



Securing outcomes and measuring progress:

A preliminary report into agricultural development and tropical health servicing in Northern Australia.

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Executive summary

The development of Northern Australia has long been a national aspiration; one more recently brought into focus through the *White Paper on Developing Northern Australia*. After three years of active implementation, it remains clear that the northern development agenda is critical to a more prosperous and secure future for all Australians. While there has been much substantive effort and many tangible outcomes from the implementation of the *White Paper*, a clearer understanding of the key measures of success arising from the agenda is just starting to emerge. Stronger and more cohesive mechanisms for measuring change and evaluating success will increasingly be required.

Through its current and specific remit in agriculture and food, northern health service delivery and Traditional Owner-led development, the Cooperative Research Centre for Developing Northern Australia's (CRCNA) early focus has been on establishing the foundations for benchmarking and monitoring progress in several key agricultural sectors and exploring future directions for these sectors. These include the beef, broadacre cropping, horticulture, aquaculture, forestry and rice sectors. Research has also been focused on exploring the emerging Traditional Owner-led development agenda and the future of the health services delivery sector across the north. Additionally, the CRCNA has started to explore foundational supply chain and policy issues underpinning major agricultural development and health service delivery problems and opportunities facing the north.

The CRCNA expects many of these now commissioned projects to be completed by mid-2020, enabling it to develop the first comprehensive report on the current state and emerging priorities facing these important sectors. When complete, that 2020 report will represent a snapshot in time, provide new insights, inform new policy and budgetary directions and support the measurement of progress and continuous improvement in these sectors. This work will have strong industry, community, government and researcher commitment and ownership. In the meantime, the CRCNA's strategic investments are already identifying and profiling the significant efforts that will be required if we are to achieve the broader vision of the 2015 *White Paper*. These, among other things, include:

- Continuing investment for new water assessment and development;
- Establishing a Northern Australian supply chain development fund;
- Supporting effective de-risking activities that support investment in priority landscapes;
- Making strategic investment in respective sector and workforce development;
- Progressing place-based energy and communication investment frameworks;
- A strategic and integrated approach to biosecurity across health and ag sectors;
- Maintaining and enhancing the current CRCNA investment arrangements;
- Continuing the role of the Northern Australian Indigenous Reference Group and Accord; and
- Maintaining the Strategic Partnership, Ministerial Forum and Northern Senior Officers Networking Group (NASONG) framework.

This preliminary report simply provides a timely snapshot of this evolving body of work to help inform the current review and refocus of the current *White Paper on Developing Northern Australia*.

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1.0 The context: Securing outcomes and measuring change

The development of Northern Australia has long been a national aspiration; one more recently brought into focus through the *White Paper on Developing Northern Australia* (Australian Government 2015). The *White Paper* formed an essential part of the Australian Government's wider collaborative plan to build a strong, prosperous economy and a safe, secure Australia. The plan has always considered that the north's future will rely on Northern Australians, local innovation, new infrastructure and the region's proximity to the Asia-Pacific. Indeed, its focus has included building strategic roads, telecommunications and water infrastructure; all with the intention of reducing the costs of doing business in the north and making it a more attractive place to invest, work and live.

After three years of active implementation, it remains clear that the northern development agenda is critical to a more prosperous and secure future for all Australians; a sentiment strongly reflected by delegates attending this year's Developing Northern Australia (DNA) conference in Karratha (ASB 2019). An emerging theme from the DNA event was that this nationally important agenda needs to focus on Northern Australia's untapped potential and abundant resources and that the future will require a long-term strategic focus with clear measures of success.

While there has been considerable effort and many tangible outcomes from the implementation of the *White Paper* (Australian Government 2018), a more comprehensive understanding of the key measures of success arising from the northern development agenda are just starting to emerge. Stronger and more cohesive mechanisms for measuring change and evaluating success will increasingly be required. This will enable everyone in Northern Australia to work together to support the initiatives which are working well and adapting our approaches when they aren't. For this reason, the Cooperative Research Centre for Developing Northern Australia (CRCNA) has invested in several strategic research collaborations which, for the first time, start to benchmark the state of our northern development trajectory regarding those key sectors that it has a research remit and responsibility for. This work, however, also has implications for the key strategic actions or directions needed for continuous improvement in the wider northern policy agenda and work program.

Through its current and specific remit in agriculture and food, northern health service delivery and Traditional Owner-led business development, the CRCNA's early focus has been on establishing the foundations for benchmarking and monitoring progress in several key agricultural sectors, including the beef, broadacre cropping, horticulture, aquaculture, forestry and rice sectors. Research has also focused on exploring the emerging Traditional Owner-led development agenda and the future of the health services delivery sector across the north. Additionally, the CRCNA has started to grasp some of the foundational issues underpinning major development problems facing the north, including:

- Pan-northern (east to west coast, rather than north to south) infrastructure and regional supply chain opportunities and limitations;
- Relationships to agricultural and other markets in ASEAN and other countries;
- The cost of freight, communications, energy, and the need to better de-risk Northern Australian landscapes to improve agricultural investment outcomes; and
- A lack of skilled and stable workforce to support established and emerging industries, especially in the areas of plant and animal agronomy and aquaculture.

The CRCNA anticipates that many of these commissioned projects to be completed by mid-2020, enabling it to develop the first comprehensive report on these sectors/issues. This will present an opportunity to support the emergence of new policy and investment directions and the measurement of progress/continuous improvement in the wider Northern Australian agenda. With early policy thinking already commencing regarding the review and refocus of the current *White Paper on Developing Northern Australia*, however, this preliminary report simply provides a timely snapshot of this evolving body of work to help inform those processes in a timely way.

1.1 About the Cooperative Research Centre for Developing Northern Australia (CRCNA)

The CRCNA is a part of the Australian Government's Cooperative Research Centre Program and was one of three institutions established to deliver the Australian Government's agenda for developing the north, as outlined in the original *White Paper* (Australian Government, 2015). An initial 10-year, \$75 million federal investment has been further bolstered by cash investment from the Queensland (Qld), Northern Territory (NT), and Western Australian (WA) Governments, highlighting the value the CRCNA brings to cross-jurisdictional and bi-partisan development of Northern Australia. The CRCNA leads a clear, integrated and nuanced research and development approach to delivering critical outcomes against the developing Northern Australia agenda. It does this by focussing its investment in the initial areas of agriculture and food (including aquaculture), northern health service delivery and Traditional Owner-led business development (in the agricultural and health services areas). Our research seeks to achieve the following objectives:

- 1. De-risk investment in Northern Australia** - Broker strategic discussions with relevant decision-makers and stakeholders and guide a coordinated approach which informs development planning and investment decision making across jurisdictions;
- 2. Deliver a coordinated approach to industry sector development** - Support strategic information and knowledge building which helps frame and enhance understanding of the critical challenges and opportunities facing the north's key agricultural sectors, health service delivery sectors, infrastructure, and regional development;
- 3. Inform appropriate supply chain development and infrastructure planning across Northern Australia** - Deliver an evidence base which helps prioritise supply chain and infrastructure investment to provide timely access to high-value international and domestic markets;
- 4. Deliver research, development, and extension solutions with impact** - Leverage grass-roots level RD&E efforts, capacity and knowledge of Northern Australia to ensure solutions are implemented in a meaningful way and for the benefit of all Australians; and
- 5. Build and support the research capacity and develop the workforce skills of Northern Australians**– Developing these capacities in the fields of agriculture, aquaculture, food, northern health service delivery and Traditional Owner-led business development (in agriculture, aquaculture, food and northern health service/ models of delivery).

1.2 Northern Australia: The engine room of Australia's economy

Northern Australia, as defined by the CRCNA, includes all the Northern Territory, and those parts of Queensland and Western Australia above and directly below or intersecting the Tropic of Capricorn. It also includes Gladstone, Carnarvon and Exmouth, as well as the Local Government Areas of Meekatharra and Wiluna in Western Australia (see Figure 1).

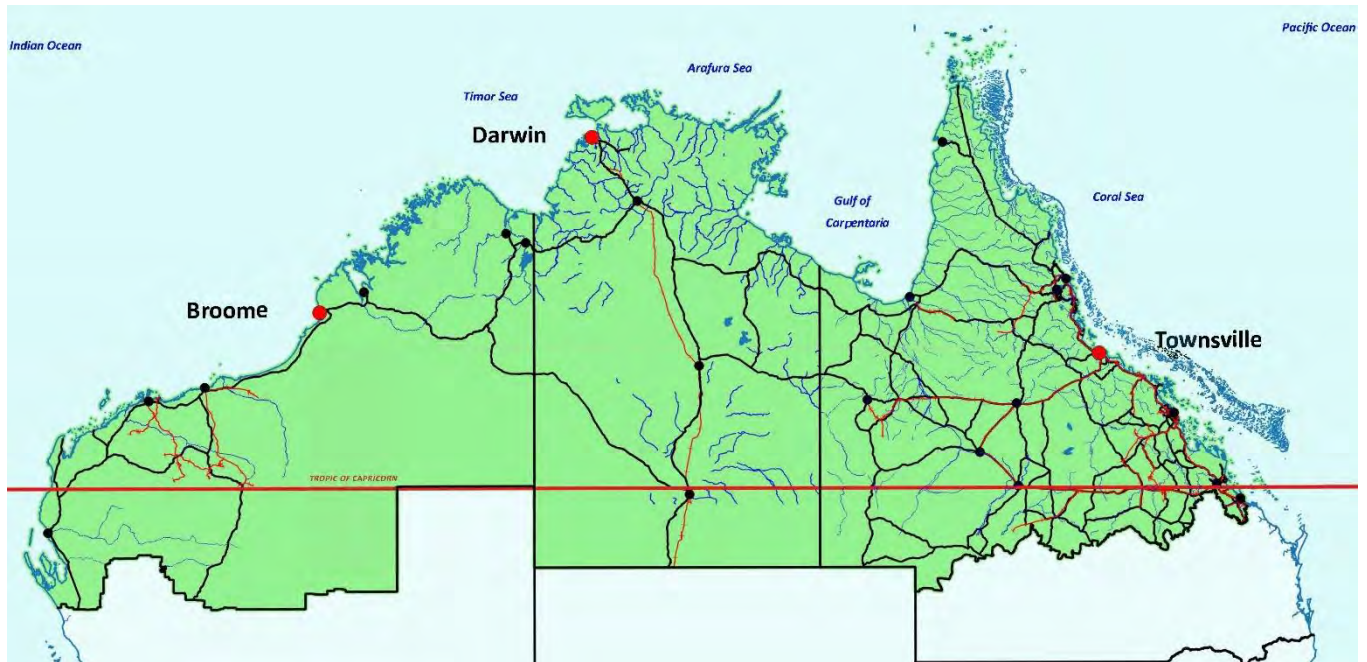
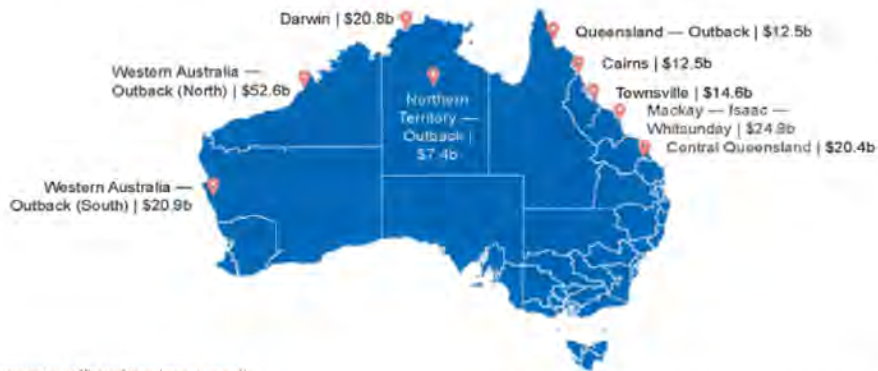


Figure 1: Map of Northern Australia as defined in the CRCNA's Commonwealth Funding Agreement.

1.3 An economic snapshot of Northern Australia



GROSS REGIONAL PRODUCT (GRP) IN NORTHERN AUSTRALIA 2016-17



Source: Office of Chief Economist, Office of Northern Australia

35% ↑

Projected increase in the volume of freight on Australian roads between 2018 -2040.

