CRCNA

# An evaluation of Northern Territory agriculture supply chains and export opportunities

A report for the Cooperative Research Centre for Developing Northern Australia (CRCNA)

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## ACRONYMS

| SHORT FORM | FULL FORM |
|---|---|
| ABARES | Australian Bureau of Agricultural and Resource Economics and Sciences |
| ABS | Australian Bureau of Statistics |
| AMA | African Mahogany Australia |
| AROWS | Adelaide River Off-Stream Water Storage |
| ASEAN | Association of Southeast Asian Nations |
| ASX | Australian Stock Exchange |
| AUD | Australian dollars |
| CAGR | compound annual growth rate |
| CEO | Chief Executive Officer |
| CRC | Cooperative Research Centre |
| CRCNA | Cooperative Research Centre for Developing Northern Australia |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation |
| DITT | Department of Industry, Tourism and Trade |
| ERF | Emissions Reduction Fund |
| ESCAS | Exporter Supply Chain Assurance System |
| FAO | Food and Agriculture Organization of the United Nations |
| FDI | foreign direct investment |
| FIANT | Forestry Industry Association of the Northern Territory |
| FTE | full time equivalent |
| GL | gigalitre |
| GM | genetically modified |
| GSP | Gross State Product |
| GVP | Gross Value Product |
| GW | gigawatts |
| HACCP | Hazard Analysis and Critical Control Points |
| HR | human resources |
| ILM | Investment Logic Map |
| km | kilometre |
| MCA | multi-criteria assessment |

| | |
|---|---|
| ML | megalitres |
| MLA | Meat and Livestock Australia |
| NBN | National Broadband Network |
| NSW | New South Wales |
| NT | Northern Territory |
| NTCA | Northern Territory Cattlemen's Association |
| NTG | Northern Territory Government |
| NTSC | Northern Territory Seafood Council |
| NZ | New Zealand |
| OECD | Organisation for Economic Co-operation and Development |
| PALM | Pacific Australia Labour Mobility |
| PJ | petajoules |
| PPE | personal protective equipment |
| PwC | PriceWaterhouseCoopers |
| QLD | Queensland |
| SIP | State Infrastructure Plan |
| SWOT | strengths, weaknesses, opportunities and threats |
| TERC | Territory Economic Reconstruction Commission |
| TRG | The Rohatyn Group |
| UK | United Kingdom |
| UN | United Nations |
| US | United States of America |
| VET | Vocational Education and Training |
| VHT | vapour heat treatment |
| VMS | vessel monitoring system |
| WA | Western Australia |

## EXECUTIVE SUMMARY

Despite the Northern Territory's proximity to international markets and rich agricultural produce, the region's geography and a small, nascent production sector presents unique challenges to supplying international markets.

With a global focus on food security driving demand and higher prices for food, new opportunities are emerging for countries like Australia to fill new and current markets. To capitalize on these opportunities, the Northern Territory agriculture sector must first identify the gaps in its supply chains and then develop stakeholder-led solutions.

The Cooperative Research Centre for Developing Northern Australia (CRCNA) has partnered with NT Farmers Association to conduct an evaluation of Northern Territory agriculture supply chains and export opportunities. This project aims to determine where to apportion effort to drive industry expansion and economic growth, and ultimately capitalize on the available opportunities. The impact of these findings will ensure that industry, government, and supply chain stakeholders have qualitative and quantitative data and information to drive long term investment. Therefore, able to deliver key long term planning and development for improved workforce skills, improving supply chain efficiencies, long term infrastructure planning and investment and influence with policy decision makers.

NT Farmers engaged PricewaterhouseCoopers (PwC) to deliver components of the Northern Territory Agricultural Supply Chains Project (the 'Project'). The scope included identifying and prioritising infrastructure and non-infrastructure options that should be considered to address the challenges and opportunities relevant to Northern Territory agricultural and agribusiness industries. A key finding of the report is that strategic infrastructure planning and development is a critical factor for the success of agribusiness in the Northern Territory and is a key enabler for industry and broader economic growth. The finding identified an opportunity to leverage planned investments in the Northern Territory to develop agriculture and improve supply chain infrastructure.

The report also identifies an increasing geopolitical need to improve capability and onshore production of food processing and the supply chain infrastructure to support distribution. This provides the opportunity for the Northern Territory to investigate a multi-user agricultural precinct that could provide synergies and efficiencies for producers and be an innovative hub for onshore food processing in Northern Australia.

The Project has also delivered a model, developed by PwC, to provide agricultural producers with an estimate of the costs to export goods from the Northern Territory, both internationally and domestically. It provides an overview of the downstream supply chain for agricultural producers in the Northern Territory and insights regarding the potential opportunities and constraints faced by producers.

The recommendations and findings of this report provide the information necessary for decision makers, both industry and government, to set out a detailed and targeted plan to address the constraints that exist in agribusiness supply chains. This will facilitate investment into the agribusiness sector and associated infrastructure, ultimately driving the Northern Territory's economic growth.

# PART I
# Analysis & Recommendations


# 1. ANALYSIS OF NORTHERN TERRITORY AGRICULTURAL SUPPLY CHAINS AND EXPORT OPPORTUNITIES

## 1.1 Background

The NT Farmers Association (NT Farmers) and the Cooperative Research Centre for Developing Northern Australia (CRCNA) are undertaking the NT Agricultural Supply Chains Project to identify export opportunities and improvements in current supply chain infrastructure across several agricultural and agribusiness industries in the Northern Territory (NT). The project is intended to highlight key constraints across the supply chain for domestic and international exporters and provide a platform for identifying and planning the enabling infrastructure required to support producers and exporters.

NT Farmers have engaged PricewaterhouseCoopers (PwC) to deliver components of the NT Agricultural Supply Chains Project (the 'Project'), including identifying and prioritise infrastructure and non-infrastructure options that should be considered to address the challenges and opportunities relevant to NT agricultural and agribusiness industries.

The report identifies that despite the NT's proximity to international markets and high-quality agricultural produce, the geography of the Territory, legacy infrastructure issues, and the immaturity of numerous production sectors, combine to create unique impediments to harnessing opportunities to supply international markets effectively and efficiently. Strategic infrastructure planning and development is a critical factor for the success of agribusiness in the NT and is a key enabler for industry and broader economic growth.

This section includes:

- Overview
- Governance
- Report Structure.

## 1.2 Overview

### 1.2.1 Objective

The objective of the project is to provide a pathway for government and industry to invest in agricultural supply chain infrastructure and reforms that will support the development of the Territory's agricultural export industries. The project will focus on the food, fibre and forestry commodities produced across the NT, including:

- Live Cattle Export
- Broadacre Cropping
- Cotton
- Horticulture
- Forestry
- Aquaculture and Fisheries

These industries are collectively referred to as 'agriculture' throughout the report unless otherwise specified.

Supply chains are defined in this report as the processes to produce and distribute products from the farm or fishery to the final point of sale.

This project aligns with a number of key policy directions in the NT, including but not limited to:

- The Territory Economic Reconstruction Commission: Final Report (TERC Report)[1] has led to a strong investment and growth agenda across the NT Government. The TERC Report noted that logistics and supply chains are critical to sustaining populations and lifestyle with food and fuel security, and for taming the tyranny of distance for freight, to and from the NT. Key logistical enabling infrastructure is of national importance to propel the Territory's productivity and contribution to agribusiness domestically and internationally.
- The appointment of the Territory's first Infrastructure Commissioner and the creation of Infrastructure NT to coordinate and prosecute the Territory's infrastructure agenda locally and nationally.
- Once-in-a-generation levels of private investment and strong public investment into numerous infrastructure projects across key agricultural sectors in the NT, including aquaculture (Project Sea Dragon ), cotton (Katherine and Kununurra cotton gins), cattle (Federal Government funded Beef Roads), and horticulture (Mango Roads).
- The implementation of a land release program by the NT Land Corporation designed to de-risk, prioritise, and assist the development of agricultural precincts in key locations in the NT.

### 1.2.2 Approach

A detailed methodology for each task is outlined in Section 2, Methodology. The project has been undertaken in five phases, displayed in Figure 1.


The findings for each phase reflect the outcomes of stakeholder engagement. They are supported by a review of key data, providing NT agricultural producers with tools to advocate for investment and reforms which support industry growth.

Figure 1. Project Approach

1. Northern Territory Government (2020). Territory Economic Reconstruction Commission Final Report. Accessed at https://ntrebound.nt.gov.au/__data/assets/pdf_file/0020/952301/terc-final-report.pdf

2. AUTHOR'S NOTE: Following completion of this report Seafarms announced a review into the viability of Project Sea Dragon. The outcome of this review may have a material impact on the accuracy of the data contained in this report.

## 1.3 Governance

The Project's governance structure is presented in Figure 2.

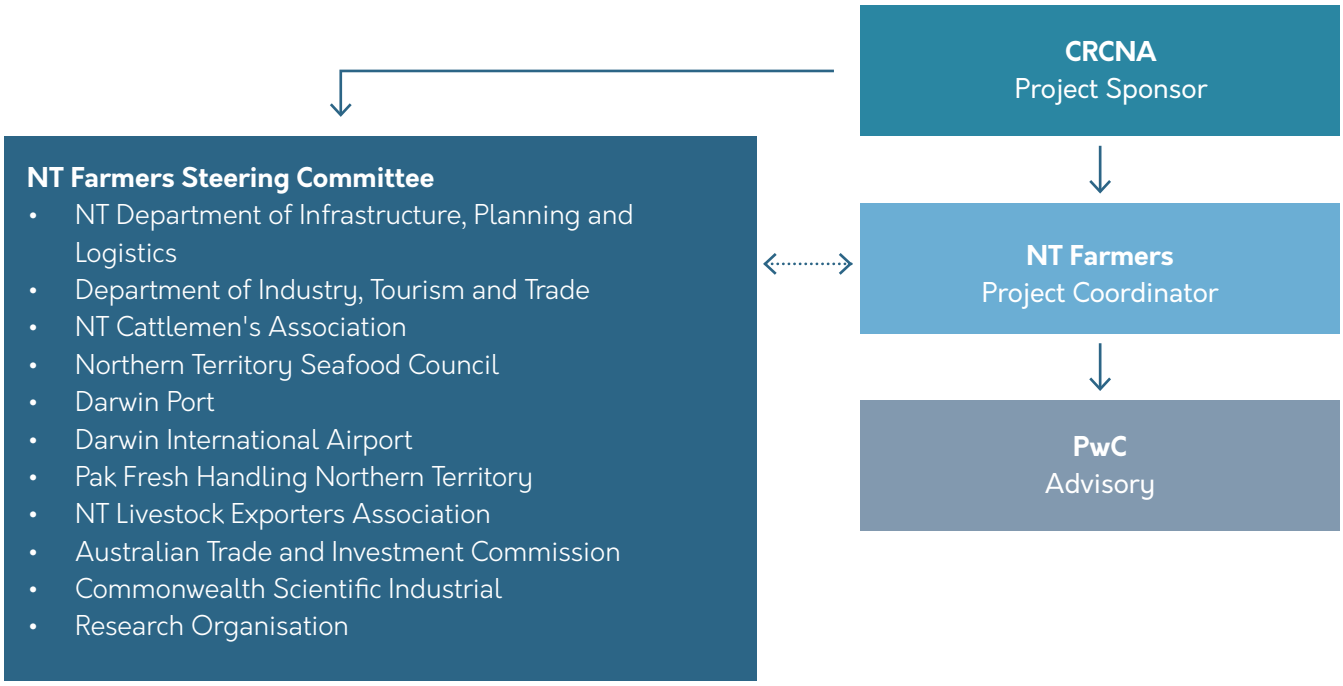



Figure 2. Project governance structure.

## 1.4 Report Structure

The report is structured into the following Sections:

**Section 2 – Methodology:** This section outlines the methodology used by the Project team to deliver key components of the Project.

**Section 3 – Stakeholder Engagement:** The stakeholder engagement section summarises the key themes communicated by various stakeholders regarding Project.

**Section 4 – Service Need:** The service need articulates the strategic requirements to be addressed, with specific focus on the opportunities that could be capitalised upon and the challenges that the Project may address.

**Section 5 – Options Identification:** The purpose of this section is to provide an overview of the Project's potential options.

**Section 6 – Options Analysis:** The options prioritisation comprehensively assesses each proposed option through a multi-criteria assessment (MCA) process.

**Section 7 – Conclusion:** This section summarises the report's key findings and provides recommendations and next steps.

# 2. METHODOLOGY

## 2.1 Introduction

The NT Agricultural Supply Chain and Export Opportunities Project identifies and prioritises options to improve agricultural supply chain infrastructure across the NT. The purpose of this section is to document the methodology used to deliver the project. This section includes:

- Approach
- Stakeholder engagement
- Service need
- Options prioritisation
- SWOT.

## 2.2 Approach

The project team developed a five-stage framework designed to provide clarity to NT Farmers and CRCNA regarding agricultural chain infrastructure needs to facilitate increased exports from the NT. The approach delivers a holistic view of the industry and provides flexibility to inform the options prioritisation process.

The five-step approach supports the consideration of multiple options, with each step providing a different aspect that will enable the identification of a suite of options for a multi-dimensional problem. The approach is depicted in Figure 3.

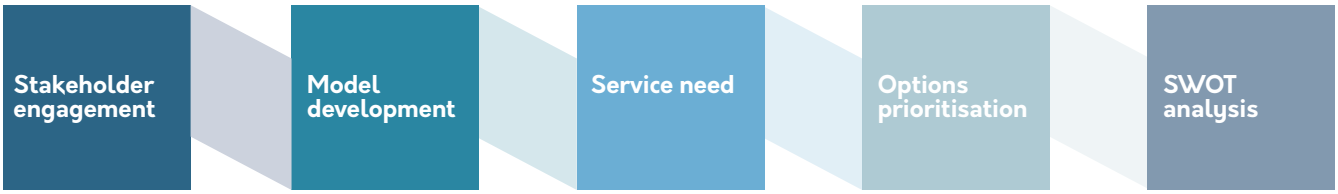



Figure 3. Project stages.

## 2.3 Stakeholder Engagement

### 2.3.1 Objective

The objective of market sounding was to explore the opportunities and constraints surrounding the agricultural supply chain and export opportunities in the NT, with feedback informing:

- Key opportunities and constraints surrounding agricultural supply chains in the NT
- Barriers to investment
- Infrastructure and non-infrastructure options for future development.

### 2.3.2 Identification of Stakeholders

A key consideration for this process was the method by which participants were identified and/or selected. Market sounding participants for the engagement were identified through a targeted process. A target list was agreed upon between PwC and NT Farmers, which included:

- NT Government agencies
- Agriculture sector representatives
- Industry bodies
- Supply chain industry representatives.

Figure 4 illustrates the simplified schedule of milestones followed throughout the market engagement process.

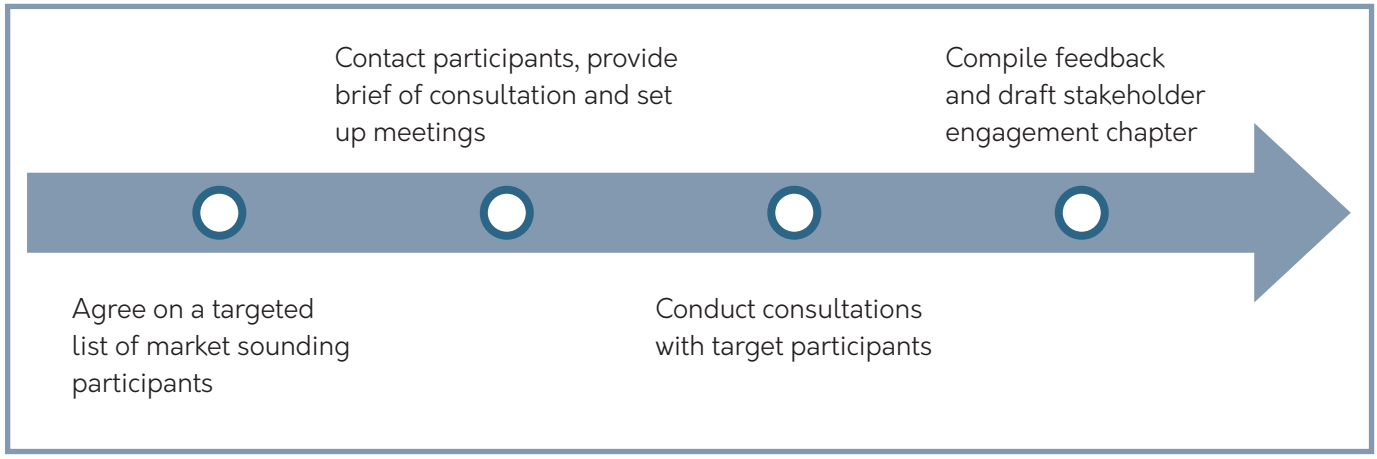



Figure 4. Targeted process.

The advantages of the targeted process are:

- It is a manageable process because it is highly targeted
- It can be implemented quickly
- It provides for an increased level of discretion and limits open dialogue
- It has a low confidentiality risk
- It assists in developing stakeholder knowledge and support for the project.

### 2.3.3 Data Collection

**Interviews**

PwC and NT Farmers conducted stakeholder engagement interviews with representatives from industry from October 2021 to February 2022. PwC and NT Farmers contacted the identified participants to discuss a range of topics related to the project and to seek feedback regarding future development options.

Participants consulted are listed below in Table 1

| ORGANISATION | REPRESENTATIVE | ROLE |
|---|---|---|
| **Chain Consulting** | Grant Williams | Supply chain consultant |
| **Humpty Doo Barramundi** | Miles Toomey | Head of Sales and Marketing |
| **Desert Fruit Company** | Ben Wall | Manager |
| **Quintis** | Johan Nortier | Operations Manager |
| **Northern Territory Seafood Council** | Katherine Winchester | CEO |
| **NT Live Exporters Association** | Tom Dawkins | CEO |
| **NT Farmers Association** | Paul Burke | CEO |
| **NT Road Transport Association and NT Buffalo Industry Council** | Louise Bilato | Executive Officer |
| **NT Forestry Association** | Frank Miller | Chairman |
| **Airport Development Group** | Allan Woo | Aviation Development Manager |
| **PakFresh Handling NT** | Robert Hall | General Manager |
| **Batchelor Abattoir** | Peter Polovinka | Area Manager |
| **Aus Asia Agribusiness** | Kevin Mulvahil | Director |
| **Darwin Port** | Ben Cheng<br>Peter Dummett | Trade Access Coordinator<br>General Manager Trade and Property |
| **PAE Marina Express Lines** | Mark Turner | Northern Australia – International Container Shipping |
| **Ord River District Cooperative** | Fritz Bolton | Chairman |

Table 1 Stakeholder Engagement Participants

**Workshop**

PwC facilitated a workshop on 2 December 2021 to engage with NT Government stakeholders. The workshop setting allowed the project team to collaboratively validate findings from industry as well as provide an overview of the project to key Government stakeholders. The participants of the workshop are listed in Table 2.

| DEPARTMENT | REPRESENTATIVE | ROLE |
|---|---|---|
| **Department of Industry, Tourism and Trade (NT)** | Warren Hunt<br>Jenny Hill<br>Susanne Fitzpatrick | Manager, Agricultural Policy, and Analysis<br>Agribusiness Development<br>Chief Veterinary Officer |
| **Department of Infrastructure, Planning and Logistics (NT)** | Nicholas Papandonakis<br>Tracey Lines | Strategy, Policy, and Legislation<br>Infrastructure Commission |
| **Invest Territory (NT)** | Luana Cormac | Chief Operating Officer |
| **CSIRO** | Chris Chilcott | Deputy Director Operations, Research Leader Northern Australian Development |

Table 2 Workshop Participants

The workshop involved a collaborative discussion, where the project team shared key findings from stakeholder engagement with industry and sought insights from Government representatives regarding these key themes. PwC recorded the insights during the workshop and distributed them to participants afterwards. The slides used for the workshop are provided in Appendix A.

### 2.3.4 Data Analysis

Following the stakeholder engagement with industry and Government, PwC consolidated the key themes to guide the development of the Service Need, specifically the Investment Logic Map, discussed in Section 2.4.

## 2.4 Service Need

### 2.4.1 Objective

Confirmation of the service needs supports the development of the strongest case for an individual or suite of investments.

### 2.4.2 Investment Logic Map

An Investment Logic Map (ILM) identifies the major problems and opportunities that the investment will be required to respond to, the benefits that the investment will be required to deliver and the strategic initiatives and solutions that will best respond to the problems and opportunities identified. It is a single page depiction of the logic that underpins an investment. It provides the strategic rationale of a proposed investment and can be modified to reflect changes to the logic throughout the project lifecycle.

ILM was established to assist organisations that must comply with complex Government project evaluation and investment processes. Several jurisdictions have adopted ILM practices, including Queensland, Victoria, and New South Wales. An indicative ILM structure is depicted as follows[3]:

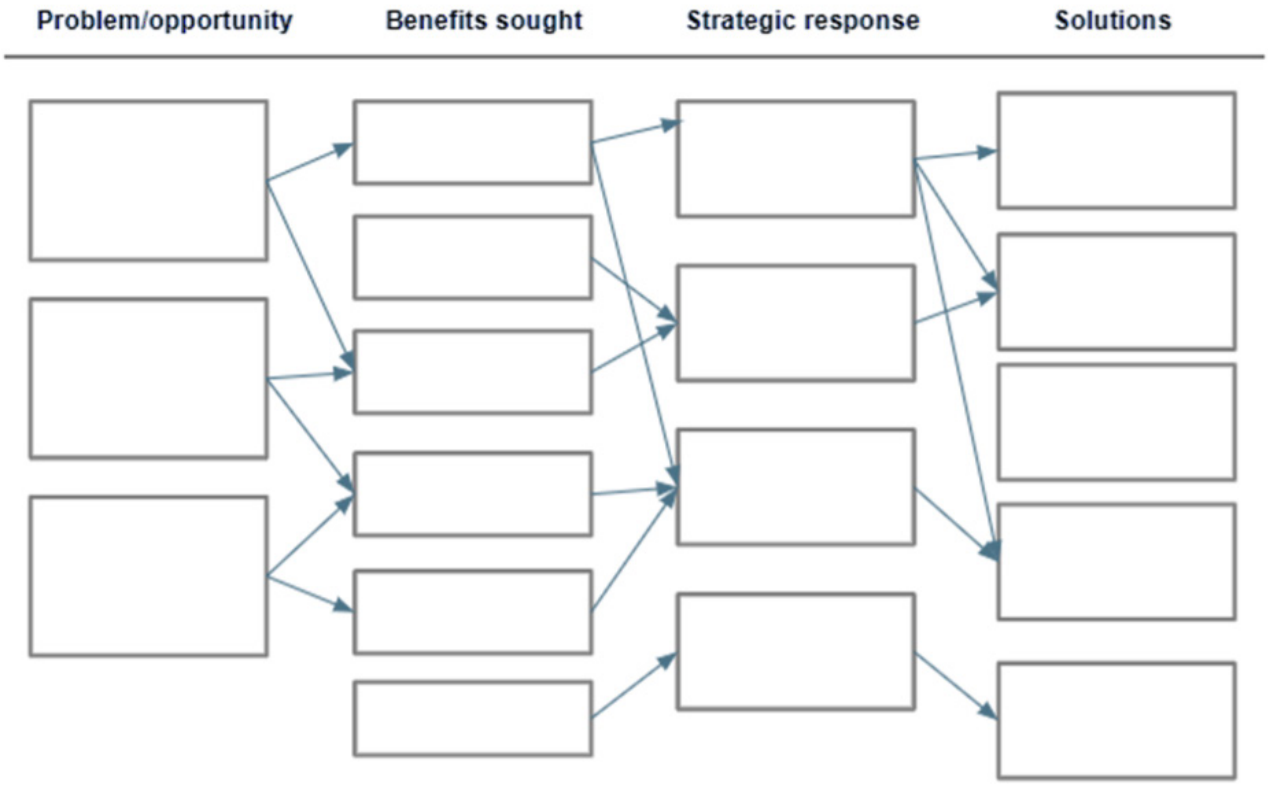



Figure 5. ILM structure

[3] Queensland Government (2016). State Infrastructure Plan, Part A: Strategy. Accessed at https://www.dsdmip.qld.gov.au/__data/assets/pdf_file/0020/31727/sip-part-a.pdf

The development of the ILM consists of three distinct components. These are:

**1. ILM Development**
Typically, an ILM is developed during a facilitated discussion between key project stakeholders. However, owing to the relatively short time frame for this Project, the ILM was developed amongst the PwC project team and NT Farmers, and then validated by key stakeholders.

**The ILM includes four elements:**

- Problem/opportunity definition - This step is designed to facilitate an understanding and articulate the need for the project. The problems and/or opportunities are determined and defined.

- Benefit definition - This step aims to consolidate the benefits that are expected to be delivered if the problems are resolved, or opportunities are pursued. High-level or indicative Key Performance Indicators (KPIs) can be identified that will best evidence that the benefits sought have been delivered.

- Strategic response definition - This element determines what high - level strategic actions could be implemented that have the potential to deliver the benefits sought. These could be applied individually or in conjunction with one another; however, initially, their applicability is judged in isolation.

- Solution definition - The intent of this component is to determine the best solutions and their respective high-level specifications to resolve the identified problems or realise the identified opportunities.

**2. Service Requirements**
The completed ILM is used to identify and develop the service requirements that the project will be required to meet/deliver to resolve the problems or realise the opportunities identified. These service requirements will inform subsequent analysis and comparison of options.

**3. Outcomes**
The findings of the ILM and subsequent Service Need Section are informed by stakeholders and existing assessments relevant to the Project while providing a contemporary and holistic view of the project and its interdependencies with the agri-business industry, potential export markets and opportunities for the region, and infrastructure requirements.

The process assists in developing and documenting the logic that underpins a potential investment decision. The completed ILM will form the basis of the options prioritisation process, providing the foundation for scoping options and future project development stages. The ILM also informs the criteria used to assess the options in the options prioritisation process. It is critical that this ILM process is outcome driven and provides realistic and achievable solutions for further development.

## 2.5 Option Prioritisation

### 2.5.1 Objective

Use qualitative criteria to prioritise options for the Project using a multi-criteria assessment (MCA) process.

### 2.5.2 Multi-criteria assessment

An MCA is a structured assessment tool used to rank or refine a list of options or projects to identify a preferred option or options for further analysis. The list of options is assessed against a range of criteria to determine the preferred option(s) for further assessment.

**The MCA process involves six components:**

1. Overview of Potential Options
2. Criteria Definition
3. Criteria Weightings
4. Assessment
5. Review
6. Validate

The MCA will be undertaken by the project team, with review and validation from NT Farmers and key stakeholders.

1. Overview of Potential Options

The project team will review and define each option identified in the ILM.

2. Criteria Definition

Defining criteria to assess options against helps to identify each option's strengths, weaknesses, and potential impacts. The project team will determine the criteria in collaboration with NT Farmers to ensure each option is assessed with respect to the underlying service need and key project objectives.

Criteria may include:

- The degree to which the option supports innovation and future proofing of the Territory supply chain
- The degree to which the option will attract investment in agricultural industries and supporting infrastructure
- The degree to which the option will increase efficiency in supply chains
- The degree to which the option will increase the competitiveness of NT agriculture and downstream industries
- The degree to which the option can realistically be implemented/delivered in the short (2-5 years) to medium (5-10 years) term.

3. Criteria Weighting

As part of the MCA process, it is necessary to decide on the weighting of each criterion. This can be achieved in several ways; however, a pairwise comparison method was used for this Project. This approach compares criteria in pairs to judge which of the criterion in the pair is more important to the Project. The pairwise comparison was undertaken by the project team. The pairwise comparison method is illustrated in Figure 6.

Due to its transitive nature, pairwise comparisons will result in one criterion scoring zero. To avoid any criterion from dropping out of the assessment, zero-rated criteria are given a minimum weighting of 5%. An applied weighting score average is calculated based on the sum of the pairwise score. The criterion-specific weightings are calculated based on the weighting of each criterion's pairwise score by the applied weighting score average.

| | CRITERIA | A | B | C | D | E |
|---|---|---|---|---|---|---|
| A | Increase innovation and future proofing | | | | | |
| B | Increase investment in agricultural infrastructure | B | | | | |
| C | Increase efficiency in supply chain | C | C | | | |
| D | Increase competitiveness of NT agriculture | D | B | C | | |
| E | Ease of implementation/delivery | A | B | C | D | |
| F | | 1 | 3 | 4 | 2 | 0 |
| | Pairwise weighting | 10% | 29% | 38% | 19% | 5% |

Figure 6. Pairwise comparison.

4. Assessment

The assessment will focus on ranking each of the potential options against the agreed criteria. The options will be assessed regarding the difficulty of implementing each option. This scoring mechanism will allow the project team to identify short-, medium- and long-term priorities. The assessment will allocate a rating against each potential option based on the traffic light system identified in Figure 7.

5. Review

Once all potential options have been assessed against each criterion, a summary of results was completed, including rankings identified for each option to indicate priority for action in the next stages of project development.

6. Validate

The results of the MCA process and the prioritisation ranking were presented to NT Farmers and the Steering Committee to obtain their validation for the process.

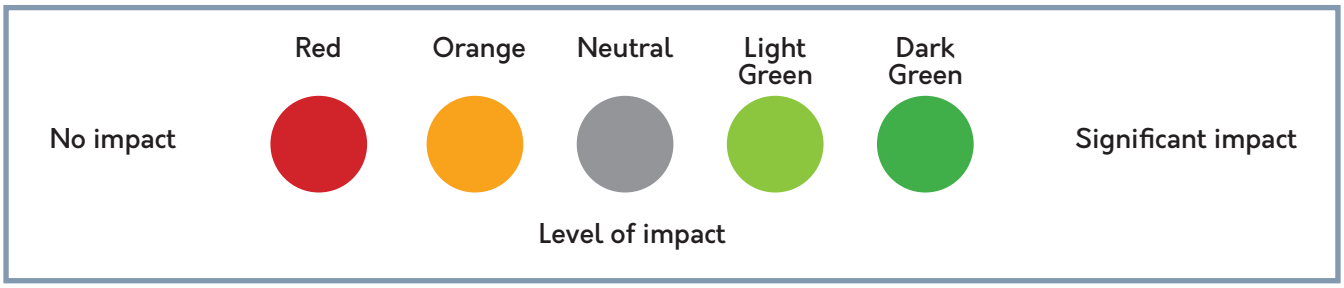



Figure 7. Scoring mechanism.

## 2.6 SWOT

### 2.6.1 Objective

The SWOT analysis draws on the work undertaken throughout the engagement to summarise the strengths, weaknesses, opportunities, and constraints of the agricultural supply chain in the NT.

### 2.6.2 Approach

The SWOT will consider both internal and external factors and will provide a situational analysis of the NT's key capabilities, competitive position, market factors and any environmental factors that may influence investment in agricultural supply chains. A SWOT analysis is presented as a square segmented into four quadrants, each dedicated to an element of SWOT, providing a visual overview of the industry's position. It is an effective tool to assist in identifying the potential foundations or the industry's vision and goals, as well as prioritisation of investments.

Owing to the broad range of industries assessed, a SWOT will be developed for each industry, as well as an overarching SWOT that consolidates common themes among industries.

The SWOT analysis is located in Part II of this report.

