

Submission

2026 NRI Roadmap Exposure Draft consultation

Department of Education | October 2026



Cellular
Agriculture
Australia

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Executive Summary

Cellular Agriculture Australia (CAA) welcomes the 2026 National Research Infrastructure (NRI) Roadmap Exposure Draft's stronger recognition of fabrication, inclusive of biological fabrication, as a cross-cutting capability. CAA also welcomes the recognition of food and ingredient infrastructure needs within the Productive Australia prospective impact scenario, which envisages a national network of shared research translation infrastructure spanning fermentation, food processing and novel ingredient pilot lines.

In this submission, CAA calls for the *Productive Australia* prospective impact scenario to be translated into an explicit NRI opportunity for a national network of shared food and ingredient research translation and innovation infrastructure. Such infrastructure could support emerging food production technologies and greater value addition to Australian agricultural commodities.

CAA also considers that further refinement is needed to ensure emerging industries, including food biomanufacturing and plant protein ingredient manufacturing, are adequately recognised in national infrastructure planning and investment decisions. This submission recommends a more technology- and application neutral- articulation of the Fabrication capability, as well as strengthening the assessment of Australia's research translation infrastructure (TRI) capabilities and gaps, improving coordination between funding mechanisms, and ensuring that emerging infrastructure needs across pre-commercial translation pathways are appropriately considered.

Summary of Recommendations

Recommendation 1: Section 3.4 should be expanded to assess the current state of TRI in Australia, including the identification of known capability gaps as well as areas requiring further assessment through subsequent landscape analysis and investment planning.

Recommendation 2: Clarify that national NRI planning should consider infrastructure needs across relevant pre-commercial translation pathways—including pilot-scale development, validation and scale-up where appropriate to the research domain—without implying that NRI-supported translation is confined to early and exploratory stages.

Recommendation 3: Incorporate end-to-end mapping of research and translation pathways into future NRI landscape analysis, including required capabilities, user access, infrastructure gaps and transition points between complementary facilities and programs.

Recommendation 4: Establish a transparent, ongoing process through which emerging or underdeveloped NRI capability gaps identified through landscape analysis can be subsequently assessed and elevated into future NRI prioritisation and investment planning.

Recommendation 5: Map the practical interfaces between NRI and complementary Commonwealth and state translation and industry programs, with particular attention to whether emerging industries and capabilities—such as food biomanufacturing—have a clear and accessible funding pathway to meet their translation research infrastructure needs.

Recommendation 6: In 2027–28, examine whether reinvestment in existing NRI capabilities and investment in new capability should be subject to comparable, transparent and competitive value-for-money assessment, including appropriate independent or peer review.

Recommendation 7: Refine the articulation of the Fabrication capability to better reflect the full breadth of biological fabrication, characterisation and testing needs, pilot-scale translation and food applications.

Recommendation 8: Translate the Productive Australia prospective impact scenario into an explicit NRI opportunity for a national network of shared food and ingredient research translation and innovation infrastructure with a focus on novel and value-added food ingredients.

Recommendation 9: Explicitly recognise food and essential supply-chain resilience, including the potential contribution of biomanufacturing infrastructure, within the Secure and Resilient Australia Opportunity Area, consistent with the broader framing established in the NRI Issues Paper.

Responses to the Consultation Questions

Q2. Where are the opportunities to strengthen the analysis of the global context and how could they be addressed?

The global context analysis would benefit from additional international examples in two areas: *strategic planning* (3.1) and *supporting pathways to translation* (3.4).

Strategic planning

The EU-funded [Pilots4U project and its successor, COPILOT](#) provide a useful example. It maps open-access bioeconomy pilot and demonstration infrastructure across Europe, combining facility- and equipment-level capability mapping with industry needs assessment and gap analysis, rather than serving solely as a facility discovery portal. Germany's TransBIB initiative provides another similar example.