Agricultural production



13.6 % OR \$8 BILLION OF AUSTRALIA'S TOTAL AGRICULTURAL PRODUCTION

Land and water



60 % OF AUSTRALIA'S SURFACE WATER RUNOFF

45% OF AUSTRALIA'S POTENTIALLY DIVERTABLE WATER YIELD

By 2030 Asia will represent



66 % OF THE GLOBAL MIDDLE-CLASS POPULATION

59 % OF THE GLOBAL MIDDLE-CLASS CONSUMPTION

Source: Information provided to the CRCNA by the Office of Northern Australia based on data and calculations by the Office of the Chief Economist incorporating various data sources including: the Australian Bureau of Statistics 2016 Census of Population and Housing, the National Freight and Supply Chain Strategy, customised report for the ONA based on International Merchandise Trade data, Dept. Industry, Innovation and Science, and OECD Observer An Emerging middle-class.

1.4 Current policy settings for Northern Australia

The 2015 *Our North, Our Future: White Paper on Developing Northern Australia* represented a unified approach to northern development. Forty-one of the original 51 initiatives have now been delivered, with the remainder expected to be completed in 2019-20. Some of the key outputs from the implementation of the investment include (Office of Northern Australia 2019):

- The implementation of the Strategic and Beef Roads funding packages;
- The roll-out of the Northern Australian Water Infrastructure Facility to investigate and progress new ways to improve water security;
- Establishment and operation of the Northern Australia Infrastructure Facility (NAIF);
- The Cooperative Research Centre for Developing Northern Australia (CRCNA); and
- Integrated governance through the Northern Australian Strategic Partnership (NASP) and Northern Australia Ministerial Forum (NAMF).

The northern agenda has made significant progress because it integrates Commonwealth, State and Territory Government efforts, reflecting a multilateral and bipartisan approach (Office of Northern Australia 2019). This clear and overarching governance framework guides collaboration across the participating Governments. Progression of the overall agenda is monitored through the Northern Australian Strategic Partnership (NASP), involving the Prime Minister, the Queensland and Western Australian Premiers, and the Northern Territory's Chief Minister. At a more operational level, the Northern Australian Ministerial Forum (NAMF), led by the Minister for Northern Development, supports cross-jurisdictional collaboration in economic infrastructure, agriculture and aquaculture, resources and gas, Indigenous business, innovation and growth, innovative economic incentives, defence and social infrastructure. An important and additional development, however, has been the establishment of the Indigenous Reference Group; a cross-governmental Commonwealth framework which is deeply engaged with Northern Australia's Indigenous leadership and the jurisdictions. A wide range of work has been progressing towards the development of a Northern Australian Indigenous Development Accord which for the first time, brings an Indigenous-led perspective to the northern agenda (NIAA, 2019).

As a result of this more comprehensive approach, the Northern Australian agenda is beginning to influence a more cohesive Australian, State and Territory policy agenda with an increasing potential to improve investment attraction and economic development outcomes for the north. In the past few years, this has specifically included influence on key agenda such as:

- The Australian Government's city deals approach (e.g. Darwin and Townsville);
- The establishment of the Roads of Strategic Importance initiative (ROSI);
- The Commonwealth's emerging Hydrogen Strategy; and
- A significant influence on the Building Better Regions Fund.

Much review-based work is specifically now seeking to refresh and refine the northern development agenda, and the CRCNA hopes this preliminary paper can inform these processes, which include:

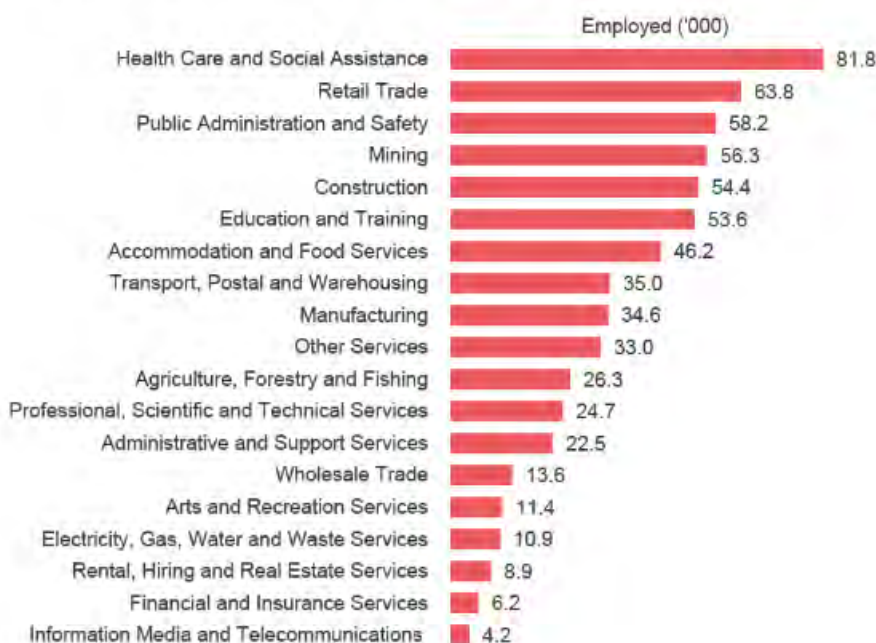
- A broad refresh of the northern development agenda through the deliberations of the Office of Northern Australia (ONA) and the new Taskforce on the Northern Australia agenda;
- The Select Committee on the effectiveness of the Northern Australian Agenda; and
- The Joint Standing Committee Inquiry into the Opportunities and Challenges of the Engagement of Traditional Owners in the Development of Northern Australia.

2.0 Sector development within the CRCNA remit: the current state-of-play, trends and priorities for action

A variety of sectors contribute to the Northern Australian economy (Figure 2). Within its mandate, the CRCNA supports industry-led research in the agricultural and health service delivery sectors and Traditional Owner-led development in those two sectors. Consequently, the CRCNA has commissioned several detailed situational analyses to help direct the future of the beef, aquaculture, broadacre cropping, indigenous agriculture and Indigenous-led development, rice, forestry, horticulture and health service delivery sectors. These studies will benchmark the current state of these sectors, inform policy and investment decision making and enable the measurement of progress.

Which industries employ the most people in the north?

The top employing industries in the north are health care and social assistance, retail trade, public administration and safety, education and training and construction industries. Together, these five industries account for 49 per cent of employment in the north.



Notes and source: ABS, Labour Force, Australia, Detailed, Quarterly, Feb 2013 (cat.no. 6301.1.63.00)

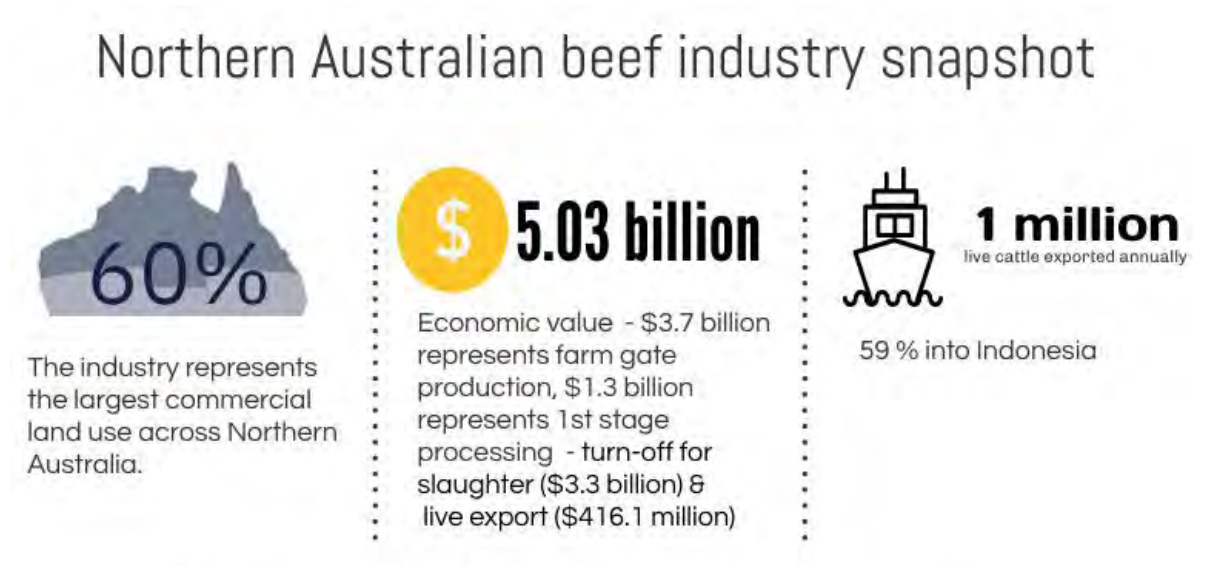
Figure 2: Key sectors contributing to the Northern Australian economy.

The following section provides an overview of the emerging research to date for these sector situational analysis projects and should not be considered final. The final reports will deliver a limited number of transformational strategies (supported by industry, researchers and governments) required to grow and strengthen these sectors. The CRCNA's focus within these works has been to ensure that these strategies have a high-level of sector ownership and based on the available evidence concerning the key opportunities and risks facing the sector. These will be completed by mid-2020 (with the exceptions of the broadacre cropping and indigenous agriculture /products projects), but the following synthesis provides a snapshot of their emerging findings.

2.1 The Northern Australian beef industry situational analysis

This section is derived from Chilcott et al. (Forthcoming).

The beef industry is a critical component of the Northern Australian economy. Property sizes are generally large and supply chains have a vast geographic spread, including the movement of animals through properties for breeding, growing and fattening cattle. This carries on through to feedlots and beef processing at abattoirs concentrated near major population centres, mostly on the east coast of Australia. Figure 3 provides an overview of the industry as identified by Chilcott et al. (forthcoming) and includes an overview of the current industry supply chain.



Northern Australian beef supply chain



Figure 3: The Northern Australian beef industry overview and supply chain. Source Chilcott et al.

2.1.1 Sectoral SWOT analysis

From the broad situational analysis undertaken by CSIRO, identified strengths, weaknesses, opportunities and threats include the following:



2.1.2 Key thematics for the sector's future

Key thematics for the sector's future have been identified as follows:

- The need to improve the translation of proven R&D to farm practice for most of the Northern Australia beef industry;
- An ongoing need for RD&E for profitability and productivity gains for the top businesses; and
- A need to support the Northern Australia beef industry to transform from its current state to a higher productivity base and to ensure future viability and profitability.

2.2 Northern Australia broadacre cropping industry situational analysis

This section is derived from MacLean, Thomas, and Narustrang (Forthcoming).

Work on this situational analysis for the Northern Australian broadacre cropping sector started in October 2019. Key geographic areas of existing and potential new areas and opportunities have been identified and are shown in Figure 4. This work is necessarily preliminary.

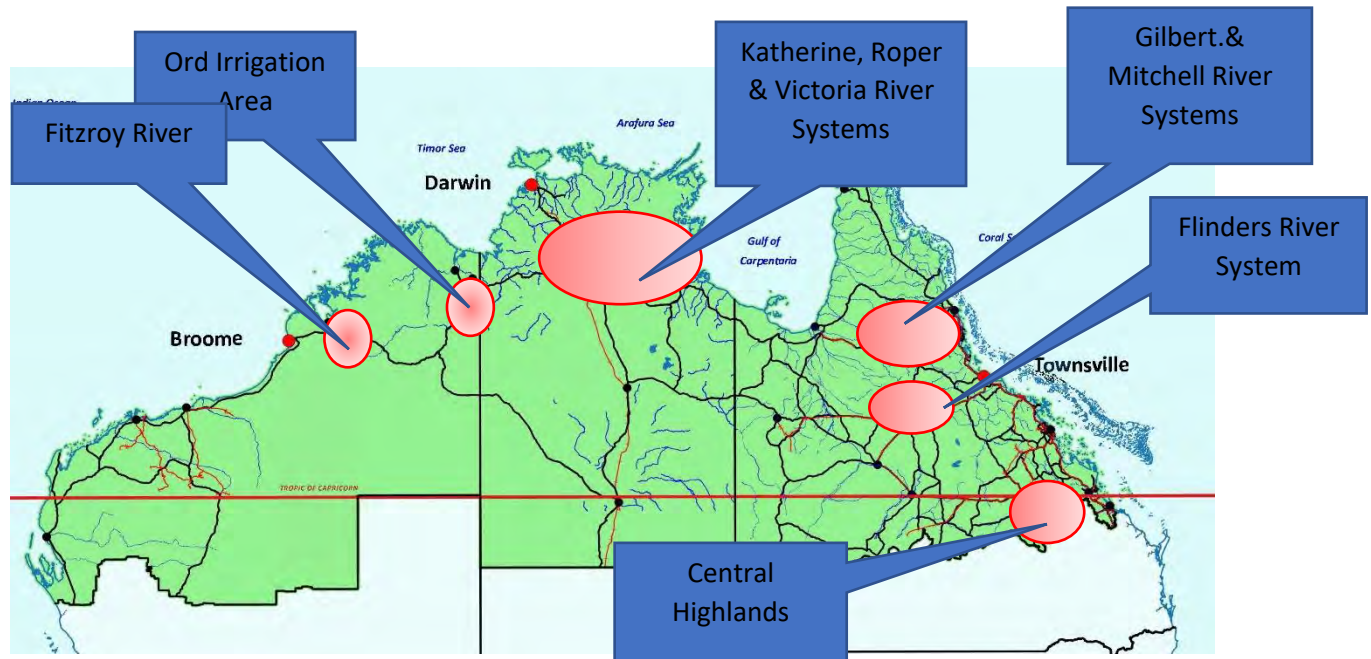


Figure 4: Key locational opportunities for the broadacre cropping sector in Northern Australia.