### 2.6.3 Data collection

The SWOT analyses will build on work undertaken throughout the engagement, specifically:

- Literature review
- Stakeholder engagement key themes and data provided by stakeholders
- Desktop research undertaken for the Service Need
- NT Farmers and PwC professional judgement based on market knowledge and precedent projects.

### 2.6.4 Data analysis

Using the data and information listed, PwC will produce each SWOT using the following questions to guide the analyses:

**Strengths**

- What is the competitive advantage in the NT?
- What resources are available?
- What products/sectors are performing well?

**Weaknesses**

- Where can the industry improve?
- What products/sectors are underperforming?
- What resources are lacking in the NT?

**Opportunities**

- What technology can be used to improve supply chain or agricultural operations?
- Is there an opportunity to expand operations or capacity?
- What new market segments can be explored?

**Threats**

- What regulations threaten operations or the efficiency of operations in the NT?
- What do competitors do well?
- What consumer trends threaten the industry?

# 3. STAKEHOLDER ENGAGEMENT

## 3.1 Introduction

A key component of the project development process was engagement with key stakeholders and industry participants to better understand the opportunities and constraints surrounding agricultural supply chains in the NT. It also provided the opportunity to inform key stakeholders about the project, its objectives and status. This section includes:

- Participants
- Key themes
- Summary

## 3.2 Participants

As described in Section 2.3 Stakeholder Engagement, stakeholders were selected through a targeted process to ensure a wide range of views were considered. Stakeholders were grouped into the following categories, listed in Table 3.

| PRODUCERS AND PROCESSORS | FREIGHT AND LOGISTICS | INDUSTRY BODIES | GOVERNMENT |
|---|---|---|---|
| • Batchelor Abattoir<br>• Desert Fruit Co.<br>• Humpty Doo Barramundi<br>• Quintis Sandalwood | • Airport Development Group<br>• Chain Consulting<br>• PAE Marianaship<br>• PakFresh Handling NT | • Aus Asia Agribusiness<br>• ORDCO<br>• NT Buffalo Industry Council<br>• NT Cattlemen's Association<br>• NT Forestry Association<br>• NT Livestock Exporters Association<br>• NT Road Transport Association<br>• Northern Territory Seafood Council | • CSIRO<br>• Infrastructure NT<br>• Department of Chief Minister and Cabinet<br>• Department. of Industry, Tourism and Trade<br>• Department of Infrastructure, Planning and Logistics |

Table 3 Stakeholder Engagement Participants

PwC and NT Farmers undertook consultation between October and December 2021. Engagement with industry was primarily undertaken through one-on-one consultations held in person, via phone or through video-conference. For consultation with Government, a workshop was held on 2 December 2021 in Darwin. The workshop setting allowed the project team to collaboratively validate findings from industry as well as provide an overview of the project to key Government stakeholders.

The key topics covered during consultations are displayed in Figure 8.

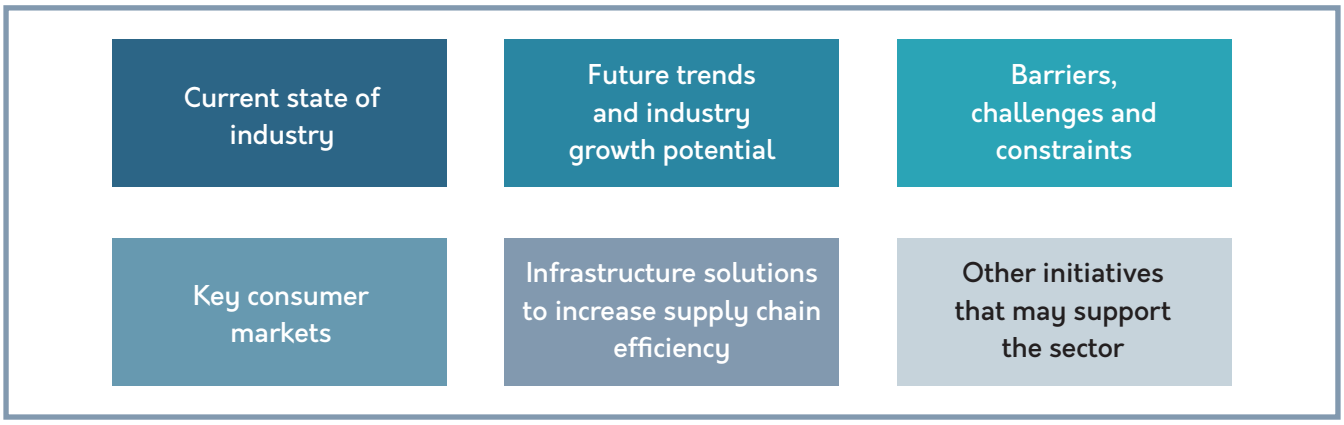



Figure 8. Key consultation topics.

## 3.3 Key Themes

Engagement with stakeholders from a diverse range of agribusiness and supporting industries was critical in the development of the recommendations as well as the accompanying supply chain model. Perspectives, expertise, and insights shared by participants highlighted that, whilst the NT's agricultural industries' day-to-day activities vary greatly, there are common challenges in the supply chain and opportunities. Key themes that emerged during the consultation are outlined in the following sections.

### 3.3.1 Supply Chain – Current State

Stakeholders noted that, apart from live cattle, most NT exports leave the country via interstate ports, after travelling there via road. This is despite the closer proximity of Darwin to export markets and the theoretically shorter time to market. Participants identified some of the drivers of inefficient supply chain routes to export as:

- Location of agricultural exporters – Participants noted that exporters have a desire to consolidate products prior to export and centralise other functions such as quality control, processing, and packaging. As few agricultural exporters are based in the NT, most products travel interstate via road to be processed and packaged for export through ports such as Brisbane, Fremantle, Adelaide, or Melbourne. These exported NT products are not measured as part of the Territory's Gross State Product (GSP) but instead contribute to the GSP of the state where their departure port is located.

- Infrequent ship departures – Container ships bound for Singapore, for example, depart Darwin Port once every seven to ten days. At other key Australian ports, departures to Singapore occur daily or more frequently. While the shipping time from Darwin to Singapore can be as little as five days, the actual time to market can be prolonged if the transport of goods to the Port is not correctly timed. The risk of delay is lessened at other ports as there are more frequent departure options should the planned departure day be missed.

The NT is a net importer – Stakeholders repeatedly noted the persuasive power that logistics companies must ensure trucks are backloaded – incentivising exporters to move NT goods interstate prior to export. As the NT is a net importer of goods from other states (including goods trucked direct from interstate ports), the backloading of trucks with NT products destined for export reduces inefficiencies for national road transport companies.

### 3.3.2 COVID-19 Impacts

Participants identified several supply chain challenges that have emerged or increased because of the COVID-19 pandemic. Whilst some of these challenges are common to supply chains globally; others are significantly intensified in the geographically isolated NT setting. Examples raised by participants include:

- Interstate exporters have been unable to travel to the NT to develop relationships with producers and supply chain participants.
- Accreditation of staff and facilities across a number of sectors has been delayed due to the Department of Agriculture, Water and Environment's requirements for in-person attendance to accredit – this has now transitioned to an online system.
- Whilst the unpredictable nature of flight schedules has hindered uptake of air transport in some sectors, recent introduction of new routes out of Darwin (even though not necessarily permanent) has provided new opportunities.
- Intra-Territory border controls have created supply chain delays and frustration. The dynamic nature of the pandemic has seen frequent changes to access routes, and urgent restrictions implemented with little warning.
- Many producers have been unable to fulfil their workforce needs due to international and domestic border restrictions, resulting in reduced productivity.

### 3.3.3 Supply Chain Visibility

Participants observed that most producers do not have much visibility of the supply chain "beyond the farm gate," noting that once payment and product are exchanged, there is no longer any need for the producer's involvement – the decisions are in the hands of exporters and distributors. In some cases, processing undertaken post-farm gate adds significant value to products, and there may be opportunities to capture this value within the NT through facilitating select processing activities in the Territory. In addition to the lack of supply chain involvement and influence by producers, stakeholders noted the following global supply chain trends that are becoming apparent in the NT:

- Traceability - Supply chain traceability allows companies to follow products as they move along the value chain, providing information on inputs and processes that can inform decision making and be communicated more broadly. Consumers are increasingly interested in access to this information, particularly as it pertains to the provenance of products and ethical practices throughout the value chain. This means producers will be expected to know more about inputs and what happens to their product beyond the farm gate.
- Decarbonising supply chains – Increasingly, corporates, consumers and governments are seeking assurance that they are receiving carbon neutral products. Achieving net-zero supply chains is a key component of this; however, this requires a deep understanding of the components and data within the supply chain. Stakeholders noted that policies are being developed to support carbon opportunities for NT producers.

### 3.3.4 Geography and Climate

Geography

Darwin is Australia's closest capital city to key export markets in Asia, and stakeholders believe there are opportunities across agricultural sectors to better capitalise on the increasing demand in these growing Asian countries. Achieving this would require increased processing capabilities and facilities in the NT and will rely upon frequent and reliable transit routes – noting that sufficient volume is needed to increase the frequency of ship departures from Darwin Port.

Tropical Climate

Agricultural production reduces significantly during the wet season, with only a small amount of seafood leaving the Territory during this time. Participants noted that this creates difficulties for staff retention and cash flows and was also noted as a key reason for the lack of exporters based in the NT. Whilst the tropical climate can result in road closures during the wet, the abundance of water and its availability at low cost are also key natural advantages of the Territory.

First Nations Agricultural Development

Many participants identified the opportunity for increased participation from First Nations peoples in agricultural developments. One identified opportunity, for example, is to use primary produce from Aboriginal land, such as buffalo or beef cattle raised on Aboriginal-owned cattle stations. The livestock could have value added through local processing into fresh or shelf-stable products that could be sold for local consumption in the region of origin. This example does not just apply to micro-abattoirs but supports the concept of regionalised processing facilities. To drive this, it is likely that policy changes and further training initiatives would be required.

Distance

Stakeholders noted that Darwin's relative isolation from other large cities results in challenges, including labour shortages, long lead times on supplies, and difficulties obtaining the required technical support for installing and calibrating machinery. Delays in equipment repair can result in significant product spoilage and lost revenue.

### 3.3.5 Barriers, Challenges, and Constraints

Stakeholders identified a range of challenges, barriers and constraints existing within the NT supply chain, of which a selection is outlined below:

Global Supply Chain Issues

Both COVID-19 and significant geopolitical shifts are causing volatility in the global supply chain. Stakeholders confirmed that these effects are being experienced in the NT and are sometimes exacerbated by the distances required to transport goods within and beyond the Territory. In particular:

- AdBlue shortages and increased fertiliser prices due to China and Russia restricting urea exports are increasing road transport costs and agricultural production in the NT.
- The shortage of pallets and shipping containers is difficult to manage in the NT, where, due to the vast distances travelled, containers and pallets take longer to be returned for the next users.

Roads

Over two thirds of the Territory's roads are unsealed, with many closing or subject to weight restrictions during the wet season, reducing access for local producers and isolating communities. When roads are closed, alternative routes are not

always available. Participants have noted that, in addition to barriers caused by flooded or weight-restricted roads, other risks include:

- Risks to driver safety
- Impacts on product quality
- Dangers to animal welfare during transport due to the amount of dust generated
- Increased fuel, repair, and maintenance costs due to damage from rough conditions and corrugations – the repair and maintenance costs of doing business on unsealed roads in the NT are three times that of regular line haul work, and even greater if the driver is using Tanami Road.

Labour

Multiple participants identified that attracting and retaining labour in the agriculture sector is a challenge in the NT, which has been exacerbated by COVID-19. Obtaining the necessary staff training and certification was also a key challenge.

Connectivity

Poor mobile connectivity was identified as a key challenge for producers in the NT. Cellular connectivity is unreliable outside major urban centres in the NT and prevents efficient business operations. For example, fishermen are unable to communicate with shore-based teams to advise how much product is about to arrive and commence product sales and organise transport. Whilst some large-scale single-site-based producers can afford to install their own telecommunications equipment; this is not feasible for most businesses.

Electricity Costs

When considering the potential to increase value-add processing occurring in the NT, a number of participants noted that the high electricity rates would likely present a barrier in weighing up the costs and benefits.

## Case Study – NT Land Transport

The Territory's road network is a critical component of the NT's agricultural supply chain. Roads are heavily relied upon for domestic freight and transport of NT products to interstate ports for export, despite the Territory's geographic proximity to Asia. Whilst the Territory's national highway network is fully sealed, 75% of the remaining road network is unsealed and vulnerable to wet weather, creating accessibility challenges and increasing freight costs (see: Territory Wide Logistics Master Plan, 2020). A number of significant projects to seal and upgrade existing roads are underway and in planning stages, including:

| MAJOR WORKS UNDERWAY | MAJOR WORKS PLANNED |
|---|---|
| Tanami Road upgrade | Plenty Highway (Outback Way) |
| Tjukaruru Road (Outback Way) | Carpentaria Highway |
| Mango Roads | Central Arnhem Road Corridor |
| Roper Highway | Berrimah Road duplication |
| Buntine Highway | Gunn Point and Glyde Point Road |

The Territory's rail network comprises a north-south rail corridor running from Darwin to Tarcoola (to Adelaide), on which six return freight services are run per week with a transit time of two days. There have been preliminary studies on the feasibility of linking this existing line to the Great Northern Line at Tennant Creek, creating a corridor through to Mount Isa and Townsville. Current work on the project is focused on understanding the needs and economic potential of the Barkly region.

The flooding in South Australia in January 2022 affected both roads and the rail. Supermarket shelves in the NT were near-empty for weeks, and some hospitality businesses were forced to close. The weather event resulted in trucks taking a 3,000km detour through New South Wales and Queensland, requiring transport regulators to change the rules so that B-triple road trains could use the roads. There were further challenges in Queensland as flooding also arrived on the Barkly Highway.

This weather event has emphasized the vulnerabilities of the NT's supply chain and land transport network, and the widespread impact of disruption to businesses and families. It has prompted increased interest in the connection to the Great Northern Line. It points to a need to reassess and reprioritise works to strengthen not just critical road networks but to improve the flexibility and resilience of the NT supply chain.

### 3.3.6 New Opportunities

During consultation, participants also raised a few opportunities to improve supply chain efficiency in the NT.

Major Projects

Multiple participants identified that the pipeline of major projects in development in the NT would help to drive increased scale in the supply chain through their development activities, products, and adjacent industries. Key projects include Katherine Cotton Gin, Core Lithium, the Nolan's Mining Project, Kununurra Cotton Gin, Humpty Doo Barramundi Farm and Project Sea Dragon. These projects will result in increased export volumes from Darwin and may provide opportunities to aggregate other products for direct export – the success of this will likely require suitable warehousing and facilities, as well as consultation with agricultural exporters.

Government Assisted Land Development

There is a role for government to play in agricultural precinct planning, identifying potential optimal land uses, undertaking necessary technical investigations, and obtaining the required approvals to attract increased agricultural investment to the NT. In a highly contested investment market, government can play a role through de-risking the investment environment. NAJA Business Consulting Services and CRCNA (2020) identify several key examples of how this can be done, including soil and water resource

assessment, allocation and supply (including land planning) and effective approval processes.

Research and Development Hub

Multiple participants have identified that the NT has the potential to be at the forefront of research and development (R&D) in tropical agriculture, driving innovation and solutions to Territory challenges. There was agreement that R&D should be driven by the market and by industry. Consequently, the structures through which this R&D is funded and delivered will need careful consideration. Suggested areas of focus for R&D include transforming waste products, shelf-stable food production, understanding optimal crop varieties for soil and using technology for agriculture training in remote areas.

Address Sovereign Capability

Participants noted the Australian Government's increased focus on sovereign capability (in response to significant geopolitical shifts and the global supply chain crises) and an increased recognition of the NT's strategic position in relation to Asia. Given the natural assets of abundant water and land, the NT is well placed to be a key contributor to regional food stabilisation and food processing.

**3.4 Summary**

The outcomes of this stakeholder engagement process have helped to define the strategic needs related to the agricultural supply chain in the NT and develop options to improve supply chain efficiency. These findings are further detailed in the sections that follow.

# 4. SERVICE NEED

## 4.1 Introduction

The purpose of this section is to demonstrate the strategic rationale for the Project by clearly articulating the key problems and opportunities the Project is responding to, and subsequently establishing the service need for the Project.
A clearly defined service need is essential to determine the appropriate solution/s available to address the identified needs, deliver the expected benefits and justify an investment decision or further investigations. This section includes:

- Approach
- Service need
- Targeted benefits
- Strategic responses
- Summary.

## 4.2 Approach

Investment Logic Mapping (ILM) is typically undertaken early in the development of projects to ensure key stakeholders' views are captured, and project drivers, benefits and potential options are defined. The process facilitates early buy-in from stakeholders and ensures any key risks are caught early in the process.

Investment Logic Mapping ('ILM') is part of the Investment Management Standard developed by the Victorian Department of Treasury and Finance. Several jurisdictions have adopted ILM practices, including Queensland through the Queensland Treasury's Project Assessment Framework and the Queensland Government's Business Case Development Framework.

ILM supports the development of the strongest case for an individual investment. It identifies the major problems that the investment will be required to address, the benefits it will need to deliver and the strategic initiatives and solutions that will best respond to the problems and opportunities identified.
This section, and the associated ILM process, have been developed with reference to the methodology outlined in Section 2, Methodology.

### 4.2.1 Investment Logic Mapping

An ILM is a methodical way of achieving mutual confirmation of the critical drivers for a project amongst key stakeholders, and seeks to confirm:

- The problems and opportunities that the Project will respond to
- The expected benefits from addressing the problems or realising the opportunities
- The potential strategic responses and business changes to deliver the benefits sought
- The initiatives or solution options that could be progressed in response to the problems and opportunities identified.

Owing to the short delivery timeframes for the project, the PwC project team conducted an internal ILM workshop, which was reviewed, and validated by key stakeholders during consultation.

Figure 9 presents the ILM that was developed by the PwC project team and endorsed by stakeholders.

PROBLEMS / OPPORTUNITIES

There is an increasing geopolitical need to improve capability and onshore production of food processing and the supply chain infrastructure to support distribution.

The smaller scale of agricultural operations in the NT (compared to other jurisdictions) is limiting investment in associated supply chain and facilitating infrastructure.

The geographic isolation and seasonal factors in the NT limit the competitiveness of the agricultural industry in both exports and the domestic market.

There is an opportunity to leverage planned investments (Middle Arm, Beetaloo, AROWS, Sun Cable, Western Davenport) in the NT to develop agriculture and improve supply chain infrastructure.

BENEFITS

Increased agricultural production in the NT.

Increased jobs.

Increased Foreign Direct Investment (FDI).

Enhanced reputation as a global agricultural supplier.

Increased regional economic resilience.

Increased opportunities for Indigenous Australians.

Improved efficiency in supply chains.

Improved export market access.

Multiplier effects of growth from industrial development in the NT.

STRATEGIC RESPONSES

Reduce the regulatory burden on industry Industry and university collaboration in food manufacturing.

Reforms encouraging flexibility in land tenure and uses.

Implement policy or legislation change to support private sector developments and attract industry to the NT.

Indigenous Economic Development through agribusiness and related industries operating on Aboriginal land.

Encourage Traditional Owners to undertake agribusiness enterprises on their land.

Certainty in natural resource planning and allocation administration and regulation.

OPTIONS

Develop a digital twin of the NT agricultural supply chain to assist with planning.

Investigate potential for multi-use agricultural processing plant.

Investigate volumes of agricultural waste and/or second/third grade product that can be used as inputs to shelf stable product manufacturing.

Facilitate aggregation of agricultural products for export through attraction of freight forwarders to the NT.

Re-prioritise national road infrastructure upgrades to promote agribusiness development in the NT.

Conduct audit of stakeholder engagement to determine smaller, idle infrastructure that could be repurposed

Facilitate and accelerate “development ready’ land for agricultural precincts.

Figure 9. Final ILM.

## 4.3 Service Need

The opportunities and problems identified in the ILM are discussed in detail in the following sections.

### 4.3.1 Problem One

The smaller scale of agricultural operations in the NT (compared to other jurisdictions) is limiting investment in associated supply chain and facilitating infrastructure.

**A Smaller Market**

The NT covers approximately 1.3 million km$^2$ of land, with agricultural land occupying approximately 46% of the Territory. Of the total agricultural land in Australia, the NT accounts for approximately 14%; however, less than 1% of Australia's agricultural businesses are located in the NT. Figure 10 demonstrates the proportion of agricultural land across Australia compared to the proportion of agricultural businesses in each state and territory.

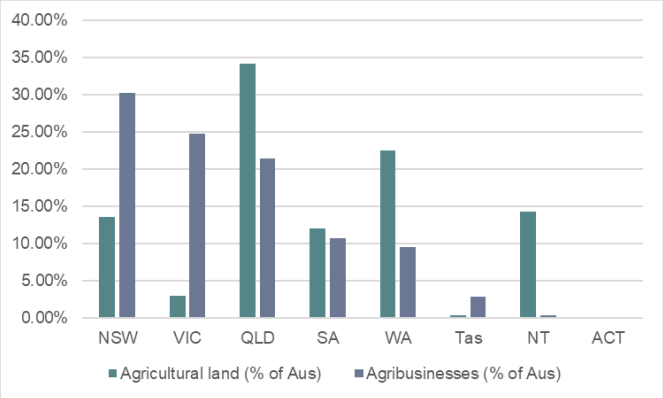



Figure 10. Location of agricultural land in Australia vs location of agribusiness[4]

The coastal marine area of the NT (to 3 nautical miles seaward of the baseline) covers approximately 72,000km2 of water and 17.5% of the coastal marine state in Australia. A significant proportion (over 80%) of the coastline is Aboriginal land, with further land grants being considered, which could result in 92% of all coastline being Aboriginal-owned.

There is potential to continue to grow the sector in the NT from its current level, however, achieving scale is a significant challenge constraining growth and industry diversification. This is primarily due to the quality of supply chain infrastructure and a lack of facilitating infrastructure, including processing, manufacturing, and utilities.

The NT also has unique land tenure, with nearly all land outside of urban centres held as Aboriginal land pursuant to the Aboriginal Land Rights (NT) Act 1976 (Cth) or held under pastoral lease pursuant to the Pastoral Lands Act 1992 (NT). Whilst both forms of land tenure can potentially co-exist with more intensive farming practices, significant changes to land use require specific authorisation and approvals.

**Supply Chain**

Roads form a major component of the freight task for the NT and connecting industries with economic activity. The road network across Northern Australia and within the NT is extensive and is characterised by long isolated roads with low daily traffic volumes. Significant proportions of Northern Australia's agricultural markets are not serviced by any other freight options other than roads and in some industries, there is significant over-reliance on road networks, leaving the industry exposed to the high costs of moving goods.[5]

The quality of road links across Northern Australia is varied, with large portions of the roads connecting the NT to Western Australia and western Queensland currently unsealed. Inadequate road access is a significant impediment for investment in, and development of, agricultural infrastructure and other key supply chains in regional areas across the Territory. For example, cattle in the NT travel on average, just under 1,000km from stations to markets, and sometimes as much as 2,500km to abattoirs and processing facilities on the east coast.[6] Regional roads are not developed to a standard suitable for the high volume of heavy vehicles required by an abattoir, creating challenges for the industry in increasing beef processing locally. The costs associated with the upgrade of critical roads -

[4] ABS (2021). Value of Agricultural Commodities Produced, Australia. Accessed at https://www.abs.gov.au/statistics/industry/agriculture/value-agricultural-commodities-produced-australia/latest-release#data-download
[5] CRCNA (2020). Reframing Smart Supply Chains in Northern Australia. Accessed at https://crcna.com.au/resources/publications/reframing-smart-supply-chains-northern-australia
[6] Ibid

including the necessity for many roads in the NT's climate to be consistently and regularly repaired - and the rate at which they are upgraded is prohibiting the growth and expansion of industries. Climate conditions also challenge road reliability, especially during floods and annual monsoons. Limited road options are most often manifested in inadequate quality and reliability. They are the main source of uncertainty for the delivery of many key commodities commonly resulting in excessive freight costs, as well as related impacts in the form of road deterioration, and time delays getting products to market.

In terms of air freight, Northern Australian airports have limited refrigerated container capability, limiting the export of high-quality agricultural products from the region. Substantial volumes of seafood, fruit and vegetables are trucked to Brisbane, Adelaide, and Melbourne, with subsequent airfreighting to Southeast Asia and domestic use. A combination of factors has led to this, including a substantial domestic market in the southern capitals, a road freight sector with refrigerated capability, low international air freight rates from airports in the south, and availability of wide-body passenger aircraft which are not available in Northern Australia[7]. Only recently, in 2020, an export facility opened at Darwin Airport which provides freight handling and cold storage services, with a similar facility also under construction at Cairns Airport in North Queensland.

**Processing and Manufacturing Infrastructure**

Industry integration is another barrier to scale in the NT, with many components of the sector working in isolation from each other, often in the same market and across supply chains. This leads to duplication of efforts and resources and limits the opportunity for a collaborative environment with resultant benefits of greater efficiency and productivity. To address processing constraints driven by the small scale of agribusiness within the NT, common user infrastructure that can be utilised by different sectors of the agricultural industry is required.

Significant potential exists to establish new broadacre crops, underpinning the viability of associated infrastructure and processing facilities. Soya bean and chia, dragon fruit, poppies, rice, onions, sorghum, and cotton are examples of new products being trialled or growing commercially in Northern Australia to meet growing market opportunities[8]. Expanding niche, high-value products and large-scale essential agricultural commodities will enable the NT to achieve scale while also capitalising on the demand for premium products - particularly in Asia, where economic growth is driving changes to the patterns and nature of food consumption. These broadacre crops may also have other beneficial uses that complement existing industries within the NT, such as soybeans which can be used in cattle feedlots or for biomass.

To align with the long-term vision for the Territory, the agricultural sector (and associated downstream sectors) must combine resources and invest in a collaborative model at a sufficiently large scale. Agribusiness and supply chains could collaborate through clusters to optimise their collective use of infrastructure such as manufacturing equipment and machinery, transport, warehousing, and other inputs. Increasing scale through better industry integration and collaboration will assist the agricultural industry, and downstream manufacturers in the NT increase export opportunities internationally through more competitive costs[9].

[7]Ibid

[8]Austrade (2015). Northern Australia: Emerging Opportunities in an Advanced Economy. Accessed at https://www.austrade.gov.au/international/invest/opportunities/northern-australia

[9]Australia Government, Department of Industry, Science, Energy and Resources. Food and Beverage National Manufacturing Priority road map. Accessed at https://www.industry.gov.au/data-and-publications/food-and-beverage-national-manufacturing-priority-road-map/why-food-and-beverage-manufacturing

## Case Study – Impediments to Scale in the Beef Processing Industry

The most common agricultural land use in the NT is grazing on native vegetation, which accounts for 45% of the land used for agriculture[10]. The Territory is a reputable producer and supplier of cattle to other states in Australia and international markets, earning a gross value of production of $823 million. The Darwin Port is one of the busiest live cattle export ports in the world and is ideally located to capitalise on growing demand for red meat in the Asian region. Over the last five years, an average of 352,000 head of cattle per year were exported from Darwin Port, with the majority to South-East Asia, and a further 369,200 head sold into domestic markets each year[11]. The significance of the live cattle export trade to the NT cannot be understated with 38% of Australia's live export cattle exiting via the port of Darwin[12]. Western Australian and Queensland ports also contribute significantly to the trade volumes at 25% and 21%, respectively[13].

While the live cattle industry has experienced success in the north, a critical challenge to the expansion of beef exports from the NT is the under development of key elements in the beef value chain, particularly a lack of abattoirs. In terms of beef processing, 46% of beef is processed in Queensland[14]. In contrast, the minimal processing activity in the NT means that data is not collected. The Batchelor abattoir is located approximately 100km south of Darwin. It is the only major abattoir in the NT after the Australian Agricultural Company (AACo) suspended operations at its abattoir outside of Darwin in 2018. Limited access to processing facilities in the NT, combined with long road transport distances to domestic markets and facilities, underpin the live cattle trade as a crucial element of the NT industry. The lack of investment in processing infrastructure and facilities in the NT is widening the gap in scale between the states and territories.

**Service Requirement:** There is a need to invest in supply chain and facilitating infrastructure to achieve scale and grow the agricultural industry in the NT.


[10] ABS (2021). Value of Agricultural Commodities Produced, Australia. Accessed at https://www.abs.gov.au/statistics/industry/agriculture/value-agricultural-commodities-produced-australia/latest-release#data-download
[11] NT Government, Department of Industry, Tourism and Trade (2022). Pastoral market update. Accessed at https://industry.nt.gov.au/publications/primary-industry-publications/newsletters/pastoral-market-update
[12] Mecardo (2018). Value analysis of the Australian live cattle trade – key highlights. Accessed at https://www.mla.com.au/contentassets/3ff3482e3d044e8ea98a960d7fc6b80c/w.liv.0196_final_report.pdf
[13] Ibid
[14] Ibid

### 4.3.2 Problem Two

The geographic isolation and seasonal factors in the NT limit the competitiveness of the agricultural industry in both exports and the domestic market.

The geographic isolation and highly variable seasons greatly increase the risk of investing in agriculture in the NT and Northern Australia more broadly. Climactic events can be severe and long lasting and can impede access to the supply chains that support the industry.

**Geographic Isolation**

Distance From Labour

The Territory's relatively small population is spread across more than 1.3 million km$^2$, with a large proportion of people living in remote and regional areas[15]. The NT has a low population density compared to southern jurisdictions, with only 0.18 people per square kilometre in the NT[16] and even lower (0.07 persons[17]) in regional agricultural regions. The population density of similar agricultural regions include:

- Regional Queensland – 1.52 persons per square km[18]
- Regional NSW – 3.55 persons per square km[19]
- Regional Victoria – 7.07 persons per square km[20].

The majority of unskilled labour is provided by temporary migrants mostly on Working Holiday Visas and Seasonal Worker Program Visas. As a result of the industry's seasonal nature, coupled with the high number of temporary visa holders, staff turnover can be high, impacting meaningful development of the workforce and the industry. This inconsistency can also cause disruption in employment in the industries, forcing both the skilled and unskilled workforce to migrate out of the NT in search of opportunities in competitive industries, such as mining[21].

The COVID-19 pandemic and the restrictions imposed on movement have exacerbated these challenges and resulted in a reduction in seasonal labour usually provided by foreign workers and had significant impacts on agricultural production, processing, and supply chains. While recent domestic and international border re-openings will provide some relief, these restrictions' long-term effects on businesses are unknown.

Even if unskilled labour is accessible, it can be difficult for businesses to recruit skilled labour in regional areas, relative to other areas in southern jurisdictions, where the population density and pool of skilled labour is higher. Attracting training providers is also difficult, meaning local options for training and upskilling staff are limited. Improving the size and development of the workforce is crucial for the sector's growth. Currently, Bachelor and Master's qualifications in agribusiness and agricultural sciences are not offered in the NT, resulting in a 'brain drain' to other jurisdictions where these degrees can be undertaken in proximity to agricultural regions. In addition, returning skilled labour to the NT is challenging, as the variables associated with agricultural production in the NT can differ significantly from southern jurisdictions. Climate and soil conditions are different, overlaid on top of a unique land tenure system, increasing the gap in skills required for expansion and development of the north. Innovation and technology in the agriculture sector have also created new job roles, which require additional skill sets that are difficult to access in the NT. Current Vocational Education and Training (VET) courses in agriculture are not commensurate with the rate of technological acceleration in the sector[22].