Supporting pathways to translation

The analysis could also include examples of how NRI typically interfaces with complementary higher-TRL programs, for example, the [Circular Bio-based Europe Joint Undertaking \(CBE JU\)](#). The CBE JU provides an example of a dedicated public-private funding mechanism supporting higher-TRL demonstration and deployment of bio-based technologies. This illustrates how later-stage translation can be supported through complementary programs, without requiring all stages of development to be funded through NRI.

Examination of the United States would also provide a useful contrasting model for translation research infrastructure (TRI). While the U.S. does not operate a single nationally coordinated NRI system equivalent to Australia's, [Manufacturing USA](#)—including [BioMADE](#) and its proposed network of multi-user pilot and demonstration infrastructure—provides a useful example of a public-private, mission-oriented translation layer between foundational research and commercial manufacturing.

CAA also considers that the discussion of global barriers to effective industry engagement with research infrastructure (p. 30) would benefit from greater recognition of two practical constraints on effective infrastructure access:

- User-side affordability: High fee-for-service costs can make shared research and translation infrastructure difficult for startups and SMEs to access, particularly where scale-up requires repeated, iterative use of facilities. For example, [recent European analysis](#) identified lack of financial resources as a major barrier to SME and startup access to technology infrastructures, and has recommended demand-side support mechanisms such as innovation vouchers and access schemes to reduce this barrier. (European Commission, *User needs for technology infrastructures – Analytical report*, 2025)
- Facility-side operating capacity: Building infrastructure does not in itself ensure effective user access. [Recent European analysis](#) highlighted the importance of adequately funding operating costs—including specialist staff, maintenance, consumables and user support—and finds that funding shortfalls can hamper maintenance and continued operation and constrain long-term capacity planning. Infrastructure assessments should therefore consider operational capacity and the services available to users, rather than installed assets alone.

Q3. Where are the opportunities to strengthen the analysis of the current state in Australia, and how could they be addressed?

CAA considers that the analysis of Australia's current state could be strengthened in two areas under *Section 3.4 – Supporting pathways to translation*.

Broaden the assessment of Australia's translation capability

CAA welcomes the Draft's stronger, system-wide emphasis on research translation. However, Section 3.4 currently focuses substantially on industry engagement, coordination and brokerage, visibility, governance, standards and access.

While TRI is acknowledged in Section 3.4, it receives less attention than in prior stages of NRI planning. By comparison, the 2021 NRI Roadmap identified TRI as a Step Change area, whilst the 2025 TRI survey and 2026 Issues Paper both explicitly sought feedback on new and enhanced TRI. The 2021 Roadmap also identified gaps in Australia's infrastructure for bridging research discovery and commercial application, particularly in prototyping, validation and scale-up. Although welcome investments in TRI have been made since, the current-state analysis in Section 3.4 does not materially assess the extent to which these gaps have been addressed, or what capability gaps remain. CAA is concerned that this leaves remaining gaps insufficiently visible in future landscape analysis and investment planning.

In assessing the current state of TRI, the Roadmap should recognise not only the infrastructure available, but also the mechanisms that enable effective translation, such as startup incubation and flexible access models e.g. NCRIS-funded Australian Genome Foundry's startup incubation model.

Recommendation 1: Section 3.4 should be expanded to assess the current state of TRI in Australia, including the identification of known capability gaps as well as areas requiring further assessment through subsequent landscape analysis and investment planning.

Clarify the scope of NRI-supported translation

The statements that NRI-supported translation focuses on "early and exploratory stages" (p. 28) and "mostly at the early stages of translation pathways" (p. 31) risk implying a narrower role for NRI than appears intended. In the Virtual Townhall session, the Department clarified that Section 3.4 is not intended to establish a hard boundary around what constitutes NRI and that translation pathways differ across research domains.

A rigid distinction between early-stage research infrastructure and later-stage commercialisation would not adequately reflect these differences. It would also sit uneasily with the Draft's recognition elsewhere of prototyping, pilot facilities, process optimisation and scale-up as legitimate research infrastructure functions. Accordingly, CAA recommends removing or qualifying both passages to reflect this.