Despite being close to key Asian markets, broadacre cropping has not significantly developed over the preceding decades. Nonetheless, through existing support of RD&E in this emerging sector, identified strengths, weaknesses, opportunities and threats have been identified.

2.2.1 Sectoral SWOT analysis

Identified strengths, weaknesses, opportunities and threats in this sector include the following:

STRENGTHS



- Where it has progressed, the selection of potential crops has been based on (i) agronomic suitability; (ii) market size and competitiveness; (iii) contribution to net profit per year; (iv) compatibility in other cropping systems; and (v) the scale required.
- Competitive industry advantages include (i) reliable annual rainfall for capture; (ii) inexpensive costs per megalitre of water use; and (iii) the potential for extensive suitable soils and climate for irrigated cropping.
- Significant market strengths in multiple cropping commodities and the potential for “whole of system approaches” which integrate, cattle, cotton, cropping and fodder.

WEAKNESSES



- Inconsistency, duplication and complexity between State and Federal Governments in agricultural development policies.
- Land tenure and water rights differing across jurisdictions not being easily understood by potential investors or financial institutions.
- Communications infrastructure is generally poor and a major business constraint.
- A lack of grain and oilseed processing and storage infrastructure and a lack of cotton gins and sugar mills.
- Large distances mean higher costs and longer transport and storage timeframes.
- A limited pool of workers, high wages and an even smaller pool with cropping experience, this includes private and retail agronomists and input suppliers.
- Depending on region, rainfall can be erratic making dryland cropping more risky.
- Water storage is a challenge because of high evaporation rates.
- The Return on Capital equation is currently unfavourable for new investment in traditional and tested broadacre models.

OPPORTUNITIES



- The north has a mosaic of suitable soil and water resources for broadacre cropping, interspersed with land more suited for extensive grazing and conservation.
- The emergence of increasing water scarcity, insecurity and cost in southern Australia is making the north a more attractive option, especially for experienced grain growers.
- Significant investor interest in the expansion of the industry in northern Australia. Social licence – continue to demonstrate that growers share the same values as the broader community of safe and quality products and environmental stewardship.

THREATS



- This is currently a small dispersed industry, lacking scale and market influence.
- The absence of economically viable cropping systems and varieties, with a historical R&D focus based in southern Australia.
- Variable climates that can make a prediction of the start and finish of seasons difficult.
- Unknown problems associated with disease, weeds and pests and potential biosecurity risks.
- Lack of experienced growers, the north in terms of agricultural industries being predominantly pastoral and horticultural.

2.2.2 Additional emerging broadacre research

Given the challenges outlined above, key sector thematics are yet to be developed further. It is worth noting, however, that there is ongoing and growing interest in cropping in the north, particularly as water becomes more costly and less secure in the south. There has been considerable new investment aimed at addressing some of these issues. From July 2019, the CRCNA, in partnership with the Grains Research and Development Corporation (GRDC), established three separate but complementary projects in northern Queensland to provide local landholders with the tools and information required to assist in developing profitable farm businesses. These include:

- *Developing an oilseed industry in Northern Australia* - Identifying a range of best-adapted oilseed crops that can be commercially viable, add value and provide a local feed source;
- *Developing a broadacre cropping sector in Northern Queensland* - Providing landholders and investors with a better understanding of yield variability, risk profile and profitability;
- *De-risking broadacre cropping options for Northern Queensland* - A participatory on-farm approach to identify knowledge gaps in cropping for grain or fodder; and the
- *Northern Territory broadacre cropping project* - A co-investment between the CRCNA, the Cotton Research and Development Corporation (CRDC) and the GRDC focused on growing cotton and peanuts.

In far northern WA, the North Australia Crop Research Alliance (NACRA) and the GRDC have invested in a five-year agronomy project investigating varietal evaluation, crop physiology, nutrition and crop sequencing. The NACRA also leads a large project focused on developing sustainable cropping systems for cotton, grains and fodder. In support of emerging grain storage issues, the GRDC is investing in resolving grain storage issues (in port and on-farm) at the Port of Townsville, specifically how best to store grains, including pulses and oilseeds in a tropical environment.

2.3 Northern Australia aquaculture industry situational analysis

Derived from Cobcroft et al. (Forthcoming).

James Cook University is leading the situational analysis for the aquaculture sector. Figure 5 provides an overview as identified by the project team of the key features of this sector.

This is a highly diverse but sector, constituting several separate and distinct sub-sectors, including pearling, barramundi farming, prawn farming and 'others', including redclaw, tropical oysters, lobsters, other finfish (groper and cobia) and algae production. Producers are comprised of predominantly small to medium enterprises (SME) and family-businesses (< 40 employees) undertaking the production of a range of species and utilising a variety of cultural systems. It is also a mostly male (>95%) and older (>71% and > than 29% under age 40) workforce, most with university degrees (58%) or vocational training (19%) qualifications and more than 10-years' experience.

Northern Australian aquaculture industry snapshot



Largest sectors in Northern Australia

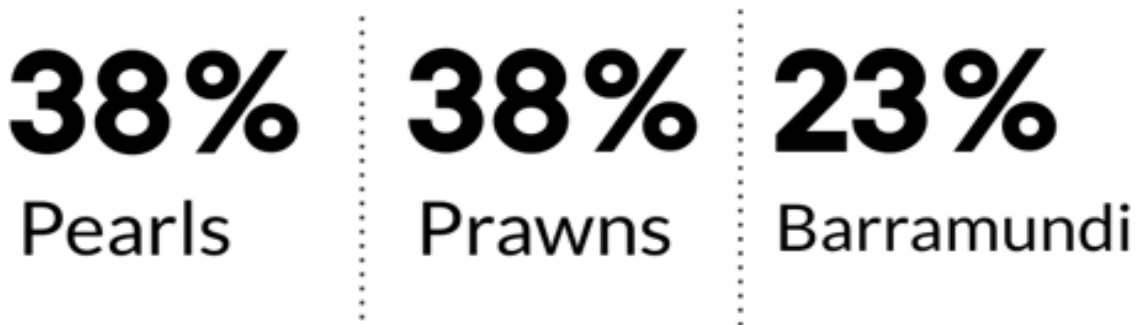


Figure 5: The Northern Australian aquaculture sector overview.

2.3.1 Sectoral SWOT analysis

The Northern Australian aquaculture situational analysis team has undertaken a series of interactive, industry workshops across the north, including the Torres Strait, Darwin and Broome. Overall more than 200 industry stakeholders attended face-to-face workshops, and more than 110 people responded to an online survey. The data and information gathered during these engagement activities in addition to a literature review have provided a solid understanding of the current state of the industry. Identified strengths, weaknesses, opportunities and threats in this sector include:

STRENGTHS



- Industry estimates indicate a probable doubling of production by 2030 to achieve an annual value of at least \$410 million.
- Education, research & training providers are comprised of a relatively large number of institutions/ entities and people involved in the northern aquaculture industry.
- Existing aquaculture producers are investing, as are new investors, to expand barramundi, prawns, and tropical rock oysters (largely focused on domestic market supplies).
- Production standards in this sector are increasingly strong, presenting opportunities to contribute to improved water quality.

WEAKNESSES



- Low industry growth over the last decade (particularly compared with southern Australian aquaculture), derived primarily by just a few new entrants and consolidations.
- The existence of commercial confidentiality concerns with third-party access to producer data provided to the government (and industry associations).
- Suppliers comprised of a combination of relatively small representative offices of large international suppliers (e.g. feeds and equipment) or SME businesses providing specialist services or products with reported annual sales ranges of \$50,000 to \$1,200,000.

OPPORTUNITIES



- An emerging scenario analysis suggests that, given the right incentives and conditions, the overall aquaculture industry could reasonably expand to five times its current production.
- New prawn/lobster/redclaw projects targeting overseas markets are developing.
- Significant opportunities to contribute to Indigenous employment and high value-add opportunities such as food tourism.

THREATS



- Power (costs, reliability, accessibility, optionality/competition).
- Liveability (being a challenge in attracting a professional workforce and retaining people).
- Environmental risks (associated with approvals, regulation and public perceptions of industry practices).
- Supply chain, infrastructure and transport (costs, accessibility, optionality/competition).

2.3.2 Key thematics for the sector's future

Key thematics for the sector's future have been identified as follows:

- Improved government policy and regulation (e.g. streamlined approvals, increased biosecurity, managing the importing of economically important species, etc.);
- The provision of strategic support for expanding markets (e.g. access to new export markets, market volume, the promotion of 'brand Australia', etc.);
- Maintaining research support in key areas (e.g. nutrition, disease management, automation, breeding and genetics, and field officers for aquaculture development);
- An increased focus on selective breeding (e.g. government-supported programs transitioning to commercial ones, improving disease resistance etc.); and
- Additional and targeted investment for new and improved infrastructure and upgrades (e.g. roads, bridges, power, airports, telecommunications, ports and cold chains) focussed on delivering efficient and reliable 'hubs' which industry can co-develop.

2.4 Developing a Northern Australian rice industry situational analysis

Derived from Henry et al. (forthcoming).

While there is currently no substantial activity in this sector, the initiation of one, or multiple, commercial rice production industries in Northern Australia is feasible with further investigation. A range of issues, not least being access to cheap and reliable water and climate change are having severe impacts on rice production in southern Australia. Major new initiatives are consequently needed to fill demands from both local and export markets. Rice growth in the north could meet this demand, especially if it is further developed as a high-value rotational crop. Rice may represent an option for farmers in rural and remote Queensland, boosting jobs and supporting the local economy. The harvest of wild rice could also provide new economic opportunities for Indigenous communities living on the floodplains of Australia's north and the development of a wild rice industry could support high-end bush tucker or gourmet products. Wild rice varieties will be harvested as part of the situational analysis work (see Figure 6).

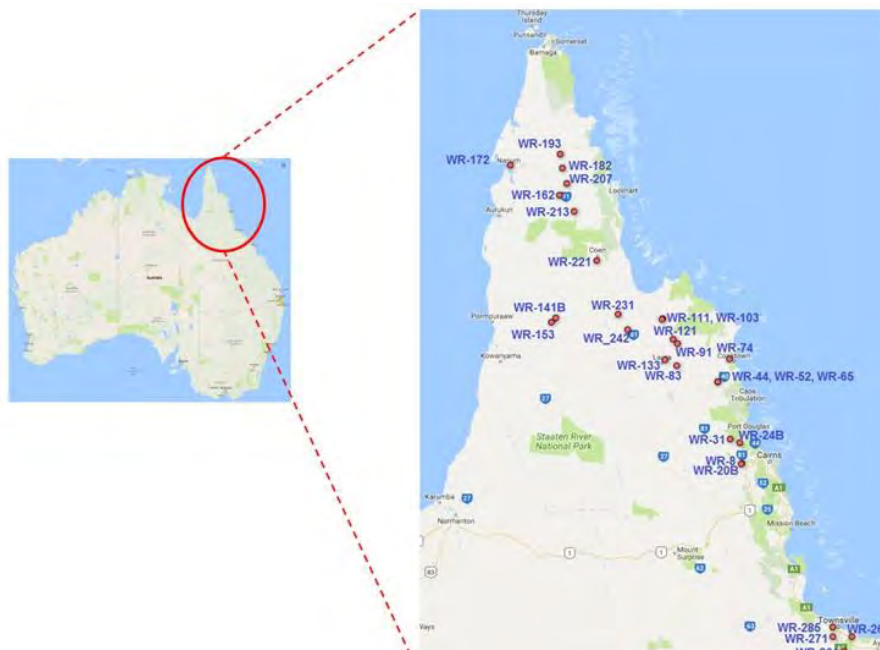


Figure 6: North Queensland wild rice harvest locations (after QAAFI 2019).