A reliable and experienced workforce with the right skills that reflect the agriculture industry's current and future needs is required. Specific training, provided through agribusiness-specific qualifications in the NT, will equip the workforce to manage the industry's major challenges and ensure a more resilient industry[23].

[15] NT Government, Department of Infrastructure, Planning and Logistics (2020). Territory Wide Logistics Plan. Accessed at https://dipl.nt.gov.au/__data/assets/pdf_file/0012/887790/TerritoryWideLogistics_MPlan_WEB-1.pdf
[16] .idcommunity (2020). Northern Territory: About the profile areas. Accessed at https://profile.id.com.au/australia/about?WebID=160
[17] .idcommunity (2020). Regional NT: About the profile areas. Accessed at https://profile.id.com.au/australia/about?WebID=240
[18] .idcommunity (2020). Regional QLD: About the profile areas. Accessed at https://profile.id.com.au/australia/about?WebID=200
[19] .idcommunity (2020). Regional NSW: About the profile areas. Accessed at https://profile.id.com.au/australia/about?WebID=180
[20] .idcommunity (2020). Regional VIC: About the profile areas. Accessed at https://profile.id.com.au/australia/about?WebID=190
[21] ISACNT (2020). NT Industries – Agriculture. Accessed at https://www.isacnt.org.au/nt-industries/agriculture
[22] Ibid
[23] Ibid

Distance From Infrastructure

While the NT holds a comparative advantage in its proximity to Asia, agricultural industries in the Territory are characterised by long distances between production, processing, and markets, with transport distances often upwards of 2,500km to 4,000km[24]. Figure 11 displays the locations of a range of agriculture production areas across the NT.

The long distances from major domestic markets make supplying domestically a challenge, as the potential revenue that can be generated is significantly affected by freight distances to export ports and domestic markets. Recently, freight supply chains have had to adapt to changing trade patterns owing to the effects of the COVID-19 pandemic. Bulk freight options have declined, and coupled with a rebound in oil prices, have led to increased prices and delays in shipping. Air freight prices also increased with the reduction in international and domestic flights.

Remote agricultural producers face growth challenges and have a greater need for investment in enabling infrastructure and supply chains. However, the tyranny of distance makes it costly for the public and private sector to provide enabling infrastructure in terms of both capital cost and per capita costs. This hinders opportunities for growth, not only within agriculture but more broadly in the NT[26]. The major townships within the NT would also benefit from improved transport infrastructure through improved travel times and increased safety.

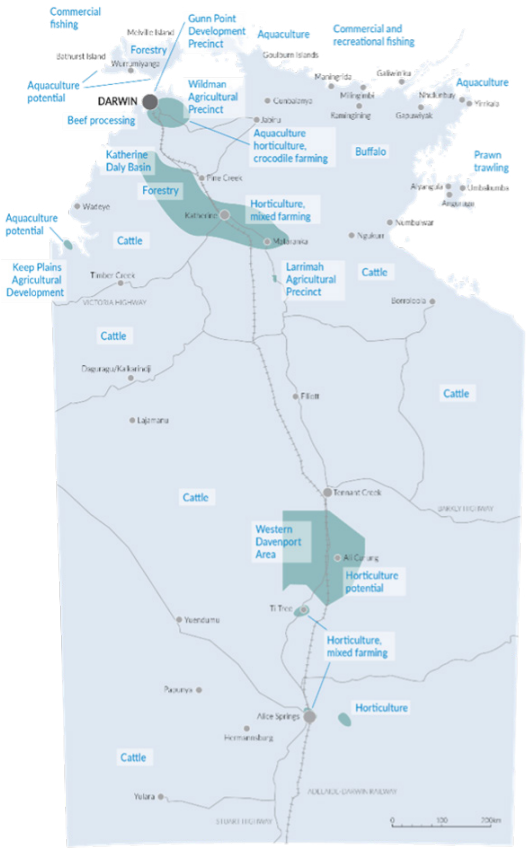



Figure 11. Agricultural production in the NT[25].

## Case Study – The Need to Invest in Processing Infrastructure in the NT[27]

In 2019, cotton growing trials in the NT resulted in over 4,500 bales of cotton harvested by five growers across the NT and Kimberley regions. This involved sending the unprocessed cotton over 3,000 km to be processed (ginned) and exported from Queensland. The trials found that NT growers, who are utilising cost-effective trucking backload rates, are charged an extra 34% to their overall costs to gin and export their cotton through Queensland. Despite being NT-grown cotton, if ginned in Queensland, the cotton seed cannot be transported back to the NT for the benefit of the local beef and livestock industry, due to uneconomical transport costs and biosecurity constraints. A cotton gin is currently being constructed in Katherine. It has the potential to create significant cost savings for Northern cotton growers and added-value benefits for the local beef industry.

[24] CRCNA (2020). Reframing Smart Supply Chains in Northern Australia. Accessed at https://crcna.com.au/resources/publications/reframing-smart-supply-chains-northern-australia

[25] Northern Territory Government, Department of Treasury and Finance. Northern NT Agriculture, Forestry and Fishing. Accessed at https://nteconomy.nt.gov.au/industry-analysis/agriculture,-foresty-and-fishing/maps?SQ_VARIATION_537823=0

[26] ACIL Allen Consulting for AgriFutures Australia (2021). The intersection of agriculture and regional development: A framework and case studies. Accessed at https://www.agrifutures.com.au/wp-content/uploads/2021/07/21-069.pdf

[27] PwC (2019). Business Case for the construction of a cotton gin in the Northern Territory. Available at https://az659834.vo.msecnd.net/eventsairaueprod/production-aapevents-public/60321b63d7bd4778a95579680cac25f2

Seasonality a Barrier to Investment in Agricultural and Supply Chains

Weather within seasons in the NT is volatile, and production challenges faced in the rest of Australia are magnified in the tropics due to the seasonal conditions. Natural disasters such as droughts, cyclones, floods, bushfires, and pests can destroy agricultural assets and infrastructure and cause livestock and crop production losses. While the natural disasters may not last for an extended period (with the exception of drought and monsoonal weather), the preparation for and effect of the events can render agricultural operations unable to generate any production and revenue for a period of time or season.

Climate events also disrupt supply chains as key freight corridors and transport, and logistics infrastructure can be impacted. The Territory's national highway network is fully sealed, however, there is only one sealed link to Queensland, Western Australia and South Australia and no alternate route should one of these networks close. Additionally, 75% of the road network is unsealed and vulnerable to closure and restrictions in wet weather. Some Top End communities may not have road access for up to six months each year due to flooding and road damage in the wet season.[28] This impacts on accessibility and productivity of the region, as it often cuts supply chains into agricultural regions and communities.

These disruptions in output and supply chain reliability caused by seasonal factors mean meeting export market demand is a challenge, as it is difficult for the region to ensure consistent supply in many products[29]. The effect on producers can be further exacerbated by the seasonal variation between industries, such as mangoes, where disruptions over a very short season may have detrimental impacts on annual output. These climate impacts, coupled with the high cost of insurance against such seasonal events, make it cost prohibitive for industry to invest in agriculture and facilitating supply chain infrastructure in the Territory.

**Service Requirement: There is a need to invest in quality, reliable supply chain infrastructure to overcome barriers to growth caused by geographic isolation and climactic factors.**

[28] NT Government, Department of Infrastructure, Planning and Logistics (2020). Territory Wide Logistics Plan. Accessed at https://dipl.nt.gov.au/__data/assets/pdf_file/0012/887790/TerritoryWideLogistics_MPlan_WEB-1.pdf

[29] ACIL Allen Consulting for AgriFutures Australia (2021). The intersection of agriculture and regional development: A framework and case studies. Accessed at https://www.agrifutures.com.au/wp-content/uploads/2021/07/21-069.pdf

### 4.3.3 Opportunity One

There is an opportunity to leverage planned investments in the NT to develop agriculture and improve supply chain infrastructure

As discussed in Section 4.3.1, a significant challenge facing the expansion of the agricultural industry in the NT is the lack of scale to attract investment. To address this, collaboration among sectors, producers and exporters is required. Cross-supply chain coordination and collaboration between like-minded producers to consolidate volumes for expansion (including export) will help the industry to deliver on growth objectives.

Consolidating and leveraging demand across sectors will attract investment in supply chain infrastructure, such as shipping lines or airlines. However, there is opportunity to leverage activity and demand in other sectors in the NT. Various related industries across the NT have synergies with agriculture, such as food (and fibre) manufacturing, tourism, resources and energy, education, and healthcare[30]. Several major infrastructure projects under development in the NT present opportunities for collaboration in supply chain infrastructure investment. These are explained in the following sections.

Adelaide River Off-Stream Water Storage (AROWS) Project

The NT Government recently finalised a Detailed Business Case to investigate the opportunity to develop a new water source in the greater Darwin region. AROWS is a proposed new reservoir located west of the Adelaide River. The area would store water harvested from the Adelaide River during the flows in the wet season. The project also involves a return to service of Manton Dam. Manton Dam has a potential yield of approximately 7,300 ML per annum and is currently in care and maintenance and used for recreational purposes only.
The provision of additional water afforded by the AROWS Project is estimated to be able to unlock approximately 2,000 ha of greenfield agricultural development. It is also expected that it will support the growth of existing agricultural and horticulture properties and producers, which are currently constrained due to oversubscribed groundwater resources and lack of reliable water. The AROWS Project is expected to increase the agricultural and horticultural crop output of higher value crops, resulting in increased profits for local producers. The potential for increased returns will drive investment in agricultural supply chains to support the increased output.

Agricultural Precincts

The Western Davenport Water Allocation Plan[31] envisages the potential development of between 8,000 to 10,000 ha of irrigated agricultural land over the next 10 to 15 years. This development, valued at approximately $300 million, will likely lead to a significant increase in the region's agricultural production, forecast to be between 150,000 and 200,000 tonnes across a range of horticulture and broad acre crops. Furthermore, with this development and subsequent expansion of agricultural land and production, it is envisaged that 2,000 to 3,000 people will likely be employed.

To enable, support and complement the development of potential production areas, several plant-based agricultural and horticultural precinct developments have been identified. This includes Western Davenport, Wildman River, Larrimah,

[30] ACIL Allen Consulting for AgriFutures Australia (2021). The intersection of agriculture and regional development: A framework and case studies. Accessed at https://www.agrifutures.com.au/wp-content/uploads/2021/07/21-069.pdf
[31] Northern Territory Government, Department of Environment, Parks, and Water Security (2021). Western Davenport Water Allocation Plan. Accessed at https://depws.nt.gov.au/water/water-management/water-allocation-plans/western-davenport-water-allocation-plan

and the Keep, all of which were identified by the Northern Territory Land Corporation. These are highly prospective agricultural and horticultural land developments, covering an area greater than 710,000 ha. Similar to the opportunities driven by the AROWS Project, an increase in agricultural output and export potential will drive investment in facilitating the NT's supply chain and processing infrastructure. Notably, the NT Government has attempted to de-risk investments in these precincts by making them 'investment-ready' with respect to land tenure, environmental approvals, and water allocations.

Cotton Gin

Over the last several years, cotton in the Northern Territory has ignited significant investment interest locally, interstate and internationally. Recent successful cotton trials resulted in grower expandability with a forecast of reaching around 400,000 bales over the next decade[32] . Australian cotton produces close to three million bales, and with 90% exported, it has a global reputation as an industry leader. There is an increased demand for cotton production and processing in the NT. The proximity to export markets compared to southern ports increased consumer demand for natural fibres, climatic conditions and land, water and environmental sustainability will continue to provide the diversification of the agricultural industry to expand and capitalise on the economic prosperity that cotton may provide. A cotton gin is currently under construction in Katherine and is expected to commence operations in July 2022.

The development of the gin will attract further investment in the cotton industry and associated supply chain infrastructure.

Middle Arm Sustainable Development Precinct

The Middle Arm Sustainable Development Precinct aims to be a globally competitive, sustainable development precinct for manufacturing low emission petrochemicals, renewable hydrogen, carbon capture storage and minerals processing. The NT Government is working with industry and the Australian Government to accelerate development of the Precinct, which is supported by proven offshore gas reserves, critical minerals reserves, access to renewable energy sources and proximity to international markets.

Once operational, the Precinct is likely to drive an increase in Darwin exports through Darwin Port or dedicated port facilities at Middle Arm. The increase in import and export activity will encourage development of supply chains and provide opportunities for an increase in agricultural exports out of the region, as large-scale industrial development will drive increased freight linkages (air, sea, and rail) with key markets internationally and interstate. The Precinct will also drive population growth and economic development of the NT through increased skilled employment opportunities, having the potential to help scale-up the size of the local domestic market for some products.

[32] PwC (2019). Business Case for the Construction of a Cotton Gin in the Northern Territory. Available at https://az659834.vo.msecnd.net/eventsairaueprod/production-aapevents-public/60321b63d7bd4778a95579680cac25f2

Beetaloo Sub-Basin Exploration

The Beetaloo Sub-basin is approximately 500km south-east of Darwin in the NT. It lies between Katherine, 100 km to the north, and Tennant Creek, 250 km to the south. The Beetaloo Sub-basin has the potential to be a world-class gas province. Estimates of the gas resource in the region vary but the results from preliminary exploration are encouraging. The NT Government estimates that there are over 200,000 petajoules (PJ) of gas in place in the region, as well as the presence of liquids-rich gas and potential oil resources[33].

Development of the resource could create thousands of jobs and drive significant economic growth in the NT, spurring significant downstream manufacturing opportunities. Increased import and export opportunities throughout the exploration and potential extraction at the Sub-basin will drive investment in remote supply chain infrastructure across the NT. This will provide benefits to the agricultural industry through increased investment in the regions and the potential for secure long-term gas supply - often a key component of value-add manufacturing or processing facilities.

Australia-Asia PowerLink

Sun Cable's Australia-Asia PowerLink (AAPowerLink) is a $30 billion energy project that is set to be one of the world's largest renewable energy infrastructure projects, with a 5,000 km transmission system to supply Darwin and Singapore with approximately 2.5 GW of zero-carbon, reliable and competitively priced dispatchable renewable electricity[34].

The project will increase economic activity in the NT, presenting opportunities to develop a renewable energy hub and creating thousands of jobs. Increased economic activity and the associated population impacts will provide opportunities for the agricultural industry to attract skilled and unskilled labour as well as drive infrastructure investment in Darwin and across the NT. The scale and size of the project will attract investment in infrastructure across the NT, specifically in the Barkly region where the solar array is to be located.

**Service Requirement: The agricultural industry must map proposed investments to align and leverage planned investments in other industries across the NT to capitalise on the investment in supply chains and infrastructure that agricultural producers may utilise.**

[33] Australian Government, Department of Industry, Science, Energy and Resources. Unlocking the Beetaloo: The Beetaloo Strategic Basin Plan. Accessed at https://www.industry.gov.au/data-and-publications/unlocking-the-beetaloo-the-beetaloo-strategic-basin-plan/the-beetaloo-sub-basin/beetaloo-gas-resources

[34] PwC (2021). Sun Cable's Australia-Asia PowerLink, Accessed at https://www.pwc.com.au/important-problems/integrated-infrastructure-building-australia/project-experience-sun-cable-australia-asia-power-link.html

### 4.3.4 Opportunity Two

There is increasing geopolitical need to improve capability and onshore production of food processing and the supply chain infrastructure to support distribution.

Australia has a strong reputation for producing high quality and safe food, driving domestic and international demand for Australian products. Agriculture in the NT has benefited significantly from its historical focus on exports of raw and minimally transformed products, with the agriculture sector as well as food and beverage manufacturing being downstream and upstream to various industries in global value chains.

Australia's historical focus on these raw products has likely created more value for the Australian economy than would have been available from a focus on more processed products[35]. However, there is an emerging opportunity for the food and beverage manufacturing sector to better utilise Northern Australian ingredients and agricultural inputs to manufacture higher value-add products onshore that meet consumer and market demand, domestically and internationally, in light of the increased vulnerability of international supply-chains that has become apparent in recent years[36].

Australia's Critical Infrastructure Resilience Strategy[37] identifies the food supply chain and the networks that support it as critical infrastructure, as disruption of links in the chain may impact social and economic wellbeing[38]. Compounding food supply concerns is the advent of the COVID-19 pandemic, where supermarket shelves are routinely sparse as people worry about continuity of supplies. These events have resulted in increasing attention on Australia's collective vulnerability to rising food disadvantage.

While Australia's reputation for quality agricultural goods has always provided a steady platform for export, the reliance on international trade (exports as well as imports used as inputs) also exposes Australian agriculture to geopolitical threats. The agriculture value chain is affected by a range of geopolitical issues that affect both the physical flows of goods through freight corridors and non-physical market access protocols. This is particularly the case in the Asian region, where Australian agricultural trade growth is concentrated and where geopolitics will affect both the strategic components of trade and the physical flows of agricultural produce through export supply chains via sea and air[39].

There is an opportunity for agribusiness and downstream manufacturing to unlock greater value from resources in the NT by creating new offerings that meet the emerging needs of global customers. Early signs of this shift have been identified by recent Austrade analysis of the three years to 2016, which showed that for the first time in Australia's history, value-added foods have accounted for the majority (60%) of food export growth[40]. Agriculture in the NT can play a key role in developing new value-adding post-farmgate industries utilising local and regional expertise and knowledge, as well as the Territory's product quality and energy advantage. The Territory's proximity to Asian markets provides another advantage, where recent global impacts of COVID-19 have resulted in congestion at major ports and a lack of shipping containers. The geographic location of the NT means manufactured foods in the region may have a shorter supply route than southern jurisdictions. Potential markets for high-quality shelf stable food produced in the NT include hospitals and healthcare, Defence rations, charities, and emergency stock. This will also lead to broader economic impacts such as increasing employment

[35] Australian Government, Department of Industry, Science, Energy and Resources. Food and Beverage National Manufacturing Priority road map. Accessed at https://www.industry.gov.au/data-and-publications/food-and-beverage-national-manufacturing-priority-road-map/why-food-and-beverage-manufacturing

[36] Ibid

[37] Australian Government (2015). Critical Infrastructure Resilience Strategy: Plan. Accessed at https://www.cisc.gov.au/help-and-support-subsite/Files/critical_infrastructure_resilience_strategy_plan.pdf

[38] Ibid

[39] KPMG (2020). Australian Agriculture in Geopolitical Maelstrom. Accessed at https://assets.kpmg/content/dam/kpmg/au/pdf/2020/australian-agriculture-in-a-geopolitical-maelstrom.pdf

[40] CSIRO (2017). Food and Agribusiness: A Roadmap for unlocking value-adding growth opportunities for Australia. Accessed at https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/csiro-futures/futures-reports/food-and-agribusiness-roadmap

and GSP[41]. Development onshore of production and manufacturing industries is becoming increasingly cost competitive as labour costs associated with large industrial development in previous decades may not be replicated in the future as digital transformation and automation increasingly dominate the manufacturing processes.

**Service Requirement: There is a need to invest in onshore agricultural processing and manufacturing to capitalise on market opportunity and ensure Australia's food supply chain's resilience.**

## 4.4 Targeted Benefits

By addressing the problems and optimising the potential opportunities identified in Section 1.3, the development of the Project is expected to generate a range of benefits. This section documents the targeted benefits that could be realised in responding to the Project's service need. The benefits have been identified in collaboration with key stakeholders and articulated in the ILM presented in Figure 9.

The key benefits that are expected to be generated by the Project are as follows:

- Increased agricultural production in the NT
- Increased jobs
- Increased Foreign Direct Investment (FDI)
- Enhanced reputation as a global agricultural supplier
- Increased regional economic resilience
- Increased opportunities for Indigenous Australians
- Improved efficiency in supply chains
- Improved export market access
- Multiplier effects of growth from manufacturing development in the NT.
- The benefits outlined above form a crucial input and starting point for developing and prioritising options.

## 4.5 Strategic Responses

Strategic responses are high level interventions that could assist in addressing the problems and opportunities identified, and the realisation of benefits. The strategic responses discussed in this section were identified in collaboration with key stakeholders during the ILM process and reflect key stakeholder perspectives.

The strategic responses aim to change behaviours or assist with activating strategies to influence causes or effects of the problem and opportunity statements. Business changes, on the other hand, seek to enable changes that could facilitate strategic responses. Table 4 outlines the strategic response and business changes identified for this project and the respective benefits they could achieve.

## 4.6 Summary

This section has provided an overview of the strategic need for investment in agricultural supply chains in the NT. The service requirements that will enable the NT to capitalise on the opportunities and overcome challenges have been clearly defined and include:

- There is a need to invest in supply chain and facilitating infrastructure to achieve scale and grow the agricultural industry in the NT.
- There is a need to invest in quality, reliable supply chain infrastructure to overcome barriers to growth caused by geographic isolation and climatic factors.
- The agricultural industry must map proposed investments to align and leverage planned investments in other industries across the NT to capitalise on the investment in supply chains and infrastructure that agricultural producers may utilise.
- There is a need to invest in onshore agricultural processing and manufacturing to capitalise on market opportunity and ensure resilience of the food supply chain in Australia.

[40] ACIL Allen Consulting for AgriFutures Australia (2021). The intersection of agriculture and regional development: A framework and case studies. Accessed at https://www.agrifutures.com.au/wp-content/uploads/2021/07/21-069.pdf

Table 4 Strategic Responses

| STRATEGIC RESPONSE | DESCRIPTION | ACHIEVED BENEFIT(S) |
|---|---|---|
| Reduce the regulatory burden on industry | This may include simplified processes and streamlining timeframes for water licences and for assessment of environmental approvals. | • ncreased Foreign Direct Investment (FDI)<br>• Enhanced reputation as a global agricultural supplier<br>• Improved efficiency in supply chains<br>• Improved export market access |
| Industry and university collaboration in food manufacturing | This would include further development of research and development opportunities with Charles Darwin University. | • Increased agricultural production in the NT<br>• Increased jobs |
| Reforms encouraging flexibility in land tenure and uses | Non-pastoral use permits, allowing the diversification of over 40% of the NT land mass, must be flexible and approvals streamlined to encourage development. There may also be a role to play for Government in proactively de-risking investment through agreement-making with land councils. | • Increased agricultural production in the NT<br>• Increased jobs<br>• Increased Foreign Direct Investment (FDI)<br>• Increased regional economic resilience<br>• Increased opportunities for Indigenous Australians |
| Implement policy or legislation change to support private sector developments and attract industry to the NT | A wide range of policy and legislative levers could be considered by Government, including reducing taxes / fees / charges affecting agribusinesses. | • Increased agricultural production in the NT<br>• Increased jobs<br>• Increased Foreign Direct Investment (FDI)<br>• Enhanced reputation as a global agricultural supplier |
| Indigenous Economic Development through agribusiness and related industries operating on Aboriginal land | Aboriginal freehold land comprises most of the NT landmass and coastline. Governments must do more to assist Traditional Owners in developing and utilising their natural assets. | • Increased jobs<br>• Increased regional economic resilience<br>• Increased opportunities for Indigenous Australians |
| Encourage Traditional Owners to undertake agribusiness enterprises on their land | Industry has a role to play in sharing knowledge, experience, and skills with Traditional Owners throughout the NT. | • Increased agricultural production in the NT<br>• Increased jobs<br>• Increased regional economic resilience<br>• Increased opportunities for Indigenous Australians |
| Certainty in natural resource planning and allocation administration and regulation | The NT Government must plan for growth, including planning for industry's water and land use. | • Increased agricultural production in the NT<br>• Increased Foreign Direct Investment (FDI) |

# 5. OPTION IDENTIFICATION

## 5.1 Introduction

A range of potential solution options has been generated to address the Project's service needs, considering the potential positive or negative impacts on stakeholders and targeted benefits that could be achieved. These options align with and evolve from the identified strategic responses. This section includes:

- Approach
- Options identification
- Options filtering
- Options prioritisation
- Summary.

## 5.2 Approach

In accordance with relevant guidelines, both infrastructure and non-infrastructure solutions have been considered in this section, including:

- Reform – typically non-asset initiatives
- Better use – typically improving service performance
- Improve existing – typically augmentations to existing assets
- New – typically new assets.

Project options can be categorised against a scale of minimal business changes (such as new legislations or policy reforms) to significant business changes (such as refurbishing existing assets or developing new assets). This options assessment process is displayed in Figure 12.

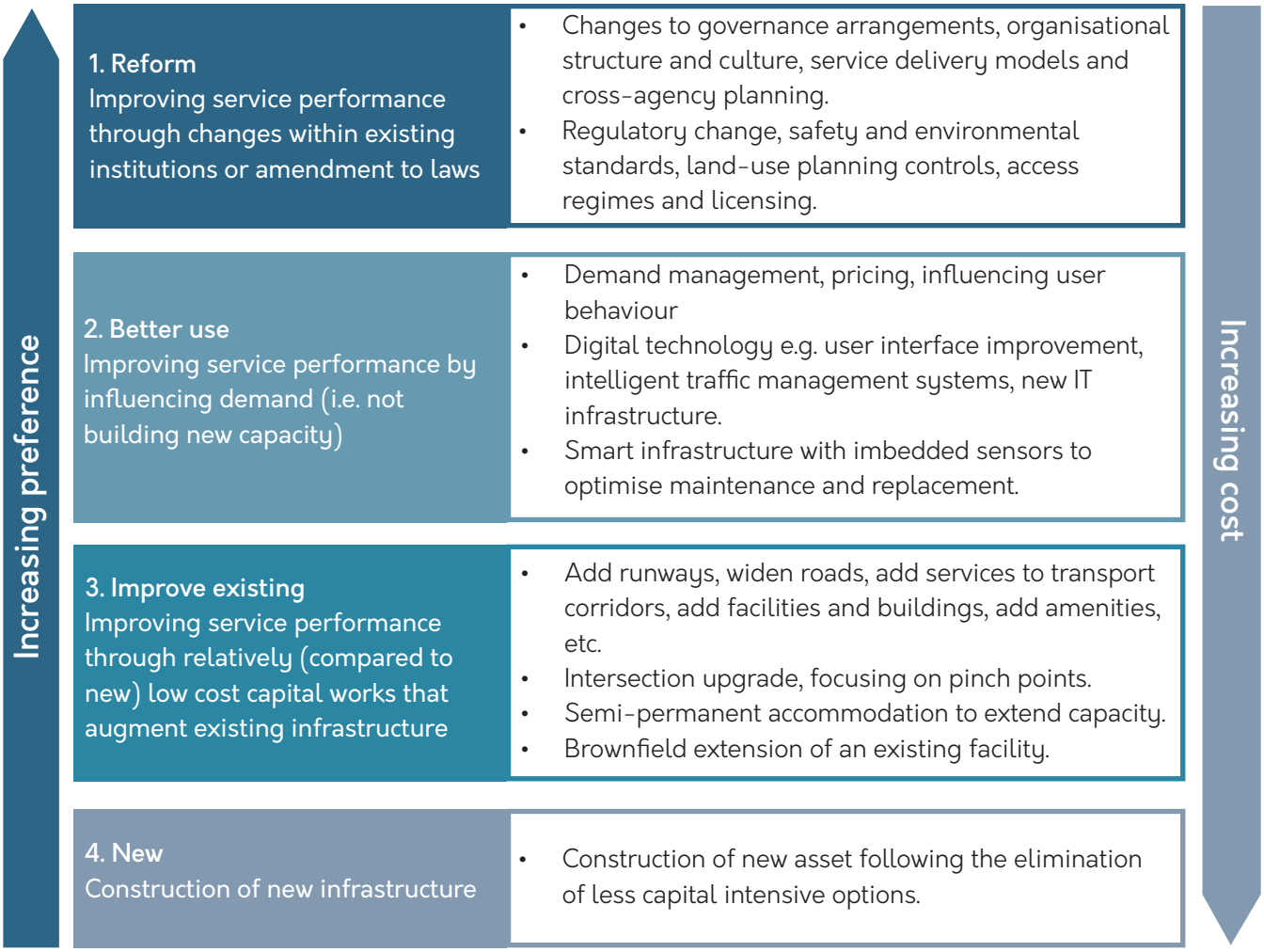



Figure 12. Options assessment process [42]

[42] Queensland Government, Department of State Development, Infrastructure, Local Government and Planning (2016). State Infrastructure Plan Part A: Strategy. Accessed at https://cabinet.qld.gov.au/documents/2016/Feb/SIP/Attachments/Strategy.pdf

Each of the solution options identified in the ILM was considered in terms of its ability to address the Project's service needs. Those options that did not adequately address the Project's service needs were not progressed to the options shortlist.
The options articulated in the following sections have been developed in collaboration with key stakeholders, through stakeholder engagement, and subsequently reviewed and refined through the project's development.

PwC has not specified a party to undertake the options and, depending on the requirements of an option, may be led by NT Farmers, Local, Territory or Federal Government, or the private sector (or a combination thereof).

## 5.3 Options Identification

### 5.3.1 Do Nothing

NT agribusiness sector could choose not to advocate to the Government or the private sector for investment or further investigations to strengthen the NT's agricultural supply chains and infrastructure, allowing any investment to occur organically if possible. While this option's effort and direct capital cost are minimal, doing nothing will fail to meet the Project's service needs identified in Section 4.

In the absence of action, the NT will not be competitive in attracting future investment in the agricultural industry, nor will the Territory be able to capitalise on emerging opportunities for the industry. This will adversely impact the NT and may include a reduction in the agriculture industry's direct contribution to the regional economy, loss of skilled workers from the Territory, reduced economic activity in downstream industries, and the Northern Australian economy more broadly. Any lack or delay in action or investment may ultimately result in the industry further losing market share to other jurisdictions.

### 5.3.2 Reform

Re-prioritise national road infrastructure upgrades to promote agribusiness development in the NT.

Stakeholder engagement identified a critical need to improve road infrastructure across the NT and Northern Australia more broadly to improve supply chain reliability, productivity, and resilience, thereby reducing freight costs and strengthening links to markets. The NT relies heavily on roads to connect agricultural regions to economic activity centres; however, many major roads remain unsealed and/or are inadequate for heavy vehicles. Road upgrades in the NT are complex and fall in the remit of multiple levels of government, often with complex land tenure and environmental overlays.

Industry-specific upgrade programs such as the Northern Australia Beef Roads Program and Mango Industry Roads Upgrades have been effective in improving the efficiency in specific agricultural industries. However, there is a need to consider how upgrades can be broadened to benefit the agricultural industry across all sectors. This option involves a reprioritisation activity that would require significant engagement with government and industry to determine critical road upgrades to benefit the agricultural sector and improve the efficiency of supply chains. It is noteworthy that during this project, both the Federal Government and Federal Opposition made significant commitments to new road funding in the NT. This may provide an opportunity after the forthcoming Federal election to engage in a re-prioritisation discussion.

### 5.3.3 Better Use

Facilitate aggregation of agricultural products for export through attraction of freight forwarders to the NT.

There is an opportunity to investigate whether aggregating a mixture of agricultural products would achieve the required scale to attract freight forwarding companies to expand operations into the NT and subsequently enable export directly out of the Territory.

A large portion of domestic and international investors are interested in investing in Northern Australia due to its proximity to Asian markets, allowing for greater integration into supply chains in Asia. The ability to export produce to these markets is crucial in the investment decision-making process, and without an efficient and affordable route to export markets, a key advantage to investing in Northern Australia is compromised. However, given the lack of scale in agricultural production and the lack of freight forwarding partners in the NT, many products are transported to southern ports to be consolidated before being exported.

This option involves investigating potential incentives, subsidies or partnerships that would attract freight forwarding companies to expand operations into the NT. The investigation should also consider synergies across supply chains and how different products can be aggregated to ensure cost efficiency.

