

Charles Darwin University
Submission to the House of
Representatives Standing Committee
on Agriculture's Inquiry into Food
Security in Australia

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Australia's most connected university

Charles Darwin University's (CDU) vision is to be Australia's most connected university by being courageous and making a difference in the Northern Territory (NT), Australia and beyond.

Being a dual sector university allows CDU to meet the education needs of Territorians in campuses in Darwin, Alice Springs, Palmerston, and Katherine; in study centres in Nhulunbuy, Jabiru, and Tennant Creek; and delivering on country in some of the NT's most remote locations. At the heart of CDU is to engage First Nations students and support their attainment of vocational and higher education.

We embrace the vitality and resilience of the Northern Territory, which is the focus of the nation's most ambitious plans for future development – to unlock the vast potential of Northern Australia and to engage with our neighbours in the Asia Pacific.

CDU supports the NT Government's ambitious goal of reaching a \$40 billion economy by 2030 by leveraging the strengths of the NT and its people.

CDU has established itself as an exciting and progressive research-intensive university with a regional focus that prioritises the complex issues facing Northern Australia and the Asia-Pacific. Research Institutes at CDU including the Research Institute for the Environment and Livelihoods, the Menzies School of Health Research, the Northern Institute, Energy and Resources Institute and their collaborative research networks, provide a strategic framework for research engagement.

CDU's research outputs consistently outperform for its size and are evaluated as being well above world standards in areas of importance to Northern Australia. The Times Higher Education World University Rankings list CDU within the top 400 universities internationally, with CDU research ranking at 348 globally. Within Australia, this places CDU 28th of 37 ranked universities, despite being one of the smallest. The Australian Higher Education Magazine ranked CDU seventh nationally in 2022 for university-industry collaboration, based on co-authored publications with industry partners.

Summary of submission and recommendations

CDU welcomes the opportunity to contribute to the Inquiry into Food Security in Australia. CDU's location is important, as the horticulture sector in northern Australia, covering north of Western Australia (WA), NT, and north Queensland (QLD), contributes \$1.6 billion per year to the Australian economy by supplying diverse food commodities to meet domestic and international demand.

In line with the Inquiry's Terms of Reference, this submission focuses predominantly on supply chains, climate change and the key factors affecting food production and the impacts on food security. An integrated understanding of Northern Australia's social, economic, environmental, and climatic contexts is essential to realise and sustain development of the agricultural sector across northern Australia.

CDU argues in this submission that the Inquiry's urgent attention to improving local capacity in Northern Australia is critical to help prepare for future shocks to food production systems and improving access to food in remote Australia, especially for First Nations people.

The expertise of organisations operating in the NT's remote and very remote locations should be at the forefront of the Committee's Inquiry and CDU supports the submissions of the Arnhem Land Progress Aboriginal Corporation; Aboriginal Medical Services Alliance NT Aboriginal Corporation; Miwatj Health Aboriginal Corporation; and NT Government Department of Industry, Tourism and Trade.

Recommendations

CDU recommends that the House of Representatives Standing Committee on Agriculture's Inquiry into Food Security in Australia:

1. Acknowledges the need for local production systems in regional and remote areas, and support CDU's business case for the NAFTI to address a critical need in the NT.
2. Acknowledges the need for greater development of a skilled workforce in the agricultural sector, across vocational and higher education, and support investment in capability building to train and retain highly-skilled workers in the agriculture industry.
3. Supports the development of targeted initiatives and policies to improve access and availability of locally sourced and affordable food in regional and remote areas.
4. Supports options for funding research into the impact of climate change on food production, and the development and implementation of solutions to address these impacts.
5. Supports the mitigation of the threats of climate change to increased biosecurity risk and subsequent impacts on food production in northern Australia by:
 - a. Co-ordination and prioritisation of resources in northern Australia to support innovation, resilience and growth to address biosecurity challenges and prepare for future shocks to food production systems.
 - b. Investment in research and development targeting preparedness and resilience in northern Australia, including the role of climate change on biosecurity risks and food production.

The Northern Territory context

The NT's population of around 250,000 is dispersed across 1.4 million square kilometres of land mass. Although the NT is home to just one per cent of Australia's population, 30 per cent are First Nations people.