The implementation of commercial rice production in the north faces complexities as it is not the first-time production has been attempted. Throughout Australia's history, numerous efforts have been made to commercially produce rice in WA the NT and Queensland. New efforts must proceed with caution, considering insight from past successes and failures and from both regional and international industries. New technologies and agronomic practices must also be considered in order to maximise the chances for success. It is exciting to see that smaller-scale trials have been occurring in Queensland and WA, and research is currently taking place on wild rice production in the NT. The Queensland Alliance for Agriculture and Food Innovation (QAAFI) has played a key role in bringing the industry leadership into a strong future-focussed collaborative alliance.

2.4.1 Sectoral SWOT analysis

Based on the research and engagement undertaken in the situational analysis, identified strengths, weaknesses, opportunities and threats include the following:



2.4.2 Key thematics for the sector's future

Key thematics for the sector's future have been identified as follows:

- Establishing strong cooperative governance and leadership within the industry;
- Developing varietal simulation modelling and a tropical rice breeding and varietal development program for domesticated rice;
- Reviewing global practices in the commercialisation of wild rice;
- Developing a management and conservation plan for Australian native rices;
- Reviewing options for storage and drying infrastructure; and
- The empowerment of traditional owners in the development of the sector.

2.5 Northern Australian forestry and forest products industry situational analysis

Derived from Stephens et al (forthcoming).

Timber Queensland is leading the situational analysis for the forestry sector. Figure 7 provides an overview as identified by the project team of the key features of this sector, which include:

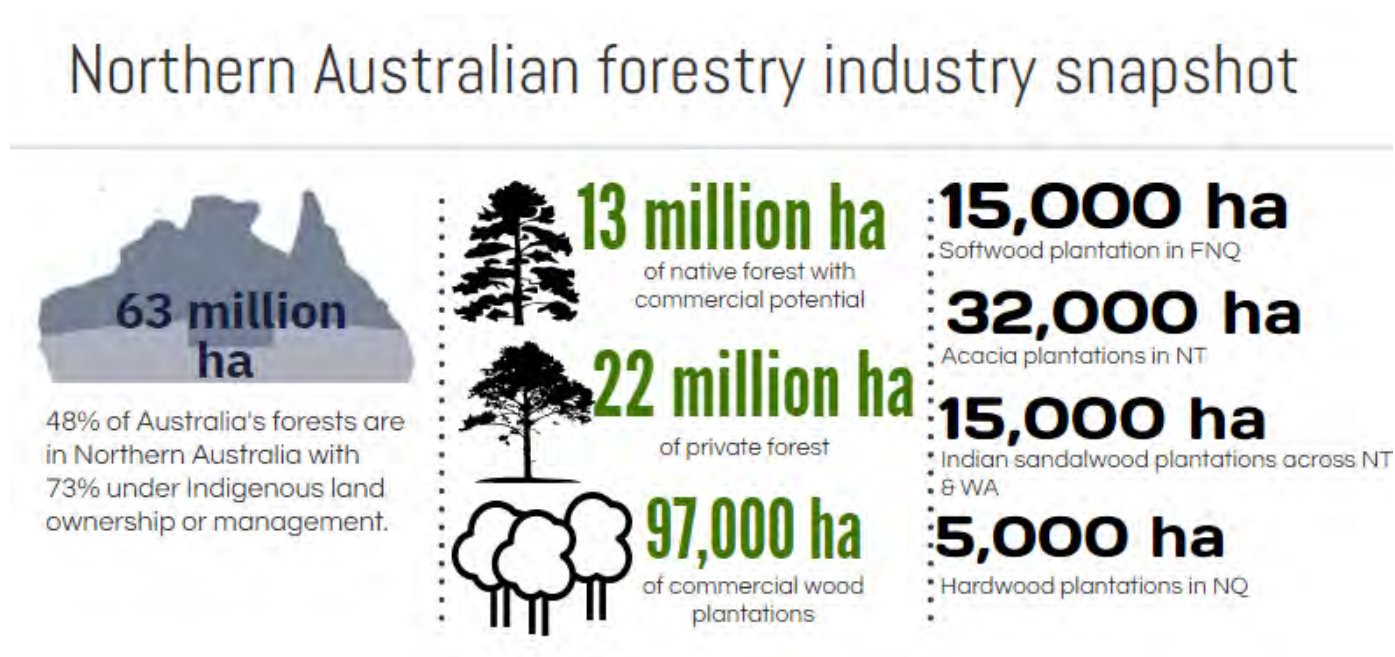


Figure 7: The Northern Australian forestry sector overview.

While Northern Australia encompasses 53% of Australia's land and broad forest areas (some 63 million hectares of native forest), remoteness and extremes of climate have limited the potential of the region for forestry and wood products. The Northern Australian forestry and forest products industry, in terms of processing and value chain activity, currently is small scale, geographically fragmented and diverse. Figure 8 provides an overview of the forest types across Northern Australia.

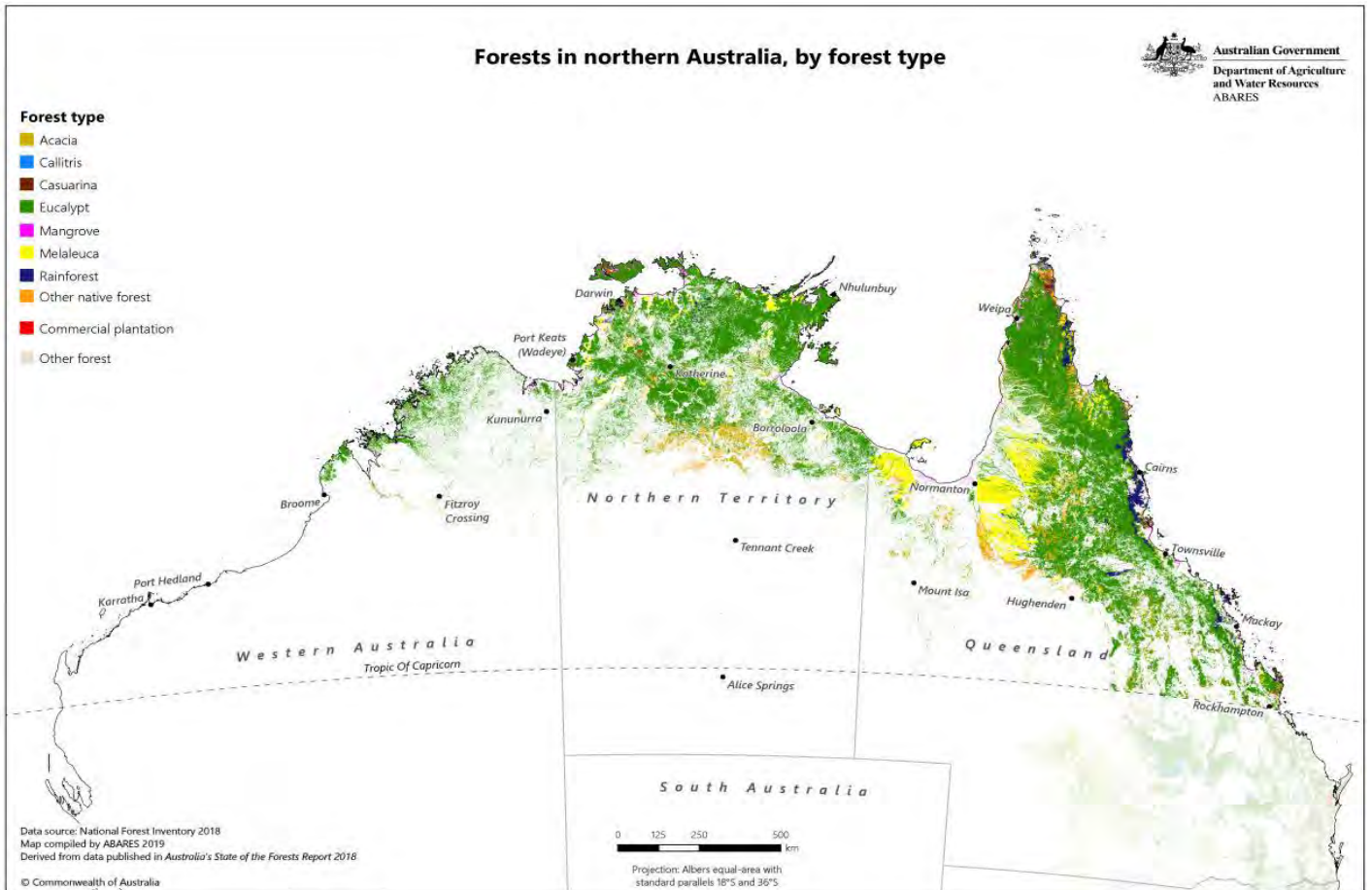


Figure 8: Forest types across Northern Australia (Timber Queensland Forthcoming via ABARES).

2.5.1 Sectoral SWOT analysis

Based on the research and engagement undertaken in the situational analysis, identified strengths, weaknesses, opportunities and threats include the following:

STRENGTHS



- Strong demand for forest products domestically and globally.
- A significant and diverse forest and forest product resource across northern Australia.
- Forest activities often strongly aligning with Indigenous development aspirations.
- Emerging potential for the role of forestry activities in landscape-scale water quality, biodiversity, carbon and fire management.
- Policy measures (e.g. the emergence of a carbon value) can aid the expansion of the industry in the north.
- The industry can supply local markets that are quite distant from other supply options.

WEAKNESSES



- Logistical and supply chain challenges.
- The need to grow economies of scale.
- The need to build more cohesive workforces for the forest and forest product sector.
- Uncertain policy frameworks for investment.
- Climate uncertainty and risk to the sector.
- The need for improved genetics, agronomic and silvicultural information.
- Insufficiently developed processing facilities.
- Low levels of forest management awareness and skills across the land holding community.
- Insufficient extension and R&D frameworks.
- Inconsistent and highly seasonal rainfall.

OPPORTUNITIES



- More certain long-term wood supply arrangements for crown leasehold lands.
- Extension of Indigenous forestry management, manufacturing and supply.
- Further development of the sandalwood industry for products.
- Increased productivity and quality of hardwood fibre pulp plantations.
- Establishment of further climatically suitable plantation species.
- Maintenance and expansion of the well-established softwood plantation estate.
- Potential harvesting of native forests on all tenures, dependent on information.
- The development of more plantations of hardwood species.

THREATS



- Lack of clarity in property rights related to forest and forest products.
- Competing land use interests which could potentially be highly competitive.
- Lack of collaboration across key players within the forest-related sector.
- Current insurance industry practices with respect to the operation of the industry.
- Poorly developed markets and competition from global suppliers with weaker practices.
- A weak public policy focus on forest sector development in Northern Australia.

2.5.2 Key thematic for the sector's future

Building on a strong Northern Australian alliance of those with a future interest in the development of the industry, the Timber Queensland-led project team has developed an emerging roadmap for the Northern Australian forestry and forest products industry and has identified the following priority opportunities, action outcomes and overarching needs and next steps for implementation.

Key thematic for the sector's future have been identified as follows:

- Specific areas of land being made available for expansion of plantations in Northern Australia, dependent upon suitable soils, rainfall and access to markets;
- While broad areas of native forest exist, there is a need for an improved forest inventory and assessment of commercial potential;
- More certain native forest resource security arrangements (whether on private or public land) will support future investment in processing, value-adding and employment;
- Expansion of forestry and forest products industries requires meaningful engagement models between industry, investors and resource owners (particularly traditional owners);
- Silvicultural understanding needs to be improved and supported through expertise and training for private native forestry (particularly among traditional owners);
- Silvopastoral systems (particularly cattle and timber) will be important to the viability of both plantation and native forestry and the expansion of beef cattle operations;
- Carbon incentive schemes could play a greater role in supporting the expansion of forestry operations in plantations and native forests (including private native forests);
- Infrastructure needs are significant across Northern Australia, linking resources with processing and export (port) opportunities; and
- While the risks of catastrophic events such as cyclones are well-understood, effective financial models or services are needed that can deal with these to facilitate investment.

2.6 The Traditional Owner-led bush products sector

Derived from MacLean et al. (2019a and 2019b).

The CRCNA is looking to more widely explore opportunities in the bush foods and bush products industry (including both Indigenous and non-Indigenous aspects) but recognises this is a complex and fragmented sector requiring a significant collaborative discussion about its future. CSIRO has undertaken a preliminary review of the sector from a Traditional Owner viewpoint. Their research efforts were guided by an Indigenous Steering Committee comprising of representatives from the Kimberley Land Council, Giringun Aboriginal Corporation, the Tropical Indigenous Ethnobotany Centre and In Group Investments Australia with support from the Australian Native Food and Botanicals industry body (ANFAB) and Australian Department of Agricultural and Water Resources.

