing shared lab space and equipment to support CAPEX-light approaches.

Driving down costs through technical innovation

Australian companies are making remarkable strides in bringing biomanufactured products closer to price parity. Below, we delve into what two Australian leaders, cultivated meat company [Vow](#) and global biomanufacturer [Cauldron Ferm](#), have reportedly achieved in driving down costs across two critical areas: hardware (facility design, bioreactors), and software (bioprocess optimisation, strain development, etc).

Case Study 1: Vow

Vow's 'Factory 2' exemplifies a first principles approach: designed entirely in-house through an iterative process, the facility uses custom bioreactors that are 20–40 times cheaper than pharmaceutical systems, with 80 per cent fewer parts and 75 per cent fewer welds (77). While the bioreactor itself was designed in-house, Vow partnered with stainless steel tank specialists Furphy Engineering in Victoria to build the tank and employed on-site welders to complete the pipework.

The factory operates with a fully automated "lights-out" system (allegedly the world's first for cultivated meat), which is expected to reduce labour costs by more than 95 per cent compared to conventional facilities, while also enabling cell harvests at optimal times and thereby increasing productivity. Additionally, the company utilises a more efficient semi-continuous bioprocess.

According to Vow's CEO George Peppou, the combination of hardware simplification and process automation has resulted in massive capital expenditure (CAPEX) and operating expenditure (OPEX) savings for the company. These innovations have enabled them to reach unit margin positive on all products currently on sale in Australia and Singapore – a milestone they claim no other cultivated meat company has reached in any market.

Furthermore, they are already surpassing best-case scenario projections made by techno-economic analyses such as Humbird's 2021 analysis (78). Vow, for example, has achieved cell densities of 100–110 g/L compared to the projected best-case of 65 g/L, with media costs nearly halved and hardware costs reduced by over 80 per cent.

Below: Vow's Factory 2



Case Study 2: Cauldron Ferm

Cauldron Ferm's mission is to realise the full potential of precision fermentation by unlocking price parity for biomanufactured goods. They provide the precision fermentation industry with facilities and expertise for technology transfer, process validation, and commercial-scale production.

Shifting from fed-batch feeding systems to continuous fermentation is widely regarded as a major pathway for lowering both CAPEX and OPEX by minimising downtime and maximising harvest, underscoring the relevance of strain selection (79). Cauldron Ferm also benefits from a unique bioprocess to drive down costs for its customers.

They are pioneering continuous fermentation through their proprietary "hyperfermentation" platform, enabling them to grow cells continuously. The result is that they can deliver 2–15 times more product per asset than fed-batch processes (80). Impressively, this reduces cost-of-goods-sold (COGS) by around 50 per cent compared to a comparable international facility in Mexico.



Continuous fermentation also requires far smaller bioreactors to produce the same amount of product, thereby significantly reducing the CAPEX required to build commercial-scale facilities. In recognition of Cauldron's technical advancements, the company was recognised as a 2025 Technology Pioneer by the World Economic Forum.

These advances mirror the historical transition in other industries – such as milling and automotive manufacturing – from batch to continuous processes, suggesting that food biomanufacturing is following a familiar trajectory of industrial maturation.

Below: Cauldron Ferm's facility in Orange, NSW.



Part 4: Current barriers & what's needed

Australia's food biotechnology and biomanufacturing industries stand at a critical inflection point. We have a clear competitive advantage and ability to build sovereign capability in these sectors, but the window to act is closing. Developing sovereign biomanufacturing capacity takes years, and Australia cannot afford to be complacent and delay action. Without targeted government investment and support, Australian companies (and talent) will be forced to seek offshore opportunities, eroding Australia's capability and control over strategically significant technologies.

The cost of inaction is high; Australia risks missing a major opportunity to drive economic security and diversification, leaving our economy more exposed to external shocks, while regional competitors move ahead. In an era of intensifying geoeconomic competition, the Indo-Pacific is becoming a strategic battleground for biotechnology leadership, with nations such as China (81), India (82) and Japan investing heavily to dominate regional supply chains and standards. China, for example, has rapidly expanded its biomanufacturing capabilities through large-scale infrastructure investments, decentralised rollouts, and heavy state support – positioning the industry as a strategic technology to 'win', not just make viable.

Against this backdrop, Australia still has a genuine opportunity to carve out leadership niches. Food is the most immediate and compelling focus because, while Australia is uniquely well-positioned, the food biotechnology sector remains underdeveloped compared with other bio-based and conventional industries.

With sufficient investment and coordinated action, Australia could establish a world-class food biotechnology and biomanufacturing industry.

Conversely, delayed investment and coordination will force Australia into increased reliance on external supply chains – particularly from China – for critical infrastructure and green technologies.

Building capability will come from nurturing a coordinated ecosystem where many can thrive, rather than supporting individual companies in isolation. The following section outlines the key challenges Australia must address and provides recommendations for government and industry to secure this opportunity.

Below: Biomanufacturing facility in China.
Sourced from [Van der Kley, D.](#)



4.1 Policy Settings

The lack of a unified national policy framework remains one of the most significant barriers to the growth of Australia's food biotechnology industry. Aligned, clear and forward-looking policy signals are essential to attract investment, align research and industry priorities, and provide certainty for long-term capability building.

Current policy settings are fragmented and siloed across multiple departments and jurisdictions, resulting in duplication, policy gaps, and missed opportunities for scale. Addressing these structural shortcomings will require more than incremental reform – it will necessitate the establishment of a unified national framework and purpose-built policy instruments that recognise food biotechnologies as a strategic industry central to Australia's economic resilience and national security.