Presently food processing in northern Australia is limited to small niche businesses. Most of Australia's food processing is located in southern Australia. Long supply chains for northern Australia encompassing 3000 – 4000 km, are vulnerable to a wide range of perturbations such as natural disasters, reductions in food processing production as evidenced in the COVID19 pandemic, and potential interruptions caused by disruptions to global fuel markets and conduits.^{1,2,3,4} It has been estimated that every person's food in Australia represented the equivalent of consuming 4.1 litres of diesel each day. Australia is highly exposed should there be interruptions in road transport fuel, and particularly so in northern Australia.

Because of the relative resilience of the current Australian food production and distribution system, Australia has arguably become complacent about food security – which is potentially problematic in more

¹ Commonwealth of Australia, 2020. Royal Commission into national natural disaster arrangements report, 28 October (ISBN: 978-1-921091-46-9). Australian Government.
<https://naturaldisaster.royalcommission.gov.au/system/files/2020-11/Royal%20Commission%20into%20National%20Natural%20Disaster%20Arrangements%20%20Report%20%20%5Baccessible%5D.pdf>

² Mabin, S, 2022. 'Flood-hit NT communities taking desperate measures to restore food supplies'. ABC News. Source: <https://www.abc.net.au/news/2022-02-04/northern-territory-floodimpact/100801536> , accessed 4 February 2022.

³ National Food Institute (NFI), 2020. '5 Ways COVID-19 is affecting Food Processing in Victoria'. Source: <https://nationalfoodinstitute.com.au/nfi/5-ways-covid-19-is-affecting-food-processing-in-victoria/> 18 February, 2022.

⁴ Parker, R., Stewart, J., 2014. Energy and Food Security: Is Australia Fragile or Resilient? Security Challenges, 10 (1) (2014), pp. 51-64.

remote regions of the country like the NT.^{5,6} Development of capabilities to buttress food security for remote and isolated communities where supply chains can be seasonally interrupted, and where cool-chain continuity can be tenuous, is critical.

On a longer trajectory, future climate projections, based on current understanding of climate systems, historical trends and model simulations for climate responses, suggest that the climate of northern Australia is likely to continue on a trajectory of change into the future⁷. Understanding these trajectories for climate change, and identifying potential impacts on food production, is of particular importance within northern Australia, which is subject to climatic extremes and already requires significant innovation and adaptation by communities and businesses to be able to reside and productively operate.

Although Australia has a world class biosecurity system, the risk of new disease and plants entering Australia is increasing due to international trade, movement of people and a changing climate (CSIRO 2014). Increased biosecurity incursions and subsequent pressures on food production are likely to increase the cost of food production. An increase in biosecurity incursions can have significant impacts on food production and trade as well as increasing the risk to the environment and human health.

National production, consumption and export of food

Supply-chains investigations have established that there is sufficient agri-food feedstock in the NT and northern WA region that could support industrial scale shelf-stable food processing. However, more work is required to develop the directions for markets and products, the necessary human capital, and the food technology and engineering pathways to make this a reality.

The Northern Australia Food Technology Innovation project (NAFTI) is investigating innovations in food processing and value-adding of agricultural produce in northern Australia. Specifically, it is focused on shelf-stable foods using novel food processing technologies. The intention is to achieve regional value capture from low-value or out-of-specification agri-food produce.

NAFTI's key contribution is to develop the business and technical case for a developmental shelf-stable food processing facility that has the flexibility to be scalable into commercial production.

Shelf-stable foods are foods that can be safely stored at room temperature in a sealed container. Ambient temperature stability enables these types of products to be stored and distributed without reliance on a cold chain thus reducing logistics costs and increasing the resilience of the supply chain. Products that are thermally treated to sterility have the utility to be able to by-pass most biosecurity barriers to interstate and international trade.

Presently food processing in northern Australia is limited to small niche businesses. Most of Australia's food processing is located in southern Australia. There is currently no medium to large scale commercial shelf-stable food processing in the north of Australia. The core aim of this project is to open a pathway to drive growth and generate employment by establishing regional shelf-stable food processing capability in the north. NAFTI is investigating the strategic, business and technological aspects of a regionally positioned facility and how a competitive advantage can be realised with northern Australian production.