Recommendation 2: Clarify that national NRI planning should consider infrastructure needs across relevant pre-commercial translation pathways—including pilot-scale development, validation and scale-up where appropriate to the research domain—without implying that NRI-supported translation is confined to early and exploratory stages.

Q4. What opportunities for change to current national planning and prioritisation approaches do you recommend for consideration?

CAA recommends two changes to strengthen national NRI planning and prioritisation.

Planning: Map complete research and translation pathways

CAA supports the Draft's emphasis on the need for national landscape analysis to better understand existing NRI capabilities, identify gaps and inform future investment priorities. As set out in [CAA's response to the 2026 NRI Issues Paper](#) (Submission #237), future landscape analysis should map the stages and infrastructure interfaces from foundational research through translation to commercial outcomes, including transition points between complementary facilities, rather than assessing assets in isolation. For food biomanufacturing, this should include assessing access to integrated upstream and downstream processing capabilities, as well as appropriate specialist staff. Please refer to our Issues Paper submission for further detail.

Recommendation 3: Incorporate end-to-end mapping of research and translation pathways into future NRI landscape analysis, including required capabilities, user access, infrastructure gaps and transition points between complementary facilities and programs.

Prioritisation: Ensure emerging capability gaps can be elevated into investment planning

CAA welcomes the Draft's recognition that disciplines differ in the maturity of their infrastructure planning and advocacy, and that prioritisation must leave room for emergent opportunities. This is particularly relevant given the significant proportion of NCRIS investment supporting existing capability, with [80.5%](#) of approved NCRIS grant funding directed to continuing activities in 2022–2025 (ANAO, 2026). While ongoing investment in established infrastructure is essential, the balance between maintaining existing capability and developing new capability warrants explicit consideration in national prioritisation.

The 2021 Roadmap's Step Changes previously provided a means of identifying emerging or underdeveloped capability areas as national strategic priorities – with approximately \$63 million subsequently approved for Synthetic Biology and \$36 million to TRI through Step Change grants in 2022–2025 (ANAO, 2026). Whilst the Department has confirmed that the 2026 Roadmap will not retain the Step Change architecture, CAA considers it important that its underlying function is preserved to ensure that emerging capability requirements beyond the existing portfolio can continue to be identified, elevated and aligned with future industry needs.

The food biomanufacturing sector demonstrates the value of this approach: The Synthetic Biology Step Change supported significant investment in nationally accessible infrastructure relevant to the sector, including approximately \$20 million directed to the Australian Genome Foundry and IDEA Bio to establish synthetic biology infrastructure and expertise supporting industrial fermentation. These investments have strengthened Australia's foundational and early translation capability, but they do not by themselves address the sector's remaining gaps in pilot and pre-commercial scale-up infrastructure (as outlined in detail in CAA's Issues Paper submission). CAA is concerned that without a transparent means of elevating emerging capability gaps, there is a risk that needs associated with newer industries and research communities receive less consideration than those supported by more established infrastructure-planning processes.

Recommendation 4: Establish a transparent, ongoing process through which emerging or underdeveloped NRI capability gaps identified through landscape analysis can be subsequently assessed and elevated into future NRI prioritisation and investment planning.

Q6. What specific opportunities for improved coordination between funding schemes do you recommend should be subject to further analysis in 2027–2028?

CAA supports the Draft's direction that NRI-supported translation should "complement and align with, not duplicate, existing Commonwealth and state translation efforts" (p. 31). However, coordination should consider

not only potential duplication between schemes, but also whether gaps, unclear responsibilities or difficult transitions between funding mechanisms leave nationally significant translation infrastructure needs without a clear pathway to support.

Australia's food biomanufacturing sector illustrates why these funding interfaces warrant closer examination. Relevant TRI supporting scale-up has been established through bespoke, institution-specific funding arrangements. For example, QUT's Pioneer BioPilot expansion was funded through a combination of Commonwealth and Queensland Government funding, university investment and support from Australia's Food and Beverage Accelerator. UQ's Biosustainability Hub, which provides smaller-scale pilot capability, similarly draws on state, industry, university and other program funding, while incorporating existing NCRIS-funded capabilities such as IDEA Bio and Q-MAP.