Existing R&D policy architecture

Current government priorities are poorly aligned with the needs of food biotechnology and biomanufacturing. The following existing policies and programs contain several critical gaps that illustrate this misalignment:

- Food biotechnologies, and bioindustries more broadly, are absent from the [National Science and Research Priorities \(2024\)](#).
- The [National Research Infrastructure \(NRI\) Roadmap \(2021\)](#), which informs priorities for NCRIS funding, did not explicitly identify food as an output of synthetic biology research.
- The [Cooperative Research Centre \(CRC\) program](#) is ill-suited to emerging technology sectors, where the pace of change makes it difficult to define a ten-year research agenda with the level of detail required.

Ensuring that food biotechnologies and biomanufacturing are clearly eligible and prioritised within these mechanisms would send a powerful signal.

Universities and research organisations, which closely align their programs with the National Science and Research Priorities, are currently disincentivised from pursuing this area, limiting both research activity and investment in research infrastructure.

Food security strategy

Australia does not currently have a unified food security strategy. More than 18 federal departments play a role in food security policy, yet there is no overarching framework to ensure coordination and alignment across government (83). Australia's food security ecosystem remains fragmented, shaped by overlapping and sometimes competing regulatory frameworks covering food safety, competition, consumer protection, environmental standards, workplace safety, and international trade obligations.

Food security is not a siloed issue, as it intersects with health, energy, environment, trade, infrastructure, and national security – and hence should not be treated as such. The complex policy environment also creates persistent challenges, such as:

- Overlapping responsibilities among federal, state, and territory agencies in areas such as biosecurity, food safety, and environmental management.
- Cross-sector dependencies on energy, transport, trade, and digital systems, where disruption in one sector can cascade into food supply challenges.
- Jurisdictional variation across levels of government produces inconsistent approaches and uneven resilience.

Moreover, Australia's food system remains highly undiversified, with a continued reliance on low-value-added agricultural production (84). Meaningful change is unlikely without clearly defined targets and strong industry buy-in.



Left: Sourced from ASPI.

Bioeconomy strategy

Globally, governments and international bodies are moving quickly to establish strategic and coordinated approaches to building sovereign bioeconomies. In 2024, the FAO became the first United Nations body to formally prioritise the bioeconomy as a policy priority and thematic focus, and now provides technical support on the sustainable bioeconomy to guide policymakers in establishing strategies, action plans, and programmes (86).

At least 25 countries have a bioeconomy strategy, including the U.S., Brazil, France, the Netherlands, as well as key regional competitors like China, Thailand, and Malaysia (87). Australia currently has no such strategy and risks falling behind if we fail to act quickly. A national strategy would provide a clear and coordinated roadmap for Australia's bioeconomy. It would also enable strategic planning for the public investments needed to accelerate the transition to a sovereign bioeconomy.

Ideally, the Australian government would follow the example of BioMADE in the United States, which is investing in a strategic, multi-year effort to build pilot-scale infrastructure (88) or China, which has announced plans to build 20 pilot-scale biomanufacturing platforms by 2027 (89). These programs demonstrate how long-term, large-scale initiatives can be delivered through clear strategic direction. A national bioeconomy strategy would provide Australia with a framework to develop similar initiatives, elevating the bioeconomy as a national priority whilst coordinating public investment and policy support to accelerate industry growth.

A national food security strategy and a national bioeconomy strategy are complementary and should be developed hand-in-hand. Together, they should recognise the opportunity to build sovereign capability in food biotechnology and biomanufacturing. The following recommendations set out how government, industry, and advocates can address these aforementioned policy barriers.

Greater policy synchronisation is essential, with clear communication channels, defined roles, and interoperable policies across agencies and jurisdictions. Progress to ameliorate these issues has been slow. Since the 2008 global financial crisis, at least 18 food security reports, reviews and inquiries have been commissioned or conducted by government, academia and industry (85) with outcomes to date limited. There is an urgent need to move beyond "analysis paralysis" and shift focus from review to implementation.

A national strategy must also set clear targets, including 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.

To succeed, we must consider both the national and regional perspectives and bring together all levels of government under a cohesive strategy. In a promising shift, in March 2025, the Department of Agriculture, Fisheries and Forestry (DAFF) committed to the development of a national food security strategy, *Feeding Australia*, which, at the time of writing, is in development and has undergone initial stages of public consultation.

Promisingly, DAFF's progress thus far has adopted principles of resilience and coordination, and there is an acknowledgement that food security must be treated as a national priority rather than solely an agricultural issue. As such, *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. The gap then lies in promptly moving from strategy to implementation.

Recommendations

Federal Government:

3. The Department of Agriculture, Forestry & Fisheries' (DAFF's) Feeding Australia plan should acknowledge that the future of food will be underpinned by the adoption of biotechnologies and biomanufacturing from paddock to plate.

Recognition of biotechnologies will enable diversification of Australia's highly concentrated food system, which is currently reliant on a narrow range of commodities and supply chains vulnerable to climate and geopolitical shocks. Additionally, Feeding Australia should recognise that food security is a cross-portfolio priority that will need to address national security, sovereign manufacturing capability and regional resilience.

3.1. Linked to the implementation of Feeding Australia, **DAFF, the Department of Industry, Science and Resources (DISR), and Treasury should establish a joint working group with industry representatives** to set clear, measurable targets for diversifying Australia's food system and accelerating the integration of emerging technologies, including biotechnologies and biomanufacturing, into agrifood supply chains. Future public funding for the sector should be linked to progress against these targets. Following this, a formal government–industry body should be established to oversee and deliver on these targets.

4. Existing R&D policy frameworks should be tasked with supporting the emergence of new technologies, products or industries through explicit funding programs or simple changes to purpose and definitions.

Current government priorities, as reflected in existing policies and programs, are not well aligned with the needs of food biotechnology and biomanufacturing with several critical gaps illustrating this misalignment. Specifically:

4.1. The Department of Education (DoE) should prioritise food and other crop-derived products as an output in future NCRIS infrastructure investments related to the bioeconomy.

4.2. The National Science and Research Priorities and National Research Infrastructure Roadmap should explicitly prioritise biotechnologies and biomanufacturing in the production of food.