MacLean et al. (2019a and 2019b) found there is currently limited research into the base condition, potential opportunities (investment and supply chain) or key development priorities (including R&D) for this sector, limiting its ability to ensure its appropriate and sustainable growth. The Traditional Owner-led bush products sector incorporates a wide range of enterprises. These include bush foods, native plant-derived industries (seed harvesting, nurseries, cut flowers etc.) and the development of botanically based products including bush medicines, essential oils, and health and beauty products. Each of these types of enterprises may result from the wild harvest, cultivation or enrichment planting of select native plants. The sector continues to grow and diversify across Northern Australia,

but Indigenous people face unique challenges to their involvement. Although the literature highlights the many challenges faced by Indigenous Australians in developing businesses and enterprises in this sector, it also reveals diverse examples of Indigenous-led pathways to access, develop and take advantage of opportunities for Traditional Owner-led bush product enterprises.

2.6.1 Sectoral SWOT analysis

Based on the research and engagement undertaken in the situational analysis, identified strengths, weaknesses, opportunities and threats include the following:



2.6.2 Key thematics for the sector's future

Key thematics for the sector's future have been identified as follows:

- Investment in Indigenous leadership for sector development;
- Supporting Indigenous business development models;
- Strengthening and diversifying supply chains and investment in product development;
- Developing a toolkit of pathways to protect Indigenous cultural/intellectual property;
- Defining the unique profile of the Indigenous-led bush products sector;

- Developing pathways to support Traditional Owners to navigate legislation and to access bush product resources on their Country;
- Developing programs to support young Indigenous people to develop business acumen and be involved in enterprise development; and
- Network development to build business acumen via training, mentoring and advice appropriate for different stages of enterprise development.

2.7 The Indigenous-led development sector

Derived from Northern Australian Land and Sea Management Alliance (NAILSMA) (2019).

Despite ownership, native title rights and other interests in large areas of land (at least some 79%) and adjacent rivers and seas in Northern Australia, Indigenous people remain marginal participants in the commercial economy (see Figure 9). Historical and contemporary determinants of economic participation remain intractable, and the original *White Paper on Developing Northern Australia* did not specifically address or support Indigenous interests in leading the development of their own lands, consistent with their own development aspirations (NTG 2014; Australian Government 2015).

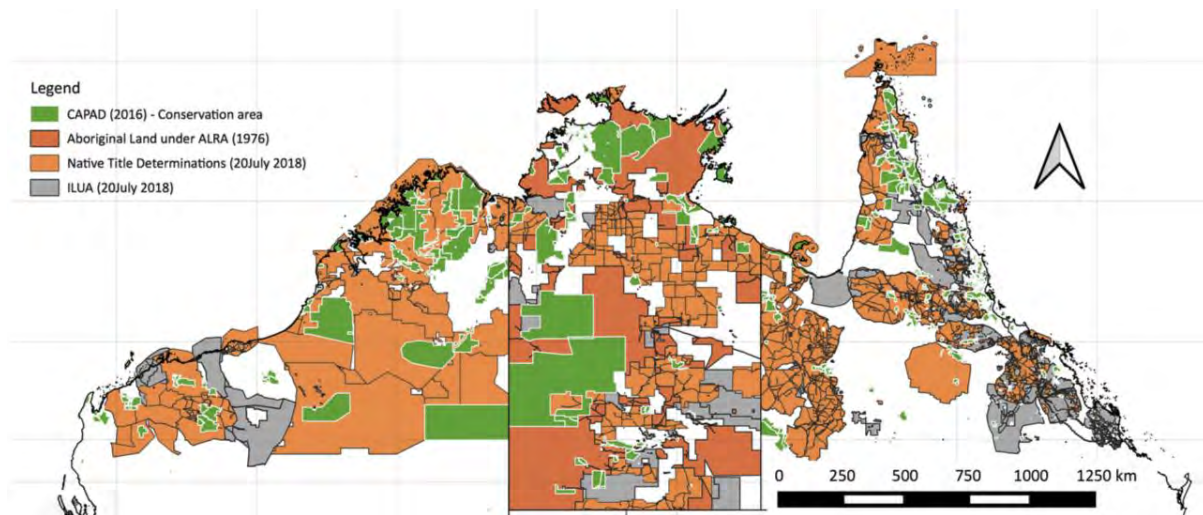


Figure 9: Indigenous title interests north of 26 degrees south (NAILSMA 2019).

An emerging study by the Northern Australian Land and Sea Management Alliance (NAILSMA), funded by the CRCNA, has been designed to support Indigenous landowners and their communities to become active participants in northern development. It builds on the work of Indigenous leaders from across the north to construct a framework for proactively considering land use options with the best available information and analysis identifying the most favourable options. These options might include inviting external investors in to support Indigenous-led approaches where appropriate (NAIEP 2013). The work considers the present state of the Indigenous estate, including the nature and condition of lands and natural resources, present uses and their socio-economic and biophysical implications, and the economic development aspirations of landowners and their communities.

2.7.1 Sectoral SWOT analysis

This new study will identify gaps and barriers to the realisation of Traditional Owner aspirations across the north. It will also explore pathways to avoid or to overcome these barriers. The work recognised that many barriers have previously limited the opportunity for Indigenous-led development. At the same time, significant opportunities exist and are emerging. These include:



2.7.2 Key thematics for the sector's future

Key thematics for the sector's future have been identified as follows:

- The sectoral development of a wide range of economic opportunities;
- Building the governance and capacity of Indigenous institutions;
- Supporting future thinking and country-based planning at the right scale;
- Resourcing and support for long term governance building and development finance; and
- The creation of de-risked pathways to investment for Indigenous-led development.

In addition to the NAILSMA work, these issues are also being strongly recognised and responded to by the Australian Government through the formation of the Indigenous Reference Group (IRG) and the development and implementation of the Northern Australian Indigenous Development Accord. Through these processes being carried out at the pan-northern level, more needs to be done to ensure Traditional Owners don't remain passive recipients of externally driven development.

2.8 The Northern Australian health services sector

Derived from Whittaker et al. (2019).

James Cook University is leading the development of a Northern Australia health service delivery situational analysis, which will identify strategic long-term development and growth opportunities for the health services sector. It seeks to improve the health and prosperity of Northern Australian communities. It involves the production of a policy report which identifies the key challenges and opportunities facing the Northern Australian health service delivery sector and health workforce and identifies strategic development priorities for future investment. The two project phases include the development of a draft situational analysis and a stakeholder engagement phase, leading to report finalisation and dissemination of the policy-focussed outputs. The emerging components of the report are a scoping review of the literature on health service delivery and workforce in the north; an analysis of health export opportunities; strengths, weaknesses, opportunities and threats analysis; an analysis of government-partnered research projects; and a preliminary health sector-focussed costing study. Some draft health sector priorities are also emerging, and these are to be refined with health system stakeholders across the north. Figure 10 provides an overview as identified by the project team of the key features of this sector.

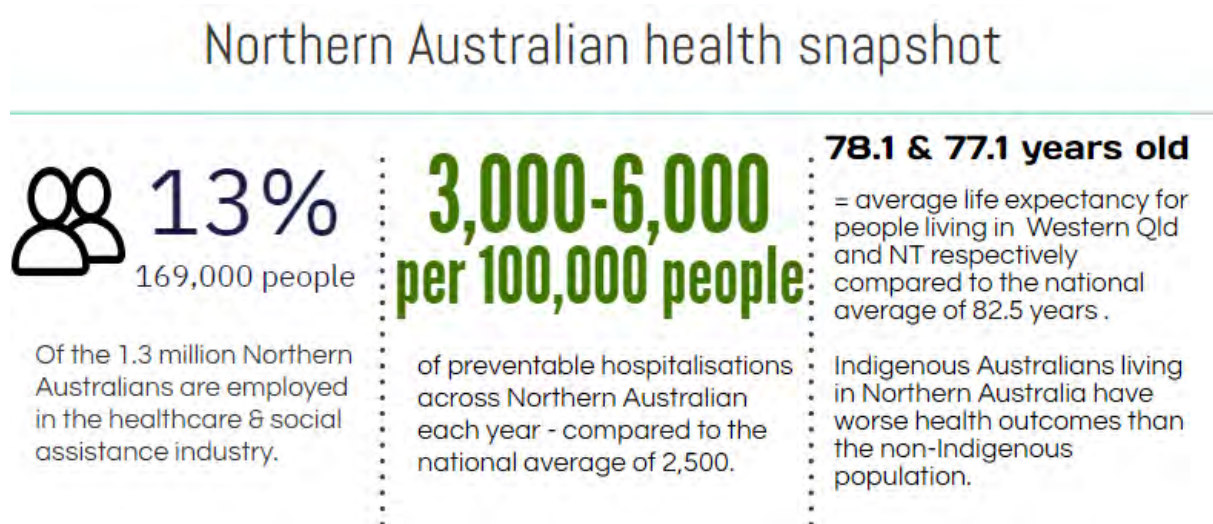


Figure 10: Northern Australia health industry snapshot.

The existing literature review synthesises a vast and diverse range of grey literature (including strategic plans, policy and annual reports) and peer-reviewed literature analysed using a classification based on the six World Health Organisation (WHO) health system “building blocks”: leadership & governance; planning & health information systems; health workforce; essential medicines & technologies; financing; and service delivery. This is supplemented by the frequently added category of community engagement. The dominant focus in the peer-reviewed literature is on improving access of rurally based patients to specialist and other health services, with the grey literature focussed predominantly on non-communicable disease planning and services. Within the literature, a mismatch has been identified between stated commitments to act on the social determinants of health at a strategic planning level, and translation of strategic intent into operational capacity and funded action. It is considered that there is limited literature addressing priorities around social and emotional wellbeing, ageing and disability services. The strengths of the

Aboriginal community-controlled health service model of community governance and comprehensive primary health care are emphasised.

It is also important to note that analysis of Asia Pacific region demand, and Northern Australian export capability demonstrates the potential for cross-institutional partnerships between Northern Australia and neighbouring countries focussed on improving health. Northern Australian health export opportunities can be considered in three categories: education and health services; knowledge transfer and exchange; and the export of new therapeutics and technologies. The emerging analysis highlights the important and unique strengths of the Northern Australian health system in rural and remote health care delivery and workforce development, but also the challenges and opportunities relating to workforce recruitment and retention, and health service financing models that should incentivise outcomes rather than the volume of services. Research currently being undertaken in the north is addressing many of the key issues, but more resources are needed for locally driven research focussed on the key health systems challenges and priorities.

2.8.1 Sectoral SWOT analysis

Based on the research and engagement undertaken in the situational analysis, identified strengths, weaknesses, opportunities and threats include the following:

<p style="text-align: center;">STRENGTHS </p> <p><i>Leadership & Governance; Community</i></p> <ul style="list-style-type: none"> • Independent governance mechanisms enable critique/review of government health policy. • Community-controlled governance mechanisms and use of models of cultural competence strengthen community participation <p><i>Health Workforce</i></p> <ul style="list-style-type: none"> • Well trained health workforce • Strong health workforce attraction. • Expertise in training a fit-for-purpose health workforce. • Involvement of local community members as health workers. <p><i>Medicines & Technologies</i></p> <ul style="list-style-type: none"> • Increasing experience and commitments among services to use telehealth/other technologies. <p><i>Financing</i></p> <ul style="list-style-type: none"> • Universal coverage - Medicare and Pharmaceutical Benefits Scheme and patient travel assistance. <p><i>Health Services</i></p> <ul style="list-style-type: none"> • Increasingly rigorous processes for managing occupational health. • Expertise in rural and remote service delivery, disaster management and communicable disease surveillance and control. 	<p style="text-align: center;">WEAKNESSES </p> <ul style="list-style-type: none"> • Leadership & Governance; Planning & Information; Financing • Fragmentation of resourcing, programming and planning due to duplication and inefficiency. • Health services most under-resourced where need highest. • Inadequate efforts aimed at continuous improvement in overarching governance systems. • Not addressing multiple complex triple bottom-line factors. • Inadequate service planning integrated into major project approval processes. • Health Workforce: <ul style="list-style-type: none"> • High rural staff turnover and shortages and insufficient Indigenous health workforce. • Health Services <ul style="list-style-type: none"> • Comparatively high rates of preventable hospitalisations. • Systems failure in capacity to provide integrated and optimal care across patient journey. • Little comprehensive primary health care/ health promotion. • Insufficient mental health and health promotion services. • Community <ul style="list-style-type: none"> • Limited research on perceptions of community of health and illness.
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OPPORTUNITIES



Leadership & Governance

- Developing cross-jurisdictional linkages, strategies and research.
- Strengthening local governance.
- Expansion of capacity-building research/teaching initiatives.
- Developing Asia Pacific partnerships in priority areas

Planning & Information

- Increasing data linkage and sharing to study remote patient flows.
- Regional health service planning across sectors and coordinated local area planning systems.
- Emerging collective place-based approaches to preventive health.