While these investments have expanded Australia's research translation capabilities, it remains unclear whether a clear or repeatable national funding pathway exists for identifying and addressing unmet needs in shared pilot-scale infrastructure. Moreover, what constitutes adequate pilot-scale infrastructure varies by application, meaning that existing facilities and funding mechanisms may nominally support food biomanufacturing without necessarily providing the scale and capabilities needed to progress through pre-commercial scale-up. As such, there is an opportunity to examine potential funding gaps for nationally significant shared infrastructure that falls between typical funding for early-stage TRI and more commercially-focused industry programs.

CAA notes that the *Ambitious Australia* report has already considered fragmentation, duplication and coordination across Commonwealth RD&I programs at a system-wide level. However, recent analysis from Dr John H Howard cautioned that a focus on expenditure programs alone may overlook translation activities funded through institutional, research agency and state government budgets. As such, further analysis should focus on the practical interfaces between funding schemes, including their respective remits and eligibility requirements, the transition points between them, and whether nationally significant infrastructure needs remain without a clear source of support.

Recommendation 5: Map the practical interfaces between NRI and complementary Commonwealth and state translation and industry programs, with particular attention to whether emerging industries and capabilities—such as food biomanufacturing—have a clear and accessible funding pathway to meet their translation research infrastructure needs.

Q7. What specific opportunities to improve governance should be analysed in 2027–2028 to enhance the efficiency and value for money of Australia's NRI?

CAA supports the Draft's emphasis on clear, expert-led prioritisation and value for money. As set out in CAA's response to the 2026 NRI Issues Paper, governance arrangements should ensure that reinvestment in existing capabilities and investment in new capabilities are subject to comparable levels of transparency, competition and independent assessment. Please refer to our Issues Paper submission for further detail.

Recommendation 6: In 2027–28, examine whether reinvestment in existing NRI capabilities and investment in new capability should be subject to comparable, transparent and competitive value-for-money assessment, including appropriate independent or peer review.

Q11. In the descriptions of any of the capabilities (workforce, digital research infrastructure, fabrication, observation, measurement, and collections), are there key aspects that have not been mentioned? If so, please elaborate.

CAA welcomes the designation of '*Fabrication*' as one of the six cross-cutting NRI capabilities. CAA is pleased to note the explicit recognition of biological fabrication, scale-up, and applications in biomanufacturing and agriculture, which provides an appropriate conceptual home for many of the infrastructure needs relevant to Australia's food biomanufacturing sector. However, we suggest four refinements to ensure the detailed description accurately reflects the breadth of the capability.

Broaden beyond biomedical applications: While the opening definition of Fabrication is appropriately broad, the detailed description places greater emphasis on clinical and biomedical applications through terms such as "biologics", "biomedical manufacturing" and "therapeutic development." CAA suggests adjusting this language to more clearly reflect biomanufacturing across both clinical and non-clinical applications, specifically:

- Revising "especially in synthetic biology, biotechnology and biomedical manufacturing" to "especially in synthetic biology, biotechnology and *biomanufacturing across clinical and non-clinical applications.*"
- Revising the second part of the Component A heading from "biologics synthesis and modification" to "*the development and optimisation of biological production systems*"

Broaden Component B beyond constructs: The term 'constructs' is commonly associated with deliberately engineered biological structures, particularly genetic constructs, and may not adequately capture the characterisation and testing needs of naturally occurring organisms (e.g. identified through bioprospecting) or the resulting biomanufactured product/ingredient. CAA therefore suggests revising the Component B heading to "Characterisation and testing of *materials, biological systems and products*", and expanding the listed critical capabilities to include:

- high-throughput physiological and functional characterisation
- compositional and physicochemical analysis
- functional performance testing and validation

Strengthen coverage of scale up: Component C identifies scale-up and prototyping, but provides comparatively limited detail on the process-development functions required to translate biological systems towards industrial production. CAA recommends expanding the critical capabilities listed under Component C to explicitly include:

- pilot-scale process development, scale-up and scale-down, and technology transfer capability;
- integrated upstream and downstream process development, optimisation and control'

It should also recognise that integrated scale-up capabilities are essential.