5. DISR should prioritise the prompt development of a bioeconomy strategy that explicitly includes food biotechnologies & biomanufacturing as a core pillar. The strategy should recognise the role of biotechnology in agricultural and food security to build a future-proof agrifood system that is efficient and resilient.

A coordinated national approach would provide a clear framework and trajectory for building Australia's bioeconomy, enabling strategic planning for the public and private investments needed to accelerate the transition to a sovereign, innovation-led bioeconomy.

Sector representatives:

6. Cellular Agriculture Australia (CAA) will establish an Industry Working Group to develop policy solutions that are grounded in industry needs and opportunities. This will enable CAA to effectively advocate to government on behalf of industry. Additionally, CAA, along with AFII and NSC will explore opportunities for further collaboration to drive science-backed advocacy and government engagement to mitigate policy barriers affecting the sector.



Left: CAA regulatory workshop with industry participants

4.2 Research & technical innovation

Scaling food biomanufacturing in Australia is not only a question of increasing production volumes but of doing so at a viable cost. To achieve this, a number of immediate research questions must be addressed.

As previously explored, companies have already demonstrated success in reducing costs and are approaching price parity with traditional products, but more work is needed. Meeting this challenge will require a combination of iterative technical improvements and step-change innovations that collectively advance both scale and efficiency and are made available through accessible peer-reviewed research.

Two areas in particular stand out as priorities for research and innovation: infrastructure optimisation and biological inputs.

Infrastructure optimisation

In precision fermentation, Cauldron Ferm has reported that bioreactors themselves are often no longer the dominant driver of CAPEX (90). Increasingly, utilities such as power, cooling systems, compressors, and supporting infrastructure can exceed the cost of the vessels themselves. Utilities may represent up to 30% of cost-of-goods-sold (COGS) for some operators, while also making up the majority of the associated capital costs (91). Efficiency improvements across several inputs, such as energy use, carbon emissions, steam time, and vessel thickness, will be essential in reducing both OPEX and CAPEX (92).

In cultivated meat production, Vow has reported that utilities similarly contribute a significant proportion of costs, typically 15–20% of COGS (93). The majority of this burden comes from gas used for steam generation and sterilisation. Vow has suggested that transitioning from gas-based to electric steam production, produced through renewable supplies, presents an immediate opportunity to reduce this reliance and mitigate both cost and emissions.

Moreover, opportunities exist to reduce costs through simplification and scale-up. For instance, replacing multiple small-scale bioreactors with a single larger unit (e.g. Vow plans to eventually move from a 10-litre working volume to a 30,000–40,000 litre line) has the potential to eliminate significant factory-level hardware (94).

Finally, whilst Vow has made significant progress in pioneering the redesign of bioreactors, further research is needed to underpin the widespread redesign of bioreactors and facilities optimised for food production.

Biological inputs - strains, cell lines and media

Strain engineering

Advances in strain engineering are proving to be one of the strongest levers for improving process performance and subsequently driving down costs. As Cauldron Ferm has noted, “software is more important than the hardware, because it informs the hardware,” highlighting the central role of biological design in shaping bioprocess requirements (95). Strain choice is particularly critical in precision fermentation. For example, methanol induction significantly increases both material and utility costs. At an industrial scale, even small increases in methanol feed rates or additional cooling requirements can each add over \$1 million AUD in annual operating expenses (96).



Left: Daisy Lab co-founders Nikki Freed, Irina Miller, and Emily McIsaac.



Left: FBS-free media prototype by Media City Scientific.

As previously mentioned, shifting from fed-batch to continuous bioprocess is regarded as a major pathway for lowering costs. Consequently, developing methanol-free strains, or strains optimised for continuous rather than fed-batch fermentation, will be key to lowering utility demands and increasing the competitiveness of precision fermentation. Importantly, strain development needs to be forward-looking and designed not just for near-term productivity in small-scale bioreactors, but for performance in large-scale commercial facilities (97).

Culture media

The cost of cell culture media remains the single most significant barrier to cost reduction in cultivated meat, accounting for the majority of production costs (98). Media is primarily composed of growth factors and amino acids, and current reliance on pharmaceutical-grade inputs drives costs far above what is viable for food production. Innovation is needed to transition to food- and feed-grade alternatives, while also developing new, lower-cost sources of recombinant proteins and amino acids. One Australian start-up, Media City Scientific, is working to develop serum free from foetal bovine serum (FBS), which is both expensive and carries ethical concerns.

Another promising opportunity lies in precision fermentation and plant molecular farming for producing the low-cost, high-volume of critical media components needed for cultivated meat production — especially growth factors, amino acids, and recombinant proteins (99). These technologies are interconnected: for instance, developments in driving down costs of precision fermentation may feed directly into more economical cell culture media.

Over the longer term, research into metabolic modelling and cell engineering will be critical to improve feed conversion efficiency and reduce the volume of media required.

Overarchingly, achieving cost-effective media is widely seen as an industry threshold, with USD \$1 per litre regarded as an early benchmark (100). Encouragingly, Vow has reportedly reached USD \$1.30/L (101), and some companies internationally claim to have already surpassed the \$1/L target — demonstrating the feasibility of these cost reductions with continued investment in innovation (102).

Cell lines

Sourcing of cell lines is another key challenge. Access to scalable, commercially relevant and open-source cell lines with desirable properties remains a major barrier for cultivated meat researchers across academia and industry (103).

Many existing lines are proprietary, difficult to obtain, or not optimised for food production. According to NZ cell line specialist Opo Bio, current cell lines for food perform poorly relative to those used in pharmaceuticals, and require an increase in doubling time, higher density in suspension, and improved flavour profiles (104). Future-ready cell lines must be developed alongside scalable media formulations and tested at larger volumes to ensure reliability and reproducibility.