Investigate volumes of agricultural waste and/or second/third grade product that can be used as inputs to shelf-stable product manufacturing

There is an opportunity for agribusiness and downstream manufacturing to unlock greater value from resources in the NT through manufacturing high-quality, shelf-stable foods for domestic and export consumption. Agriculture in the NT can play a key role in developing new value-adding post-farmgate industries utilising local and regional expertise and knowledge, and the Territory's product quality and energy advantage. Potential markets for high-quality shelf-stable food produced in the NT may include hospitals and healthcare, Defence rations, charities, and emergency stock.

To understand the opportunity, a feasibility study should be conducted to determine the volume of second/third grade or waste agricultural product available as inputs and the gaps in local product (e.g., carbohydrate products) required as inputs. The study should determine at what scale of output would a processing facility be commercially viable, considering risk factors such as potential disruptions in supply, transport costs and geopolitical factors that may affect export and distribution. Investigations should gauge market interest and determine if an anchor customer would incentivise or contribute to investment in such a facility. The development of a facility may also encourage investment in agricultural products produced specifically for input into the facility.

### 5.3.4 Improve Existing

Conduct audit or stakeholder engagement to determine smaller, underutilised infrastructure that could be repurposed.

Stakeholder engagement identified that there may be underutilised infrastructure across the NT that could be repurposed into supply chain assets such as warehousing, cold storage facilities and processing facilities. There is an opportunity to undertake a comprehensive audit of infrastructure across the NT that may be repurposed as supply chain infrastructure. This option would require extensive stakeholder engagement with participants not only from agriculture but from a range of industries. The audit may also investigate how to improve sustainability of the industry in the NT, such as efficiency of transport infrastructure (e.g., road vs rail) and potential opportunities to utilise renewable energy and/or resource recovery.

Facilitate and accelerate 'development ready' land for agricultural precincts.

While the NT has a comparative advantage in land and water required for agricultural development, it is often difficult to access owing to complex tenure arrangements, environmental approval requirements and supply chain access. This can be a deterrent to not only investment in the agricultural industry, but also investment in the supply chains that support the industry.

Facilitating 'development ready' land and water for investment in agricultural precincts may incentivise investment and drive scalability. This could include facilitation or assistance navigating environmental approvals, water allocations, land-use permits amendments, Indigenous Land Use Agreements, liaising with Land Councils, base infrastructure and providing connections to utilities and services.

### 5.3.5 New

Investigate the potential for a multi-user agricultural processing plant

Development of a facility that has the capability to process a diverse range of goods is close to agricultural regions and supply chain infrastructure and will benefit the agricultural industry and provide a resilient supply chain asset that is not dependent on seasonal produce.

To understand synergies between existing and future industries, a feasibility study should consider:

- Compatible industries that could utilise a facility
- Common-user infrastructure requirements
- Site selection
- Market appetite.

Establishment of the precinct may act as an anchor for an agricultural precinct and encourage other industry to establish or relocate near the precinct. In recent years, the NT Government commissioned a scoping study for a multi-product seafood processing facility in Darwin that identified potential for such a facility to be considered. The Northern Territory Seafood Council has been leading a body of work across their industry to continue to move the concept forward. Other NT industries could conceivably link into this concept or engage in their own body of work and assessment.

Develop a digital twin or the NT agricultural supply chain to assist with planning

A digital twin is a virtual supply chain replica that consists of hundreds of assets, warehouses,

logistics and inventory positions. Using analytics and artificial intelligence, a digital twin simulates the supply chain's performance, including complexities that drive value loss and risks. It identifies where volatility and uncertainty exist and where optimisation is possible. A digital twin also enables scenario planning to allow companies to make decisions based on business needs, rather than resolving issues as and when they arise[43]. A digital twin will enable companies to investigate net-zero options for their supply chains, an increasingly important consideration for the agricultural industry and its consumers.

A digital twin for supply chains in the NT and across Northern Australia would assist in planning and decision-making regarding supply chain infrastructure investment. It would also be a valuable tool for potential investors in understanding agricultural investment in the context of the NT.

## 5.4 Options Filtering

Each of the options has been assessed in terms of its high-level ability to address the Project's service needs, presented in Table 5.

## 5.5 Summary

This section has described the options identified in the ILM and considered the strategic merit of each option in relation to how it responds to the service needs. While some of the options address the problems and opportunities to different extents, multiple options to attract investment in agricultural supply chains in the NT should be further analysed.

Table 5 Options to Address the Service Needs

| Number | Option | SIP priority | Problem 1: Scale of agriculture in the NT is limiting investment | Problem 2: Geographic isolation and seasonal factors limit competitiveness | Opportunity 1: Leverage planned investments in the NT | Opportunity 2: Improve capability and onshore food processing |
|---|---|---|---|---|---|---|
| 1 | Do nothing | N/A | x | x | x | x |
| 2 | Reprioritise national road infrastructure upgrades | Reform | ✓ | ✓ | x | ✓ |
| 3 | Facilitate aggregation of agricultural products for export through attraction of freight forwarders to the NT | Better use | ✓ | ✓ | x | x |
| 4 | Investigate volumes of agricultural waste and/ or second/third grade product that can be used as inputs to shelf stable product manufacturing | Better use | ✓ | ✓ | x | ✓ |
| 5 | Conduct audit or stakeholder engagement to determine smaller, idle infrastructure that could be repurposed | Improve existing | ✓ | ✓ | ✓ | x |
| 6 | Facilitate and accelerate 'development ready' land for agricultural precincts | Improve existing | ✓ | ✓ | ✓ | ✓ |
| 7 | Investigate the potential for a multi-user agricultural processing plant | New | ✓ | ✓ | x | ✓ |
| 8 | Develop a digital twin or the NT agricultural supply chain to assist with planning | New | ✓ | ✓ | ✓ | x |

# 6. OPTIONS ANALYSIS

## 6.1 Introduction

The purpose of the options analysis process is to leverage key findings to assess a range of project options for the Project, and to rank the identified options for progression to a more detailed analysis. The analysis of options is incremental to the base case of 'do nothing' as outlined in Section 5.3.1. The outcomes from this options analysis inform Section 7, Recommendations. This section includes:

- Approach
- Assessment
- Results and sensitivities
- Summary.

## 6.2 Approach

### 6.2.1 Options Confirmation

As part of the ILM process, several options were developed to respond to the problems and opportunities identified by stakeholders and the project team. The options identified are:

1. Reprioritise national road infrastructure upgrades to promote agribusiness development in the NT
2. Facilitate aggregation of agricultural products for export through the attraction of freight forwarders to the NT
3. Investigate volumes of agricultural waste and/or second/third grade product that can be used as inputs to shelf-stable product manufacturing
4. Conduct audit or stakeholder engagement to determine smaller, underutilised infrastructure that could be repurposed
5. Facilitate and accelerate 'development ready' land for agricultural precincts
6. Investigate the potential for a multi-user agricultural processing plant
7. Develop a digital twin or the NT agricultural supply chain to assist with planning.
8. These options are further defined in Section 5, Options Identification.

### 6.2.2 MCA Approach

Following confirmation of the options by NT Farmers, an MCA was undertaken by the project team to prioritise options that should be progressed for further analysis. Figure 13 provides a high-level overview of the MCA process applied to assess the identified options. The detailed methodology used for the MCA process is outlined in Section 2, Methodology.

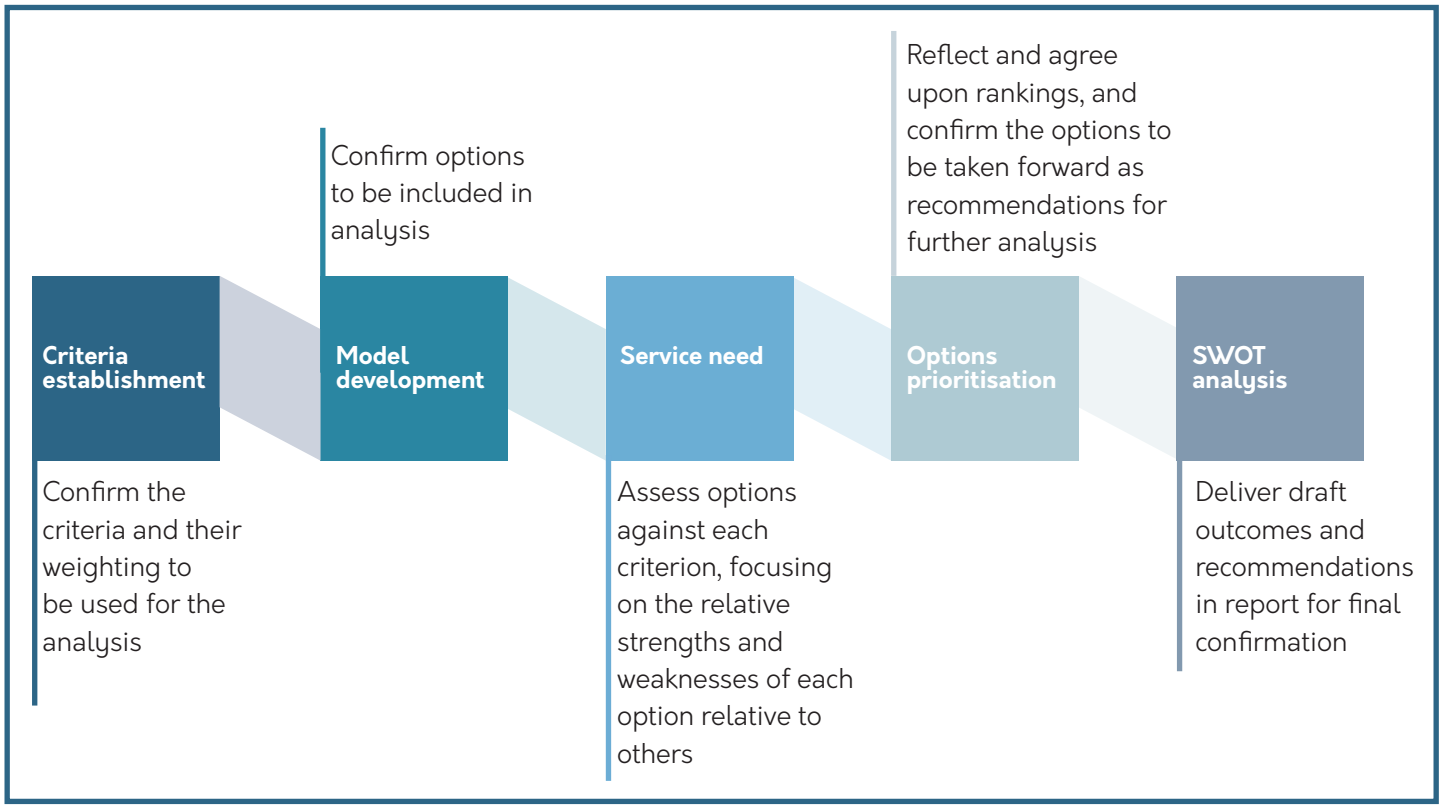



Figure 13. Approach to the MCA process.

Following the internal MCA, a Steering Committee meeting was held on 22 February 2022 to provide an overview of the MCA process, present the outcomes and considerations, and outline the next steps regarding the Project. This meeting provided an opportunity for the Steering Committee to provide feedback regarding the identified options, the MCA process and scoring rationale, and the ranked outcomes prior to finalising the Project.

## 6.3 Assessment

### 6.3.1 Criteria and Weightings

Criteria were developed by drawing upon the service needs for the Project, the stakeholder engagement, and the characteristics of the Project. As discussed in Section 2, Methodology, a pairwise comparison was used to determine the weighting for each criterion. Figure 14 outlines each criterion and the respective weightings.

| CRITERIA | DEFINITIONS | WEIGHTING |
|---|---|---|
| A. Innovation | The degree to which the option supports innovation and future proofing of the NT supply chain | 10% |
| B. Investment | The degree to which the option will attract investment in agricultural industries and supporting infrastructure | 29% |
| C. Efficiency | The degree to which the option will increase efficiency in agricultural supply chains | 38% |
| D. Competitiveness | The degree to which the option will increase the competitiveness of NT agriculture and downstream industries | 19% |
| E. Implementation | The degree to which the option can be implemented/ delivered in the short (2-5 years) to medium (5-10 years) term | 5% |

Figure 14. Criteria and weightings

Criterion C 'efficiency' is the highest weighted criterion at 38%, as this was considered a critical factor for improving the performance and capacity of agricultural supply chains across the NT. The ability of an option to improve the efficiency of supply chains is likely to have a significant effect across the industry by increasing investment in agriculture in the NT as well as the supply chain infrastructure that supports the region. Criterion B 'investment' is the second highest weighted criterion at 29%, as it was considered that options that attract investment would result in significant benefits to the agricultural industry and supply chain while also providing broader economic outcomes for the NT. Criterion D 'competitiveness' and Criterion A 'innovation' were weighted at 19% and 10%, respectively. Whilst both criteria remain important considerations in the analysis, they were considered less critical in comparison to the other criteria. Criterion E 'implementation' was the lowest weighted criteria at 5%. Implementation and deliverability are very important considerations to any project option selected for further analysis; however, it was considered that this should not significantly impact the merit and opportunity to further investigate an option.

The impact of the criteria weightings is tested through a sensitivity analysis outlined in Section 6.4.1.

### 6.3.2 Scoring Scale

A simplified rating system was used to score the individual criteria. This rating system, presented in Figure 15, focuses on the relative impact of each option against the agreed criterion. This culminated in a weighted score for each option.

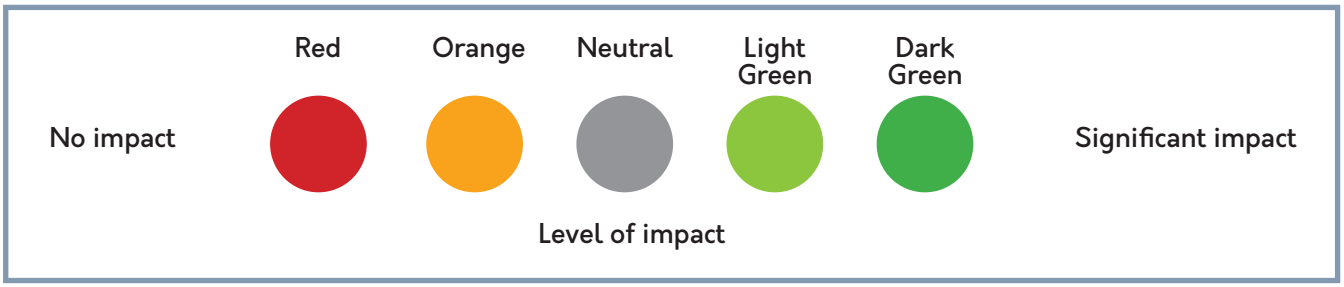



Figure 15. Scoring mechanism.

### 6.3.3 Criterion A – Innovation

The innovation criterion measures the degree to which the option supports innovation and future proofing of the Territory supply chain. Table 6 presents the scores, and substantiating advantages and disadvantages, for each option under this criterion.

| OPTION | SCORE | ADVANTAGES | DISADVANTAGES |
|---|---|---|---|
| **1 - Reprioritise national road infrastructure upgrades** | | High quality road infrastructure would benefit the industry now and into the future | Not innovative<br>Long lead times in implementation. |
| **2 - Aggregation of agricultural products** | | Potential for innovative solutions to aggregate different agricultural products | Existing scale challenges of industry production |
| **3 - Investigate shelf-stable manufacturing** | | Numerous potential customers/ markets<br>Could attract skills to the region<br>Potential for R&D activities at facility | Market demand unknown. |
| **4 - Conduct audit of idle infrastructure** | | Potential for innovative solutions from result of audit | Audit itself is not innovative |
| **5 - Facilitate 'development ready' land** | | Positive reputation earned for ease of investment in the NT | N/A |
| **6 - Investigate multi-user agricultural processing** | | Potential for innovative solutions in common-user infrastructure | Governance and ownership complexity across multiple producers and industries |
| **7 - Develop digital twin of supply chain** | | Innovative and can be updated in real time | Long lead time |

Table 6 Innovation Criterion Scoring

Option 3 was the highest performing option for Criterion A. The high-quality shelf-stable food manufacturing facility was considered innovative in terms of its functionality and the potential product that could be developed. Option 5, Option 6, and Option 7 also deliver a high impact as they will materially affect the agricultural industry and the future direction of investment. Option 1, Option 2, and Option 4 all have a neutral effect. While they will result in positive outcomes for the industry, their effect in terms of innovation and future proofing the industry is not as significant compared to the other options.

### 6.3.4 Criterion B – Investment

The investment criterion measures the degree to which the option will attract investment in agricultural industries and supporting infrastructure. Table 7 presents the scores, and substantiating advantages and disadvantages, for each option under this criterion.

| OPTION | SCORE | ADVANTAGES | DISADVANTAGES |
|---|---|---|---|
| **1 - Reprioritise national road infrastructure upgrades** | | Will provide confidence to investors regarding reliable supply chains | Long lead time |
| **2 - Aggregation of agricultural products** | | Certainty of export route from NT may attract investment | Success may depend on what party is taking on a coordinator role |
| **3 - Investigate shelf-stable manufacturing** | | Potential stream of income (from lower grade/waste product) for investors | Technology and workforce availability |
| **4 - Conduct audit of idle infrastructure** | | May encourage investment from infrastructure owners | May not attract new investment |
| **5 - Facilitate 'development ready' land** | | Will provide incentive and benefit for potential investors | Tenure availability, lack of environmental data in regions |
| **6 - Investigate multi-user agricultural processing** | | A resilient asset that can be utilised by multiple users instead of building their own asset | May require investment from anchor customer |
| **7 - Develop digital twin of supply chain** | | Will provide NT supply chain context for potential investors | Complexity of data ownership |

Table 7 Investment Criterion Scoring

Option 1, Option 5, and Option 6 were the highest performing options for Criterion B as they were considered to have a significant chance of attracting investment in the agricultural industry and in supply chain infrastructure in the NT. Option 2 and Option 3 may have a neutral impact, as these options may be considered too niche or high risk to encourage investment. While Option 4 and Option 7 will provide useful information to potential investors, they were considered to have a lower impact on attracting investment than other options.

### 6.3.5 Criterion C – Efficiency

The efficiency criterion measures the degree to which the option will increase efficiency in supply chains. This may include efficiencies in cost, inputs, or travel time to market. Table 8 presents the scores and substantiating advantages and disadvantages, for each option under this criterion.

| OPTION | SCORE | ADVANTAGES | DISADVANTAGES |
|---|---|---|---|
| **1 - Reprioritise national road infrastructure upgrades** | | Will improve reliability of roads | N/A |
| **2 - Aggregation of agricultural products** | | Supply chain and export costs may be shared<br>More routes to market will decrease travel times | Potential biosecurity and regulatory issues |
| **3 - Investigate shelf-stable manufacturing** | | May commoditise waste stream for producers | Does not improve efficiency |
| **4 - Conduct audit of idle infrastructure** | | Audit itself does not increase efficiency | Idle infrastructure improvements must be actioned to increase efficiency |
| **5 - Facilitate 'development ready' land** | | Will decrease costs and lengthy approvals processes for producers | N/A |
| **6 - Investigate multi-user agricultural processing** | | Will decrease costs for users as they can utilise common infrastructure | Not all products will benefit |
| **7 - Develop digital twin of supply chain** | | Provides a holistic view of supply chain efficiencies and gaps | Supply chain gap must be actioned to improve efficiency |

Table 8 Efficiency Criterion Scoring

Option 1, Option 2, Option 5, and Option 6 were the highest performing options against the efficiency criterion. These options represent key themes from stakeholder engagement and are considered to be critical in improving efficiency of agricultural supply chains. Option 3 and Option 4 were not considered to have a material impact on efficiency and were therefore low performing.

### 6.3.5 Criterion D – Competitiveness

The competitiveness criterion measures the degree to which the option will increase the competitiveness of NT agricultural products and downstream industries. This criterion is similar to Criterion B – 'investment', as it is a measure of demand. However, the competitiveness criterion measures how an option will increase the demand for NT agricultural goods, whereas the investment criterion measures how an option will attract investment in infrastructure in the NT. Table 9 presents the scores, and substantiating advantages and disadvantages, for each option under this criterion.

| OPTION | SCORE | ADVANTAGES | DISADVANTAGES |
|---|---|---|---|
| **1 - Reprioritise national road infrastructure upgrades** | | Reliable roads will reduce travel time to market and reduce supply chain costs | Other jurisdictions are already ahead in terms of road and supply chain infrastructure |
| **2 - Aggregation of agricultural products** | | Cost savings for product aggregation may be passed on to consumers | N/A |
| **3 - Investigate shelf-stable manufacturing** | | New products and markets | N/A |
| **4 - Conduct audit of idle infrastructure** | | Easy to implement | No direct effect on competition for goods |
| **5 - Facilitate 'development ready' land** | | Cost savings from development ready land may be passed on to consumers | Tenure constraints limit land available |
| **6 - Investigate multi-user agricultural processing** | | Multi-user infrastructure may provide cost savings and aggregation benefits that may be passed on to consumers | Complexity of processing |
| **7 - Develop digital twin of supply chain** | | N/A | Other jurisdictions already have a supply chain digital twin |

Table 9 Competitiveness Criterion Scoring

Option 2, Option 3, Option 5, and Option 6 are the highest performing options under the competitiveness criterion. These options provide the most potential for cost and time savings that may be passed on to consumers, increasing the competitiveness of NT produce over other jurisdictions. Option 1 may also have a similar impact, however, it was scored slightly lower as this aspect of the supply chain is already significantly advanced in other jurisdictions. Option 4 and Option 6 were considered to have minimal impact on competitiveness, as there were no efficiencies that could be passed on to consumers.

### 6.3.5 Criterion E – Implementation

The implementation criterion measures the degree to which the option can realistically be implemented or delivered in the short (2 to 5 years) to medium (5 to 10 years) term. PwC used stakeholder engagement and professional judgement to estimate ease of implementation and determine the scoring. Table 10 presents the scores, and substantiating advantages and disadvantages, for each option under this criterion.

| OPTION | SCORE | ADVANTAGES | DISADVANTAGES |
|---|---|---|---|
| **1 - Reprioritise national road infrastructure upgrades** | | N/A | Competing with other jurisdiction for funding will take time |
| **2 - Aggregation of agricultural products** | | Private sector may drive development | May require monetary incentives/ benefits<br>May require government facilitation |
| **3 - Investigate shelf-stable manufacturing** | | Private sector may drive development | Significant feasibility studies required |
| **4 - Conduct audit of idle infrastructure** | | Can be mobilised relatively quickly | High impact outcomes unlikely |
| **5 - Facilitate 'development ready' land** | | Could have positive outcomes if stakeholders work together | Approvals and regulatory process take significant time and cost |
| **6 - Investigate multi-user agricultural processing** | | Private sector may drive development | Significant feasibility studies required |
| **7 - Develop digital twin of supply chain** | | Already developed in other jurisdictions so could import technology/skills | Requires specialised skills that may not be readily available in the NT |

Table 10 Implementation Criterion Scoring

Option 4 and Option 7 were the best performing options against the implementation criterion as they can be mobilised relatively quickly compared to other options and may be delivered by the private or public sector. Option 2, Option 3, and Option 6 have a neutral score as they may require significant stakeholder engagement and further studies to determine their feasibility. Option 1 and Option 5 scored the lowest as they have the potential for high costs and require extensive consultation and planning in very complex stakeholder environments.

## 6.4 Results and Sensitivities

Table 11 presents the ranked MCA outcomes. These ranked outcomes were determined through a clear rationale for the scoring of each option and criteria presented in Section 7.3 and, where applicable, qualitative information and feedback provided by key stakeholders. Representatives from the Steering Committee approved these ranked outcomes.

| OPTION | A | B | C | D | E | SCORE | RANK |
|---|---|---|---|---|---|---|---|
| 1 - Reprioritise national road infrastructure upgrades | | | | | | 8.8 | 3 |
| 2 - Aggregation of agricultural products | | | | | | 8.3 | 4 |
| 3 - Investigate shelf-stable manufacturing | | | | | | 5.6 | 6 |
| 4 - Conduct audit of idle infrastructure | | | | | | 3.4 | 7 |
| 5 - Facilitate 'development ready' land | | | | | | 9.4 | 2 |
| 6 - Investigate multi-user agricultural processing | | | | | | 9.6 | 1 |
| 7 - Develop digital twin of supply chain | | | | | | 5.8 | 5 |
| Core weightings | 10% | 29% | 38% | 19% | 5% | | |

Table 11 Ranked MCA Outcomes

Option 6 is the highest scored option (9.6), closely followed by Option 5 (9.4) and then Option 1 (8.8).

Option 6 delivered positive outcomes over four of the five criteria, with a neutral outcome in its timeline for implementation and deliverability, owing to the unknown volume of feasibility work that may have to be completed to prove commercial viability.

Option 5 and Option 1 were ranked second and third with a core weighted score of 9.4 and 8.8, respectively. These options delivered strong outcomes for the three highest weighted criteria in the MCA. The options were identified through stakeholder consultation and are both key advocacy priorities of the industry. However, both options scored poorly in terms of implementation and deliverability owing to the complex land tenure, environmental and regulatory considerations to be overcome if development ready land is to be provided, as well as the significant cost and competing investment priorities in other jurisdictions.

### 6.4.1 Sensitivity Testing

To test the robustness of the results from the MCA, sensitivities were undertaken using alternative weightings than those outlined in Section 7.2.2. These sensitivities included:

1. Equal weighting of all criteria
2. 'Implementation' recognised as the highest weighted criterion.

Table 12 presents the outcomes for each sensitivity.

| SENSITIVITY | | OPTION | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Core MCA | Score | 8.8 | 8.3 | 5.6 | 3.4 | 9.4 | 9.6 | 5.8 |
| | Rank | 3 | 4 | 6 | 7 | 2 | 1 | 5 |
| Equal weighting | Score | 7.2 | 7.6 | 6.4 | 4.8 | 8 | 8.8 | 6.4 |
| | Rank | 4 | 3 | 6 | 7 | 2 | 1 | 5 |
| Implementation as highest weighted | Score | 5.9 | 7.2 | 6.3 | 6.1 | 6.5 | 8.1 | 7.3 |
| | Rank | 7 | 3 | 5 | 6 | 4 | 1 | 2 |

Using equal weightings, Option 6 (investigate multi-user agricultural precinct) and Option 5 (facilitate development ready land) remained as the highest scoring options, while Option 1 and Option 2 interchanged between third and fourth. This demonstrates the ability of the highest ranked options to address the Project's service needs.

When implementation is the highest weighted criteria, Option 6 (investigate multi-user agricultural precinct) remains as the highest ranked option. This is followed by Option 7 (develop digital twin of supply chain) and Option 2 (aggregation of agricultural products). These options were considered to have higher potential for delivery and implementation in the short to medium term.

## 6.5 Summary

This section has summarised the MCA process undertaken to rank the identified project options. Based on the analysis, investigation into a multi-user agricultural precinct was the highest ranked option to be considered for further analysis. This option performed favourably against key criteria and addressed the service needs of the Project. While this section has presented a ranked list of options, this is not to exclude any options from further investigation and development. Some options may be bundled into packages, considered in the longer term, or be delivered by third parties. These alternatives are discussed further in Section 7 Conclusion.

# 7. CONCLUSION

Agricultural industries are an integral part of the NT's economy and play an important role in food production, employment, and contribution to GSP – especially in the NT's regional areas. The NT is an emerging producer of various food, fibre, and forestry products, complimenting the success of cattle, fisheries, and other longer-established industries.

Despite the NT's proximity to international markets and high-quality agricultural produce, the geography of the Territory, legacy infrastructure issues, and the immaturity of numerous production sectors, combine to create unique impediments to harnessing opportunities to supply international markets effectively and efficiently. The NT's agriculture industry has potential to expand and increase productivity; however, several constraints are inhibiting the growth of the sector.

As identified in Figure 16, investment in the capacity and capability of agricultural supply chains in the NT, and across Northern Australia, is underpinned by a clear service need and strong strategic rationale.

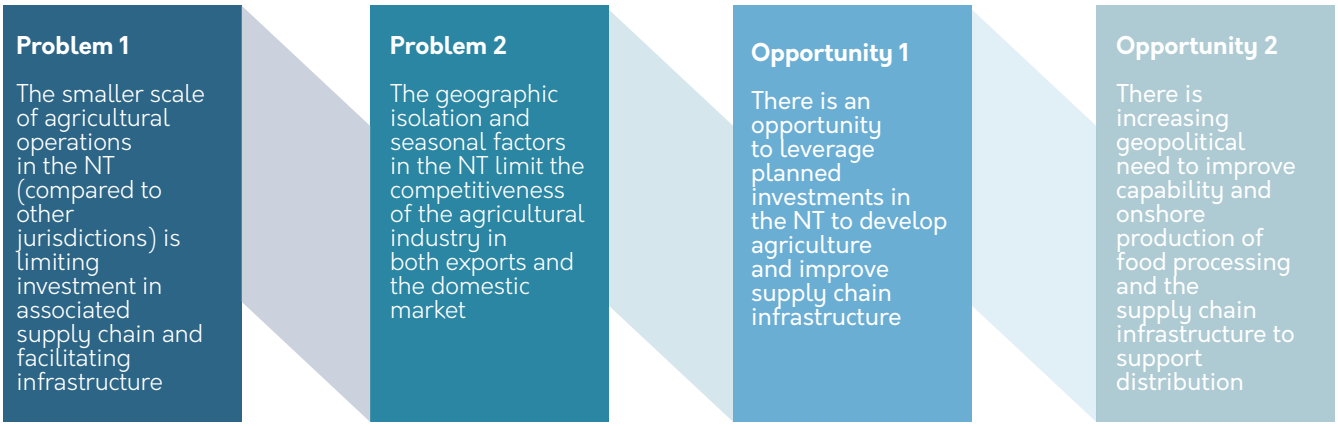



Figure 16. Service needs.

Strategic infrastructure planning and development is a critical factor for the expansion of agribusiness in the NT. To align with the long-term vision for the Territory, investment in enabling infrastructure is critical and is a key driver of productivity and the NT's contribution to agribusiness domestically and internationally.

The NT Agricultural Supply Chains Project and Export Opportunities has highlighted key constraints across the supply chain for domestic and international exporters and identified infrastructure and non-infrastructure improvements required to support producers and exporters. Following engagement with key stakeholders across various agricultural sectors and the supply chain industry, a list of options was developed and ranked using an MCA process to determine priorities that should be further investigated. Whilst the options are ranked, this does not preclude any from being further investigated. All project options were developed in consultation with industry and are

considered to have significant potential for further investigation. The options, in ranked order, include:

1. Investigate the potential for a multi-user agricultural processing plant

2. Facilitate and accelerate 'development ready' land for agricultural precincts

3. Reprioritise national road infrastructure upgrades to promote agribusiness development in the NT

4. Facilitate aggregation of agricultural products for export through the attraction of freight forwarders to the NT

5. Develop a digital twin or the NT agricultural supply chain to assist with planning

6. Investigate volumes of agricultural waste and/or second/third grade product that can be used as inputs to shelf stable product manufacturing

7. Conduct audit or stakeholder engagement to determine smaller, idle infrastructure that could be repurposed.

The option to investigate a **multi-user agricultural precinct** was the highest performing option in the analysis and delivered positive outcomes against four of the five criteria. A multi-user agricultural precinct that has the capability to process a diverse range of goods will benefit the agricultural industry and provide a resilient supply chain asset that is not dependent on seasonal produce. The facility could provide synergies and efficiencies for producers and be an innovative hub for onshore food processing in Northern Australia. This option could be investigated alongside the potential for a shelf-stable food manufacturing facility that utilises local second/third grade or waste agricultural product.