Increase the visibility of food applications: Food biomanufacturing appears to fall within the scope of the Draft's broad definition of Fabrication, but food applications are not explicitly identified. Greater visibility is warranted to ensure food applications are appropriately considered in subsequent NRI planning, as elaborated further in Q16. While CAA acknowledges that the Roadmap cannot name every sector or application, a targeted addition is appropriate given the existing recognition of biomanufacturing and agriculture. CAA therefore suggests revising the existing sentence in the Component A description to: "This underpins applications in biomanufacturing, agriculture and **food ingredients**, environmental remediation and sustainable materials."

Recommendation 7: Refine the articulation of the Fabrication capability to better reflect the full breadth of biological fabrication, characterisation and testing needs, pilot-scale translation and food applications.

Q15. Please add any feedback on the draft findings you would like the Roadmap Expert Working Group to consider

CAA supports the inclusion of Finding 4, which calls for a “greater focus on translation”, and Finding 6, which recognises the need for “infrastructure to support end-to-end capability” spanning validation and translation.

To strengthen Finding 4, CAA recommends explicitly recognising translation research infrastructure (TRI) and the need for new or enhanced translation capability aligned with industry standards, in alignment with CAA’s concerns outlined in its response to Q3. This would also more closely reflect the consultation process, which specifically sought input on TRI needs and new or enhanced translation infrastructure, as well as the Draft’s own discussion of pilot, validation and scale-up capability.

Q16. Please add any other feedback you would like the Roadmap Expert Working Group to consider

CAA notes that the consultation questions do not provide a specific opportunity to comment on Chapter 4. CAA welcomes the Opportunity Areas set out in the Draft Roadmap and their alignment with the National Science Research Priorities (NSRPs), but suggests two areas of refinement to ensure that emerging infrastructure needs are adequately recognised and considered.

1. Translate the *Productive Australia* impact scenario into an explicit NRI opportunity

Unlike the other Opportunity Areas, *Productive Australia* does not currently identify a discrete set of potential opportunities for new or enhanced NRI. CAA notes that during the Virtual townhall session, the Department acknowledged this omission and indicated that its inclusion remained under discussion.

Given the breadth of *Productive Australia*, identifying potential NRI opportunities is important to provide greater clarity on which infrastructure needs should be carried forward into future landscape analysis, prioritisation and investment planning. CAA thus argues for their inclusion in the final Roadmap, and that the currently included “*Prospective impact scenario: Agriculture and food systems productivity to 2045*” (p. 35) already identifies various infrastructure elements that could underpin an explicit NRI opportunity under Productive Australia. By 2045, the scenario envisages:

“A national network of shared translation and innovation infrastructure—spanning fermentation, green extraction, advanced drying and packaging, and novel ingredient pilot lines—gave the food-producing system as a whole, from single-site processors to large manufacturers, new bench-to-pilot capability.”
(2026 Draft Roadmap, p. 37)

CAA welcomes this framing, which closely aligns with present-day research translation needs across its two sectors of interest: food biomanufacturing and plant protein ingredient manufacturing. CAA notes that the TRI needs for food biomanufacturing have already been recognised through the Roadmap consultation process, with the 2026 Issues Paper identifying “*cellular agriculture research translation hubs*” (p. 19) as a potential opportunity for new NRI.

CAA recommends that the final Productive Australia section translate its prospective scenario into an explicit opportunity for a ***national network of shared food and ingredient research translation and innovation***

infrastructure, with a focus on novel and value-added food ingredients. In particular, CAA suggests retaining the elements already set out in the scenario, while broadening them where necessary to reflect the full range of relevant food and ingredient technologies. The opportunity should ensure the following elements are explicitly mentioned or clearly within scope:

- Pilot-scale capability for novel and value-added ingredients (rather than novel ingredients alone), to capture both genuinely novel ingredients as well as the scale-up of higher-value ingredients derived from established Australian agricultural commodities where domestic value-added production remains limited e.g. pulse-derived protein isolates and concentrates from crops such as faba bean, chickpea and lentil.
- Emerging food production technologies including both precision fermentation and cell cultivation
- Wet/dry fractionation capability, to clearly encompass the R&D and pilot-scale processing needs of plant protein ingredient manufacturing;
- Integrated food-processing and product development capacity, including, but not limited to, advanced drying and packaging.