Scaffolds

For cultivated meat products such as structured cuts (steaks, fillets), scaffolds made from biomaterials safe for human consumption are essential. Current scaffold technologies have largely been developed for regenerative medicine using human-derived proteins, which are neither scalable nor necessarily appropriate for food. Australian companies have reported that new research is needed to identify and validate food-grade scaffolds that can provide the required structure, texture, and performance at scale.

Overarchingly, while strong technical progress has been achieved, further research is essential to enable the successful and widespread commercialisation of biomanufactured food ingredients. Continued investment in both foundational and applied research will be needed to address persistent cost and scale barriers, and to ensure innovation keeps pace with the evolving needs of industry.

Recommendations

Federal and State Governments:

7. Government should commit to additional National Collaborative Research Infrastructure (NCRIS) funding for research infrastructure beyond the current 2024–2028 period, particularly through investment in agrifood-related facilities of Bioplatforms Australia and the Australian Plant Phenomics Network (APPN).

Ongoing and additional funding for NCRIS is essential to maintain continuity in foundational biotechnology research. It will ensure adequate funding is available to address the ongoing and evolving research needs as the sector scales.

8. State and Federal governments should expand support for cross-disciplinary, open-access research in critical areas linked to the advancement of food biotechnology and biomanufacturing. This requires ensuring that foundational food biotechnology research is explicitly eligible for, and prioritised within, relevant government funding mechanisms (e.g. university block grants).

8.1. As a part of this, at least 30% of Federal & State R&D funding allocated to the agrifood sector over the next funding cycle should explicitly prioritise food biotechnologies and biomanufacturing.

Advancing Australia's food biotechnology and biomanufacturing sector requires foundational research in critical areas including: strain and cell line development, bioprocess optimisation, and facility design. Currently, investment in this foundational research is limited, and much of the existing knowledge is proprietary and restricted within private companies (105) – which hinders innovation and creates a strategic risk for sector growth.

9. DISR, in consultation with Innovation and Science Australia (ISA) and the Cooperative Research Centre (CRC) Advisory Committee, should review current CRC allocations to determine whether existing Cooperative Research Centres could expand their mandates to include biotechnology and biomanufacturing in food production, or whether a new CRC is required.

Several CRCs already address aspects of the agrifood system (Future Food Systems CRC, Food Agility CRC, End Food Waste CRC, and the ZNE-Ag CRC). CRCs have historically broadened their research scope mid-cycle in response to emerging priorities; for example, the Food Agility CRC expanded its remit to include carbon and natural capital in 2021 (106). Drawing on this precedent, a targeted review would identify opportunities to align existing research investments with emerging areas of strategic importance for Australia's agrifood sector.

Sector representatives:

10. The sector should clearly identify and document high-priority research areas and technical innovations needed to support the transition to large-scale production and commercialisation in Australia.

Whilst the sector is aware of high-level areas of research required (outlined in this report), there is currently no coordinated and aligned understanding of the highest-priority research questions for the Australian industry. By mapping critical research and technical gaps, the sector will be able to make more effective and targeted funding requests, ensuring investment is directed where it can most accelerate scale-up and technology adoption.

4.3 Regulation

Clear, fit-for-purpose regulatory processes are essential for enabling market access for foods produced using biotechnology. Robust regulation leading to product approvals also provides a critical signal to government stakeholders, as well as to consumers and investors, by demonstrating the safety and reliability of these products.

As previously mentioned, Australia is in a relatively strong position, with an established regulatory system that is capable of assessing novel foods and foods produced using gene technology and plant molecular farming. There are three primary regulatory bodies involved: FSANZ, the Office of the Gene Technology Regulator (OGTR), and DAFF.

To date, industry stakeholders have anecdotally reported largely positive dealings with the OGTR, citing that their approach has generally been progressive but that there are opportunities for efficiency gains. As new food products reach the Australian market, DAFF will play a critical role in ensuring that biosecurity, trade regulations, and related statutory frameworks keep pace with innovation in the sector.

With regard to FSANZ, a lack of forward-looking allocation of its constrained resources is presenting several barriers that are pushing companies to prioritise other jurisdictions for first market entry. CAA has provided detailed submissions to recent consultations on these challenges, which can be viewed [here](#). Key regulatory issues are summarised below.

Current regulatory barriers

Lengthy assessment timelines

Australia's regulatory assessments are slower than those of leading jurisdictions such as Singapore and the U.S FDA, creating extended lead times to market. This is a particular challenge for SMEs, and undermines both competitiveness and productivity.

The issue extends beyond precision fermentation and cultivated meat, also affecting new plant varieties, where Australian farmers often wait longer than their overseas counterparts for access to technologies.

Lengthy assessment timelines are largely due to resourcing constraints, as estimates suggest 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 (107).

High costs

Cost-recovery arrangements by Australian regulators and compliance agencies mean that achieving regulatory approval in Australia is more expensive than in most comparable markets, adding further barriers to entry.

Not fit-for-purpose

Current frameworks are not fit-for-purpose or future-proofed for emerging technologies. Current areas of concern sit primarily with the regulation of precision-fermented ingredients, and include:

- There are inconsistencies among regulators in how they define and assess gene technologies. FSANZ and the OGTR, both under the Department of Health, apply different definitions of genetically modified food (108).



Left: Impossible Foods' burger containing precision-fermented soyleghemoglobin, approved for sale in Australia in 2020.

Below: Tastilux® precision-fermented fat by Nourish Ingredients, which received US FEMA approval in 2025. .



- Our current framework for precision-fermented food substances is outdated and in need of revision. For example, the Food Standards Code may classify isolated proteins produced via precision fermentation as genetically modified (despite the absence of modified DNA), while non-protein precision-fermented products are treated differently (109). This will likely necessitate GMO labelling for many precision-fermented products, which will have substantial implications for consumer acceptance. However, FSANZ does not have the resourcing or clear mandate to prioritise the mitigation of these issues.

