Joint Submission

National Research Infrastructure Roadmap Issues Paper

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Authored by:

Cellular Agriculture Australia

Cosignatories: This submission has been formally endorsed and cosigned by

ECLIPSE INGREDIENTS

Responses to consultation questions

1. Should the proposed definition of NRI in the 2026 NRI Roadmap be modified – such as by elaborating what is meant by 'nationally significant', or by other changes? If 'yes', please contribute a potential definition (or definitions).

A key structural issue in Australia's system is the persistent separation between research, innovation, and commercialisation. As currently framed, NRI primarily operates as a research enabler, which limits the ability of NCRIS funding to address current bottlenecks between foundational research and research translation to create new commercial opportunities. Strengthening this connection is critical to de-risking early commercialisation and unlocking the full economic and societal value of research investments.

Accordingly, we propose the following revised definition: "NRI comprises the nationally significant assets, facilities and highly-skilled personnel providing services that together support the development and translation of leading-edge research and innovation to create new commercial opportunities. It is accessible to publicly and privately funded users across Australia and internationally and may be single-sited, virtual or distributed."

9. How can NRI facilities ensure their capabilities are made widely known and available to potential users in relevant industry sectors across Australia's cities and regions?

CAA has observed that the cost of utilising existing NRI is a key barrier limiting the accessibility of NRI to the Australian cellular agriculture ecosystem (which is encompassed by the broader food biomanufacturing industry, and includes both precision fermentation and cell cultivation technologies). Shared-use facilities must accommodate diverse processes and associated expertise, and often require retrofitting of existing facilities to accommodate new projects. This often makes these facilities inherently more complex and expensive to operate relative to industry-specialised facilities.

This challenge is amplified in food production because the gap between R&D and commercial scale is much larger, and the required production costs are much lower, compared to other biomanufacturing verticals (e.g., pharmaceuticals). This necessitates more complex, iterative and expensive R&D and scale-up processes. Companies consistently describe the substantial upfront R&D required to establish optimised processing and develop products, followed by highly iterative programs of work to

troubleshoot technical challenges, refine production methods and explore new applications with prospective customers. Thus, R&D should not be seen as merely a foundational enabler, but a continuous imperative throughout an industry's scale-up trajectory. As a result, significant ongoing R&D demands may make current NRI fee-for-service access costs a limiting factor for food biomanufacturing startups.

CAA welcomes the recent launch of the NCRIS Synthetic Biology Voucher Scheme, administered by Bioplatforms Australia, to provide matched funding to increase the accessibility of existing NRI facilities. CAA recommends that this Scheme be continued and expanded into 2026-27, and that the eligibility of commercial entities be maintained to support industry research translation.

Recommendation 1: The current NCRIS Synthetic Biology Voucher Scheme should be continued and expanded to:

- Remove the cap on the maximum voucher value on a case-by-case basis.
- To allow access to the same provider multiple times to support multiple iterations of a project, when appropriate.

10. How can NRI facilities build the know-how and support that will lead to an increase in productive research-industry collaborations?

Cellular agriculture and food biomanufacturing companies require a clear articulation of how relevant existing NRI (e.g. The Australian Genome Foundry (AGF), IDEA Bio) relate to and complement one another. Greater transparency around their respective roles and points of interface would help ensure that companies can effectively progress through the NRI pipeline, thereby improving research translation and commercial outcomes. This is particularly important and valuable for start-ups using high-pressure funding mechanisms such as venture capital, as it helps ensure they set realistic expectations for the scale-up process and timelines.

Recommendation 1: Develop a more accurate articulation of the stages and processes required to develop foundational research and how this can be translated into commercial outcomes.

For example, public-facing resources that map the roles (based on capability and capacity), responsibilities, and transition points between key NRI facilities (e.g., when/how to transition from AGF to IDEA Bio). This should include outlining the potential magnitude and structure of iterative processes based on representative case studies.

For precision fermentation, strain development needs to be forward-looking and designed not just for near-term productivity in small-scale bioreactors, but for cost reduction and production performance in large-scale commercial facilities.

CAA has observed that the precision fermentation industry lacks access to institutional experience and knowledge in preparing strains for commercial-scale production, and that current NRI expertise is often constrained by the operational scale of existing facilities (i.e. 250 mL–25 L). Without bridging this gap, there is a risk of progressing strains that perform well at a small scale but fail to scale effectively in food-grade, commercial-scale manufacturing environments.

Recommendation 2: Invest in the development of the skills and expertise needed to assist users of existing NRI facilities to support the translation of research and bridge the critical gap between early-stage research and development, and commercial scale (e.g. bioprocess engineering expertise).

Stakeholder feedback to CAA indicates that the current NCRIS funding model does not consistently meet industry needs (particularly in translating R&D through to pilot and on to commercial scale), thereby limiting productive research–industry collaborations.