For further details on relevant infrastructure capabilities and requirements, refer to CAA's Issues Paper submission. Food Frontier's 2025 industry analysis (Unlocking Australia's potential: The case for a national plant protein ingredient industry, 2025), provides a concrete example of industry needs that could be addressed through such infrastructure, identifying shared pilot-scale fractionation, process development and small-batch ingredient production capabilities as important to support the diversification of domestic plant protein ingredient supply chains. CAA notes that these infrastructure needs were not specifically raised during the Issues Paper consultation, as Food Frontier (now merged with CAA) did not make a submission.

Additional note: CAA interprets 'novel ingredients' broadly in this context, including new ingredients produced using emerging technologies (e.g. precision fermentation), rather than as a reference to the specific regulatory classification of 'novel foods'. CAA recommends similarly clarifying this distinction in the final Roadmap.

Recommendation 8: Translate the Productive Australia prospective impact scenario into an explicit NRI opportunity for a national network of shared food and ingredient research translation and innovation infrastructure with a focus on novel and value-added food ingredients.

2. Broaden the framing of *Secure & Resilient Australia*

Section 3.2 of the NRI Issues Paper explicitly identified biomanufacturing as relevant to NSRP *Priority 5: building a secure and resilient nation*, acknowledging "the need for investment in biomanufacturing facilities to *bolster domestic food supply chains and reduce reliance on foreign technologies*." This connection is less visible in the Exposure Draft, with the *Secure and Resilient Australia* Opportunity Area placing greater emphasis on research security, cybersecurity, Defence and critical technologies.

However, food and other essential supply chains are themselves important dimensions of national security and resilience, as acknowledged through the Australian Government's recent fast-track of the National Food Supply Chain Assessment. More specifically, food biomanufacturing has the potential to diversify Australia's ingredient supply chains and strengthen onshore production capability, reducing vulnerability to disruptions affecting both international and concentrated domestic supply chains. Accordingly, CAA recommends retaining a broader conception of sovereign resilience within the *Secure and Resilient Australia* Opportunity Area to ensure the food- and supply-chain resilience dimension identified in the Issues Paper remains visible.

Recommendation 9: Explicitly recognise food and essential supply-chain resilience, including the potential contribution of biomanufacturing infrastructure, within the *Secure and Resilient Australia* Opportunity Area,

consistent with the broader framing established in the NRI Issues Paper.
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Additional consideration: Strategic visibility of emerging capabilities

CAA acknowledges the Department's clarification that issues raised through earlier consultation remain part of the evidence base, even where not explicitly reflected in the Exposure Draft. Nevertheless, this submission has sought explicit recognition of food biomanufacturing and food applications at several points. The intent is not to create a sector-specific carve-out, but to ensure that as an emerging field, food biomanufacturing is sufficiently visible within national NRI planning to be identified through landscape analysis and considered in subsequent prioritisation and investment decisions.

This is particularly important where technologies cut across established sectoral and funding boundaries. CAA-commissioned analysis of Australian food biomanufacturing found that the sector has been left unsupported 'by construction' not because any single program has deliberately excluded it, but because different programs are designed around particular end uses, stages of development or policy portfolios. As a result, the sector was found to be technically eligible across several programs while no single mechanism identified or addressed the infrastructure needed to support progression from research through translation and scale-up. This demonstrates that being technically "in scope" is not always sufficient. In the context of the NRI Roadmap, CAA therefore considers targeted recognition appropriate to help ensure that emerging capability gaps are identified and assessed alongside the needs of more established research communities.