Lack of international harmonisation

The absence of international regulatory harmonisation poses a significant barrier for companies, which are often required to prepare separate approval dossiers for multiple jurisdictions with both duplicative and differing requirements. The wine industry offers a clear example: as Australia exports to numerous markets, organisations such as AWRI that develop wine strains must navigate a highly complex and cumbersome regulatory environment.

Recommendations

Federal Government:

11. DAFF should add 'regulatory and policy agility' as a key guiding principle in the formation of Feeding Australia.

In order to embed a future-focussed approach to the integration and adoption of biotechnologies in agricultural and food production, Feeding Australia should explicitly focus on building an enabling policy and regulatory environment.

12. The next Federal Budget should allocate additional funding to Food Standards Australia New Zealand (FSANZ) to enable it to accelerate assessment timelines.

FSANZ is currently not sufficiently resourced to deliver its current regulatory functions (110) and completes assessments more slowly than other comparable jurisdictions. Additional funding would enable faster assessments of novel foods, including precision-fermented ingredients, without compromising safety. This funding should be championed by the Minister for Health & Ageing and in coordination with the Department of Health and Aged Care.

13. Federal Government departments (e.g. DAFF, DISR) should provide earmarked funding to FSANZ to raise a Proposal to review and update the Food Standards Code to ensure it keeps pace with new and emerging industries and technologies.

Specifically, the Proposal should focus on the use of biotechnologies and biomanufacturing to create new food ingredients.

Current frameworks are not fit-for-purpose or future-proofed for emerging technologies, particularly in relation to food ingredients produced using precision fermentation. However, FSANZ is currently significantly under-resourced, which necessitates a focus on its statutory obligations rather than proactive and forward-looking projects. Precedents exist where the federal government has provided earmarked funding to FSANZ to address emerging industry needs, for example, DAFF supporting FSANZ to review labelling of plant-based foods with funding of \$1.5 million in the 2024-25 Budget (111).

14. The FSANZ Act should be amended to introduce a comparable overseas regulator (COR) regime.

This would empower FSANZ to accept dossiers and assessment outcomes from trusted international regulators to streamline local approvals.



Above: Forged smoked quail spread, served in canapés at Made & Grown. Credit: Adam Daley

15. The FSANZ workplan should be amended to include a formal Proposal related to the use of biotechnologies in food production, particularly precision-fermented ingredients, to ensure the Food Standards Code is fit-for-purpose and future-proof.

The [FSANZ workplan](#) is currently focused on fulfilling its statutory obligations including assessing applications, and progressing current Proposals.

16. FSANZ should promptly develop clear guidance documents to inform companies of what must be included in regulatory dossiers for novel food products (e.g. cultivated meat) and foods produced using gene technology (e.g. precision-fermented ingredients) before submission for approval.

Industry feedback has suggested that the [FSANZ Application Handbook](#) does not provide sufficient details on the relevant tests and data that would underpin a successful application, creating additional costs and delays in submitting a dossier.

17. Establish a cross-agency working group between FSANZ, Office of the Gene Technology Regulator (OGTR) and Therapeutic Goods Administration (TGA) tasked with improving domestic harmonisation between regulators to reduce overlap and inconsistency.

This should include, but not be limited to, standardisation of currently diverging definitions for genetically modified organisms (GMOs).

Sector representatives:

18. Continue to leverage CAA's Regulatory Industry Working Group to identify industry challenges and advocate for reform through submissions to public consultations and direct engagement with regulators. CAA is currently working to expand membership and industry engagement.

4.4 Infrastructure

Much of Australia's food biomanufacturing sector is currently at the laboratory or pilot scale (TRLs 4–8). Companies are encountering significant bottlenecks in scaling to the commercial volumes required to bring products to market. Achieving scale is also essential for reaching unit costs comparable with traditional products. There are two key categories of infrastructure required to enable this transition: **publicly-funded shared research infrastructure** and **commercial-scale infrastructure**, each of which will be explored in turn.

Shared scale-up infrastructure

Access to shared scale-up pilot infrastructure consisting of 25L – 2000L fit-for-purpose bioreactors suitable for food production, as well as downstream processing capability, is critical to the advancement of food biomanufacturing in Australia. Scale-up infrastructure provides a critical stepping stone to commercial-scale facilities. Such facilities enable critical product testing and prototyping, developing and optimising bioprocesses, demonstrating feasibility to be able to engage with commercial facilities, and preparation for regulatory assessment. Without this infrastructure, companies cannot robustly evaluate economic viability, limiting their ability to raise investment.

Existing facilities

Existing facilities include the [QUT Pioneer BioPilot](#), which completed an upgrade in September 2025 to include pilot-scale precision fermentation capability. This facility, previously known as the Mackay Renewable Biocommodities Pilot Plant (MRBPP), now offers bioreactor capacities of 100L, 1200L, and 2400L. Critically, it is the only pilot-scale PC2 large-scale precision fermentation facility in Australia suitable for food production (112).

Facility users can benefit from strong expertise in process and plant engineering, helping start-ups de-risk and design simpler, more cost-effective systems at commercial scale. Moreover, the [UTS Biologics Innovation Facility \(BIF\)](#) provides bioprocessing technology suitable for cultivated meat production. Other initiatives include CSIRO's planned upgrade to the Food Innovation Centre at its [Werribee site](#) and NCRIS-funded [Plant SynBio Australia](#), which are helping to expand access to scale-up infrastructure. These facilities enable deep collaboration between researchers and industry, addressing not only process engineering questions but also fundamental design challenges.

Below. QUT Pioneer BioPilot in Mackay





Left: FermentHQ in Legana, Tasmania.
Sourced from AgriCULTURED.