**Facilitating 'development ready' agricultural** precincts is a key advocacy priority for industry as it has the potential to be a major driver of agricultural growth and investment in supply chains. De-risking investment through the provision of supporting infrastructure and facilitation of regulatory approval pathways to attract and secure investment will drive scale across the industry. However, complexity surrounding land tenure, environmental and regulatory considerations must be overcome if development ready land is to be provided. Industry or Government-led agricultural precincts may also provide incentive for freight forwarding businesses to expand operations into the NT. This may provide an opportunity for local aggregation of product that may then be exported directly out of the NT.

**Reprioritising national road upgrades** was a key theme across stakeholder engagement and scored highly as a priority for improving agricultural supply chains. The quality of road links across Northern Australia is varied, with large portions of the roads connecting the NT to Western Australia and western Queensland currently unsealed. Inadequate road access is a significant impediment for investment in, and development of, agricultural infrastructure and other key supply chains in regional areas across the Territory. The costs associated with the upgrade of critical roads - including the necessity for many roads in the NT's climate to be consistently and regularly repaired - and the rate at which they are upgraded is prohibiting the growth and expansion of industries.

Road upgrades should also consider other enabling infrastructure related to the road network which may require similar upgrades. For example, large-scale growth of agricultural industries and related businesses, such as cotton, in and around Katherine should necessitate further investigations of the suitability of the existing Katherine River bridge

with respect to the significant growth in large-scale freight volumes. Issues related to the bridge, or breakdowns or traffic on the bridge, what severely limit not only movement to and from Katherine, but all north-south road freight across the Territory.

Reprioritising road upgrades is a significant task and extends beyond the stakeholders within this Project, however, is a critical driver for improving agricultural supply chains across Northern Australia. It is noteworthy that during this project, both the Federal Government and Federal Opposition made significant commitments to new road funding in the NT. This may provide an opportunity after the forthcoming Federal election to engage in a prioritisation discussion. This option could be further investigated alongside development of a digital twin of the agricultural supply chain in the NT and beyond. A digital twin may help to plan and reprioritise road upgrades using real time data from across Northern Australia.

## 7.1 Recommendations

Based on the analysis undertaken for the Project, recommendations for consideration are as follows:

**Recommendation One:** Endorse the outcomes of the Project by confirming the prioritised options that address the service needs. Industry, government and relevant stakeholders to align and progress future planning activities based on the priorities identified in this report.

**Recommendation Two:** Determine costs to undertake feasibility studies on the identified project options.Industry to partner with government to commission feasibility studies into the seven identified options, based on priority, identified through this report.

**Recommendation Three:** Seek approval and funding from the relevant agencies to commence early work investigations and other activities. The Northern Territory Government is to nominate the key agencies with which industry will partner to develop and priorities funding for early work based on the priorities identified in this Project.

**Recommendation Four:** Continue to engage with stakeholders and industry to understand key constraints and opportunities.

Based on the findings of the Project, continued engagement with key industry participants and stakeholders will be required to ensure accurate and current data is used to inform and progress plans to address supply chain constraints.

# PART II – Research & Stakeholder Engagement

# 8. INTRODUCTION

The research undertaken for the Project, which focusses on the Northern Territory, was commissioned by the CRCNA to identify the current and near-term supply chain constraints to growing the agricultural, aquaculture and forestry industries in the Northern Territory. The study has been undertaken by NT Farmers Association who have jointly appointed PwC as a consultant to assist with completion of the study.

Part II of this report features the literature review and stakeholder engagement processes that provided a significant element of the data to inform the analysis undertaken in Part I.

## 8.1 Research Methodology

Well defined and transparent lines of communication were maintained between CRCNA, NT Farmers Association, and all project participants throughout the study process. There was rigorous consultation on the research scope, identification of strategic project participants, key stakeholders, engagement management and project governance. The project was continually assessed by the Steering Committee as the research was carried out and was subject to vigorous and robust peer reviews.

The study was based on a combination of results from a literature review, decision tree mapping, gap analysis, SWOT analysis, workshops, interviews, surveys and case studies with relevant industry and commercial stakeholders and government departments.

### 8.1.1 Phase 1: Literature Review

A comprehensive review of academic and grey literature was undertaken to evaluate the impediments and opportunities across the Northern Territory Agricultural supply chains. These were themed across six industries: Fisheries and Aquaculture, Forestry, Cotton, Broadacre Cropping, Horticulture, and Beef and Live Cattle Exports. Identification of current analysis, near-term supply chain constraints, industry trends, industry prioritisation, and demand driven activities to grow the primary agricultural industry sectors across the Northern Territory were defined for each industry.

Industry gaps have been identified by prioritising the demand driven activities for increasing agricultural supply. Refer to Appendix B (Literature Review) and Appendix C (Complete List of Constraints, Trends, Priorities and Opportunities Identified by Stakeholders).

The literature review was themed across six agricultural industries, and the findings from each were grouped into five areas: Strategic Development, Supply Chain Infrastructure, Resources, Markets, and Workforce. Cross-industry connections were identified across the five areas and were then assessed to provide insights into Industry Constraints, Industry Trends, Industry Prioritisation, and Industry Opportunities across the agricultural supply chains in the Northern Territory.

| | |
|---|---|
| STRATEGIC DEVELOPMENT | • Overarching industry plans & strategies<br>• Industry investment & development<br>• Collaboration & engagement<br>• Political agreements<br>• Research, development & extension<br>• Production methods<br>• Business models<br>• Future risk proofing & de-risking against domestic, global, environmental, and geopolitical challenges |
| SUPPLY CHAIN/ INFRASTRUCTURE | • All freight routes, including rail, road, airfreight, & sea freight<br>• Processing & warehousing facilities locally & regionally<br>• Value added activities<br>• Power, energy, digital connectivity, inputs & fuel |
| RESOURCES | • Approvals, regulations & licences<br>• Environment, water, sea, and land tenure<br>• Public and political support for policies, programs & regional development (including precincts) |
| MARKETS | • Domestic, export & import<br>• Market access<br>• Biosecurity<br>• Consumer buying behaviours<br>• Global & domestic consumption<br>• Market impacts – food fraud, authenticity, traceability, providence, quality, sustainability & ethical sourcing<br>• Domestic & international market development & analysis |
| WORKFORCE | • Employment (internal & external)<br>• Skilled workforce development<br>• Capacity building |

Table 13 Summary of Group Explanations

### 8.1.2 Phase 2: Supply Chain Mapping

A supply chain map has been created to provide a high-level visual representation of supply chains in each key agricultural sub-sector. The purpose of the supply chain maps is to identify gaps in the Northern Territory supply chain, which may be constraining industry development and exposure to a wider range of domestic and international markets. The supply chain maps also informed model development.

Supply chain maps have been developed for the following agricultural sub-sectors:

- **Aquaculture**: Breeding and farming fish, molluscs, and crustaceans.
- **Fisheries**: Freshly caught fish, molluscs, and crustaceans.
- **Beef and Live Cattle Export:** The commercial transport of live cattle across national borders.
- **Forestry:** Management and logging of native forest and timber plantations.
- **Broadacre Cropping:** Includes a wide range of crops, including cereals, oilseeds, lupins, sugar cane, legumes, hops, cotton, hay, and silage.
- **Cotton:** Growing, ginning, and trading cotton.
- **Horticulture:** Includes the cultivation of a garden, orchard, or nursery; the cultivation of flowers, fruits, vegetables, or ornamental plants.

The maps are designed to be read from left to right, with spurs that run from top to bottom displaying key inputs to a particular stage or process. For clarity, the supply chain maps do not include complex details and steps of distribution of final products to end users, with high-level distribution steps and processes provided instead.

The key steps that are displayed in the supply chain maps include:

- Key inputs to production: Include the resources and inputs to be used in the production process to produce output.
- Industry production: Indicates the industry specific output.
- Transportation: Encompasses the type (e.g., road, rail) and method of transportation.
- Distribution, processing, and packing: Describes high level value add processes, preparation and packaging processes that are required prior to consumption, as well as distribution mechanisms to end users and consumers.
- Gap in the Northern Territory supply chain: Highlights key gaps in the Northern Territory supply chain that are constraining industry growth and opportunities for development.
- End user: Represents downstream users and consumers of the final product.

### 8.1.3 Phase 3: Data Collection

Decisions for the best methods for stakeholder engagement were driven by consultation with the steering committee. Data collection was obtained through a range of activities, including one on one and group interviews, workshops, and surveys. Interviews were targeted to commercial operations and industry stakeholders via telephone or online platforms, face to face and group meetings.

Workshops canvassed government representatives across infrastructure, agriculture and policy development aimed at scoping the sector's current situation, impediments to economic development, and proposal of recommended enablers.
The survey was distributed through key industry stakeholder networks, professional networks, government, and universities. Refer to Appendix E for survey questions and responses.

To provide broader input into the project, case studies were conducted to understand practical and current impediments and opportunities in real life situations that will assist with prioritising activities required to further develop the Northern Territory agricultural supply chains.

The methodology for determining which case studies to progress and to be undertaken were at length discussed with the steering committee, and a master list was developed for the undertakings to occur. The case studies are presented in full later in the report.

A summary of stakeholder engagement participants appears in Appendix D.

### 8.1.4 Phase 4: Data Analysis

Data collection, modelling, and analysis have been conducted as part of the study, and the results have been assembled manually and automatically sorted and grouped into six sectors and themed into distinct areas of commonality that address the impediments and enablers across the agricultural supply chain.

Description analysis of data gathered will assist in providing valuable insights and presenting data in a meaningful way and has allowed for further exploratory analysis to be conducted to find relationship connections and build hypotheses and solutions to some of the specific findings. Prediction of future answers to the specific findings has allowed the project to uncover potential future trends, inefficiencies in the supply chain, sectorial connections, and any casualties in the data.

The data used to populate the current and projected production values for the sector and individual industries was obtained from multiple sources and combined with a projected growth rate based on either historical or industry data.

Although some industries are variable in their growth due to seasonal and market conditions, a standard growth rate was applied to predicted future values to provide consistency across industry projections.

The methodology for producing the future values of each industry is as follows:

- **Fisheries and Aquaculture** - A 7% growth rate was applied to wild caught fisheries and barramundi aquaculture based on actual data from the Northern Territory Government (2019). The growth rate of the prawn aquaculture data is based on SeaFarms' projections to produce 6000 metric tons of prawns in 2023 and to reach an expected volume of 150,000 to 180,000 in 15 years.[44]
  To produce graphs showing future industry value an increase of 6000 metric ton per year was applied to annual production volumes and a 3% increase in value per year was applied to the price. Values for price per ton were based on wild caught pricing of approximately $15,000 per ton (Laird 2021).

- **Forestry** - production values are based on the 2017-18 value of Tiwi Island woodchip (Stephens et al 2020) with an annual average growth rate of 10.66% (NT Farmers 2020) based on historical growth rates. NT Farmers (2020) places a rolling value of $110,000,000 per year on forestry plantations which has been applied from 2027 when commercial harvests of African mahogany and sandalwood plantations are expected to begin.

- **Cotton** – data for cotton industry annual growth has been applied using the long-term industry standard of $500 per bale (PwC 2019).

- **Broadacre** - a 10.66% annual grown rate has been applied based on historical growth rates (NT Farmers 2020).

- **Horticulture** - a 10.66% annual grown rate has been applied based on historical growth rates (NT Farmers 2020).

- **Beef and Live Cattle Exports** – a 4% annual growth rate (Northern Territory Government 2019) was applied to predicted future industry growth.

[44] AUTHOR'S NOTE: Following completion of this report Seafarms announced a review into the viability of Project Sea Dragon. The outcome of this review may have a material impact on the accuracy of the data contained in this report.

# 9. SECTOR REVIEW

## 9.1 Current Sector Production Value and Potential Growth

In 2018/19 the combined gross value of production from the agriculture, fisheries and forestry industries in the Northern Territory was $854 million (ABARES 2020). Historically the biggest contribution to gross production value has been the livestock sector. As new sectors emerge and others expand, however, the value across all sectors is forecast to grow significantly.

Modelling of projected values across the six industries shows (Figure 17) an increase in total value of 289% to $3.96 billion in 2030. The most significant increases from current values are forecast to be seen in fisheries and aquaculture ($913m increase), horticulture ($571m increase) and cotton ($498m increase).

There are key factors driving these rises in values, particularly in those industries with the most significant gains, which in some cases can be linked to specific major projects within that industry. For example, the staged commencement of production from Seafarms' Project Sea Dragon[45], anticipated to start in 2023, will see large incremental increases year on year. Another example is in the cotton industry where the construction of a cotton gin in Katherine is expected to facilitate an increase in area planted under cotton as a result of significant reduction in transport costs with local processing available to growers.

The large increase in horticulture, however, is a combination of increased production and farm gate prices, and not attributable to any one major project or event.

The growth in projected values for each industry is discussed in more detail under the respective industry analysis sections of this report.

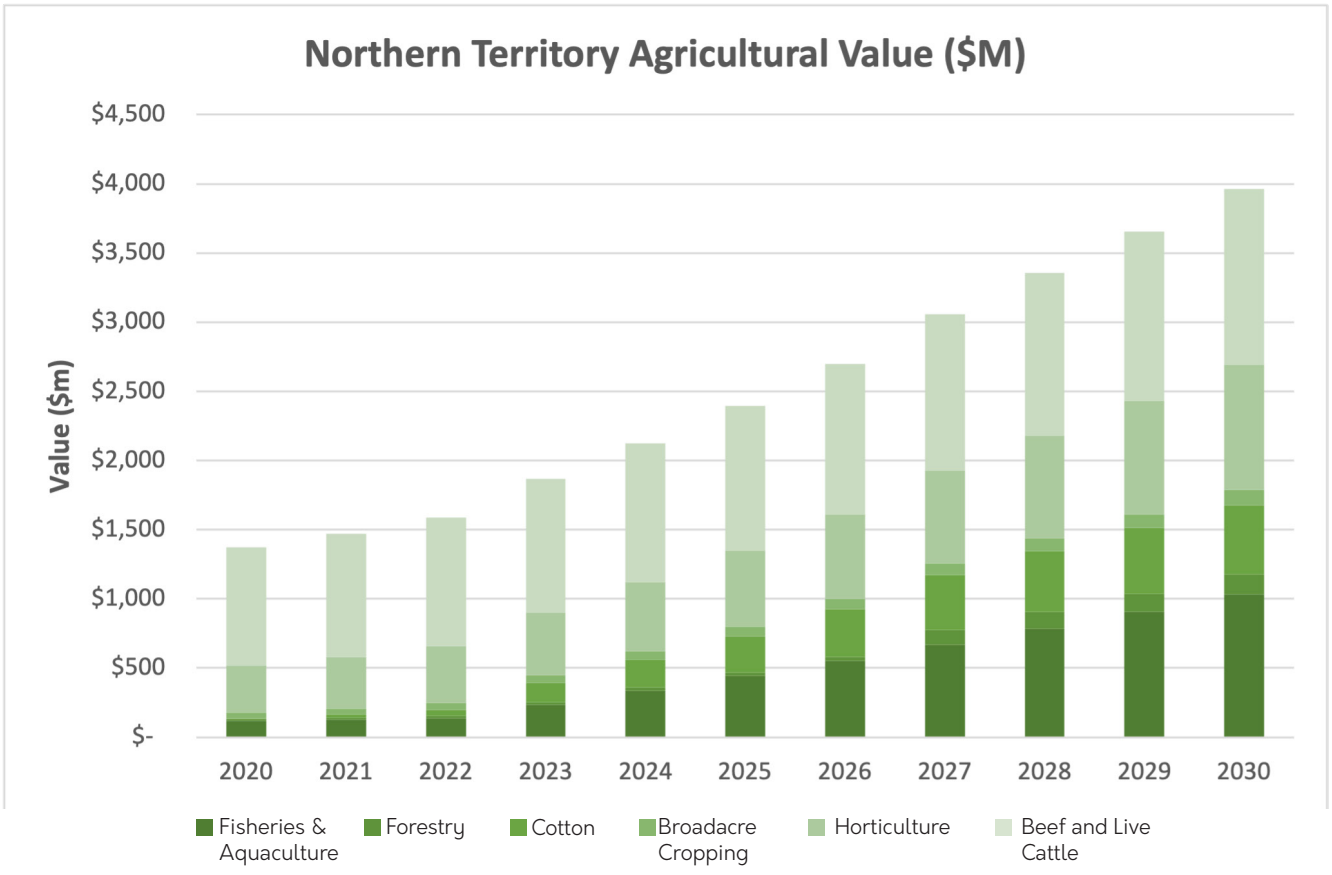



Figure 17. Current value and predicted future growth in Northern Territory agricultural value

[45] AUTHOR'S NOTE: Following completion of this report Seafarms announced a review into the viability of Project Sea Dragon. The outcome of this review may have a material impact on the accuracy of the data contained in this report.

## 9.2 Sector Constraints

The identification across industry to understand where the constraints in agricultural sectors are presented have been established through the review of literature and stakeholder engagement.

Some of the challenges and constraints facing the Northern Territory are undeniably unique however it is also well accepted that there are commonalities across northern Australia. The supply chain infrastructure shortcomings are prominent in the data collected. Figure 18 highlights that 47% of all industry constraints are found within the supply chain category. This deficiency in supply chains highlights the major comparative disadvantage for the Northern Territory against other states. Without these constraints being addressed the attraction to invest in the agricultural sector is limited and impedes economic development for these sectors.

There were fifty-four industry constraints (refer Appendix C), however, the top ten industry constraints identified below were strongly featured throughout the sectors with the top constraint being barriers in policy and regulatory approval processes. Many of these constraints have been presented throughout previous CRCNA reports and through many industry briefings and consultations with government departments over many years.

There is a requirement for greater collaboration across all stakeholders in both policy development and industry strategies to address these constraints with a focus on reframing pathways for improved and new development opportunities and sustainable economic advancement for the Northern Territory agricultural sectors.

Top ten sector constraints:

1. Constraints and barriers in policy and regulatory approval process.
2. Lack of skilled workforce entering industry.
3. Lack of all-weather road access.
4. Lack of regional and local infrastructure (including cold storage, mills, warehousing, consolidation facilities, protocol treatment facilities and processing).
5. Affordability of sea freight.
6. High cost of inputs.
7. Cost effective, dependable, and sustainable farming in the Northern Territory environment.
8. Access to research, development, and extension.
9. Lack of collaboration between Governments, TO's, pastoralists and mining sector.
10. Geographic isolation.

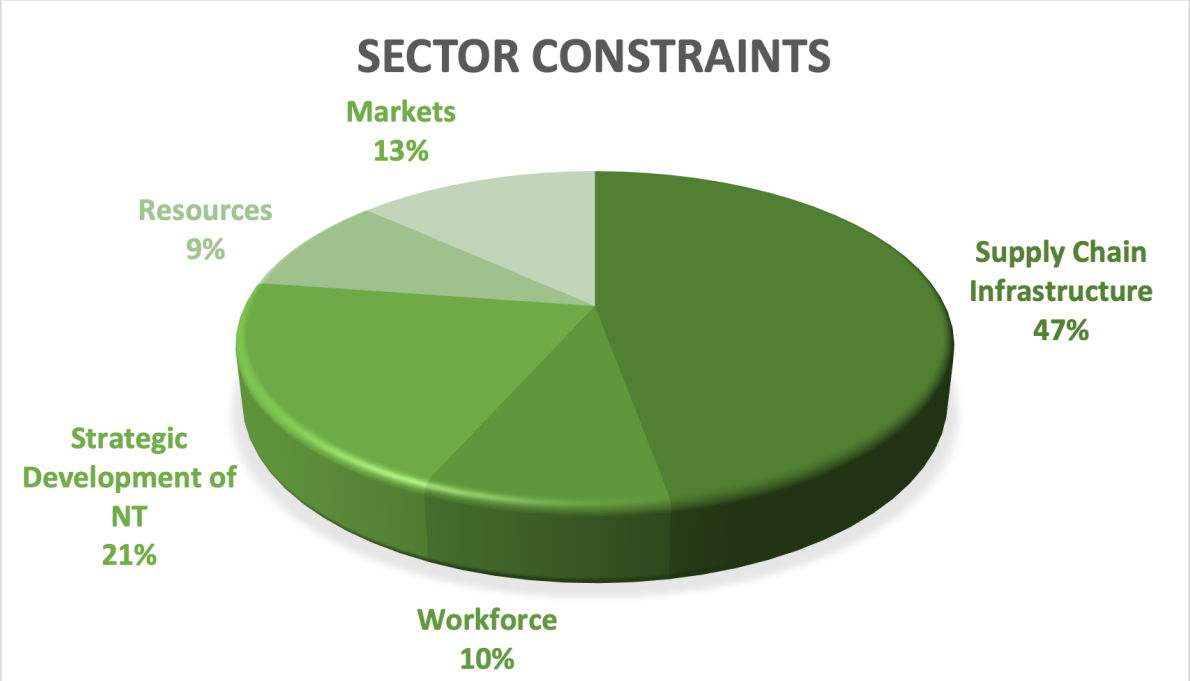



Figure 18. Constraints across all industries in the Northern Territory.

## 9.3 Sector Trends

The review approach for industry trends across all the agricultural industries saw three common themes apparent across these trends: Strategic Development of the NT, Supply Chain Infrastructure, and Markets. This falls in line within a global context that assumes a wider perspective of inputs to include technology, infrastructure, and agricultural training which will be critical drivers of agricultural development (OECD-FAO 2021).

Strategic Development of the Northern Territory which represents 47% of industry trends focuses on national, global, environmental, and technological areas and will constitute the key areas where investment will need to be understood and applied for the advantages of gaining sustainable economic growth.

There were thirty-two industry trends (refer Appendix C), however, the top ten industry trends identified below were strongly featured throughout the sectors with the top trend being 'global demand for food and fibre products is expected to increase into the future due to population growth'. With the UN predicting by 2050 that the global population could be 9.8 billion and with the current Asian population growth being the third highest steeds the Northern Territory into a competitive position to endorse the growth required to contribute to the effectiveness of agri-food and fibre economies.

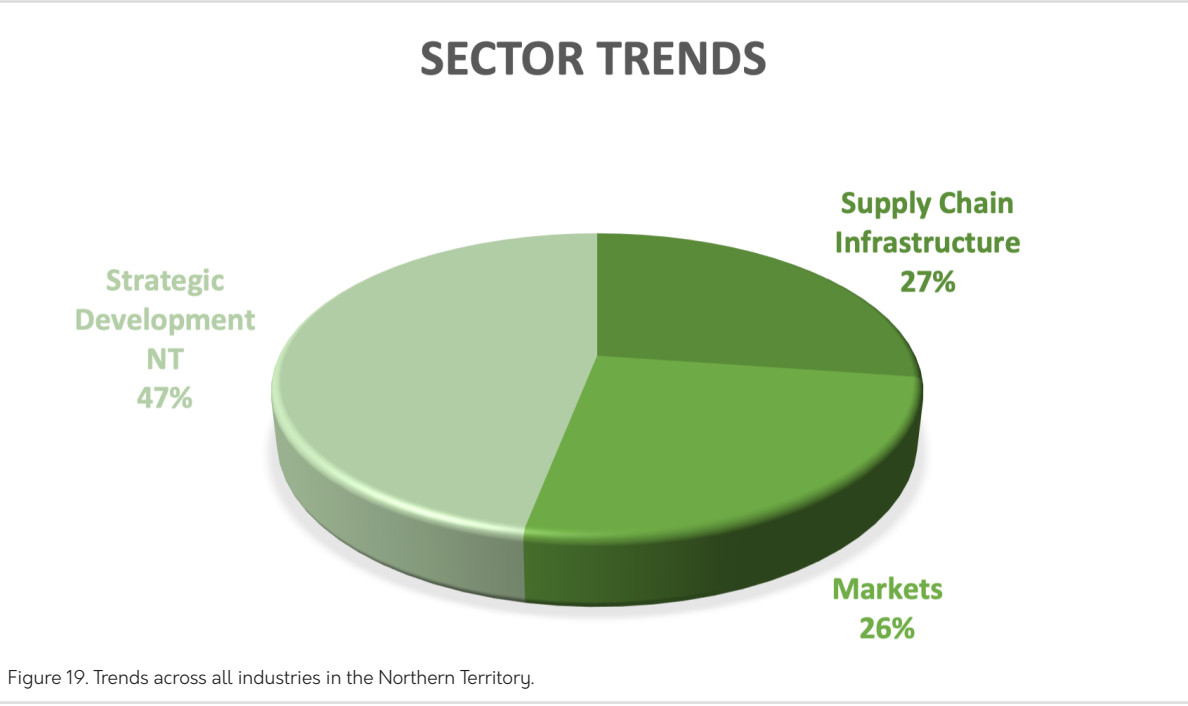



Figure 19. Trends across all industries in the Northern Territory.

The top ten industry trends are:

1. Global demand for food and fibre products is expected to increase into the future due to global population growth.
2. Infrastructure needs to be regionally located for commercial production viability.
3. Population growth is expected to come from Asia providing opportunity for northern Australia.
4. Reducing environmental and market impacts including food fraud, increase in provenance and authenticity, high quality and consistent products, sustainability, and ethical sourcing.
5. High value products in driving new supply chains.
6. Australia leading the way in best practice management.
7. Increased digital uptake for improved data driven decision making across the supply chain.
8. Increasing automation.
9. Acceleration of innovation.
10. Emerging production methods and models that are understandable and relatable to communities.

## 9.4 Sector Priorities

A total of fifty-six priorities were identified across all six industries during stakeholder consultations and reviews of relevant literature. The research found that many of these priorities have previously been identified in reports relevant to the development of the agriculture, forestry, and fishing sector of northern Australia. Some, however, have been identified by industry stakeholders because of new opportunities, such as markets and major project completions, in recent times.

Priorities were identified across all five categories as shown in Figure 20; however, the majority were categorised as Strategic Development of the Northern Territory (35%), with Supply Chain Infrastructure also featuring significantly (21%).

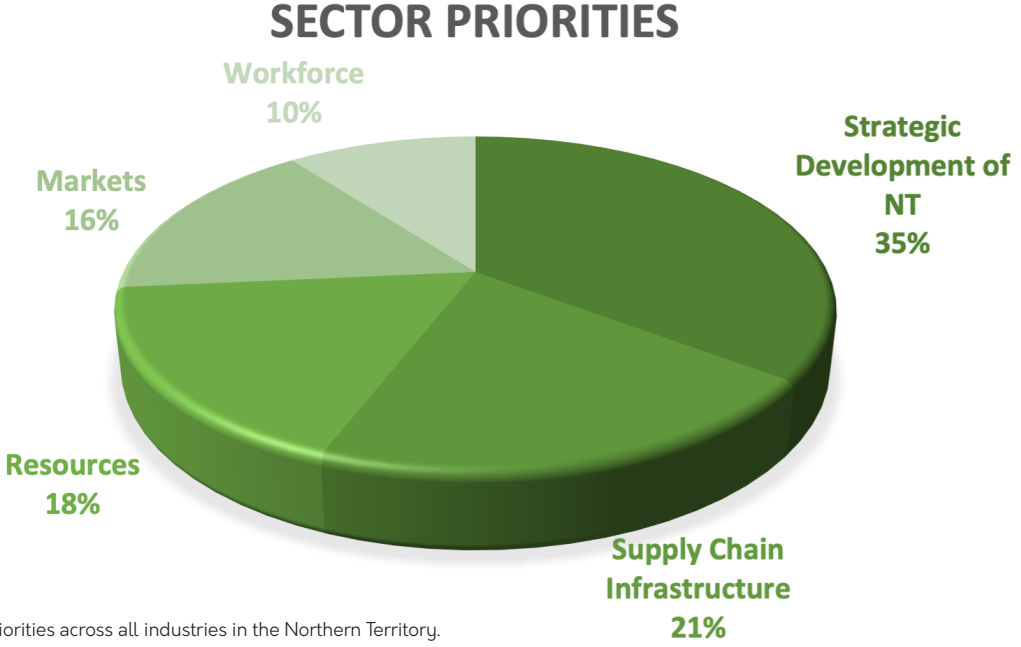



Figure 20. Priorities across all industries in the Northern Territory.

The top priorities identified by the research across all industries are:

1. Focused regional research, development, and extension activities.
2. Targeting and opening new market access for export.
3. Developing complimentary rotational crops.
4. Future risk proofing and de-risking the industry against domestic, global, environmental, and geopolitical challenges.
5. Licensing and regulatory approval navigation pathways that create greater investment certainty.
6. Improved efficiency in gaining access to land and water to build scale.
7. Advocacy priorities to streamline and strengthen public and political support for policies, programs, and regional development strategies for horticulture development including Government, Aboriginal landowners, Aboriginal organisations, and all industry stakeholder proponents.
8. Workforce development and local employment opportunities in forestry and horticulture across the supply chain.
9. Building capacity and knowledge in pastoral operations.

## 9.5 Opportunities Driven by Demand for the Sector

Across the Northern Territory, agricultural supply chains identification of notable industry gaps has allowed for the assessment of opportunities to increase supply. These have been characterised by an assessment of constraints and industry trends conducted through the literature review and through consultation with industry experts.

The reports reviewed noted sectorial commonality and differences across commodities including geographical locations. The opportunities and industry priorities have been clearly aggregated into the key elements below:

- Strategic Development of the Northern Territory
- Supply Chain Infrastructure
- Resources
- Markets
- Workforce

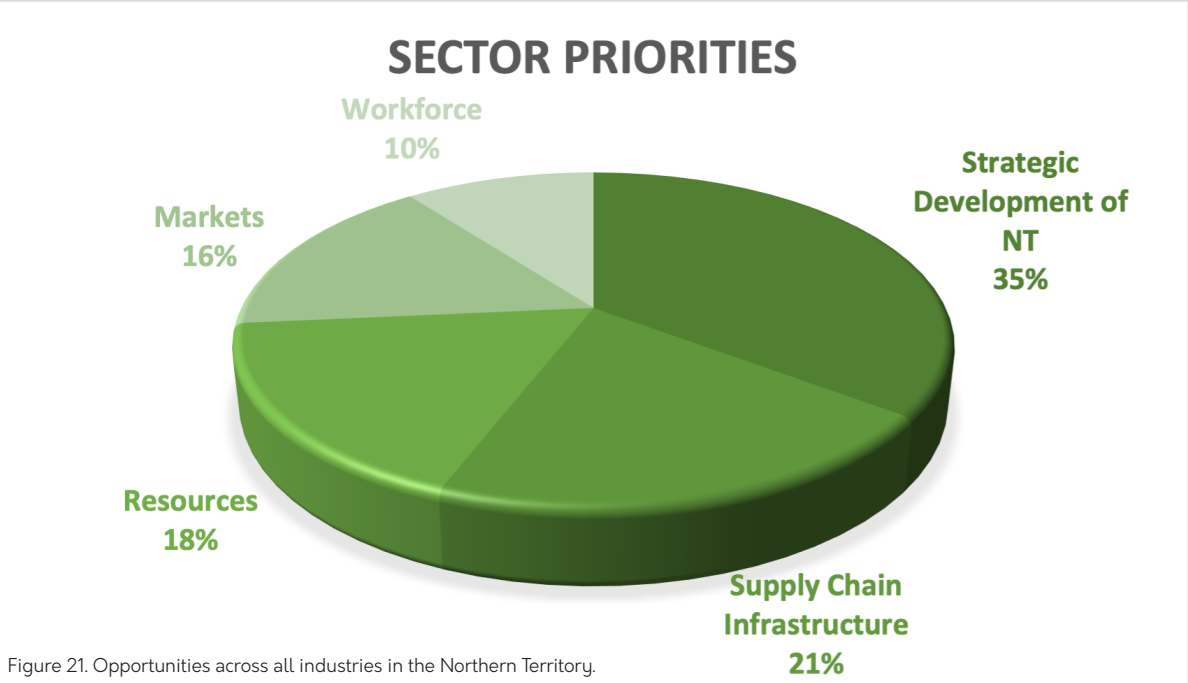



Figure 21. Opportunities across all industries in the Northern Territory.