Feedback suggests that existing funding streams tend to prioritise incumbent platform managers and host universities, leading to investment decisions that do not always align with evolving bottlenecks and gaps experienced by both academia and industry. In some cases, industry feedback has indicated that NRI funding has reportedly been allocated to capabilities that are already readily available through academic and commercial providers - sometimes at lower cost and with faster turnaround times (for example, offshore DNA sequencing services).

Whilst CAA recognises the value in building on existing investments, funding to upgrade existing NRI facilities should thus be subject to a rigorous, transparent value-for-money assessment that would be required for a new NRI capability. This would ensure that funding decisions are transparently aligned with evolving research and industry capability gaps, and that investments actively support the holistic growth of Australia's biomanufacturing and synthetic biology ecosystems.

Another notable example is the $18 million upgrade to the QUT Pioneer BioPilot in Mackay, funded by University, State and Commonwealth sources outside of NCRIS. Despite this facility being nationally significant and critical for translating Australian research strength

into new industry and commercial opportunities, NCRIS is absent in supporting the establishment, operations, or access to this facility by Australian industry. This illustrates an opportunity for NCRIS to invest in well-targeted initiatives that could provide substantial research uplift for academia and industry through nationally significant research infrastructure, thereby strengthening research-industry collaborations and enabling research translation outcomes to be directly attributed to NCRIS.

Recommendation 3: Reform NCRIS investment processes to establish a fully open, competitive, and peer-reviewed framework that applies equally to re-investment in existing capabilities and the establishment of new capabilities.

This could include a pivot towards 'Request for Procurement' style funding programs, where industry and academic partners are invited to submit proposals for funding through an open process.

11. To improve research translation capability, can you identify and briefly describe needed enhancements of existing NRIs, and/or new NRI?

CAA welcomes the explicit recognition in the NRI Issues Paper of "cellular agriculture research translation hubs" as an opportunity to leverage nationally funded infrastructure to support industry growth. We are also encouraged that biomanufacturing facilities are highlighted under two priority areas outlined in the Issues Paper: achieving net-zero emissions (Priority 1) and bolstering national food supply chains (Priority 5)

NCRIS investment in cellular agriculture research translation hubs (as a part of a new NRI capability focused on biomanufacturing, with a priority on food) would alleviate current infrastructure bottlenecks and accelerate commercial translation outcomes for Australia's emerging food biomanufacturing sector. This sector represents one of Australia's most strategic, though currently underleveraged, opportunities to: strengthen food security; enhance national resilience; build a high-value bioeconomy; and add value to Australia's agricultural industries and associated onshore.

Below, we identify and describe investment opportunities that could enhance and complement existing NCRIS investments in The Australian Genome Foundry (AGF), IDEA Bio, and UTS Biologics Innovation Facility (BIF).

New NRI required:

As outlined in CAA's submission to the initial NRI consultation, existing facilities are not adequately servicing the burgeoning cellular agriculture industry in Australia. As acknowledged in the Issues Paper, the industry requires "fit-for-purpose bioreactors (accommodating increasing volumes) that facilitate the optimisation of upstream and downstream processing at scale." Critically, these must be:

- Food-grade facilities designed specifically for the scale-up of technologies used to produce food ingredients, enabling companies to transition to large-scale commercial facilities.
- At a volume/capacity larger than what currently exists.
- Able to be used for pre-commercial production batches to support regulatory approval processes.

These criteria are not being met by the current NRI facilities, which have been established to service a wide range of synthetic biology applications beyond food. NRI facilities like AGF and IDEA Bio currently only provide bioreactor capacities suitable for precision fermentation up to 250 mL and 25 L, respectively.

For cell cultivation, the UTS BIF is the largest shared facility that exists, based on a 200L manufacturing process, and critically, is not a food-grade facility designed specifically for food applications. As such, cell cultivation companies must either build their own facility (unlikely to be economically viable in the current funding environment), or scale offshore.

The current NRI network cannot bridge the gap between research and commercialisation. Stakeholders report that the limited availability of pilot and scale-up facilities is now impeding the use of existing NRI infrastructure, as companies cannot access larger facilities to graduate to.

For precision fermentation, non-NRI scale-up facilities do exist, including:

- The recently launched (at the time of writing, not yet operational) upgrade to the QUT Pioneer BioPilot (offering food-grade capacity of 100-2400L),
- CDMO Cauldron Ferm's demonstration-scale PC2 facility (2L-10,000L)
- CSIRO's planned upgrade of the Food Innovation Centre at its Werribee site (100 & 400L capacity).

However, CAA has been advised that Cauldron Ferm is largely at capacity through 2026, and we anticipate that once the Pioneer BioPilot quickly reaches capacity, additional facilities will be required.