FaBA - enhancing infrastructure accessibility

Programs such as the Food and Beverage Accelerator (FaBA) have been cited by startups as having a pivotal role in making specific infrastructure and associated capabilities across multiple academic institutions more accessible and affordable. By subsidising access to shared pilot-scale facilities, providing technical expertise, and supporting collaboration between researchers and industry, FaBA lowers the financial and operational barriers that early-stage companies face when testing and scaling their processes. However, continuity of these kinds of programs is critical, and FaBA's funding is scheduled to conclude in 2026 (113).

Current gaps and opportunities

Despite their value, the existing shared publicly-funded research infrastructure facilities face two systemic barriers:

High costs of access - the need to accommodate diverse processes makes shared-use facilities complex and expensive to run. As a result, access costs are often prohibitively high for start-ups, especially compared to industry-specialised facilities overseas.

Limited availability - there is a critical shortage of fit-for-purpose infrastructure in Australia for precision fermentation and cell cultivation technology. This gap significantly limits research translation opportunities. As noted above, while the National Collaborative Research Infrastructure Strategy (NCRIS) funds open access to research infrastructure, 'food' is not currently listed as a priority investment area, thus presenting a major barrier to building Australia's biomanufacturing capacity.

Ideally, the Australian government would follow the aforementioned U.S. and China initiatives involving multi-year commitments to build multiple scale-up facilities.

A key opportunity lies in developing shared infrastructure hubs that could serve industry and research simultaneously. Such hubs could provide economies of scale and enable faster commercialisation. And by being both scalable and adaptable, they could pivot production in response to changing demands - making them critical assets in resilience planning.

FermenTas - a regional scale-up hub for traditional fermentation

FermenTas and its new FermentHQ facility in Legana, northern Tasmania, illustrate the growing role of regional shared infrastructure in strengthening Australia's food innovation ecosystem with a focus on traditional fermentation. Established as a not-for-profit and supported by more than \$7.5 million in federal funding (114) alongside \$1.7 million from the Tasmanian Government, the 1,800 m² hub aims to become a centre of excellence for fermentation-based food and beverage innovation (115).

Launched in August 2025, FermentHQ provides multi-user pilot and training facilities, including production suites, laboratories, sensory testing spaces and commercialisation support, designed to help companies prototype new products, optimise processes and bring innovations to market. Beyond technical capability, the facility integrates education, skills development, and public engagement, supporting workforce pipelines and agritourism while embedding fermentation more deeply into the region's agrifood economy. Expected to support more than 650 direct and indirect jobs by 2030 (117), FermentHQ demonstrates how strategically located shared-use infrastructure could be applied to the food biotechnology sector to lower barriers for start-ups, accelerate product development, and catalyse regional economic growth.

Recommendations

Federal Government:

19. DISR should endorse and implement CAA's proposal for a Co-Pilot Manufacturing Scheme (CPMS), which proposes that the Government underwrite subsidised access to existing Australian research and commercial-scale infrastructure for food biomanufacturing companies to undertake key commercialisation steps.

The construction of new facilities takes time, so CAA has designed the CPMS scheme as an interim measure to accelerate company progress through enabling widespread access to commercial, shared and research facilities that already exist.

20. State and Federal co-funding should be administered to develop shared scale-up facilities for food biotechnology and biomanufacturing. Existing infrastructure (e.g. QUT's Pioneer BioPilot, planned upgrade to CSIRO's Werribee facility) should be assessed as potential recipients of future investment and/or as models for the establishment of additional facilities.

Access to share scale-up infrastructure is a critical stepping stone to commercialisation, however such facilities suited to food production remains scarce in Australia.

21. The Federal Government should commit to extending the Food and Beverage Accelerator (FaBA) funding beyond its scheduled conclusion at the end of 2026.

This extension should align with, and be informed by, the ongoing Trailblazer Universities Program funding cycle (currently allocated through 2025–26) to ensure continuity of support for the food biotechnology industry in accelerating scale-up and commercialisation outcomes.

Commercial infrastructure finance

Critically, there are currently no mid-large (100kL+) scale commercial manufacturing facilities suitable for food biomanufacturing in Australia. The largest operational domestic facilities are those of Cauldron Ferm (25,000 L demonstration-scale precision fermentation facility), which is available for contract manufacturing, as well as Vow's private facility for cultivated meat (20,000L line, total capacity of 37,200L)(118). High CAPEX, utilities, and labour costs already make it more difficult to build large-scale facilities in Australia compared with competitor markets (119). As a result, some companies are already seeking scale-up opportunities offshore.

Funding mix

Sourcing the right funding mix to build these first-of-a-kind (FOAK) facilities in a particularly tight investment climate is proving to be a major industry challenge, both in Australia and globally. Private and government investors have pointed to the emergence of a "second valley of death," where companies have moved beyond early-stage R&D but are unable to access the right mix of risk-tolerant and scale-appropriate capital to cross the threshold into profitable commercial-scale operations (120).

At this stage, projects are too capital-intensive to be financed through equity alone, yet debt remains out of reach as lenders see high risks without the certainty of long-term offtake agreements – leaving companies stranded between prohibitively expensive equity and inaccessible debt. This creates a 'chicken and egg' problem where no one investor is willing to take the first leap in funding a facility.

Government grants could help bridge this gap, but existing State and Federal mechanisms in Australia are often too slow, narrowly targeted, or not applicable to food biomanufacturing (121). The industry is missing a viable and coordinated capital stack that brings together equity, concessional financing, fast-moving grants, and demand assurances such as volume guarantees, all aligned to land at once (122).