⁵ Reis, K., Desha, C., Bailey, M., Liddy, P., and Campbell, S., 2021. Towards local food resilience. Key considerations for building local food resilience and contingency plans: A focus on the Cairns region.

Final Report, 26 March. Cities Research Institute in consultation with the Cairns Regional Council.

⁶ Sinai, S., 2022. 'Deep roots': Agriculture, national security and nation-building in northern Australia. The Australian Strategic Policy Institute, Barton.

⁷ CSIRO (2015) Climate change in Australia projections

https://www.climatechangeinaustralia.gov.au/media/ccia/2.2/cms_page_media/168/MONSOONAL_NORTH_CLUSTER_REPORT_1.pdf

The development of a regional shelf-stable food processing sector could also buttress food security for remote and isolated communities where cool-chain continuity is sometimes tenuous, and which can suffer extended periods of isolation typically in the annual wet-season.

A food processing capability utilising local beef, seafood and horticultural produce is pivotal in further expanding the NT agribusiness sector.

Charles Darwin University is partnering with a range of industry and research bodies in this project, including Central Agri, CSIRO, the University of Tasmania Centre for Food Innovation, and NT peak rural industry bodies. It is also in dialogue with AACo, and Coles.

Regionalised food processing also is an economic multiplier. Remote regions in Australia have benefitted from these types of investments. The case of vegetable processing in northern Tasmania and SPC Ardmona's Shepparton operations in Victoria, showcase this point in terms of the wealth generation and employment growth that food processing can deliver to isolated regional economies.

CDU is exploring building the case for:

1. A developmental plant:
 - a. A small-scale food-grade facility, certifiable for food production, piloting multiple processing lines.
 - b. Being available for use by external stakeholders to undertake precompetitive, commercial-in-confidence market testing for de-risking future investment.
 - c. Having utility for training and teaching purposes.
 - d. To serve as steppingstone to commercial expansion.
2. A future commercial shelf-stable food processing facility operating at scale.

Recommendation 1

That the enquiry acknowledge the need for local production systems in regional and remote areas, and support CDU's business case for the NAFTI to address a critical need in the NT.

Workforce development

To achieve greater production of high-value foods, training and workforce development is also essential and has the potential to create new jobs in northern Australia. Greater development of a skilled workforce is required at all levels in the NT, including from VET Certificates in Agriculture/Horticulture, through to scholarships and operational funding for PhD and other higher degree research students. Agricultural and horticultural development in the NT affects First Nations lands and provides economic and other opportunities for First Nations communities. Training programs need to be adapted to encourage workforce participation, including a focus on horticultural training that is suitable for remote communities, and ongoing training of station hands to work in the northern livestock (cattle and buffalo) industries.

Recommendation 2

That the enquiry acknowledge the need for greater development of a skilled workforce in the agricultural sector, across vocational and higher education, and support investment in capability building to train and retain highly-skilled workers in the agriculture industry.

The impact of supply chain distribution on the cost and availability of food

Presently northern Australian agriculture is geared entirely to generating and moving fresh produce. Horticultural produce has to travel extreme distances from the NT and northern WA to markets in Sydney, Brisbane, Adelaide, Perth, and Melbourne. In the case of cattle they must travel long distances to either northern or interstate abattoirs, or to export ports.

There are limited options available for growers to directly sell their produce locally in major cities across the north such as Darwin, Katherine, Broome, Cairns, and Townsville. The long supply chain to southern destinations significantly contributes to increased costs for growers as they bear all the costs throughout the supply chain until the product is sold. Key challenges in the horticultural produce supply chain include inadequate cooling of produce before transportation (a consequence of limited on-farm cooling space); mixed levels of monitoring of cool-chain temperatures during transport, and variability in the state and territory compliance protocols for accessing and selling produce in various southern markets.

The carbon footprint as agricultural produce travels significant distances before it reaches the end customer also remains an issue. It is necessary to develop regional and local retail centres for efficient and sustainable delivery, and to reduce the cost both for growers and consumers.