Moreover, food biomanufacturing companies have also reported difficulty accessing appropriate fee-for-service facilities for early-stage R&D. Again, the lack of research

infrastructure may necessitate companies to undertake unfavourable or unviable alternatives, such as outsourcing R&D or building their own facility.

A further, often overlooked, constraint is the lack of food-processing and product-development facilities to support the transformation of biomanufactured ingredients into final food products. Effective commercialisation depends not only on producing ingredients at scale but also on ensuring they can be formulated into appealing, safe, and functional foods. Product formulation capability is especially important given that traditional food science and product development have been historically underfunded, combined with the growing need to integrate new biomanufactured ingredients into an increasingly wide range of final food products (which we detail in this article). Without dedicated or expanded access to food-processing infrastructure, biomanufactured ingredients risk remaining confined to scale-scale and unable to reach their full potential. CSIRO's Food Innovation Centre provides a potential replicable example of such a facility, which includes advanced food-processing technologies, food safety and quality testing and sensory testing.

Recommendation 4: **NCRIS funds cellular agriculture research hubs as a part of a new NRI capability in biomanufacturing (with food as a priority bioindustry). These hubs should consist of:**

- Early-stage R&D facilities (e.g. similar to CoLabs, AGF, IDEA Bio)
- Food-grade pilot facilities from 25-2500L designed specifically for the needs of the cellular agriculture sector (both precision fermentation and cell cultivation). The QUT Pioneer Biopilot could provide a strong evidence base to inform the design and optimisation of future facilities and equipment (e.g. bioreactor and bio-process design).
- Integrated food-processing and product-development capacity, either through:
    - Newly established NRI capability or
    - NCRIS investment in expanding access to existing food-processing facilities (expanded upon in Recommendation 5 below).

However, universities and other research-focused institutions are not always best placed to support research translation through to commercialisation. To address this gap, we propose the following:

Recommendation 5: NCRIS funding should also be directed towards enhancing access to existing non-NRI facilities. We recommend that this should consist of:

- Subsidising the operating costs of existing facilities (e.g. QUT Pioneer BioPilot, CSIRO Food Innovation Centre (Werribee)), enabling them to prioritise the research translation needs of Australian start-ups rather than high-value multinational clients.
- Expanding the NCRIS Synthetic Biology Voucher Scheme to broaden eligibility beyond the current list of Lead Providers, allowing industry access to a wider range of non-NRI facilities.

Implementing Recommendation #5 would maximise research translation outcomes by ensuring widespread access across Australia's full biomanufacturing pipeline - thereby helping meet NCRIS objectives. It would also serve as an effective interim measure to optimise the use of existing infrastructure while new NRI capabilities are established.

For the ecosystem to become commercially self-sustaining in the long term, Australia needs to stimulate both the creation of and demand for privately-operated food biomanufacturing facilities. Supporting pre-commercial scale-up is central to this. By improving access to available, fit-for-purpose infrastructure, Recommendation #5 would build the customer base and demand for commercial facilities, thereby derisking investment for prospective operators. This could be further strengthened through targeted NCRIS investment in infrastructure co-located with, or directly operated by, commercial operators.

Enhancement of existing NRI:

As part of developing cellular agriculture research translation hubs, existing NRI facilities could be expanded in scope. For example, IDEA Bio - which is currently focused on microbial fermentation - could expand its scope to include dedicated infrastructure and personnel for cell-culture capabilities. However, as previously mentioned, any such reinvestment in existing NRI should first be subject to a rigorous, transparent value-for-money assessment.

Q12. How should research translation be planned for in the development of new NRI?

As referenced in Q10 above, research translation should be planned with a future-oriented focus, by:

- Developing a more precise articulation of the stages and processes required to develop foundational research and how this can be translated into commercial outcomes.
- Investing in the development of the skills and expertise needed to assist users of existing NRI facilities to bridge research and industrial scale.
- Ensuring that funding decisions are transparently aligned with genuine research and industry capability gaps.

13. Review the full set of available suggestions for potential new or enhanced capabilities from the published Survey responses and identify up to 3 that you regard as most important to consider for inclusion in the 2026 NRI Roadmap.

- **Capability 1:** CAA's submission (#277) calls for biomanufacturing to be nominated as a new NRI capability, with food as a priority bioindustry, recognising that a critical juncture has emerged in which the cellular agriculture industry is struggling to bridge the gap between foundational research and successful translation and scale-up.

- **Capability 2:** IDEA Bio (#99) advocates for bioprocess scale-up and manufacturing facilities. This will fill a similar need to Capabilities 1 & 2, but with a specific focus on synthetic biology only.

- **Capability 3:** Australian Genome Foundry (#151) advocates for large-scale fermentation infrastructure (1000L+). This would help address the aforementioned critical bottlenecks in the cellular agriculture industry, with a specific focus on fermentation alone.