Grant funding

Renewable energy is the only sector in Australia with access to significant government grant funding for translational projects, which is due to the existence of the Australian Renewable Energy Agency (ARENA) (123). Established in 2012, ARENA is a statutory agency that administers government-appropriated funding to accelerate the development and deployment of renewable energy technologies in Australia. ARENA provides a useful model to potentially address the financing gap for FOAK biomanufacturing facilities and pilot/demonstration projects. An ARENA-style agency for biomanufacturing could be established to provide:

- **Direct project funding:** ARENA's baseline funding provides targeted, debt-free project funding to support high-capital, high-risk projects across the full innovation chain – with the aim of de-risking emerging technologies and building investor confidence. Notably, in the 2024–25 Federal Budget, ARENA was allocated a total AUD \$7.1 billion over 16 years (124).
- **Coordination and consolidation of funding streams:** ARENA works with other government programs and co-investors to leverage funding, reduce duplication, and de-risk investments (125). Current funding for Australia's bioeconomy is fragmented across multiple agencies, making nascent sectors like food biomanufacturing less competitive. A dedicated ARENA-style agency for biomanufacturing could consolidate support, provide sector-specific guidance, and ensure that high-potential projects receive funding and strategic oversight.

Offtake agreements & volume guarantees

De-risking mechanisms that provide revenue certainty are just as critical as the financing mix in enabling scale-up. However, in food and agriculture, securing long-term offtake agreements is a major challenge. While such contracts have successfully supported capital-intensive growth in sectors like renewables and pharmaceuticals, in food, offtake contracts are typically short-term, non-binding, and rarely extend beyond a year (126). This creates another “chicken and egg” problem: lenders require predictable cash flows before committing financing, yet large food buyers wait to see proven commercial-scale output before entering binding agreements.

One mechanism that has broken this cycle in other sectors is the volume guarantee, in which governments underwrite minimum purchase volumes under specific conditions (e.g. a ceiling price). These guarantees are rarely called because they are structured only after rigorous analysis of buyer demand and strong assurances that there are prospective buyers. With guarantees serving as a credible backstop, they reduce risk for both investors and customers, assuring revenues and lowering financing costs.

Given the substantial challenges associated with scaling and financing FOAK facilities, some investors anticipate that the financing of facilities and scale-up of higher-value, lower-volume applications (e.g. specialty chemicals, fuels, or nutraceuticals) will precede commodity ingredient applications due to the stronger unit economics (127). This is reflected in the growing trend of food biomanufacturing companies pursuing nutraceuticals as their initial market entry point.

Strategic interventions such as volume guarantees could shift this trajectory by making larger-scale, multi-product facilities investable sooner. With food ingredients serving as anchor products (i.e. a stable revenue base), these facilities could spread fixed costs and enable production of higher-value applications alongside commodity ingredients. This would not only secure Australia’s position in globally significant commodity markets, such as dairy proteins, but also expand the suite of biomanufacturing opportunities available across product applications – strengthening the overall economic case for biomanufacturing.

The role of government

Government incentives and support will be critical in overcoming these challenges and building and attracting biomanufacturing facilities to Australia.

Reducing CAPEX represents the most effective lever to strengthen the competitiveness of food biomanufacturing facilities. Analysis by GFI-APAC suggests that a 50% reduction in CAPEX through non-dilutive loans or targeted government funding would deliver both the highest net present value impact for companies, and the highest return on investment for governments, out of a range of assessed government incentives (128).

The Australian Government’s National Reconstruction Fund (NRF) is a sovereign wealth fund which is a key mechanism that could help address the financing challenges faced by the food biomanufacturing industry as it scales. The NRF is designed to provide long-term, risk-tolerant capital in priority sectors, including value-added agriculture, to help build sovereign capability and create secure jobs.

The fund has the potential to play a catalytic role in food biomanufacturing by deploying both equity and debt to de-risk early commercial facilities and crowd in private investment that would not otherwise flow.



Left: Martijn Wilder AM, Chair of the NRF, speaking at Made & Grown.

To date however, no funding has been deployed by the NRF for food biomanufacturing, despite the fund being under strong pressure to deploy capital.

This likely reflects a combination of the sector's misalignment with the fund's historical risk appetite and a lack of clear investment guidance across the NRF priority areas (particularly as they relate to nascent industries).

Unlocking NRF investment will likely require both some targeted measures from the NRF and, according to feedback shared at Made & Grown, a shift in how the sector engages with the fund is also required.

The September 2025 release of guidance for the Agriculture, Forestry and Fisheries priority area is a great starting point. It clearly states TRL5–9 are covered and clarifies the NRF's role is catalytic and includes "de-risking projects, accelerating innovation adoption, and ensuring Australia becomes a trusted, sustainable, high-value food and fibre producer for global markets."⁽¹²⁹⁾ Contrary to this, detailed and specific guidance around new and emerging industries like food biotechnology and biomanufacturing is not available.

According to insights shared by the NRF at Made & Grown, key considerations for industry engagement include (130):

- **NRF funding is being widely sought:** Applicants are competing for funds across three key areas: rescue packages – keeping legacy industries alive, transition industries – modernising old industries with new technologies, and new industries – like biomanufacturing.
- **Biomanufacturing is manufacturing:** Food biomanufacturing is not uniquely risky compared to other advanced manufacturing industries, but rather, requires the same coordinated focus and capital that has underpinned the growth of other sectors, such as MedTech.

- **Evolving risk appetite:** The risk adversity within government has been repeatedly called out as a key challenge for industry. The NRF is currently evolving to take on more risk and broaden the scope of its investments. However, it faces strong scrutiny compared to private investors, which can limit bold moves.
- **Ecosystem building:** To build resilience, investment strategies must move beyond supporting single firms to cultivating the wider ecosystem: funding both producers and offtakers, building supply chains, and creating the conditions for a self-sustaining industry. The NRF has been considering how it can adopt this approach.
- **Unified vision and narrative:** Building a supportive consumer and political narrative will be essential to unlocking long-term investment. Without both public and political buy-in, government and institutional support will remain constrained. Australians must understand that biotechnology and the wider bioeconomy strengthen – not threaten – our food security. The sector must therefore present a more cohesive vision and quantify the opportunity for food biomanufacturing, shifting the national narrative away from extractive models of "dig it up and ship it out" towards one that embraces the future of food and manufacturing.
- **The NRF welcomes open dialogue and interaction with industry**

Clearer alignment between policy ambition, risk appetite, and the specific needs of this emerging sector is needed for the NRF to invest in the scale up of food biomanufacturing in Australia.