### 9.5.1 Strategic Development of the Northern Territory

Across Northern Australia there are many similarities of supply chain constraints and opportunities within the agricultural perspective, which have been noted throughout past reports by the CRCNA and have been underpinned by the Our Future Our North White Paper on Developing Northern Australia (Australian Government, 2015) and more recently Our North, Our Future 2021–2026 (Office of Northern Australia 2021). However, the Northern Territory clearly has identified its own specific issues across their supply chain actors. The similarities across the six sectors have highlighted as a high priority the below opportunities for the fisheries and aquaculture and agricultural sectors that will help to drive demand and to inform future policy, development planning, management, and investment.

1. Fully understand the constraints and opportunities imposed by climate, soils, and ecosystems.
2. Take a measured, evidence based and socially inclusive approach to the future of agricultural development.
3. Enabling Aboriginal agricultural development.
4. Northern Territory Government to prioritise focus on improving critical inputs for agribusiness namely water, infrastructure, and improvement to supply chains, increase resilience of the workforce and enable producers to capitalise on emerging technologies.
5. Advocacy priorities to streamline and strengthen public and political support for policies, programs and regional strategies that enable fisheries/aquaculture and agricultural development including Government, Aboriginal

landowners, Aboriginal organisations, and all industry stakeholder proponents.
6. Integrated and all of region agricultural development approach.
7. Collaboration across the value chain (sharing of information for mutual benefit – production, supply chain and consumer facing participants).
8. Diversified capital streams and models to support business growth and entry.

Refer to Appendix C for complete list of demand driven opportunities for increased supply

**9.5.2 Supply Chain Infrastructure**

Despite incremental improvements in addressing infrastructure requirements and issues there are still major difficulties especially from a Northern Territory perspective in terms of infrastructure across the whole supply chain. A number of research publications have noted that freight and supply chain factors have emerged as major impediments for supporting infrastructure development and major challenges in attracting investment in remote regions, notably Chilcott et al (2020) and KPMG (2020). Notwithstanding the exposure the Northern Territory has to extreme weather events including cyclones and floods and climate impacts of high temperatures, seasonal high and variable rainfall between the regions which add further complexities to an already complex supply chain. Northern Territory and northern Australia road infrastructure challenges have been emphasised in numerous policy and research documents, however, with all agricultural and fisheries commodities having to rely on road freight throughout their supply chains which cannot be serviced through any other freight options must be the top priority if agricultural development is truly going to be achieved.

Value adding opportunities for domestic processing and having the required infrastructure to help facilitate agricultural growth, including for export markets, was heavily noted across all sectors. With the establishment of the new Export Hub out of Darwin, this has gone some way in assisting new export growth directly out of the Northern Territory. To continue this growth there needs to be an emphasis on de-risking management mechanisms across government, industry, and all stakeholders to ensure that the export agricultural potential can be achieved.

Across the six sectors the below opportunities have been highlighted as priorities that could support supply chain effectiveness and increase the ability for further economic growth within the sectors.
9. Investment required for all weather road access.
10. Further exploration of domestic processing and value adding opportunities.
11. Provision of new infrastructure and upgrade of existing infrastructure to facilitate agricultural development.
12. To further expand export growth, an export risk management mechanism could be developed to minimise/mitigate export risks and develop a mechanism to ensure the distribution of added value for each step in the export supply chain. With the group buying model evolving in the Asian market, a regional export hub would be a solution to directly connect with international customers.
13. Infrastructure development for major processing facilities to assist with geographical and logistic remoteness.

Refer to Appendix C for complete list of demand driven opportunities for increased supply

### 9.5.3 Resources

The Northern Territory is renowned for its abundance of natural resources, those being sea, land, native forests, and water and it has long been acknowledged that the economic potential for agricultural investment is substantial. Even though it has been some time since the White Paper on Developing Northern Australia was released there is still limited opportunity to meet industry desires and requirements for agricultural growth in the Northern Territory. The newly released Our North Our Future 2021-2026 (Office of Northern Australia 2021) has set out to deliver Master Plans which will set out the strategic direction for efficient economic development. Two of the priority Master Plans which will have significant agricultural economic benefit is the:

1. Beetaloo Basin to Katherine to Darwin and
2. Broome to Kununurra to Darwin plans.

These will deliver a 20-year blueprint supported by five-year action plans which will anchor resources and investment from across all levels of government to maximise the long-term public benefit of regional planning and development. The opportunity now for industry is to take leadership and be actively involved during the extensive consultation process and commit to the development of the NT's food and fibre industries for the sustainable protection of the industry and to enable future domestic and international food security.

During the review and stakeholder consultation process across all sectors it has been identified that the same challenges and impediments to developing growth in the NT, which have previously been noted in a number of reports, are highlighted below as priority for unlocking the economic and investment opportunities for the Northern Territory.

1. Abundant and valuable natural resources and has exceptional investment and growth potential.
2. Unlock regulatory barriers to agricultural development.
3. Requirement of needing a supportive development environment.
4. Develop an approach (particularly within precincts) to converting parts of pastoral leases to freehold to meet short timeframes and appropriate native title and environmental approvals.
5. Redefine and proactively navigate a pathway for approval processes.

Refer to Appendix C for complete list of demand driven opportunities for increased supply in resources.

### 9.5.4 Markets

The Northern Territory has a unique opportunity in its geographic proximity to Southeast Asia, and via key hubs, faster access to more distant markets. Its biosecurity, natural resources, and diverse agricultural activities make for an attractive environment for exploring ways to partner with existing trading partners and for the opportunity to develop new trading opportunities growing the trade within the region and allowing agribusinesses to build on its global footprint.

Global food trends and demands are becoming increasingly sophisticated, especially for the discerning Southeast Asian markets, which presents an opportunity for the Northern Territory to supply high quality, healthy and sustainable primary produce to these markets. The export roadmap will need to be refined to consider global megatrends. The agribusiness sector, however, has the potential to strengthen its export positioning which will have positive flow on effects for the competitiveness of the domestic market.

Across the six sectors the below opportunities were highlighted as key priorities for the growth of markets for agricultural products.

1. Industry recognition of value through support of a local Northern Territory branded products and promotion.
2. Collaboration between like-minded producers to consolidate volume for expansion (including export).
3. Domestic and international market development and analysis.
4. The industry roadmap was refined to take into account current megatrends (a less predictable planet, health on the mind, choosey and informed customers, one world and smarter food chains), conclude the Australian agribusiness sector has the potential to strengthen its position as a small but significant exporter of sustainable, authentic, health, high-quality and consistent supplier of agricultural products. It challenges the notion of being an Australian Food bowl and to a more realistic expectation of being a 'delicatessen' of high-quality products for the informed discerning customer.
5. To ensure sustainable exports requires Australian suppliers to develop collaborative relationships with supply chain actors that can help ensure quality and consistent products are delivered to end-consumers.

Refer to Appendix C for a complete list of demand driven opportunities for increased supply.

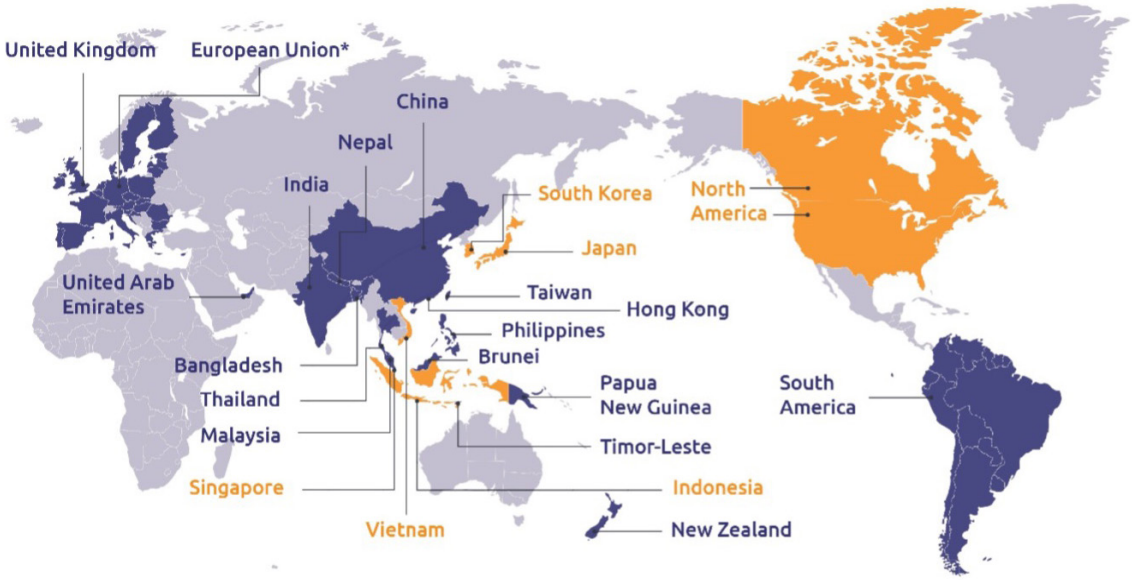



Figure 22. Priority export and investment markets. (Source: Northern Territory Government International Engagement Strategy 2022-2026)

### 9.5.5 Workforces

The Northern Territory agriculture, fisheries and aquaculture sectors are vital to not only the Northern Territory workforce but also play a pivotal role to many remote and regional communities that have significant links to other supply chain actors and sectors of the local economy. These economic opportunities and employment provide approximately 2,410 people representing 1.8% of the Northern Territory workforce (KPMG, 2020).

Evidence suggests that all sectors, pre and post COVID-19, are experiencing significant skills challenges and staff retention issues which have a considerable effect across the supply chain. This also creates the opportunity for industry, government, and key stakeholders to work together with a holistic approach to improve the pathway to employment in the agricultural and fisheries industries, not just sectorial pathways, with an increased focus on regional and remote requirements. Increasing corporatisation in agricultural sectors will continue to create new opportunities for skilled labour across a range of areas including corporate governance, agribusiness management, professional and technical skills, science and technology, and environmental and sustainable business operating systems.
Across the six sectors the opportunities listed below were highlighted as key priorities for the growth of workforce development in agriculture and fishery industries.

1. Generating sustainable local employment and incomes through increased supply of agricultural and fisheries/aquacultural products.
2. Facilities, services, and technical capabilities need to be relatively close to regional centres with suitable amenities given the need for sustainable skilled workforces, at a time when the agribusiness sector is struggling to attract workers.

Refer to Appendix C for complete list of demand driven opportunities for increased supply in workforce development.

### 9.5.6 Recommended Sector Priorities

The approach aimed at identifying priorities across the six industries in the Northern Territory to try and reframe and further develop economic outcomes for these industries. This required an evaluation of the current gaps, which were established through the reviewed industry opportunities, and prioritised into five key areas:

- Strategic Development of the NT
- Supply Chain/Infrastructure
- Resources
- Markets
- Workforce

The method used to address these priorities was to gauge the sectorial commonalities through the five key themes. The purpose of this study is to address agricultural supply chains, however, as noted below Strategic Development of the Northern Territory is rated the highest priority which aligns with findings in numerous reports supported by the CRCNA. For these sectors to continue to grow into sustainable and economic industries it will be a priority for all stakeholders including industry, governments, and the private sector to continue to work together to pursue reform and reframe development pathways for growth.

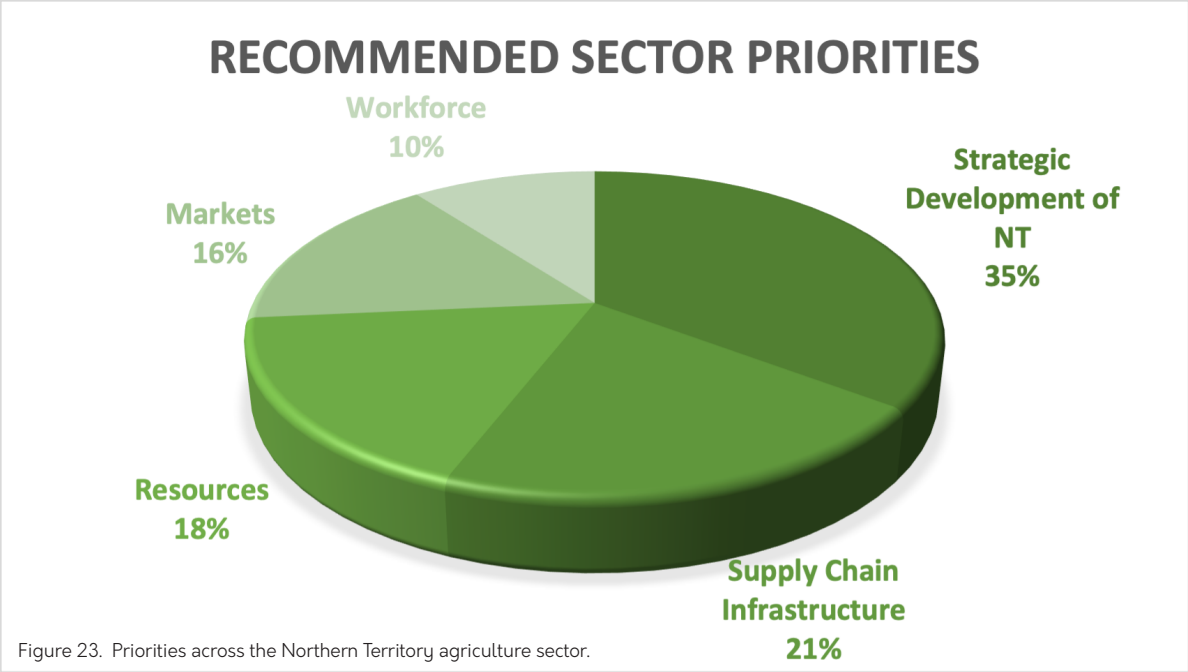



Figure 23. Priorities across the Northern Territory agriculture sector.

There were sixty industry priorities (refer Appendix C), however, as shown in Figure 23, the top ten industry priorities were strongly featured throughout the sectors in which even within themselves could have significant impact on the competitive advantage of the Northern Territory agribusiness sector.

Refer Appendix C for complete list of Industry Priorities

The top ten sector priorities are:

1. Future risk proofing and de-risking the industry against domestic, global, environmental, and geopolitical challenges.
2. Focused regional research, development, and extension activities.
3. Developing complimentary rotational cropping.
4. Licensing and regulatory approval navigation pathways that create greater investment certainty.
5. Improved efficiency in gaining access to land and water to build scale.
6. Advocacy priorities to streamline and strengthen public and political support for policies, programs, and regional development strategies that horticulture development including Government, Aboriginal landowners, Aboriginal organisations, and all industry stakeholder proponents.
7. Workforce development and local employment opportunities across the agricultural supply chain.
8. Targeting and opening new market access for export.
9. Building capacity and knowledge in agricultural operations.
10. Post farm gate processing development linked to integrated enterprises that would facilitate increased uptake of industry best practices that promote consistency and quality of product, higher standards, export opportunities, industry collaboration and cooperation, co-branding development and creating research and development prospects.

## 10. SECTOR SWOT

**Strengths**

- The Northern Territory (NT) has abundant and valuable natural resources
- The Port of Darwin is equipped with rail connections
- NT Government focused on improving critical inputs for agriculture including water, infrastructure, supply chains and increasing workforce

**Weaknesses**

- Longstanding workforce/population attraction issues
- High road freight costs
- Lack of scale in production
- Limited port utilization
- Availability of data for production and costs
- Land tenure challenges and barriers
- Extreme weather conditions

**Opportunities**

- Growing consumption in neighbouring Asian countries
- Utilising brand/reputation as safe and secure producer
- Proximity to target new export markets
- Coordinating supply to take advantage of shipping infrastructure
- Improving road access

**Threats**

- Cheap imported products
- Water availability
- Increasing fuel prices
- Increasing geopolitical risks of exporting
- Trade barriers
- Slow digital technology uptake
- Lack of succession planning within the workforce

# 11. ANALYSIS OF INDUSTRIES

## 11.1 Fisheries and Aquaculture

### 11.1.1 Current State of the Industry

**Northern Territory**

The gross value add for the Northern Territory fisheries and aquaculture industry was $136m in 2017/2018 comprising direct fishing ($47.8m), aquaculture ($25.5m) and processing (approximately $8m) creating approximately 940 local jobs (KPMG 2020). Total Gross Value for the Northern Territory $143m and total gross value product $120m (Ogier et al 2019). The industry has more than 200 commercial fishing licences and 190 registered fishing vessels operating across 15 different wild harvest and two major aquaculture operations. The trade and processing sector on average harvests 7300 tonnes of fish and aquatic life annually (KPMG 2020). The industry provides important resources to develop small-scale inshore fisheries, larger offshore fishing operations and a growing aquaculture sector and ornamental trade. The industry's economic significance extends well beyond coastal communities, involving wholesalers, processors, and retailers. The industry has committed through the development of the NTSC strategic plan to proactively advise sectors about key emerging risks and opportunities by providing clarity and transparency to their members and stakeholders.

Seafood exports contribute only 0.04% to Australia's overall export seafood value with 0.2% of the overall volume of Northern Territory product being exported (KPMG 2020). In the analysis by Ogier et al. (2019) that the Northern Territory export is valued at $0.6m with volumes of mud crabs at 14 tonnes and other fish volumes at 4 tonnes (Ogier et al 2019). Fisheries in the Northern Territory contribute approximately 10.8% of production value to the overall key agribusiness sectors (KPMG 2020).

**Northern Australia**

The northern Australia aquaculture industry for 2017 had an annual GVP of $223m, predominately made up in three areas, barramundi 33%, prawns 32%, pearls 31% and other species of red claw, tropical rock oysters, and other finfish at 3% (Cobcroft et al, 2020). In 2016-2017 the northern Australia aquaculture industry produced approximately 11,182 tonnes with a GVP of $223m and direct employment in aquaculture was approximately 520 in 2016. Within the three sectors barramundi totalled 6970 tonnes with a value of $74.8m, prawns 3980 tonne with a value of $72.4m, and pearls $70.4m (Cobcroft et al, 2020). Since 2006/2007 the northern Australia aquaculture production has increased at a steady rate of 3.7% per annum.

### 11.1.2 Current Industry Production Value & Potential Growth

Currently the combined gross value of the Northern Territory fisheries and aquaculture industries is $134 million. This is predicted to rise significantly by 2030 to a value of around $1 billion as a result of Seafarms' Project Sea Dragon commencing production in 2023 and ramping up product output year on year.

This major project alone will have a significant impact on the gross value of production for the sector in northern Australia by adding almost $800m to the annual gross value of production.

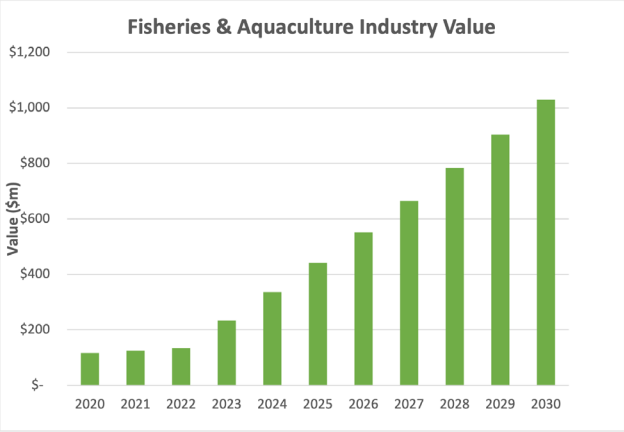



Figure 24. Current and predicted future value of Northern Territory fisheries & aquaculture industries.

### 11.1.3 Industry Constraints

A total of thirty-nine constraints were identified in the fisheries and aquaculture industry supply chains during stakeholder interviews and consultation.

While constraints exist across all five categories (Figure 25), supply chain infrastructure was identified as the largest constraint category (40%) to the fisheries and aquaculture industries in the Northern Territory. Constraints in the strategic development category also presented significantly (25%) in the data.

Stakeholders identified during interviews constraints throughout the supply chain, from production and wild harvest to final market destination. One of the challenges the industry faces is that the total volume of product is small, and harvests are seasonal. This leads to an underinvestment in supporting infrastructure, which in turn impacts product quality and market access, which in turn makes entry to the industry for new participants difficult and costly to justify therefore limiting the ability to increase total industry volume and reduce seasonality. As a result, most constraints fall within the supply chain infrastructure category.

Constraints relating to strategic development of the Northern Territory were also identified by stakeholders, who cited issues with community perception, access to fishing permits and geographical isolation as significant factors in constraining the industry.

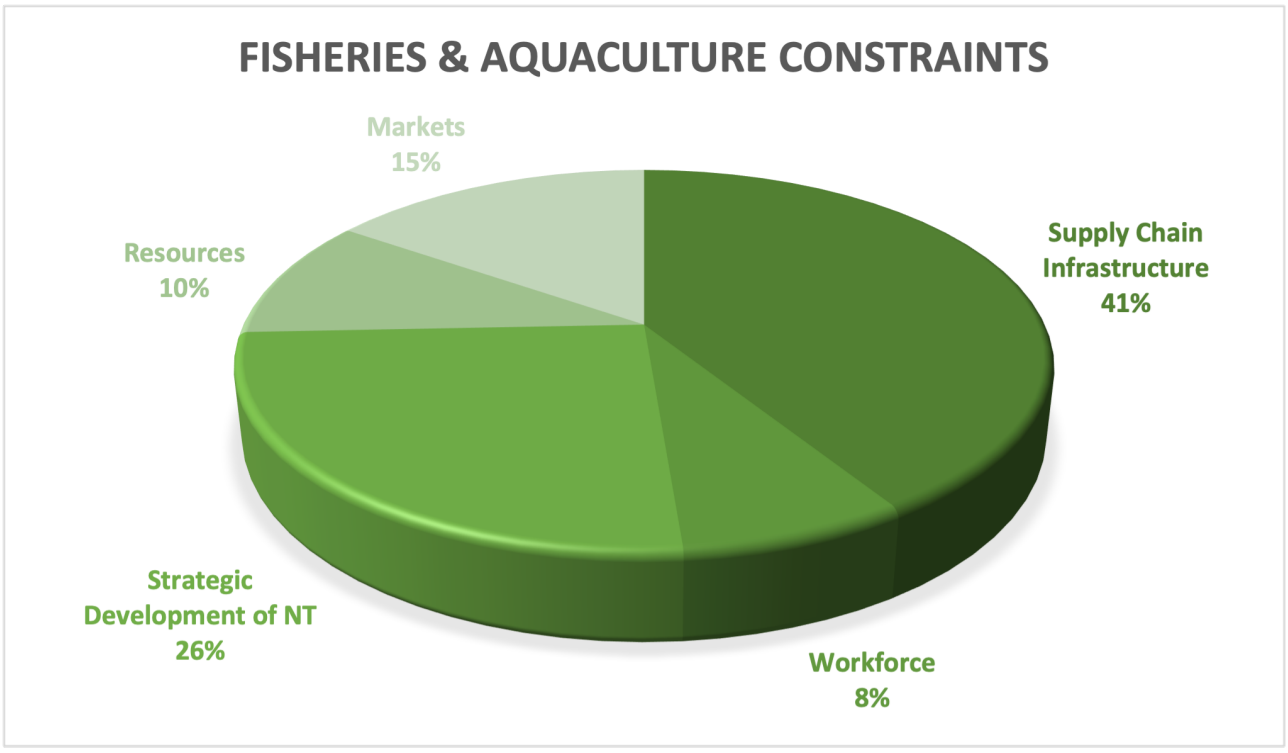



Figure 25. Northern Territory fisheries and aquaculture industry constraints.

**The most significant constraints identified by stakeholder during consultation are:**

1. A portion of local communities opposed to the Northern Territory fisheries industry.
2. Lack of a skilled workforce entering the industry and low salaries across the supply chain.
3. Declining number of skippers that have experience operating in the NT.
4. Lack of succession planning and workforce.
5. Aboriginal communities are not effectively involved in the industry.
6. There is a gap of understanding the overall supply chain risks and opportunities from the industry and government perspectives.
7. Complexed issues to secure market access and access to fishing grounds.
8. Current supply chain limitations persist through challenges of backfilling trucks to interstate markets, airfreight, and air route availability with no opportunity for sea freight options.
9. Small product volumes and industry fragmentation limiting economies of scale required to support freight routes and be cost competitive against south-eastern ports
10. Geographically isolated.
11. Cost effective, dependable, and sustainable catching and growing of products in variable climate and environmental conditions.
12. Frequency and affordability of airfreight.
13. Most products are processed and exported out of eastern states.
14. No seafood processing facilities with significant scale.
15. Current processing facilities are limited to filleting, battering, and crumbing at small scale with local operators.
16. Value added processes are performed currently closer to markets.
17. Current processing is reliant on access to labour and constrained by lack of processing space at current sites and lack of equipment investment.
18. High volume fishers currently send whole or frozen products to southern markets for processing.
19. Competition of road freight during other agricultural seasons.
20. Increased fuel prices may affect cost competitiveness.
21. Securing export licenses and vessel export accreditation.
22. Increased geopolitical risks for exporting.
23. Maritime infrastructure in Darwin has deteriorating issues.
24. Unloading areas require covering to enhance product and packaging integrity.
25. Lack of regional, and remote cold storage and processing and service facilities.
26. Underutilisation of Maningrida fish processing facility by commercial fisheries.
27. Improvements are required to remote communications infrastructure.
28. High barge logistic costs.
29. Main barge has limited capacity and expensive access.
30. Limited and inconsistent data availability.
31. Lack of all-weather access roads increasing product time to market due to barge timings and limitations.
32. Competition from cheap imported products.
33. Environmental approvals.
34. Native title.
35. Constrained by access to research and development.
36. Constrained by seasonality to supply all year round for securing of supply chains hence leakage of product to southern ports for export.
37. Absence of breeding programs and brood stock supply and quality (prawns).
38. High cost of inputs (i.e.: feed, power, labour, parts and services, and supply chain components).

### 11.1.4 Industry Trends

The market category trends were identified as the most significant within the fisheries and aquaculture industries at 46%, (Figure 26). Growing domestic and global demand for sustainable, consistent, and high-quality seafood products is the key trend identified in stakeholder engagement and literature research.

The industry trends identified by stakeholders in the fisheries and aquaculture industries as being most significant are:

1. Industry commitment on reducing environmental and market impacts including reducing food fraud and increase provenance.
2. Large organisations are increasing automation.
3. Some sectors in industry are accelerating innovation.
4. Growing domestic and global demands for an alternative natural source of protein and health and ethical reasons.
5. Growing demand to provide consumers with sustainable, consistent, and high-quality seafood.

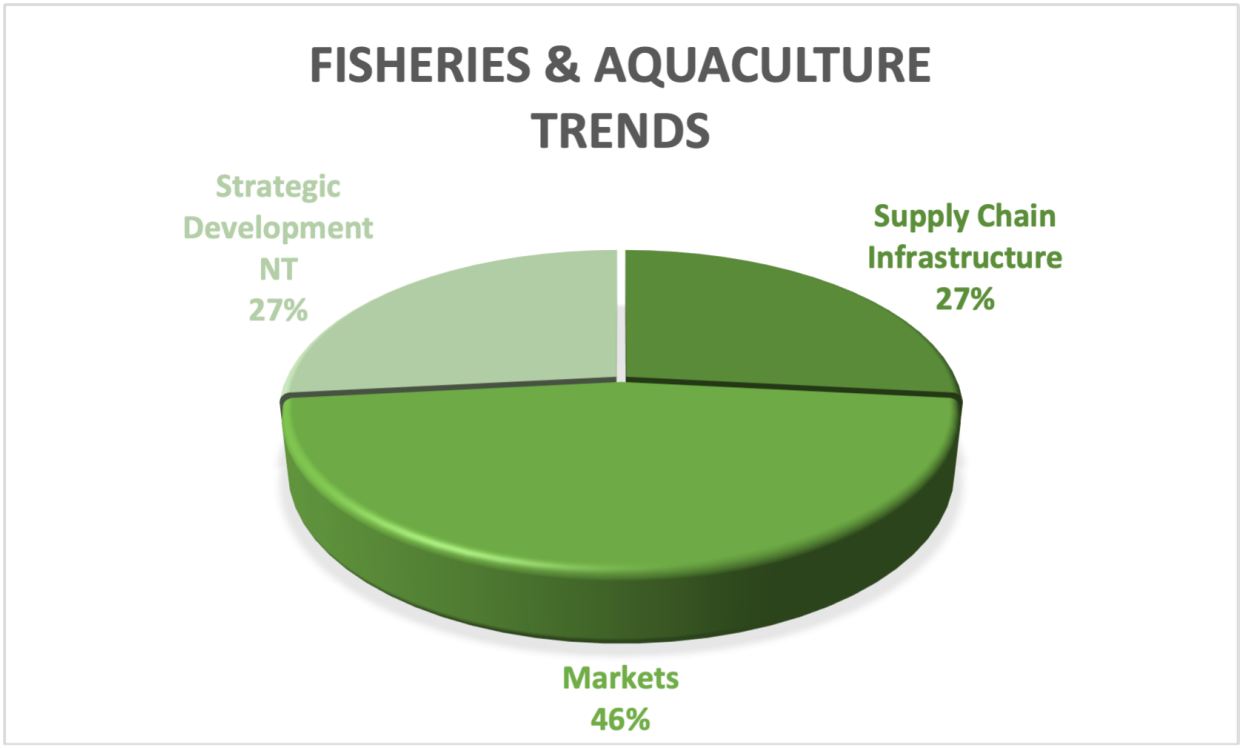



Figure 26. Northern Territory fisheries and aquaculture industry trends.

### 11.1.5 Priorities

There were eleven priorities identified by stakeholders in the fisheries and aquaculture industries during interviews and consultations, across all five categories (Figure 27). The largest representation was in the strategic development of the Northern Territory category (28%) and supply chain infrastructure category (27%). Also significant were the resources process and markets categories (both 18%).

In all the reports reviewed, a common theme was evident across fisheries and aquaculture for the future investment development requirements – research, development and extension, regulatory framework and pathways, market development and access, biosecurity, public perception, environmental and sustainability performance, infrastructure investment support, and workforce development planning (education and training).

The top priorities identified through the research and stakeholder engagement processes are:

1. Feasibility studies have shown options for a seafood processing facility in the Northern Territory. A processing facility would increase uptake of industry best practices that promote consistency and quality of product, higher standards, export opportunities, industry collaboration and cooperation, co-branding development and creating research and development prospects.
2. Targeting and opening new market access for export.
3. Workforce development - upskilling of workforce.
4. Attract and retain people into the industry.
5. Inter-industry collaboration for scalability.
6. Improved road access.
7. Improved coverage and closure line markers.
8. NBN satellite ability for remote and offshore service.
9. Future risk proof the industry against global, environmental, and geopolitical challenges.
10. Licensing and regulatory approval navigation pathways that create greater investment certainty.
11. Continuing the significant role of biosecurity for securing and growing international markets.
12. Focused research, development, and extension activities.