Medicines & Technologies

- Expansion of telehealth models to rural/remote specialist services.

Health Workforce

- Redesign recruitment, training and support for Indigenous workforce
- Rural retention strategies for primary healthcare staff.
- Training and health systems expertise as export opportunity.

Financing and Service Delivery

- Exploration of new funding models for integrated primary healthcare.
- Scale-up of comprehensive primary care/local government capacities.
- Extending non-communicable disease risk surveillance/response.

THREATS



Leadership & Governance

- Failure to deal with risk factors for chronic disease.
- Vulnerability to biosecurity threats, emerging infectious diseases and extreme weather/climate change.
- Failure to harmonise health system and partnering university processes for research and workforce.

Planning & Information

- Multiple funding sources, jurisdictions, programs present a threat to efficient planning.
- Demographic change presents health service planning challenges.

Health Workforce

- Inability to attract, retain and locally recruited workforce.
- "Poaching" of work-ready graduates by southern institutions.

Financing

- Increased costs due to increasing rates of preventable hospital admissions/perverse incentives.
- Unsustainable financing trajectory due to growing demand.
- Fee-for-service models of financing primary care leading to increasing out-of-pocket expenditures.
- Small fraction of resources allocated to prevention.
- Lack of resourcing/consideration of social determinants of health.

2.8.2 Key thematics for the sector's future

Key emerging priorities within this sector include the need to establish a durable, cross-jurisdictional (WA-NT-Queensland) network to drive forward shared health service policy and workforce priorities and to support regional place-based health service and workforce planning. An initial costing study undertaken as part of this project highlights the potential for targeted investments in community-led primary healthcare to improve health outcomes and reduce health system costs in the north.

3.0 Regional and supply chain development

The CRCNA has commissioned several detailed supply chain analyses which are seeking to establish a clear strategic direction for the future of agricultural supply chains in northern regions. These studies seek to define the demand-led potential for agriculture and potential value-added products in these regions and the capacity of the regions to supply these needs. Each analysis will also deliver a limited number of transformational strategies required to grow and strengthen these regional supply chains. Again, the CRCNA’s focus has been in ensuring these strategies have strong regional ownership and are based on the available evidence concerning opportunities and risks.

At the time of writing, only the North Queensland Agricultural Market and Supply Chain Study was complete. This study focused on the Townsville and surrounding regions was completed in June 2019, with work continuing the implementation of the final strategic recommendations and action steps. The CRCNA has also contracted a Mackay, Isaac and Whitsunday Market Export Supply Chain Study which is due for completion by the end of 2019 and the Far North Queensland Agricultural Export Supply Chain Study is due to be completed by mid-2020. Expansion of this work is being considered in the Kimberley, Pilbara and Gascoyne regions, while important work on the development of collaborative supply chains is also emerging in Central Queensland (via Central Queensland University). With these other studies in progress, the following provides an early snapshot from completed work in North Queensland.

3.1 North Queensland Market and Agricultural Supply Chain Study

Derived from Townsville Enterprise Limited et al. (2019).

North Queensland is a major agricultural producing region of Australia (Figure 11). In 2016-17, the region's agriculture, forestry and fishing sectors contributed over \$1 billion to a total gross regional product of \$15.5 billion. The work has identified the opportunity to increase this contribution significantly. The region incorporates the five Local Government Areas of Townsville, Hinchinbrook, Burdekin, Charters Towers and Palm Island. This includes a significant mix of viable agricultural land, ease of export access to major global markets via the Port of Townsville and Townsville Airport, available and affordable irrigation infrastructure, and the potential to produce a broad range of in-demand agricultural products. These findings position North Queensland as a major agricultural hub. Traditional livestock and cropping systems such as beef and sugarcane currently represent most of the industry production and employment, supported by small areas of high-value horticulture. However, changing food and market demand and extensive soil and climate potential provides the capacity to diversify into a range of other high-value agricultural industries.

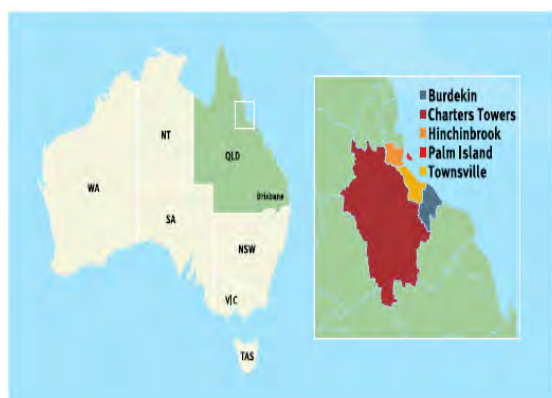


Figure 11: The North Queensland Market and Agricultural Supply Chain study area.

The region considers that the increase in the volume and value of global food consumption is a major megatrend that is set to confront this generation and that global, national and regional policymakers should consider these trends as part of their forward planning. A growing international market concern with food security and supply has contributed to mounting interest in North Queensland products across key markets including South East Asia, China and the Middle East. As such, Townsville Enterprise Limited (TEL), the North Queensland Regional Organisation of Councils (NQROC), the CRCNA and industry stakeholders came together to fund the North Queensland Market and Agricultural Supply Chain Study (NQMASCS). The study adopted a 'demand-led' approach to the qualification of priority markets and products, existing supply chain opportunities and constraints, industry capacity to supply, sector collaboration and future investment considerations. The NQMASCS was undertaken so North Queensland's primary producers, industry peak bodies, stakeholders, investors and the government are in a better position to further consider the appropriate allocation of finite resources and the formulation of supportive policy settings which take into consideration the sector's long-term growth and sustainability.

The NQMASCS found there is \$3 billion in unmet global market demand across ten of Australia's leading agricultural export destinations and identified five priority products: beef, avocado, macadamia, onshore aquaculture and soybean. In addition to this, the study also identified unmet demand in many other categories of relevance to the region of study. Transitioning land use and strategic efforts to embrace the five priority products was estimated to result in a positive net present value of up to \$271.1 million, generating approximately 2,000 new jobs within the region (noting intensification of food and fibre production in the region must be undertaken in a manner which improves soil and water health and reduces the risk of nutrient loss). Proposed growth strategies also need to include the adoption of digital and new technologies.

Some of the region's supply chain infrastructure for priority products is underdeveloped or inefficient. The NQMASCS considered building value in these constrained supply chains will be key to ensuring the region can meet anticipated global demand. Recommended actions arising from the study specifically included:

- Transitioning the beef industry to a higher value-add sector, such as targeting boxed beef markets, requiring additional infrastructure investment and planning;
- Utilising existing sugarcane land and fallow cropping systems to improve soil health and improve total farm output through the rotation of soybean and other broadacre crops;
- Developing a new farming systems group to identify issues and inform collaborative RD&E;
- Intensifying the production of fresh food supported by improved cold chain logistics and better use of shared services for biosecurity, customs and quarantine;
- Leveraging the Port of Townsville and Townsville Airport as key hubs for driving new export growth based on the study's identified priority markets and products; and
- Targeted investment attraction, matching customers to producers, and linking customers' needs to suitable land, water and supply chain assets are key.

In short, as will the other emerging regional studies, the NQMASCS has produced a holistic 'developmental road map' which seeks to define the key products and target markets. More work is required to contemplate the development of value-added food processing in the region and several case studies of successful value-adding have been considered. Continued momentum and effective implementation of the identified strategies will be key, with further consideration of how to build cross-supply chain cooperation and identification of the key enabling infrastructure which will support industry's capacity to ensure continuity of supply across the priority products.

4.0 Emerging pan-northern policy issues

The identification and resolution of higher-level policy thinking, and the development of coordinated cross-jurisdictional responses will be important for the future of Northern Australia. Consequently, the CRCNA has also commissioned several detailed policy pieces seeking to create more dialogue about the strategic direction for some of these key policy issues. Each study will deliver a limited number of transformational strategies required to progress these priority issues. The focus has been ensuring these strategies have a high level of community and government ownership and are based on substantive evidence concerning opportunities and risks.

These targeted policy analyses are expected to be fully completed by mid-2020 and focus around a key range of issues, including the exploration of the ASEAN market opportunity in agriculture, the cost of freight across Northern Australia, communications, and the broader need to better de-risk agricultural landscapes for greater development investment. It is intended this work will support key policy and investment initiatives which could be progressed through the Northern Australian Senior Officers Network Group (NASONG) and the Northern Australian Ministerial Forum (NAMF). The outlines provided below simply give a snapshot of these important and emerging policy-based projects.

4.1 Capturing the ASEAN agricultural opportunity for Northern Australia

Derived from Austcham ASEAN (2019).

Given the significance of the ASEAN region to the future of the north, CRCNA commissioned the Australian-ASEAN Chamber of Commerce (AustCham ASEAN) to explore key export opportunities for Northern Australian agri-food businesses and associated policy and investment priorities.

Considering all Australian agri-food export to the Association of South East Asian Nations (ASEAN) region, 15 products were considered to hold the highest future potential. These were wheat, live cattle, beef, milk and cream powder, malt, table grapes, sheep meat, cheese, milk and cream, oranges, infant food preparations, rock lobsters, macadamias, avocados and soybeans. These were identified based on a broad review of Australia's largest agri-food exports to ASEAN nations between 2012 and 2017, the projected largest export opportunities for Australia over the following five years by the International Trade Centre (ITC), and complementary research (e.g. the NQAMSCS).

Consistent with Chilcott et al. (forthcoming), two products from the top 15 were assessed to be most relevant for the Northern Australian agri-food sector (live cattle and beef). These were identified based on a detailed analysis of projected exports from Australia to ASEAN in 2025 for each of the 15 products, coupled with an analysis of supply feasibility for all products in Northern Australia (including production conditions, disease tolerance, existing production expertise, and existing supply chain). Together, these two products have a total upside opportunity of A\$13 billion per annum by 2025 (as compared to a "business-as-usual" scenario). Among the ten ASEAN Member States, over 90% of the untapped export opportunities for live cattle and beef are in just three countries: Vietnam (71%), Indonesia (13%), and Malaysia (7%). Of the top 10 product opportunities, the top two are in Vietnam and two of the top five are in Indonesia.

Live cattle have been considered to have the highest untapped annual export demand at A\$7.5b in 2025 (versus a "business-as-usual" scenario). Historically, the trade has traditionally been driven by a lack of beef processing facilities, cheaper costs of processing beef overseas, and the shifting of the

burden of Halal compliance to local producers. Northern Australia is consequently the country's production and export hub, with Darwin Port managing 38% of the country's exports. Three focus markets have been identified for live cattle based on forecast untapped demand. Indonesia and Vietnam are the primary markets and Thailand is a smaller market (REID 2013). An ASEAN issue that restricts profitability, however, is the uneven application of customs processes/standards, and corruption issues have been cited as a key challenge (Austcham ASEAN 2019).

Beef has been identified as the second largest untapped annual incremental opportunity (AUS\$5.5 billion in 2025). Australia is the top external supplier of beef to Indonesia, is second in Malaysia, Philippines, Singapore and Thailand, third in Cambodia, and fourth in Vietnam. Processed beef products that cater to the mass market (including manufacturing beef, offal, and mixed meats) comprise over half of beef exports from Australia to ASEAN nations. Northern Australia supplies this market but presently comprises a small proportion of it. It faces increased competition from frozen Indian buffalo meat, which presently captures 50% of the Southeast Asian market (ex-Indonesia) at cheaper prices. Increased supply from South America, the US and New Zealand will further increase competition for Australian beef, particularly reducing profitability in markets such as Indonesia (due to price controls and import quotas), and Thailand (due to tariffs and volume restrictions).