Moving forward, both government and industry must work in partnership to design financing solutions that reduce risk, catalyse private investment, and build the ecosystem foundations necessary for long-term competitiveness. The following recommendations outline practical steps to achieve this.

Recommendations

Federal Government:

The Australian Government should support the development of infrastructure to underpin a commercial biomanufacturing supply chain to underpin the sustainability and security of Australia's food supply chain. As a starting point, this should include:

22. Direct the Treasury, under the Future Made in Australia framework, to undertake a sector assessment of the food biotechnology and biomanufacturing sector.

In accordance with the Future Made in Australia Act 2024, this assessment should identify investment priorities, barriers to private capital, and clarify which public instruments (e.g. tax exemptions, grants, blended finance, strategic procurement, and government-backed volume guarantees) are viable based on expected returns and sovereign benefits.

This would enable the government to map capital needs and match them to appropriate financial instruments, helping to address the current challenges in securing a viable funding mix for first-of-a-kind (FOAK) facilities.

22.1. To support this, a sub-working group of the proposed *Feeding Australia* government-industry working group (see 4.a) should assess the current funding landscape and recommend priority actions. This should include representation from DISR, Treasury, DAFF, NRF, and relevant industry bodies and representatives.

23. DISR should establish a dedicated ARENA-style agency for the Australian biomanufacturing industries (inclusive of food, biofuels, chemicals, textiles, materials, biopharmaceuticals, etc.). This agency would define the critical strategic priorities for the bioeconomy and administer funding across the entire sector, including debt-free funding for pilot studies and first-of-a-kind (FOAK) facilities, as well as the consolidation of existing government grant streams under a single, sector-specific body.

The Australian Renewable Energy Agency (ARENA) provides a proven model for administering large-scale, targeted funding programs that accelerate commercialisation, build investor confidence, and support strategic national priorities.

24. The Minister for Industry, Innovation and Science & Minister for Finance should work with the National Reconstruction Fund (NRF) Board to ensure the risk tolerance and investment guidelines of the NRF are aligned with the catalytic nature of funding required to support nascent industries – specifically food biotechnologies and biomanufacturing. This could be achieved through:

24.1. Releasing investment guidance for the Enabling Capabilities NRF priority area to provide guidance on investments. Guidance should include clear eligibility for food as an application of biotechnology and biomanufacturing, and define technology readiness levels (TRLs) and investment thresholds at which the NRF would invest. Alternatively;

24.2. Establishing a dedicated fund within the NRF to support novel or nascent industries that drive diversification of the Australian economy. The sub-fund should incorporate adjusted risk parameters to account for the nascency of the sector and the challenges of demonstrating early commercial demand, and include food biotechnologies and biomanufacturing clearly in scope. The \$5 billion Net Zero fund, administered by the NRF, provides a precedent for this approach.

The NRF has recognised that current investment parameters and competing funding asks make it challenging to justify funding for higher-risk, nascent industries. Food biotechnology and biomanufacturing currently appear to straddle multiple NRF priority areas (e.g. enabling capabilities, value-add in agriculture, forestry and fisheries) which can result in these sectors being overlooked. A co-investment plan would provide clarity for industry, whilst a dedicated fund would ensure sufficient flexibility and risk appetite to catalyse the growth.

Sector representatives

25. Undertake robust economic modelling to quantify the commercial, employment, and export potential of Australia's food and agricultural biomanufacturing sector.

This evidence base will support a clear, unified vision, demonstrating the sector's value and strengthening the investment case to government and the public.



Conclusion

Australia stands at a critical moment in shaping the future of its food system. Food biotechnologies and biomanufacturing stand as a strategic capability at the intersection of food security, national security, and economic prosperity. By strengthening domestic innovation and production, Australia can reduce reliance on imported inputs, build resilient supply chains, and enhance preparedness for future shocks. What's more, we have a genuine competitive advantage – and a narrowing window of opportunity – to build sovereign capability by investing in Australia's food biotechnology and biomanufacturing industry.

We are already seeing strong signals: commercial partnerships extending beyond the sector, a broadening and maturing ecosystem, and significant technical progress towards cost parity. Coupled with the current political landscape and the opportunities provided by sovereign wealth funds like the NRF, there is a clear window to mobilise. But that window is closing. Global competitors are moving quickly, and hesitation will mean losing our early-mover advantage and long-term competitiveness.

What is holding us back is not capability, but coordination. A lack of a united vision, coherent policy, and fit-for-purpose funding structures continues to slow momentum. Building resilience into food systems will require a whole-of-nation approach, with government, industry, and research institutions working in alignment – just as is already being done for energy security. Long-term planning, investment, and accountability must underpin this effort if it is to succeed.

Building sovereign capability is expensive, but the cost of inaction is far higher: that is, the cost of not having food when and where it is needed if global markets fail, if conflict occurs in our region, or if crops and livestock are lost to climate extremes. By sharing the upfront burden, government can unlock long-term resilience and ensure Australians are not left vulnerable to external shocks.

This white paper has outlined the practical steps needed to address these gaps across government and sector representatives to build a thriving, resilient food biotechnology and biomanufacturing industry. Bold moves will be required – government must act with urgency, providing both policy clarity and catalytic funding. Meanwhile, advocates and think tanks such as CAA and ASPI have a critical role to play in shaping the national narrative and advocating for reform.

We must remember, biomanufacturing is manufacturing – standing up this sector is no harder than other successful industry-building efforts Australia has undertaken. It simply requires focus, momentum, and commitment.

If we act now, food biotechnologies and biomanufacturing can deliver resilience, prosperity, and a leadership position for Australia in the global bioeconomy. The building blocks are here, the question is whether we will move fast enough to seize them.

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