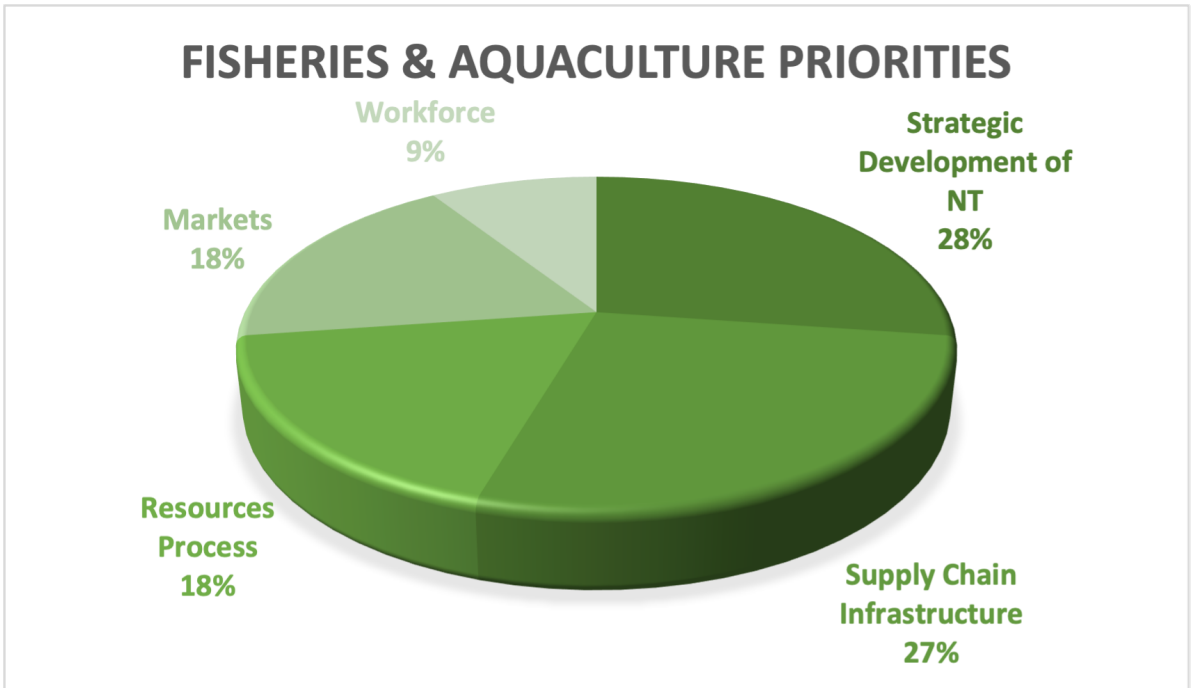



Figure 27. Priorities for the Northern Territory fisheries and aquaculture industries.

### 11.1.6 Demand Driven Opportunities to Increase Supply

Opportunities created by strategic development were identified in a total of thirty-one opportunities as the most significant opportunity for the fisheries and aquaculture industries with 32% falling into this category (Figure 28). Opportunities in markets (26%) and supply chain infrastructure (23%) were also identified as significant in the research and stakeholder engagement.

Supply chain modernisation, product consolidation to create volume efficiencies, and export capacity and capability development all featured heavily in the opportunities for the industry.

The top opportunities identified by stakeholders during interviews and consultations are:

1. Industry recognition of value through support of a local 'NT Caught' promotion.
2. Export opportunities for high value, high quality seafood products and value-added products further into Asia markets with a focus on China, Vietnam, Japan, Hong Kong, Singapore, and Indonesia.
3. Export capability and capacity building programs for industry to increase export knowledge gap.
4. Investment required for all weather road access.
5. Leverage of new cold store facilities for export out of Darwin as airfreight capacity becomes available.
6. Collaboration between like-minded producers to consolidate volume for expansion (including export).
7. Fully functional cross supply chain coordination function to deliver export growth objectives.
8. NTG to prioritise focus on improving critical inputs for agribusiness namely water, infrastructure, and improvement to supply chains, increase resilience of the workforce and enable producers to capitalise on emerging technologies.
9. Advocacy priorities to streamline and strengthen public and political support for policies, programs, and regional development strategies that enable seafood/aquaculture development including Government, Aboriginal landowners, Aboriginal organisations, and all industry stakeholder proponents.
10. Abundant and valuable natural resources and has exceptional investment and growth potential.
11. Relatively young industry to capitalise on new opportunities.
12. Global growing protein demand to provide sustainable, consistent, and high-quality seafood.
13. Unique/niche seafood opportunities.

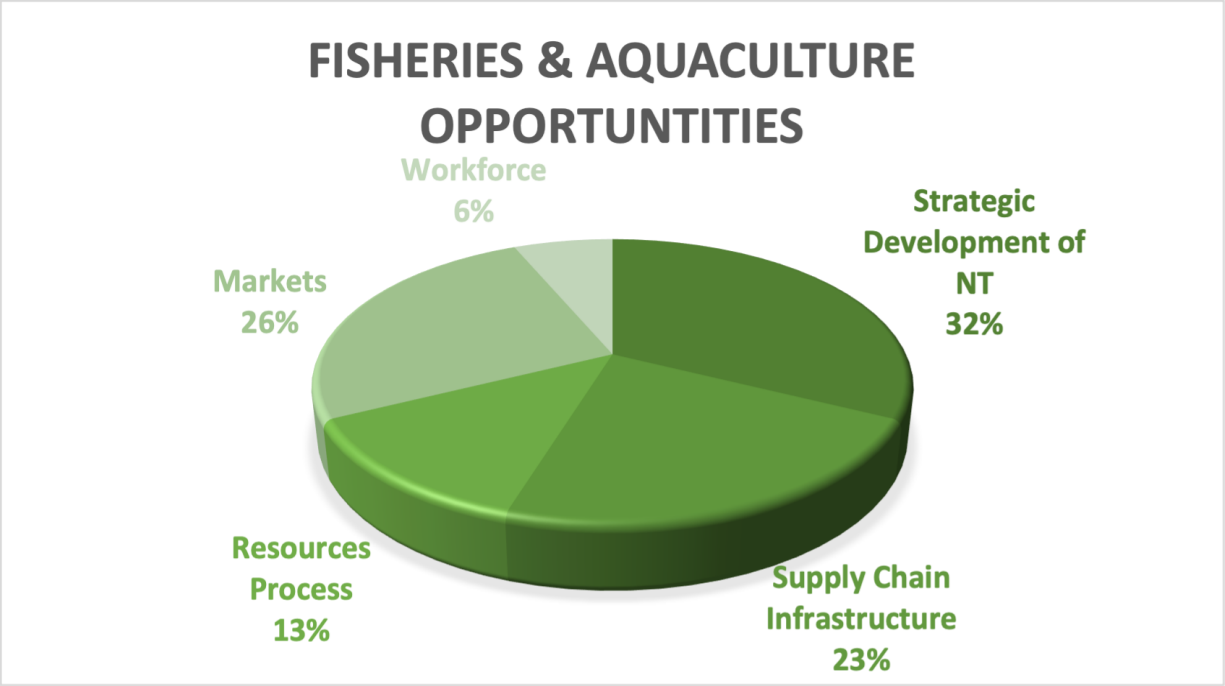


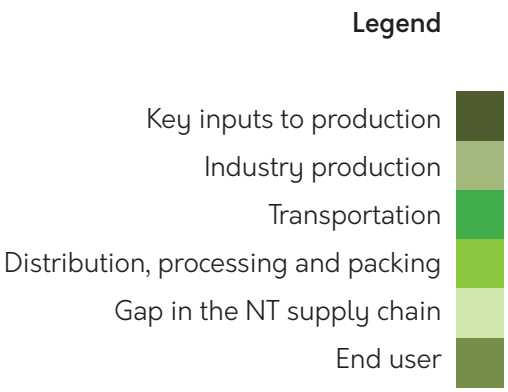

Figure 28. Opportunities driven by demand for the Northern Territory Fisheries and Aquaculture industries.

### 11.1.7 Aquaculture & Fisheries Industry Supply Chain Maps

**Aquaculture**

**Key Issues:**

- Major food retailers require testing of all fish products by the National Association Testing Authority (NATA) in an approved laboratory, and none are present in the NT.
- The absence of a frozen container facility in Dawrin requires product to be transported interstate before shipment to export markets.



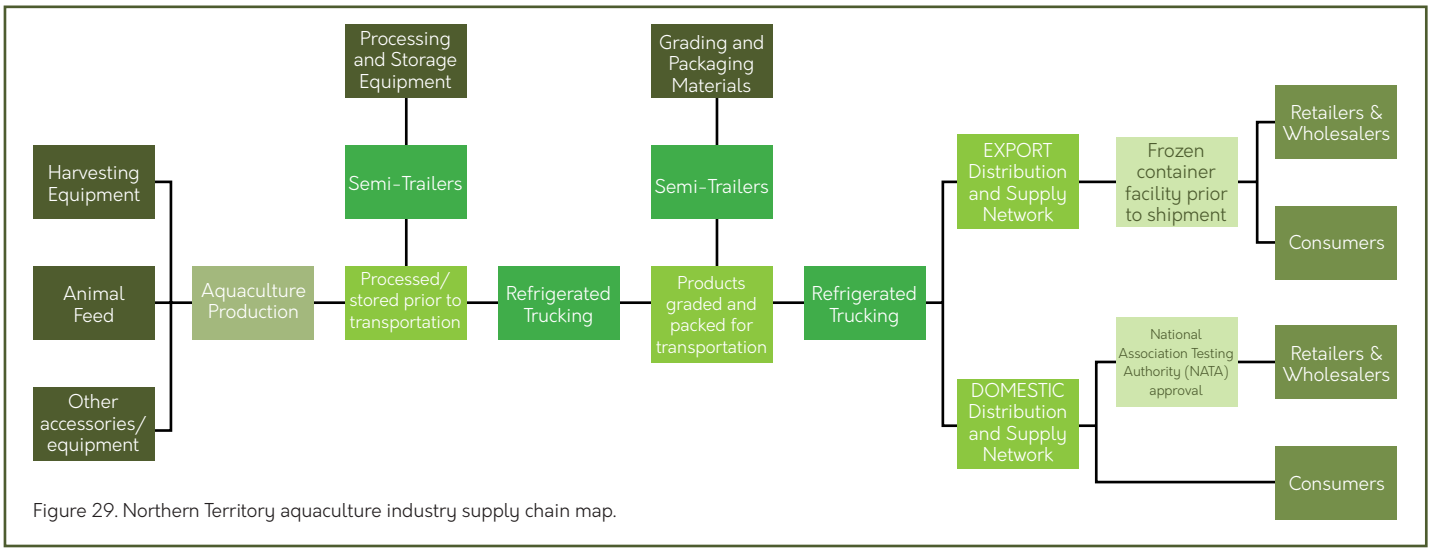
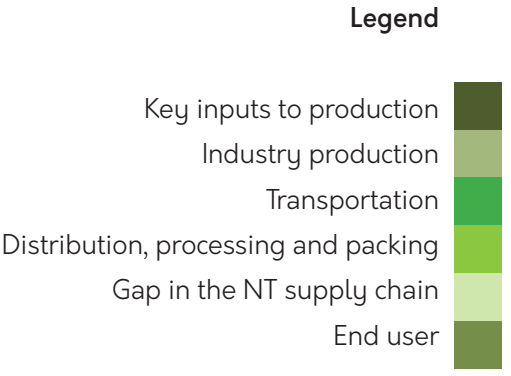




Figure 29. Northern Territory aquaculture industry supply chain map.

**Fisheries**

**Key Issues:**

- Major food retailers require testing of all fish products by the National Association Testing Authority (NATA) in an approved laboratory, and none are present in the NT.
- The absence of a frozen container facility in Dawrin requires product to be transported interstate before shipment to export markets.



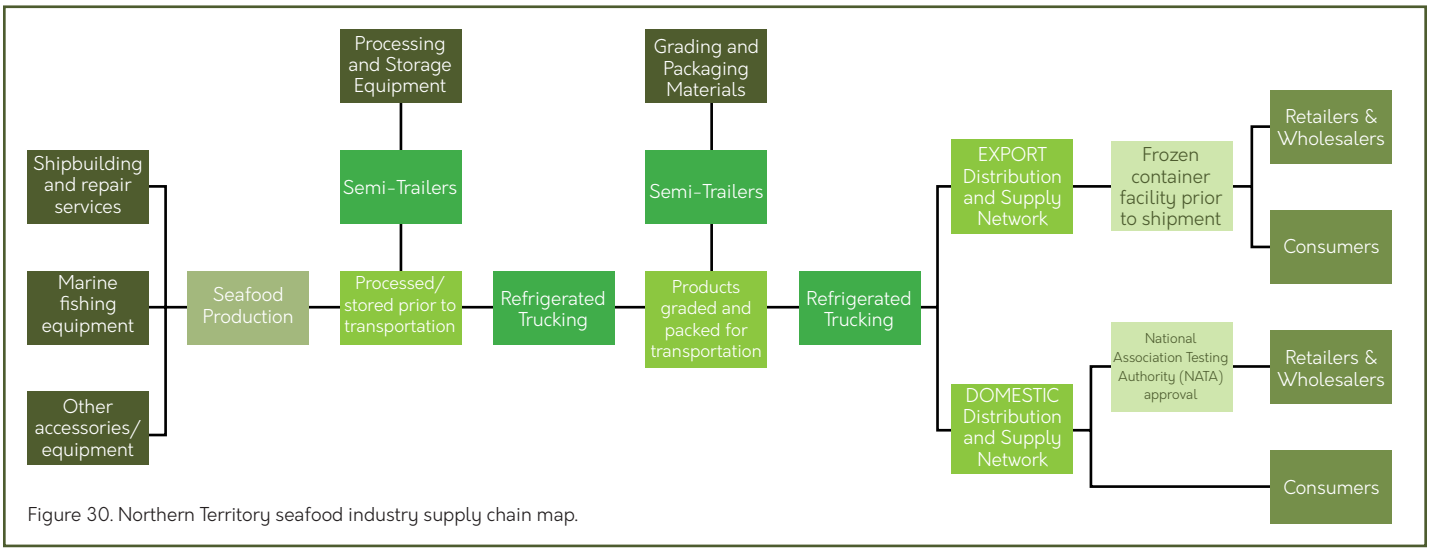




Figure 30. Northern Territory seafood industry supply chain map.

### 11.1.8 Aquaculture & Fisheries Industry SWOT

| Strengths | Weaknesses |
|---|---|
| • Northern Australian aquaculture production has increased steadily in the last decade.<br>• Strong government support for the aquaculture industry.<br>• Advantageous environment for niche aquaculture opportunities. | • Minimal seafood export from the Northern Territory.<br>• Persistent supply chain limitations.<br>• Processing and exporting largely occurs in eastern states.<br>• Limited research and development.<br>• Connectivity and telecommunications access. |
| **Opportunities** | **Threats** |
| • Growing domestic and global demand for alternative protein sources.<br>• Growing domestic demand for sustainable wild harvest produce.<br>• Potential for small-scale inshore Indigenous fisheries businesses.<br>• Potential for Northern Territory processing facilities and utilising new Darwin cold storage facilities. | • Portion of local communities opposed to the seafood industry.<br>• Declining number of experienced skippers.<br>• Competition for road freight during other agricultural seasons.<br>• Lack of sufficient inputs for future aquaculture projects.<br>• Unique challenges with tenure and Northern Territory access. |

## 11.2 Forestry

### 11.2.1 Current State of the Industry

**Northern Territory**

For the Northern Territory, which is currently an emerging industry for the NT, is made up presently of total Native Forest 18.7million ha of indigenous ownership or management, 13.5million ha of private and 9.3million ha of leasehold and approximately 51,000ha of plantation forest (Stephens et al 2020). The industry harvests $115 million worth of timber per year, manages $1.32 billion in plantations and employs approximately 170 FTE's (NT Farmers n.d. a). Forestry is based around three regional growing areas, Douglas Daly/Katherine, Tiwi Islands, and East Arnhem which provides and will continue to provide future employment and income generation opportunities. Plantation operations are categorised into three major varieties, African Mahogany (Khaya senegalensis), Indian Sandalwood (Santalum album), and Black wattle (Acacia mangium).

The Australian Government has recently provided support to develop a Regional Forestry Hub in the Northern Territory, Forestry Association of the Northern Territory (FIANT) will assist in underpinning the growth in Australia's renewable timber and wood-fibre industries and assist policy drivers to reduce barriers to forestry expansion. FIANT will provide value to existing infrastructure and processing and identify key investment infrastructure opportunities as the industry evolves. Building capability and capacity, research and development resources and being the industry voice will assist with fostering industry collaboration and public support and awareness.

**Northern Australia**

Northern Australia makes up 48% of total forests in Australia and has an annual production value of $80million. This has created approximately 1240 direct jobs and 1860 indirect jobs within the industry. Overall hectares are categorised into three areas consisting of 13million ha of native forest with commercial potential, 22million ha of private native forest and 100,000 ha of plantation forest. Other than Northern Territory, Northern Australia is divided into several regions, Cape York, and Far North Queensland with a total of native forests of 24.2million ha of indigenous ownership or management, 23.6million ha leasehold, 7.7million ha private and approximately 38,500ha of plantation forests. Northern Western Australia (Ord River-southern Kimberley) has a total of native forests of 3.2million ha of indigenous ownership or management and approximately 10,000ha of plantation forest (Stephens et al 2020).

With some plantations of African Mahogany, Indian Sandalwood and Acacia approaching harvest maturity Northern Australia is forecasted over the next 5-10 years to double or treble output up to a value of $300million (Stephens et al 2020).

### 11.2.2 Current Industry Production Value & Potential Growth

There is currently very limited forestry product sold from the Northern Territory due to the first plantations still maturing. Maturation is expected to commence from 2027 when the first forestry products are expected to be harvested and sold. With forestry products in the Northern Territory being a high-value product it is forecast that with the commencement of sale of these products, along with the maturation of further plantations in future years, there will be a significant increase in the gross value of production (Figure 31) from the forestry sector ($140m by 2030).

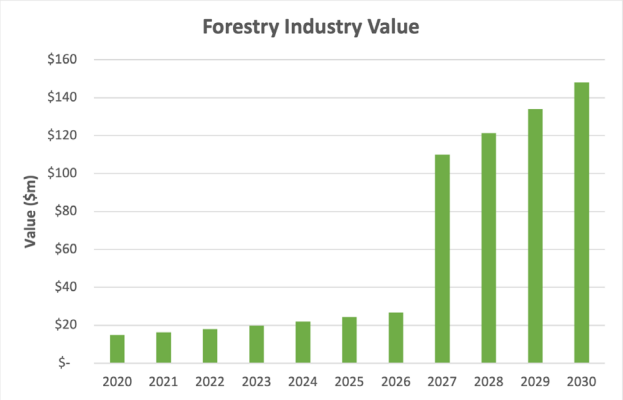



Figure 31. Current and predicted future value of Northern Territory forestry industry.

### 11.2.3 Industry Constraints

A total of twenty-nine constraints were identified by the research, with the majority (41%) categorised as supply chain infrastructure constraints. Constraints relating to strategic development also featured significantly (31%), while there were constraints identified across all five categories (Figure 32).

Forestry is a fledgling industry in the Northern Territory, with plantations still to mature. While yet to harvest product the industry lacks scale in terms of output, which presents challenges in securing investment in supply chain infrastructure, such as sealed roads. While the crop may still be maturing, the industry is acutely aware that the enabling infrastructure, such as all-weather roads capable of withstanding significant volumes of heavy traffic required to deliver the timber to processing or shipping facilities, is not yet connecting the plantations with key transport corridors.

Supportive regulatory environments are also a challenge to a new industry. Issues such as access to native forestry resources due to land tenure restrictions, security of access to supply, and fragmentation and conflicting policies among stakeholders are a challenge to industry growth.

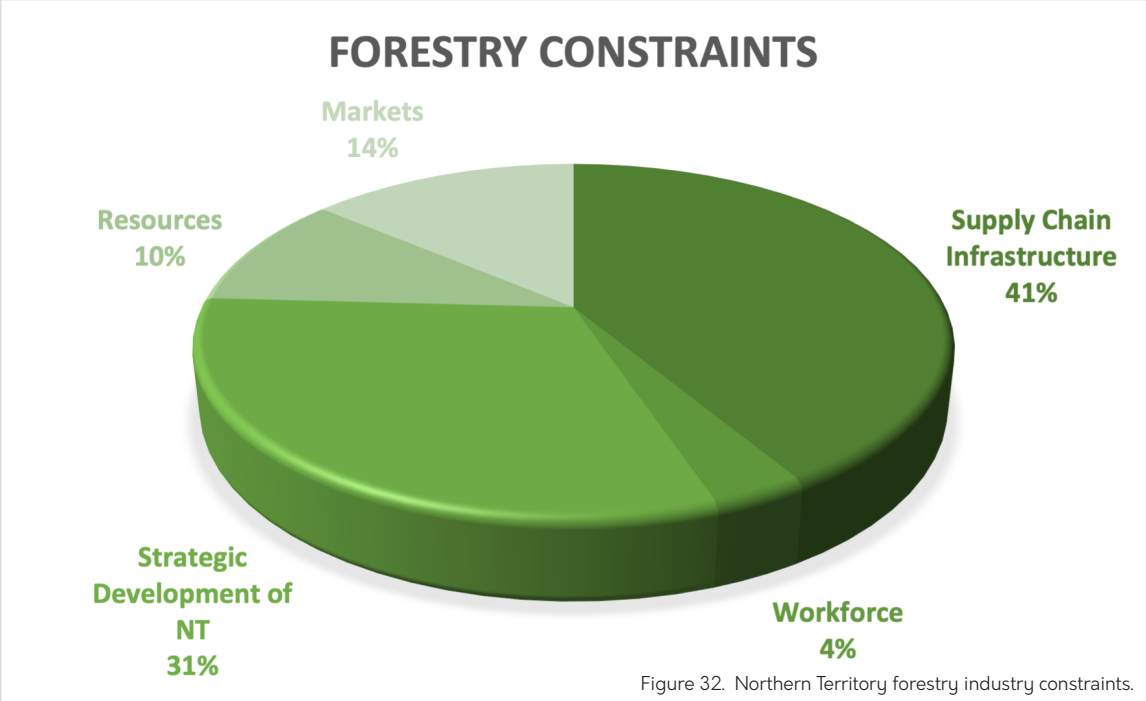



Figure 32. Northern Territory forestry industry constraints.

Some of the most critical constraints identified by stakeholders during interviews and consultation are:

1. Limitations of resources and inconsistency of accurate data and collection.
2. Remote geographical locations.
3. All weather access roads.
4. Transporting distances to wood processing facilities, ports, and population centres.
5. Native title and land tenure barriers.
6. Economies of scale.
7. Security of access to supply of resource.
8. Pest and diseases.
9. Limited forestry skills in industry.
10. Inconsistent rainfall (highly seasonal).
11. Lack of collaboration between government, Traditional Owners, pastoralists, and mining sector.
12. High energy costs.
13. Processing technologies for African Mahogany not fully evaluated.
14. Limited access to maintenance and technical support.
15. Australia's tropical savannas are highly flammable.
16. Water availability.
17. ERF barriers to carbon market access.
18. Wood product processing and value chain activities currently small scale and fragmented.
19. Policy and regulatory impediments.

### 11.2.4 Industry Trends

A total of fifteen industry trends were identified, with the majority (60%) categorised as strategic development trends. Markets (27%) and supply chain infrastructure (13%) also featured (Figure 33).

Stakeholders identified emerging opportunities for the industry, such as carbon farming, new production systems, new product sources, and technology advancements in processing. All of these require strategic planning and direction by industry and governments to be realised. These opportunities present significant scope for industry growth into the future and explains the dominance of strategic development trends among those identified.

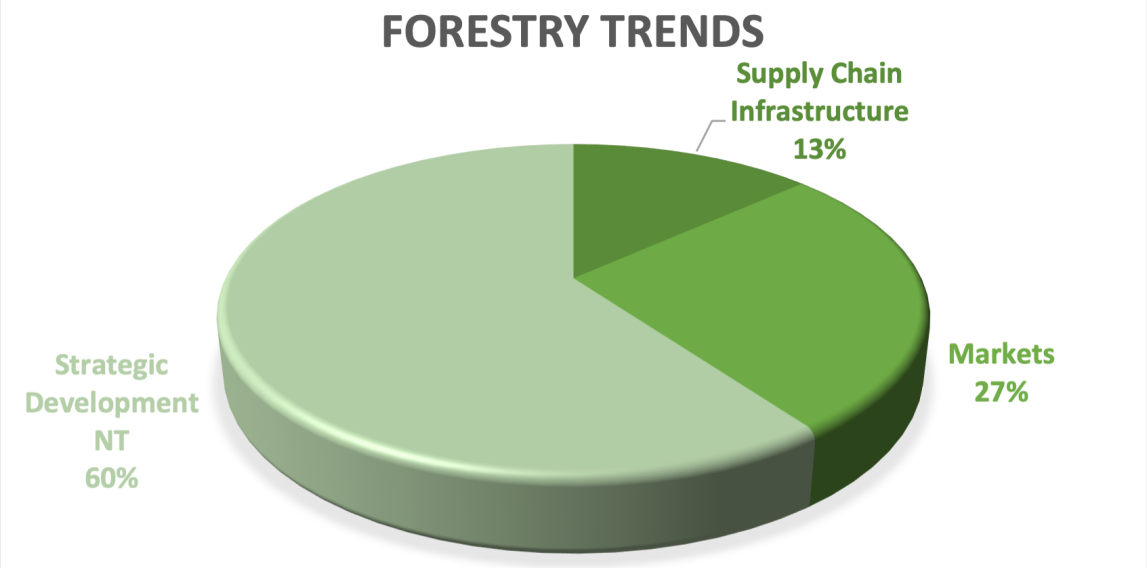



Figure 33. Northern Territory forestry industry trends.

The key trends identified by stakeholders during interviews were:

1. Silviculture and silvopastoral production systems.
2. Carbon farming initiatives for ERF forestry participants.
3. Mine site revegetation.
4. Continued growth in domestic and global demand for hardwood fibre.
5. Well established growth in Australia for sawn wood products.
6. New technologies that can convert the volume of smaller diameter or lower quality logs to high performance engineered wood products

### 11.2.5 Priorities

A total of eleven priorities were identified by industry stakeholders during interviews and consultations. Priorities were identified within all five categories, with the resources process category (28%) and markets category (27%) featuring most significantly (Figure 34).

In line with the emerging market opportunities identified as industry trends, the priorities outlined by stakeholders during interviews and consultations focus on the removal of barriers to realising those opportunities. Addressing policy and legislative barriers to industry growth, as well as market and product access issues were identified strongly in the priorities.

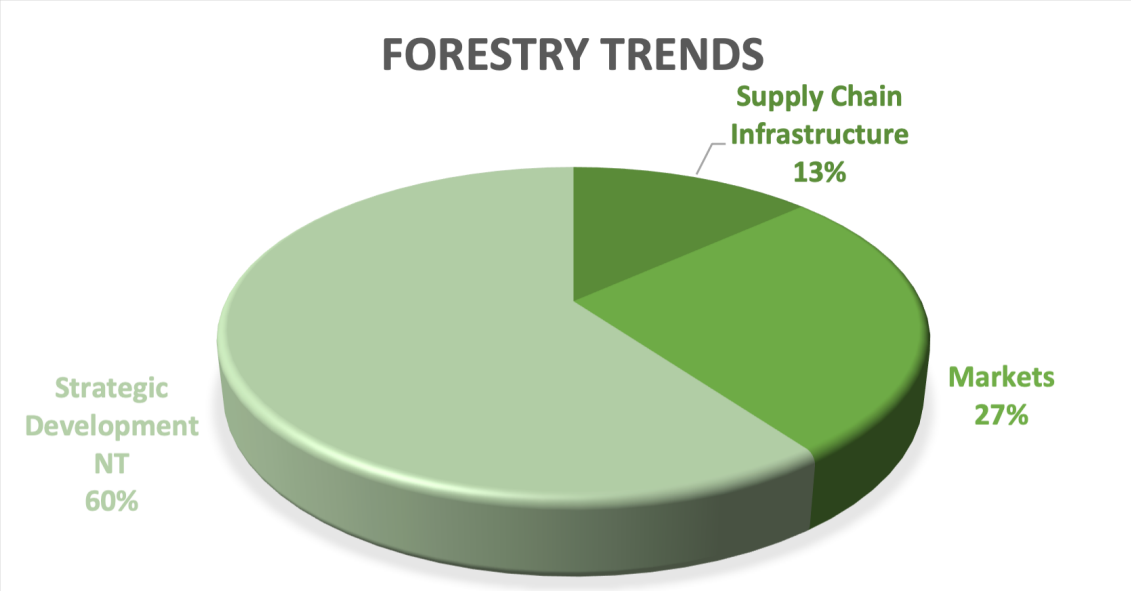



Figure 34. Priorities for the Northern Territory forestry industry.

The top priorities identified by stakeholders during interviews and consultations are:

1. Workforce development and local employment opportunities of forestry across the supply chain.
2. Market access and export market connectivity.
3. Improving and having clear pathways for securing native forests and plantations.
4. Removing carbon market access barriers.
5. Building improved engagement models with stakeholders.
6. Reducing and changing CFI policy regulation.
7. Support expansion of indigenous forestry and wood products manufacturing.
8. Support of harvesting opportunities of native forests on all tenures.
9. Infrastructure mapping to develop wood product supply chains in northern Australia forestry regions.
10. Mining land rehabilitation.

### 11.2.6 Demand Driven Opportunities to Increase Supply

A total of thirty-two opportunities for demand-driven supply growth were identified by forestry industry stakeholders during interviews and consultations.

While opportunities were identified across all five categories (Figure 35), strategic development of the Northern Territory was most significant with 47% of opportunities falling into this category.

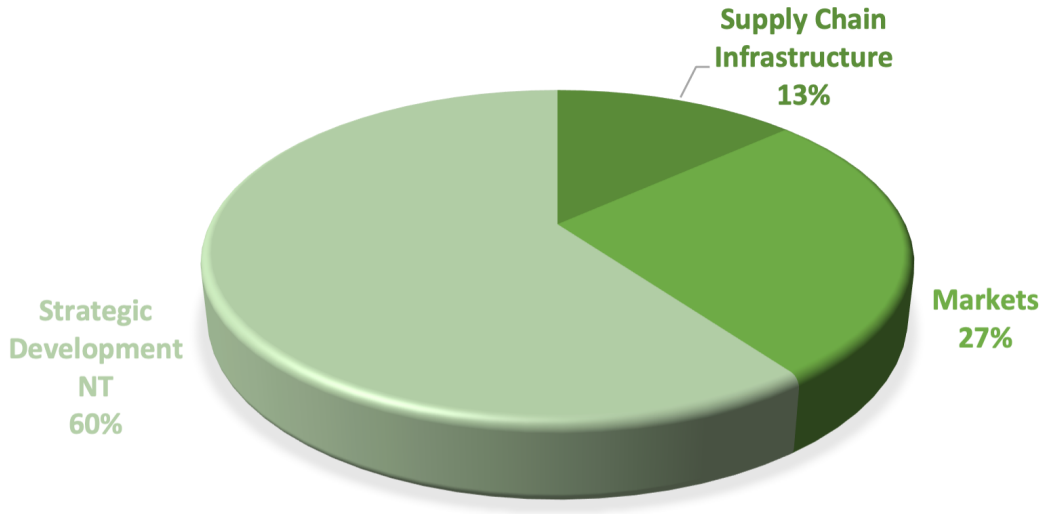



Figure 35. Opportunities driven by demand for the Northern Territory forestry industry.