Even northern beef processing (i.e., at Batchelor and Colourstone abattoirs), is geared to export manufacturing markets, with almost nil additional value-adding done locally – a lost opportunity for the regional economy. Additionally there are negative carbon footprint, cost differentials, and animal welfare outcomes from the transport of cattle as much as 3,600 km to meat processors interstate.

Food production that benefits remote communities could have major beneficial social and health impacts. First Nations communities and other people living in locations outside the major population centres across the Territory are confronted by vast distances to access goods, services and markets and are subject to climatic extremes. Other than the major routes, many secondary roads across the Top End remain unpaved and regularly become impassable during the Top End wet season (December to April). This can leave many remote communities and agricultural properties isolated by road for protracted periods. Seasonal road closures have a direct impact on the delivery of services and access to markets. Consequently, socio-economic status and access to services across the region is not equitable. Outside the Greater Darwin area, communities and businesses are challenged by more limited access to employment opportunities, housing, healthcare, education, financial and welfare services.

To appropriately address supply chain issues at the local, regional, and national scale, we need to investigate the business and technical solutions that could augment regional economies. By doing so we could reduce losses in the food system, and create agri-food networks more resilient to internal or external shocks.

Recommendation 3

That the Inquiry supports the development of targeted initiatives and policies to improve access and availability of locally sourced and affordable food in regional and remote areas.

The opportunities and threats of climate change on food production in Australia

Food security for Australia requires the strategic development and expansion of food production in northern Australia. Research to further develop sustainable farming systems in the north are essential. This includes development of horticultural and broadacre crops that are currently commercialised elsewhere in Australia, along with agroecologically suitable novel crops. Northern Australia agri-production systems have a raft of advantages and challenges not experienced in subtropical and

temperate farming systems. To achieve increased security in food production, support is required to adapt crops and farming systems in northern Australian environment, especially the Top End of the NT. Critically, integrated pest and disease management and biosecurity systems need to be developed to ensure the longevity of production systems. Presently, northern agri-food development is limited by the low level of investment in cropping and livestock systems research. This investment must be enhanced to enable growth and resilience in the northern food production sector.

With the projected changes in climate, including rising temperatures, increased frequency of floods, and variable rainfall, there are serious threats to agriculture in northern Australia. For example, in 2022, mango production was significantly reduced compared to an average year as the temperatures required to stimulate mango flowering were not reached, resulting in a low fruit set. Similarly, agricultural practices and techniques are not updated to deal with season-specific, climate-adaptive, agriculture production systems. A holistic approach to agriculture systems is required throughout Australia for linking agricultural produce with food systems, human health, climate change, and efficient use of natural resources (water and land) and overall environmental resilience. A whole systems approach is a must for addressing climate change and maintaining or enhancing our food production in the future.

Recommendation 4

That the Inquiry support options for funding research into the impact of climate change on food production, and the development and implementation of solutions to address these impacts.

Northern Australia is recognised as the biosecurity frontline for many high-risk animal and plant pests and diseases due to its proximity to neighbouring countries, particularly the northern islands in the Torres Strait, which are only a few kilometres from Papua New Guinea. Other unique considerations include ecological and climatic conditions that are conducive to the introduction and establishment of exotic pests and disease, and the size, remoteness and sparse population of this region.

A Tropical Biosecurity research program is being developed at CDU to understand the potential impacts and facilitate sustainable agricultural expansion.

The changing climate is likely to create opportunities for the movement and establishment of new pests and diseases.⁸ In northern Australia, an increase in extreme rainfall events and tropical cyclone intensity may increase the risk of pests and disease vectors entering via natural wind driven pathways. A changing climate could create conditions that facilitate the establishment or spread of a pest, infectious diseases and vectors. Warmer temperatures may create more favourable conditions for vectors and increasing the potential pathogen threat within them. Global warming not only increases the frequency and intensity of flooding, but intense heat and prolonged droughts can subsequently concentrate high abundances of the vectors and hosts around shrinking resources (Selwood et al 2015)⁹. This may have implications for the amplification and spread of vector borne diseases, especially for livestock and human health.