A critical challenge to the expansion of beef exports from Northern Australia is the under-development of key elements in the beef value chain, particularly a lack of abattoirs. This gap exists due to a lack of investment in developing Northern Australian facilities, skilled labour in sparsely populated areas, and despite available opportunities for complementary agriculture (e.g. broad acre crops like soybeans which can be used in cattle feedlots or for biomass). Transfer of knowledge from southern Queensland, together with planned development projects in logistics and transport infrastructure (e.g. the AUS\$100m Beef Roads Program, a AUS\$10m export hub development in northern Queensland, improvements to Townsville Port, etc.) could help mobilise the requisite investment required to support expansion of production and exports.

In addition to live cattle and beef, avocados and macadamias could be considered as "smaller bets" as they have relatively high supply feasibility in Northern Australia but low forecasted export demand from ASEAN nations due to lack of market development and high product prices. However, both are expected to see growth in production scale in the long-term as they turn their attention to developing their ASEAN presence, creating valuable jobs in the process. Output from Australia's nascent avocado industry is expected to increase by over 50% by 2025, and this could outpace local market demand, creating increased demand from ASEAN markets (Avocados Australia 2018).

In conjunction with stakeholders and industry partners, four strategic recommendations have been developed to reduce barriers to trade in ASEAN nations and to increase production or supply of produce from Northern Australia to ASEAN markets. These include:

- Engaging regulators in ASEAN Member States to address key regulatory impediments noted by Australian producers related to tariffs, quotas, technical market access, and non-tariff barriers (e.g. market access for avocados in Thailand and Vietnam, Halal standards, etc.);
- Developing a "farm-to-fork" supply chain diagnostic tool to analyse beef and cattle supply chains from Northern Australia into ASEAN markets to measure time and cost at each stage of the supply chain and to identify key impediments to trade (e.g. infrastructure);
- Exploring an export strategy for bovine genetic materials (e.g. semen, embryos, germplasm) that can be used to add desirable characteristics to herds in ASEAN countries; and

- Developing a market research study for Australian macadamias in ASEAN to understand major importers, retail partners, distribution networks, and the competitor landscape in priority markets including Indonesia, Singapore, Malaysia, and the Philippines.

4.2 Northern Australian Communication Analysis

Derived from Marshall et al. (2019a; b).

Internet and telecommunications connectivity are essential for prosperity and development in all societies. A policy-focused report in 2019 funded by the Australian Communications Consumer Action Network (ACCAN) documents a qualitative study of digital connectivity and telecommunications in rural Far North Queensland (FNQ). This preliminary work set the scene for the CRCNA to further invest in a broader exploration of these issues through its 'Northern Australia Communications Analysis' project led by the Queensland University of Technology (QUT).

The ACCAN research investigated the lived experience of digital inclusion (a combination of internet access, affordability of technology and digital ability) in agricultural households and communities in the Northern Gulf region. The Australian Digital Inclusion Index (ADII) shows the region is one of Australia's least digitally supported regions. Furthermore, farmers and farm managers tend to score more poorly on the Index than other Australians in comparable circumstances, particularly on the digital ability sub-index. This research aimed to unpack how these quantitative insights 'play out' in the context of rural FNQ, thereby shedding light on the nuanced and context-specific factors that impact digital participation of farming households and communities.

The findings of Marshall et al. (2019a) address issues of relevance to the wider Northern Australian context, ranging from barriers to connection (such as lack of continuity in the telecommunications network); social factors impacting digital resource allocation and consumption (such as intergenerational and gender-related circumstances); threats to agricultural industry (such as the need to preserve product integrity and to attract or train workers); and consumer-level insights (such as population heterogeneity and expectations of fairness). These comprehensive findings gave rise to several recommendations for federal, state and local governments to consider in partnership with community and industry organisations. These include:

- Improving basic infrastructure and services at local scales, including diversifying service plans to meet specific needs;
- Embracing alternative connectivity infrastructure, whereby State and Federal governments collaborate with the regions to jointly resolve infrastructure and service gaps;
- The need to redefine affordability at the Federal level to ensure the true cost of being connected in the bush is realised and accommodated;
- Delivering targeted digital capability programs to address farmers' thirst for digital skills;
- Developing digital mentors, support brokers and upskilling remote workers to help ensure digital skills programs are relevant and rolled out in situ;
- Empowering rural local governments and community organisations to plan and deliver through strategic linkages with the broader national digital inclusion ecosystem; and
- Adopting principles for a holistic approach to digital inclusion policy that recognises the role of digital capacity building to social and economic development in rural Australia.

With this previous work in focus, the Northern Australian Communication Analysis (Marshall 2019b) has already identified some emerging opportunities and threats, and future directions, for achieving

digital inclusion in Northern Australia. This is not exhaustive, but rather an indication of some themes emerging from the emerging data that will be used to underpin a Directions Paper.

4.2.1 Policy SWOT analysis

Based on the research and engagement undertaken in the analysis to date, identified strengths, weaknesses, opportunities and threats facing this policy issue include the following:



4.2.2 Key thematics for future policy consideration

Key thematics for future policy consideration have already been identified, including the need to:

- Advocate for broader acceptance that digital infrastructure is as essential as other infrastructure (power, water, roads);
- Ensure Indigenous perspectives and solutions are at the core of digital inclusion;
- Develop innovative models to deliver affordable, reliable, local, fit-for-purpose digital connectivity into remote areas;
- Consider new 'logics' for digital inclusion investment/decision-making in the north;
- Suggest policy reform (local, state/territory, federal) in telecommunications regulation, major projects/grants, etc;
- Provide advice to industry and government to improve the reach and effectiveness of digital inclusion related community programs;
- Recommend ways to better quantify the cost of digital exclusion across sectors;
- Identify ways to share hardware/methodologies across sectors (e.g. health/education); and
- Explore Northern Australian specific ethics and equity issues.

The final Directions Paper will provide a five-year road map for digital inclusion research, practice, and policy development for Northern Australia.

4.3 De-risking landscapes for agricultural development

The CRCNA is working closely with the Office of Northern Australia (ONA) and the WA, Qld and NT governments in starting to shape a strategic Northern Australia agricultural development agenda. While there is a strong multilateral and bipartisan aspiration in the *White Paper on Developing Northern Australia* to secure the expansion of agricultural investment, significant Commonwealth, State and Territory solutions to key policy, regulatory and regional development challenges need further consideration, analysis and negotiated resolution. The potential for harmonised solutions across the north could also be considered. By focusing effort on exploring those issues constraining development in key or priority agricultural development regions in each jurisdiction, the CRCNA is working closely with the Commonwealth, State and Territory Governments to explore the issues at hand and to propose innovative policy, regulatory and other solutions to facilitate agricultural development. Substantive research findings from this work will be emerging by mid-2020.

4.4 Attracting new investors for agricultural development

Northern Australia makes a substantial contribution to the Australian economy, particularly through agriculture, mining and tourism. Agriculture is seen as the next sector to benefit from a rising middle class across the developing world. There is an opportunity for Australia's north to provide a mechanism for expanding production significantly over the coming decades. Indeed, agriculture and food is one of Austrade's priority development sectors, and as such, this sector is providing coordinated government assistance at a national level to promote, attract and facilitate productive Foreign Direct Investment (FDI) into the Australian agriculture industry.

Given these common needs, the CRCNA and Austrade are working together to achieve a greater shared vision and coordination amongst the various institutions involved in attracting investment in northern agricultural development. Together, we seek to improve agricultural investment pathways for the benefit of the Northern Australia economy, its various communities and investors. This work will assist in informing current and new entrants to investing in Northern Australia. During 2019, CRCNA worked with Austrade to engage PwC to analyse the agricultural investment environment in Northern Australia and to develop an investor typology and an investor target list for the region. The project will identify and characterise the range of potential investors who may be interested in establishing agricultural businesses in Northern Australia. It is envisioned that these investors will have the capacity to undertake investment in Northern Australia in an economic, socially and environmentally beneficial way. The project's objectives are:

- Through engagement with the investment community, identify, characterise and prioritise potential key agricultural investor types (from global to Northern Australian scales);
- Based on knowledge concerning these investors, identify the agricultural sectors across Northern Australia with the most potential to support agricultural development investment;
- Based on investor preferences, identify the types or forms of agricultural development most suitable and likely to succeed in the identified regions;
- Through deep investor engagement, develop and refine the proposed typology of investors based with an interest in investment in key sectors and regions;

- Develop a potential investor target list for Austrade and State and Territory Governments and CRCNA to work with and to identify what the key challenges have been to their decisions regarding whether to invest in the North; and
- Identify, through discussions with the above groups, what information potential investors may need to assess the viability of an agricultural development in the north.

5.0 New directions for Northern Australia

Already, some cross-cutting thematics are emerging that will be important in any review of the *White Paper*. Based on the CRCNA's stakeholder engagement and knowledge arising from its early strategic investment, the following represents some key issues and considerations that could be integrated into the development of any refresh of the Northern Australian agenda during 2019-20.

1. *Continue investment for new water assessment and development*

The *White Paper on Developing Northern Australia* identified several economic challenges, especially a lack of water resource assessment underpinning development planning at the catchment level. This posed a barrier to water infrastructure development and some \$467.2 million was committed to water infrastructure feasibility studies and construction in Northern Australia. The application of this fund has been extremely successful, with development committed and several new and positive preliminary business case developments looking to progress to full business case development and impact assessment. The recently completed \$15 million Northern Australia Water Resource Assessment (NAWRA) also has investigated and identified the potential of water and soil resources to support increased primary production in three priority northern catchments.

Despite some defined Northern Australian outcomes from the recent Australian Government announcement to expand the National Water Infrastructure Development Fund by more than half a billion dollars, a second defined tranche of Northern Australian-specific investment (for ongoing studies and new capital development) would offer substantial benefit. This could also include funding allocated to support local communities and industries to undertake the planning required to ensure the highest and best value use of water once a commitment to construction has been made, ensuring that all new developments provide affordable water and deliver maximum economic benefit. With continuation and expansion of the original water infrastructure investment, a stronger bilateral approach to agreeing on shared investment priorities and the development of a cohesive and long-term work plan for implementation (based on current studies) could also be established.

2. *Establish a Northern Australian supply chain development fund*

Recent supply chain analysis for Northern Australian agriculture suggests there is significant unmet demand for typical agricultural products across key markets. The most significant challenge for the development of agriculture in the north, however, remains the under-development of higher value and more efficient, low impact agricultural ventures and supply chains, whether they be large or small in scale. Through the emerging evidence and experience in facilitating this work, the CRCNA increasingly sees the importance of Australian, State and Territory Governments investing more strategically, and in a more coordinated way, in further supply chain analysis (e.g. better understanding supply chain potentials and logistics) and development (e.g. targeted investment in key supply chain collaboration building, strategic planning activities and infrastructure building). The key activities required could cover four key stages in supply chain development, though these stages often are highly iterative within any supply chain (sector or placed-based):

- *Stage 1:* Supply Chain Research and Analysis;
- *Stage 2:* Supply Chain Governance, Partnership and Strategy Building;
- *Stage 3:* Feasibility Assessment for Critical Supply Chain Infrastructure; and
- *Stage 4:* Strategy Implementation, Infrastructure Investment Brokerage and Monitoring.

Stage 1 activities can currently be funded within the existing CRCNA investment remit under its existing Commonwealth Funding Agreement. However, there are no clear investment streams available for *Stages 3 through 4*. Because of the generally immature investment environment and lack of scale in Northern Australia, there is a strong need for government investment to help facilitate the development of collaborative supply chains through these early stages. With the establishment of strong governance arrangements in the formative years, however, these supply chain collaborations can become strongly self-sustaining over time. The approach could first be trialled in the agricultural development space but could then be extended into other sectors in future years (e.g. tourism, tropical knowledge, health and other human services, etc.).

The work associated with this funding should be strongly linked (i.e. *Stage 4* brokerage) to the ongoing and targeted deployment of key infrastructure investment and financing mechanisms already in place, including the Northern Australian Infrastructure Facility (NAIF), the National Water Infrastructure Development Fund (NWIDF), the North Queensland Livestock Industry Recovery Agency (NQLIRA), the Regional Investment Corporation (RIC), the Clean Energy Finance Corporation (CEFC), the Roads of Strategic Importance initiative (ROSI), Regional Development Australia (RDA)-linked infrastructure grants and associated State/NT-based infrastructure grants and loans.