Declining resources and increased pressure on the biosecurity system will reduce the ability to respond to new pests and disease and increase food production costs. In northern Australia, the difficulties in attracting and retaining skilled and specialised workers will result in limited capacity and capability to respond to increasing biosecurity risks and future shocks to food production systems.

⁸ Russell RC. (2009) Mosquito-borne disease and climate change in Australia: time for a reality check. *Australian Journal of Entomology*. 48(1):1-7

⁹ Selwood KE, Clarke RH, Cunningham SC, Lada H, McGeoch MA, Mac Nally R. A bust but no boom: responses of floodplain bird assemblages during and after prolonged drought. *Journal of Animal Ecology*. 2015;84(6):1700-10.

Recommendation 5

That the Inquiry supports the mitigation of the threats of climate change to increased biosecurity risk and subsequent impacts on food production in northern Australia by:

- a) Co-ordination and prioritisation of resources in northern Australia to support innovation, resilience and growth to address biosecurity challenges and prepare for future shocks to food production systems.
- b) Investment in research and development targeting preparedness and resilience in northern Australia, including the role of climate change on biosecurity risks and food production.

Innovative and high-value produce

There are many opportunities for establishing high-value crops in northern Australia, including native plants, such as Australian native rice. Commercial production of a range of native plants for the high-value bush food market is possible. To achieve these opportunities, the development of knowledge and protocols addressing a range of issues is required. These include: agronomic issues; selecting or breeding plants to make them suitable for commercialisation; food processing to suit various markets; and development of robust supply chains systems. Funding programs need to be directed to enabling this capability to be further developed in Australia's north to build this overall resilience.

Case Study: Blacklip Rock Oyster

The Blacklip Rock Oyster (BRO) *Saccostrea echinata* is culturally significant and is harvested by local communities within northern Australia and the Indo-Pacific region. The emerging BRO industry in northern Australia is moving closer to commercial production. Darwin Aquaculture Centre on Channel Island houses BRO hatchery and nursery facilities which are used to supply juvenile oysters (spat) to local farms at South Goulburn Island and Groote Eylandt. Previous research has resulted in significant improvements to BRO hatchery protocols which has seen settlement rates of larvae increase. Ongoing work is focusing on quality assurance compliance and addressing mortality events within the larvae hatchery, and juveniles in the nursery.

This Indigenous-led industry will provide jobs on country and establish BRO leases in the above-mentioned locations in northern Australia as the leading producers of highest quality, fair trade, low carbon footprint, ethical sources of high-quality protein. As such, it is essential that funding be allocated to training Indigenous people on country – particularly with respect to water quality surveillance that can then be used more strategically and cost-effectively to trigger oyster testing.

This industry is a major success story, but additional funding is required for further research to reduce the aforementioned larval and juvenile mortality events, and provide an understanding of how climate change-associated increased temperatures and extreme weather events will impact the oysters. It is possible that this species will be resistant to some of the diseases, especially those associated with climate change (vibrios) and research in the north on this species is essential to ensure that shellfish quality assurance guidelines take into account regional and climatic differences. The success of this industry will improve food security in these regional and remote areas.

Conclusion

CDU supports the Standing Committee's Inquiry and commends the Committee for its interest in addressing food security in Australia. As outlined in this submission, the seriousness of food security, and the potential consequences of not responding in the face of future climate change events is catastrophic. CDU also argues that increasing food production, reducing the movement of produce and further developing to scale agribusiness in northern Australia is a potential catalyst for new industry and local workforce development.

CDU would be pleased to participate in further consultation with the Committee. Please feel free to contact Dr Warren Hunt, Northern Australia Food Technology Innovation Project, Charles Darwin University via warren.hunt@cdu.edu.au.

Further information

Sangha, K.K., Ahammad, R., Mazahar, M.S., Hall, M., Owens, G., Kruss, L., Verrall, G., Moro, J., Dickinson, G., 2022. An Integrated Assessment of the Horticulture Sector in Northern Australia to Inform Future Development. *Sustainability* 14 (18), 11647.[doi:10.3390/su141811647](https://doi.org/10.3390/su141811647)