3. *Support effective de-risking of priority landscapes for investment*

As mentioned above, wider cooperation is emerging between the CRCNA and the Qld, WA and NT Governments to support the development of new agricultural activity in the north. While there is a strong multilateral and bipartisan aspiration in the *White Paper*, to secure the expansion of agriculture, solutions to key policy, regulatory and regional development challenges at the Commonwealth, State and Territory level need consideration, analysis and negotiated resolution. Emerging directions from this unfolding work suggest the need for:

- Greater prioritisation of a collaborative effort to progress key development areas and initiatives (inclusive of both new and existing agricultural areas development areas);
- The development of improved processes and approaches aimed at de-risking priority landscapes (across environmental, social and infrastructural risks) in ways that can attract suitable investment/development; and
- The exploration and development of new models for the improved brokerage of investment in agricultural development, including more coordinated approaches to identifying, attracting and progressing investment from agricultural development interests.

Progression of these activities will need to be undertaken in close collaboration within each jurisdiction and their relevant agencies. Clear cross-jurisdictional knowledge sharing is also needed.

4. *Strategic investment in sector and workforce development*

The CRCNA's investment in strong situation analysis across several agricultural and health services sectors will deliver a cohesive set of actions such that these sectors prosper and deliver on the intent of the *White Paper*. Strong priorities will begin emerging by mid-2020, and it will be important for the review of the *White Paper* to progress these with industry, government and research agency support. Examples of key emerging agenda already include the proposed *Tropical Aquaculture Accelerator* to turbocharge RD&E and workforce development in that sector. More consideration will also need to be given to enhancing the future role of Universities in the northern development space, but particularly in the context of both workforce development and in the context of building a larger educational export sector with stronger Northern Australian links.

5. *Progress place-based energy and communication investment frameworks*

Current energy prices are adversely impacting industry-based consumers, adding to cost-of-living pressures and restricting business expansion and regional economic growth opportunities across the north. A lack of appropriate communication infrastructure and low levels of digital inclusion are also major impediments to economic development (Marshall et al. 2019). Consequently, a key new policy objective for the north might be to support the development of more place-based *Northern Australian Energy and Communication Sector Investment Frameworks* that will identify the most effective pathways to deliver reliable, secure and affordable energy and communication solutions.

6. *A strategic and integrated approach to biosecurity across health and ag sectors*

Biosecurity threats and opportunities have consistently emerged as a high priority in the agricultural and health situational analyses. Limited resources, thin workforces, skills and response capacities, the lack of foundational knowledge and monitoring systems and rapid response protocols all feature as priorities. The emerging broadacre cropping sector particularly needs to be based on a greater understanding of the underlying burden of disease risk. In short, biosecurity unknowns can prevent investment, while significant pest or disease outbreaks can quickly impact profitability. We also need to avoid increasing biodiversity risks into southern Australia. An emerging realisation, however, is the potential to integrate biosecurity considerations, responses and expertise across the agricultural and health sectors. The potential surveillance roles of traditional owners and Indigenous workforces across the biosecurity space (e.g. ranger services) also presents opportunities.

7. *Maintain and enhance the current CRCNA investment*

The CRCNA, through its partnerships with the Australian, NT, WA and Qld Governments, continues to lead a clear, integrated, coordinated and nuanced research and development approach to delivering key outcomes in the developing Northern Australia agenda. The CRCNA has demonstrated its ability to work across all northern jurisdictions to deliver a framework to shape future investment and development of the north. Crucially, the CRCNA has proven it has the capacity to bring together and leverage relationships between world-leading researchers, industry leaders and Traditional Owner advocates to deliver innovative research that supports the broader northern agenda.

Moving forward, the CRCNA is well placed to continue to deliver this approach to delivering long-term research solutions and impacts for Northern Australia. Its 10-year funding model means the CRCNA can be agile and flexible in its approach in identifying and coordinating research outcomes. Consequently, any revision to the Northern Australia agenda may consider expanding the current CRCNA model to include:

- Increase R&D investment in Traditional Owner-led business development;
- Increase R&D investment into health services development and improvement; and
- Create new R&D investment into additional industry sectors such as tourism.

8. *Continue the role of the Northern Australian Indigenous Reference Group*

The Northern Australian Indigenous Reference Group is currently progressing an important body of work, developing several priority actions, and creating a strategic foundation for Indigenous led development in Northern Australia. Commitment to the further development and implementation of the accord-based actions of the IRG will be important. There is also capacity to see the IRG

process and framework, if successful, to become a strong framework for broader economic dialogue between Aboriginal and Torres Strait Islanders with the Commonwealth in Northern Australia.

9. *Maintain the Strategic Partnership, Ministerial Forum and NASONG Framework*

The core governance frameworks for Northern Australia include the Strategic Partnership and the Northern Australian Ministerial Forum (serviced by ONA and the NASONG). Without these foundational arrangements in place, the basic architecture for cross-jurisdictional coordination in implementing and adapting the *White Paper on Developing Northern Australia* agenda would not exist. While CRCNA is building a strong evidence base for new policy, investment of industry development agenda, it aims to collaboratively work with all jurisdictions to help feed policy options into these governance arrangements. These over-arching governance arrangements should be maintained and enhanced into the future and could also be better serviced by stronger collaborative effort across Commonwealth agencies involved in implementing the *White Paper*.

5.1 Conclusions

Through much of the above emerging work, there are consistent themes that are starting to emerge concerning what has worked well in the northern development agenda, and where further concerted policy and investment effort is required. Indeed, because of these strategic research and collaborative efforts, the CRCNA is becoming well positioned to support communities, industries and researchers to help frame broader directions and policy-based discussions of importance to the Commonwealth and the State and Territory governments. Our more comprehensive update of this work will be completed by mid-2020.

References

- Association for Sustainability on Business (ASB). (2019). Developing Northern Australia Conference Outcomes – Karratha 2019. Retrieved from: <https://www.northaust.org.au/post-conference-themes-developing-northern-australia>
- Australian Bureau of Statistics (2019). *Agricultural Commodities, Australia, 2017-18*. ABS, Canberra, Australia.
- AustCham ASEAN (2019). *Australian business in ASEAN survey 2019*. Retrieved from: <http://austchamasean.com/wpcontent/uploads/2019/03/Australian-Business-in-ASEAN-Survey-2019.pdf>. Cited in Austcham ASEAN (2019). *Capturing the ASEAN Agricultural opportunity for Northern Australia*. AustCham ASEAN, Singapore. Retrieved from : <https://www.crcna.com.au/resources/publications/capturing-asean-agricultural-opportunity-northern-australia>
- Austcham ASEAN (2019). *Capturing the ASEAN Agricultural opportunity for Northern Australia*. Report to the CRCNA. AustCham ASEAN, Singapore. Retrieved from : <https://www.crcna.com.au/resources/publications/capturing-asean-agricultural-opportunity-northern-australia>
- Australian Government. (2015). *Our north, our future: White paper on developing Northern Australia*. Canberra. Retrieved from : <http://northernaustralia.gov.au/files/files/NAWP-FullReport.pdf>.
- Australian Government (2018). Annual statement on developing Northern Australia. Retrieved from: <https://www.minister.industry.gov.au/ministers/canavan/speeches/2018-annual-statement-developing-northern-australia>
- Avocados Australia (2018). *Facts at a glance - 2017/18 for the Australian avocado industry*. Retrieved from: https://www.avocado.org.au/wpcontent/uploads/2018/10/2017-18_AAL-Facts-at-a-glance_FINAL.pdf 16 . Cited in Austcham ASEAN (2019). *Capturing the ASEAN Agricultural opportunity for Northern Australia*. Report to the CRCNA. AustCham ASEAN, Singapore. Retrieved from : <https://www.crcna.com.au/resources/publications/capturing-asean-agricultural-opportunity-northern-australia>.
- Cobcroft, J., Bell, R., Fitzgerald, J., Dietrich, A. and Jerry, D. (forthcoming). *Northern Australia aquaculture industry situational analysis: Stage 1 Report*. JCU, Townsville, Australia. Retrieved from: https://www.crcna.com.au/sites/default/files/2020-01/CRCNA_AISA%20Stage_1_20200107.pdf
- Chilcott, C., Ash, A., Lehnert, S., Stokes, G., Charmley, E., Collins, K., Pavey, C., Macintosh, A., Simpson, A., Berglas, R., White, E. and Amity, M. (forthcoming). *Northern Australia beef situation analysis: A report to the CRCNA*. CSIRO, Darwin, Australia.
- Gleeson T., Martin, P. and Mifsud, C. (2012). Northern Australian beef industry: Assessment of risks and opportunities, ABARES report to the Northern Australia Ministerial Forum, Canberra, Australia.
- Henry, R. et al (2019). *A situational analysis for developing rice industry in Northern Australia*. Interim report. Report to CRCNA. Queensland Alliance for Agriculture and Food Innovation (QAAFI), the University of Queensland, Brisbane, Australia.

James Cook University (forthcoming). *Northern Australian health service delivery situational analysis*. Report to CRCNA, Townsville, Australia.

MacLean, B., Thomas, S. and Narustrang, M. (forthcoming). *A situational analysis for the Northern Australian broadacre farming sector*. Report to CRCNA, Townsville, Australia.

Maclean, K., Woodward, E., Jarvis, D., Rowland, D., Rist, P., Turpin, G., Martin, P., and Glove, R. (2019a). *Building the Traditional Owner-led bush products sector in Northern Australia*. Report to CRCNA, Townsville, Australia.

Maclean, K., Woodward, E., Jarvis, D., Rowland, D., Rist, P., Turpin, G., Martin, P. and Glover, R. (2019b). *A strategic sector development and research priority framework for the Traditional Owner led bush products sector in Northern Australia*. CSIRO, Brisbane, Australia. Retrieved from: <https://www.crcna.com.au/resources/publications/strategic-sector-development-and-research-priority-framework-traditional-owner-led-bush-products-sector-northern-australia>

Marshall, A., Dale, A.P., Babacan, H. and Dezuanni, M. (2019a). *Connectivity and digital inclusion in Far North Queensland's agricultural communities*. The Cairns Institute, James Cook University, Cairns, Australia.

Marshall A. et al. (2019b). *Northern Australian communications analysis: Communiqué*. Queensland University of Technology, Brisbane, Australia. Retrieved from: <https://www.crcna.com.au/sites/default/files/201912/amended%20CRCNA%20forum%20communique20122019.pdf>

National Indigenous Australians Agency (NIAA). (2019). *Northern Australia Indigenous Development Accord*. NIAA, Canberra. Retrieved from: <https://www.niaa.gov.au/resource-centre/indigenous-affairs/northern-australia-indigenous-development-accord>

Northern Australian Indigenous Expert Panel (NAEIP). (2013). *An Indigenous prospectus for participating in the sustainable development of north Australia*. North Australian Indigenous Experts Forum on Sustainable Economic Development. Second Forum. Kakadu National Park, NT, Australia 30 April - 2 May 2013. Report to the Northern Australia Ministerial Forum. NAILSMA, Darwin, Australia. 78 pp.

Northern Australian Indigenous Land and Sea Management Alliance (2019). *State of the Indigenous estate: Background information for identifying and evaluating opportunities for economic development on Indigenous lands: Interim report*. NAILSMA, Darwin, Australia.

Northern Territory Government (2014). *Submission by the NT Government to the Joint Select Committee on Northern Australia Inquiry into the Development of Northern Australia*. February 2014. Northern Territory Government, Darwin, Australia. 15 pp.

Office of Northern Australia (2019). *Workshop discussion paper: New 5-year Plan for Northern Australia*. ONA, Darwin, Australia.

Resource Efficient Innovations Database (REID)., (2013). *FreshPaper by Fenugreek*. WRAP, Banbury, Oxon, England. Retrieved from: <http://reid.wrap.org.uk/item.php?id=453>. Cited in Austcham ASEAN (2019). *Capturing the ASEAN Agricultural opportunity for Northern Australia*. Report to the CRCNA. AustCham ASEAN, Singapore. Available at :

<https://www.crcna.com.au/resources/publications/capturing-asean-agricultural-opportunity-northern-australia>Stoeckl, N. (2012). Comparing multipliers from survey and non-survey-based

Input-Output models: An empirical investigation from Northern Australia. *Int. Regional Science Review* 35:367-388.

Stephens, M., Woods, T., Brandt, C., Bristow, M., Read, S., Annandale, M., Smith, T. (2010) *Northern forestry and forest products industry situation analysis. Stage 1 - Overview of the forestry and forest products industry and preliminary evaluation of forestry opportunities*. Timber Queensland, Brisbane, Australia.

Townsville Enterprise Limited (TEL) (2019). *North Queensland agricultural market and supply chain study*. TEL, Townsville, Australia. Available at: <https://crcna.com.au/resources/publications/north-queensland-market-and-agricultural-supply-chain-study>

Whittaker et al. (2019). *Draft Northern Australian health service delivery situational analysis*. Report for CRCNA. James Cook University, Townsville, Australia.

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