The most important opportunities for demand-driven increase in supply identified by stakeholders during interviews and consultations are:

1. Rehabilitation activities leveraging existing mining sites.
2. Reduction of economic impact through understanding implications of climate and weather-related events.
3. Further exploration of domestic processing and value adding opportunities.
4. Generating sustainable local employment and incomes through increase supply of wood products.
5. Increasing silvicultural production systems throughout Northern Australia.
6. Transforming forestry management practices using space-based technologies.
7. Domestic and international market development and analysis.
8. Product branding opportunities.
9. Financial investment models and access to insurance opportunities to assist with major climatic events (i.e., Cyclones).
10. Integrated and regional development approach.
11. Infrastructure development for major processing facilities in conjunction with plantation expansion to assist with geographical and logistic remoteness.
12. Applied research in silvopastoral systems to test commercial benefits.
13. Improved native forest inventory and assessment of commercial viability.
14. Value-add development of products and downstream infrastructure to support ceremonial, pharmaceutical and personal care products.
15. Supply to local and export markets that are distant from other building materials.
16. Cross jurisdictional collaboration to promote development of forestry industry across northern Australia.
17. Development of climatically suited plantation species.
18. Increase productivity of future hardwood pulp fibre plantations.

### 11.2.7 Forestry Industry Supply Chain Map

**Key Issues:**

- The NT does not have a complete offering of mills that are required to produce a full range of forestry and paper products

**Legend**

- Key inputs to production
- Industry production
- Transportation
- Distribution, processing and packing
- Gap in the NT supply chain
- End user

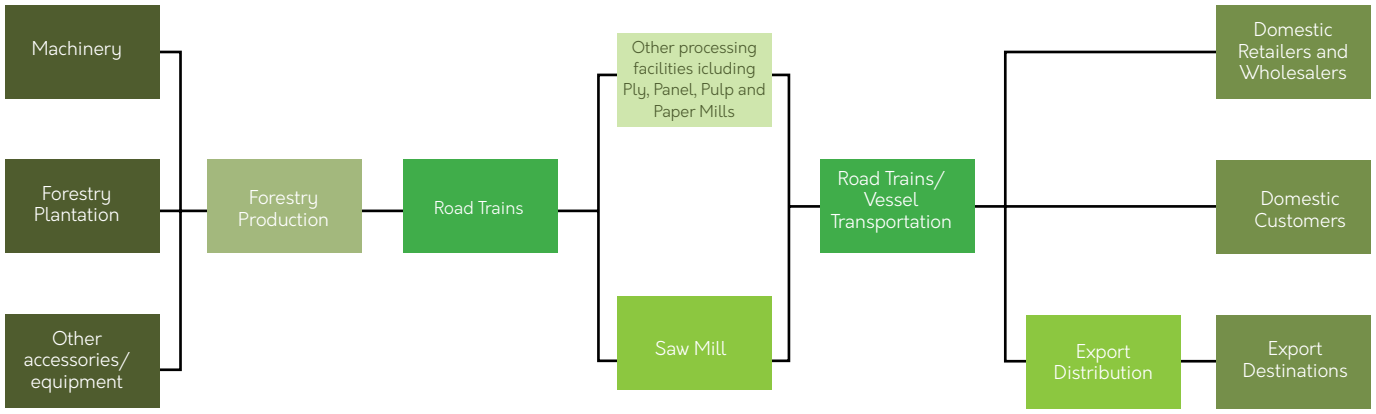



Figure 36. Northern Territory forestry industry supply chain map.

### 11.2.8 Forestry Indistry SWOT

| Strengths | Weaknesses |
|---|---|
| • Northern Australia makes up 48% of total forest in Australia.<br>• Continued growth in domestic and global demand for wood fibre.<br>• Growth in in Australian demand for sawn wood products.<br>• Development of a Regional Forestry Hub in the NT. | • Remote geographical locations of plantations.<br>• Large transporting distances.<br>• Termites and other pests.<br>• Inconsistency and seasonality of rainfall.<br>• Lack of collaboration with traditional owners.<br>• Barriers to carbon market access.<br>• High biosecurity expenses.<br>• Fit-for-purpose port facilities required |
| **Opportunities** | **Threats** |
| • Emerging markets in engineered wood products.<br>• Silviculture production systems.<br>• Carbon farming initiatives.<br>• Future mine site rehabilitation.<br>• Niche/high-value forestry species such as Indian Sandalwood and African Mahogany.<br>• Development of processing facilities. | • Unproven processing technologies for some plantation species.<br>• Climate and weather-related events (cyclones, droughts, bushfires).<br>• High power costs may disincentivise processing investments.<br>• Chinese ban on Australian timber imports. |

## 11.3 Cotton

### 11.3.1 Current State of the Industry

**Northern Territory**

Cotton in the Northern Territory over the last several years has ignited significant interest locally, interstate and internationally for investment. With current successful cotton trials has resulted in grower expandability with a forecast of reaching around 400,000 bales over the next decade (PwC 2019). Australian cotton produces close to 3 million bales and with 90% exported it has a global reputation as being an industry leader.

The increase in the demand from the Northern Territory for cotton production and processing and with our proximity to export markets compared to southern ports, increased consumer demand for natural fibres, climatic conditions and land, water and environmental sustainability will continue to provide the diversification of the agricultural industry to expand and capitalise on the economic prosperity that cotton may provide. Cotton processing locally has additional benefits in producing cottonseed, a valuable high-protein meal for cattle, fed either as whole cottonseed or as cottonseed meal. There would also be export potential for cottonseed meal (Ash et al 2014).

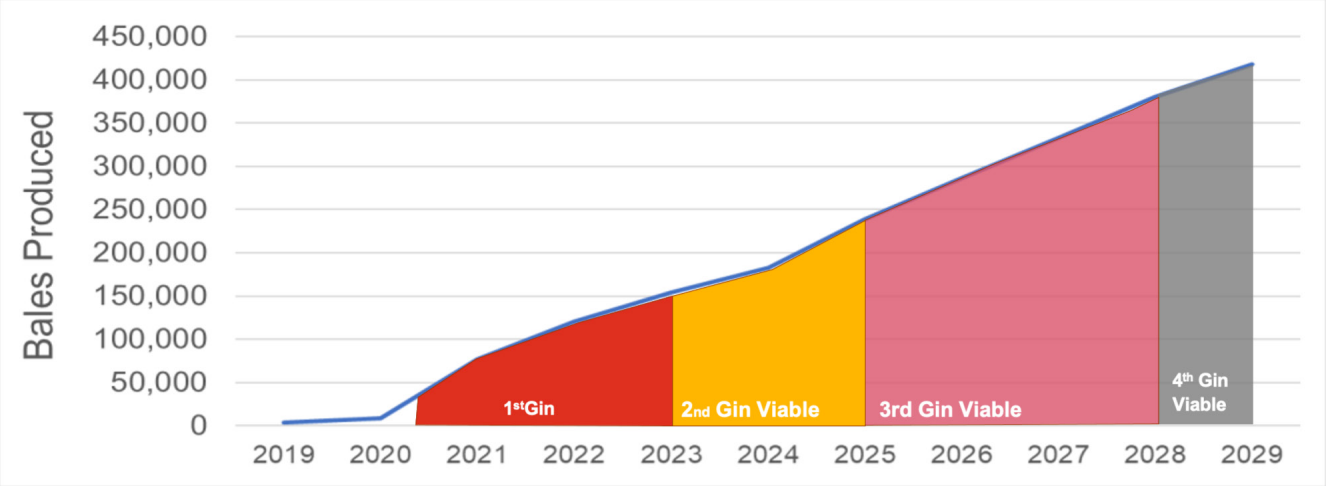



Figure 37. Projected cotton bale production in the Northern Territory and estimated viability of cotton gin establishment based on production levels. Source: PwC/NT Farmers

Figure 37 depicts the projected cotton bale production in Northern Australia (across the Northern Territory and Kimberley region) as well as indicating when and how many cotton gins may be viable in the region. These figures are based on engagement with over 40 landowners and growers in the region (PwC 2019).

Currently Northern Territory grown cotton is shipped back to Queensland for processing (ginning) and shipped and traded from southern ports. The 2022 Northern Territory cotton harvest will be processed through new facilities which are currently being constructed allowing for a positive cost benefit to growers across the Northern Territory and Northern Western Australia (Kununurra). However, with increased global sea freight costs there would be benefit of understanding how updated costings may or may not affect the cost benefit from directly exporting out of the Darwin Port.

The Northern Territory now has the opportunity to capitalise on the current and potential benefits of a highly prospective Northern Australian cotton industry, with the gin taking supply from local Northern Territory growers and Kimberley regional growers. With an ever-improving grower skillset, favourable climate, and soil conditions, as well as proximity to export markets, investment is needed to provide the infrastructure that will propel the industry and provide stimulus across the Northern Territory economy (PwC 2019).

### Northern Australia

Dryland and irrigated cotton production are already well established in Australia, with the annual area grown generally changing in response to water availability. Commercial cotton production has been tried a number of times in northern Australia and the early attempts encountered major challenges due to capital limitations, climatic adaptability, and pest control. Since the introduction of genetically modified (GM) cotton in 1996, yields and incomes from cotton crops have increased in most regions of Australia, with the key benefits of GM cotton (compared with conventional cotton) being savings in insecticide and herbicide use, and improved tillage management.

In 2019 there was approximately 62,400 tonnes of cotton produced in North Queensland (CRCNA 2020). Northern Territory production commenced in 2019 with cotton being ginned on the east coast and Northern Western Australia were in their second year of production with cotton being ginned also on the east coast.

### 11.3.2 Current Industry Production Value & Potential Growth

Cotton is an emerging industry in Northern Australia, including the Northern Territory. Trial crops of new varieties were successful, as were early commercial crops. This success has seen a significant increase in interest among farmers in Northern Australia and the area of land is predicted to increase in the next few years.

One of the key drivers for this increase will be the construction of a cotton gin in Katherine Northern Territory. Cotton from the Northern Territory and Ord River Irrigation Area in Western Australia is currently trucked to Queensland for processing. The transport costs significantly reduce the economic viability of the crop and prevent farmers accessing their own cotton seed due to the cost of return transport being too high simply due to the distances involved.

A cotton gin in Katherine, along with greater knowledge about the crop will make growing cotton more attractive to supply chain participants and drive further growth.

The gin is expected to come online in 2022, and as a result the number of bales produced, and therefore the value of the industry, is predicted to climb from 2022 onwards to a peak of around $500 million by 2030.

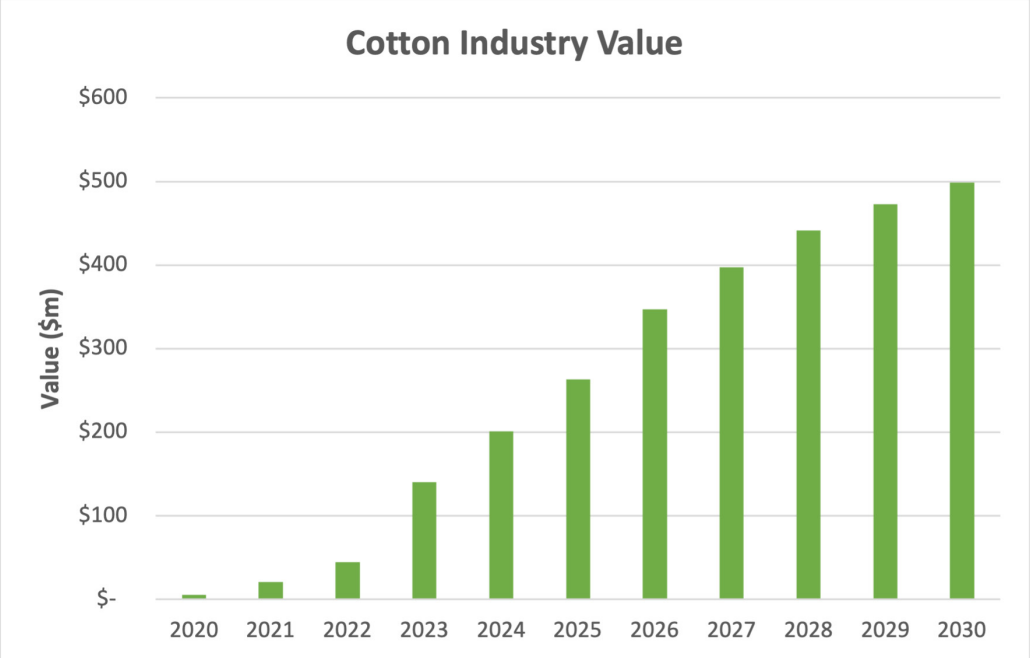



Figure 38. Current and predicted future value of Northern Territory cotton industry.

### 11.3.3 Industry Constraints

A total of eighteen constraints were identified by stakeholders during interviews and consultations. The majority (50%) of constraints were identified as supply chain infrastructure constraints with workforce and resources constraints both prominent in the data (both 17%).

Processing infrastructure has been identified by the industry as a major constraint. Without local processing capacity, and the associated enabling infrastructure, it is difficult to viably expand the production of cotton through development of the cropping systems and land required to grow the crop.

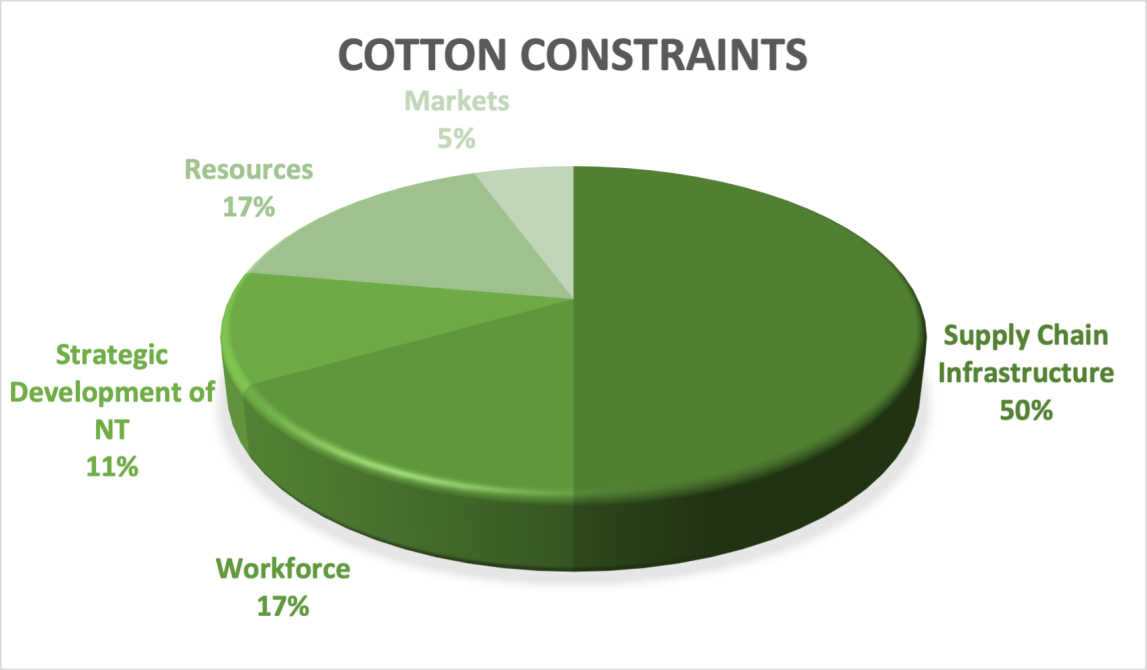



Figure 39. Northern Territory cotton industry constraints.

### 11.3.4 Industry Trends

A total of fourteen trends were identified in the cotton industry through consultation with stakeholders. These trends fell into three categories – supply chain infrastructure and strategic development of the Northern Territory (36%) were equally significant, while trends in the markets category (28%) also featured prominently (Figure 40).

Local processing capacity and associated enabling infrastructure, transport and logistics infrastructure and planning, and policy and regulation changes feature strongly in the trends identified.

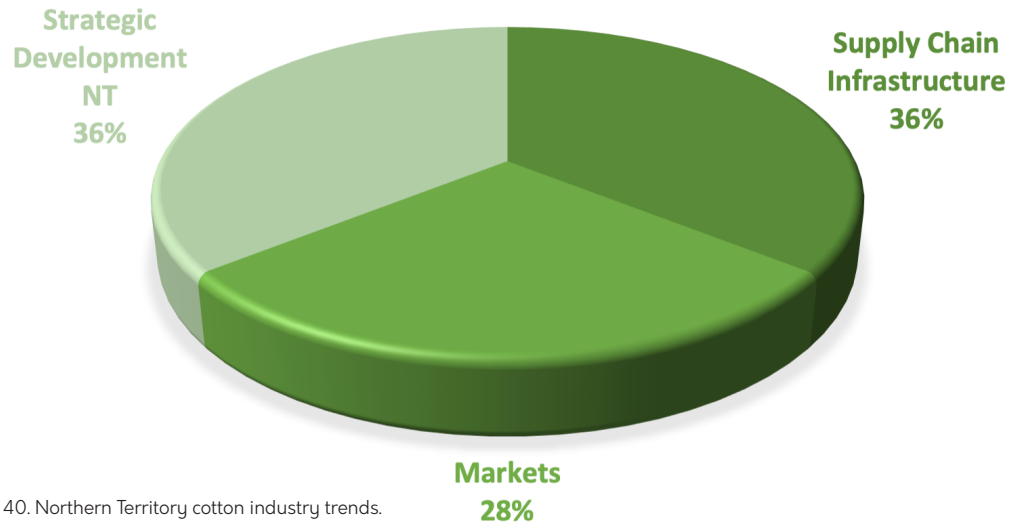



Figure 40. Northern Territory cotton industry trends.

The cotton industry trends identified by stakeholders during interviews and consultations are:

1. The emergence of high value products (such as cotton) is crucial in driving new supply chains (Babacan, Tremblay and McHugh 2020).
2. Gins need to be regionally located for commercial production viability
3. Current lack of warehousing ability.
4. Major driver for southern producers looking at expanding in the north due to continued drought conditions in main eastern production areas as well as the reduction in purchasing power of water in the Murray Darling Basin for competing crops (Rabobank 2020).
5. Global cotton consumption average 1.1% year on year growth from 2021 to 2030
6. Australian export market share has the potential to grow from approximately 4% in 2021 to 10% in 2030.
7. Support for local growers to be involved.
8. Local industry commitment in Northern Territory and Northern WA to the building of cotton gins by 2023 season.
9. The Port of Darwin is currently equipped with rail connections from Katherine directly to the Port, which significantly reduces a level of double handling of shipping containers

### 11.3.5 Priorities

A total of eight priorities for the cotton industry were identified during interviews and consultations. Once consolidated the priorities were equally distributed (25% each) across four categories – strategic development of the Northern Territory, workforce, supply chain infrastructure and resources processes.

The spread of priorities across four of the five categories is indicative of the needs of an emerging industry, with multiple factors needing to be addressed to ensure the projected growth can be realized.

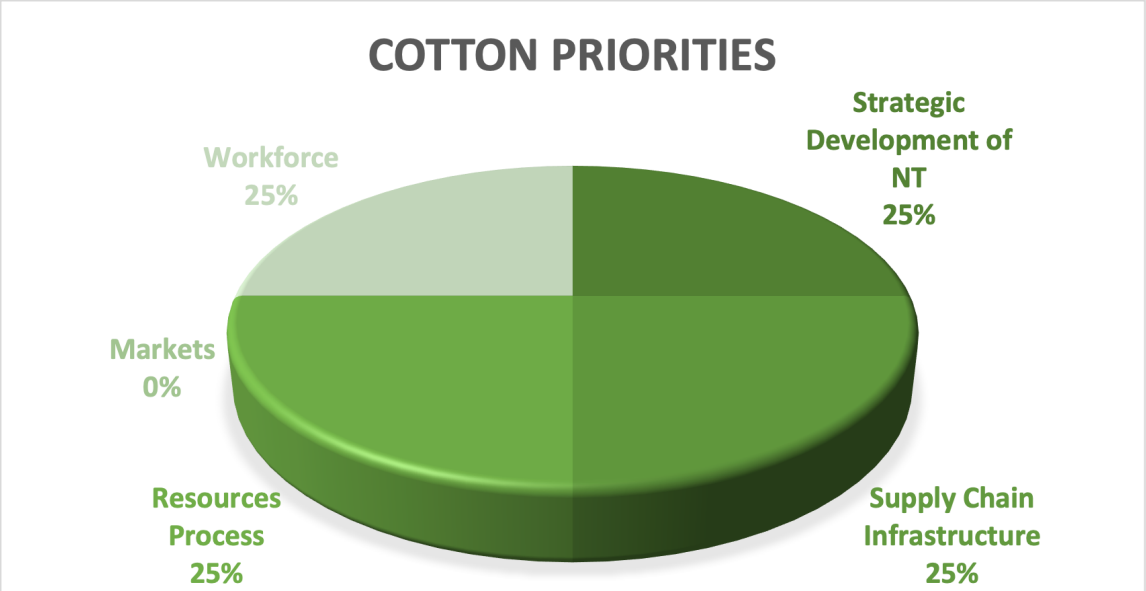



Figure 41. Priorities for the Northern Territory cotton industry.

The priorities identified by stakeholders during interviews and consultations are:

1. Cotton has been identified as the cornerstone crop going forward in Northern Territory plant-based agricultural and horticultural crop developments.
2. The development of the cotton industry will generate significant economic activity in the NT.
3. Development of the cotton industry will support employment of up to 424 full time employees (FTE's) which represent a total wage and salary contribution of $29.6m per annum (NT Farmers 2020).
4. Developing complimentary rotational crops.
5. Access and maintaining quality labour and technical staff.
6. Securing water and land development.
7. Installation of infrastructure.
8. Market and value chain development – commercially viable freight, logistics and ginning.
9. Building capacity and knowledge in pastoral operations.
10. Advocacy priorities to streamline and strengthen public and political support for policies and regulatory frameworks.

### 11.3.6 Demand Driven Opportunities to Increase Supply

A total of twenty-two opportunities to increase supply in response to demand were identified by stakeholders during interviews and consultations. Opportunities were identified across all five categories (Figure 42), but the most prominent opportunity categories were resources process (36%) and strategic development (32%). Regulatory and policy settings, approvals processes, and environmental considerations were identified as opportunities for the industry if addressed which would allow for growth in production to meet the significant export demand for Australian cotton.

Stakeholders also identified opportunities for the industry itself to develop clear plans and strategies for its development, to be collaborative in its approach and proactive in developing sustainable production methods and business models.

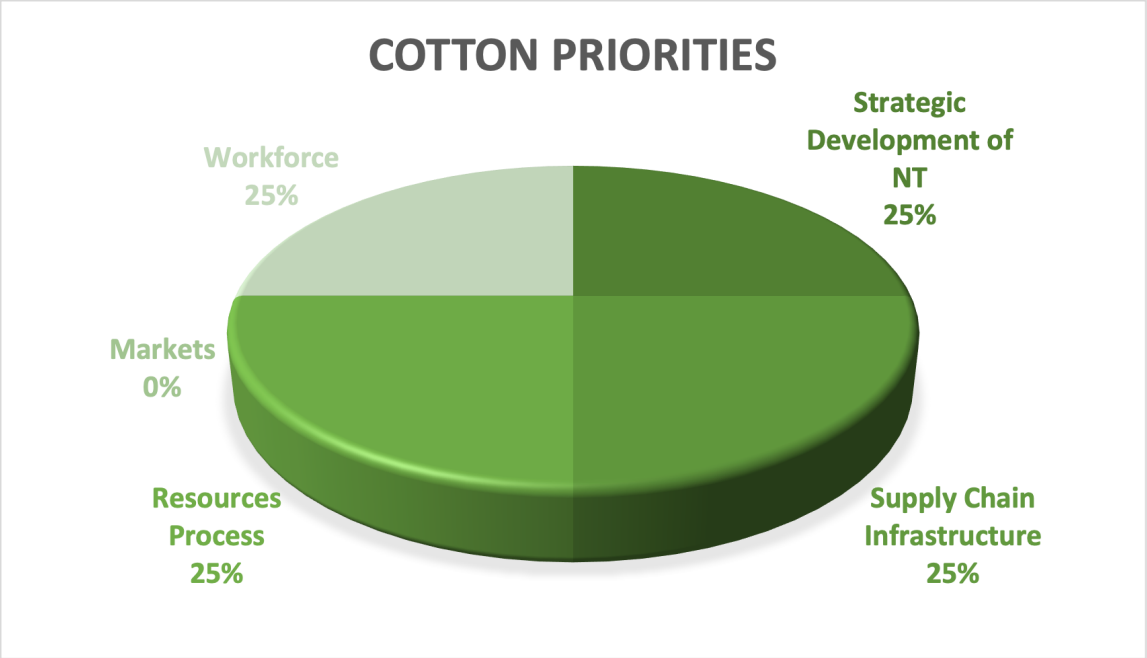



Figure 42. Opportunities driven by demand for the Northern Territory cotton industry.

Some of the key opportunities identified by stakeholders are:

1. Unlocking land for agricultural development.
2. Enabling Aboriginal agricultural development.
3. Infrastructure to facilitate agricultural development.
4. Unlock regulatory barriers to agricultural development.
5. Supportive development environment.
6. Allow irrigation development to gain scale.
7. Improving relationships and culture between government, industry, pastoralists, and Traditional Owners

### 11.2.7 Forestry Industry Supply Chain Map

**Key Issues:**

- The NT does not have a cotton gin and therefore requires product to be transported interstate for ginning and distribution to end users

**Legend**

- Key inputs to production
- Industry production
- Transportation
- Distribution, processing and packing
- Gap in the NT supply chain
- End user

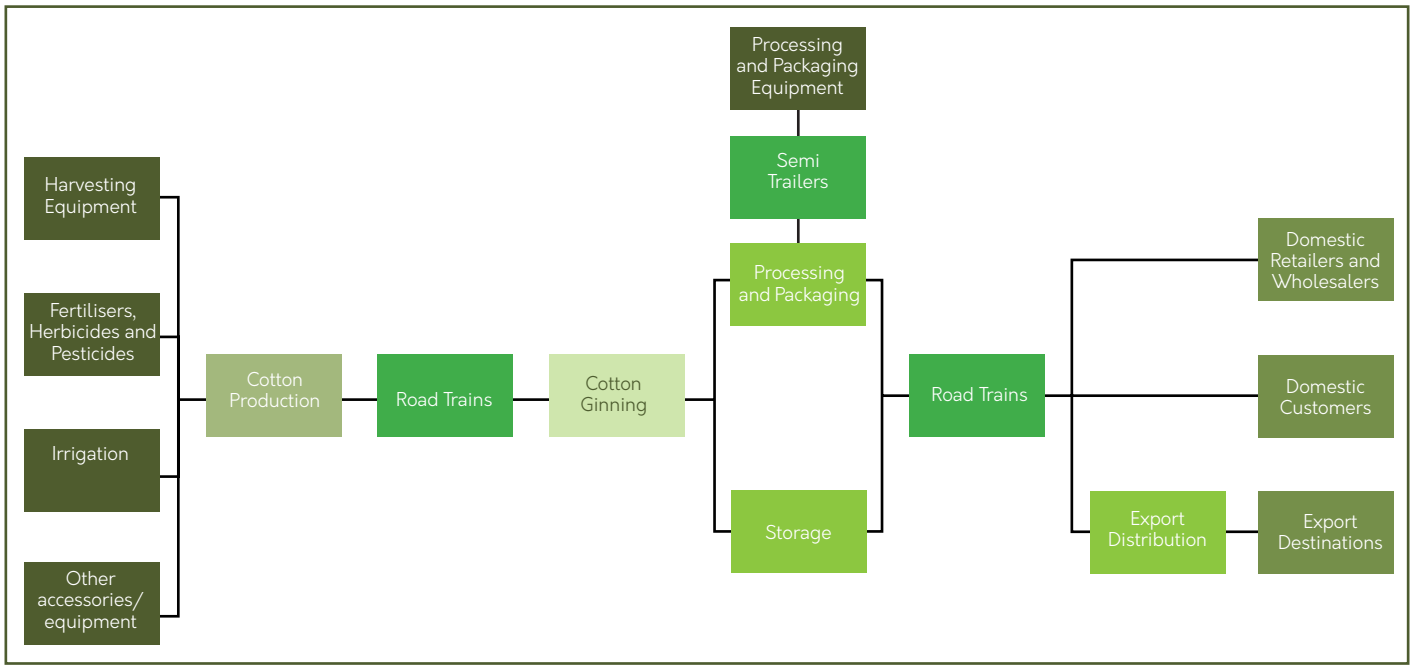



Figure 43. Northern Territory cotton industry supply chain map.

### 11.2.8 Forestry Indistry SWOT

| Strengths | Weaknesses |
|---|---|
| • Successful cotton trials have resulted in growers expanding in the NT.<br>• Australian cotton has a global reputation as an industry leader.<br>• Well established Australian irrigated cotton production and emerging dryland production.<br>• 90% of the cotton produced in Australia is exported. | • Remote geographical locations of cotton farms.<br>• High freight costs.<br>• Lack of water for farming expansions.<br>• High capital requirements for investment in the cotton industry.<br>• Cotton gins must be regionally located for commercial production viability. |
| **Opportunities** | **Threats** |
| • Development of new processing facilities.<br>• Production of cottonseed as a feed source for cattle.<br>• Export out of the Darwin Port could significantly reduce road freight costs.<br>• Opportunity to develop rotational crops to boost productivity and longevity. | • Difficulties in finding and maintaining qualified workforce.<br>• Must ensure water and land development are synchronised.<br>• Must ensure enabling infrastructure is able to support development.<br>• Storage is a key issue for setting up cotton exports out of Darwin Port. |

## 11.4 Broadacre

### 11.4.1 Current State of the Industry

There has been successful broadacre agricultural production in the Northern Territory since the early 1820s. Unfortunately, there has not been continuity in many productions systems which has led to stop start production and lacking the ability to achieve constant learning and improvement to maintain a viable cropping system outside of fodder production to service the Northern Territory Livestock sector. Northern Territory broadacre cropping is currently very limited and largely consists of hay, a small amount of sorghum, maize, peanuts, and mung bean production (ST Strategic Services and Pivotal Point Strategic Directions 2020).

| | HAY & FODDER | GRAIN AND OILS SEEDS | PASTURE SEED | TOTAL |
|---|---|---|---|---|
| 2019 | 136,670t<br>16,720ha | 1320t<br>370ha | 70t<br>65ha | 138,060t<br>17,155ha |

Table 14 Northern Territory Broadacre Cropping Area & Yield in 2019 (Source: NT Farmers n.d. b)

There is significant area of production under broadacre production, with the majority being dryland fodder production in the top end. On the back of the now expanding cotton production there is momentum to develop a broadacre cropping system that will include a wider range of crops to complement the potential addition of protein from the cotton seed. As the cotton seed becomes more readily available it will drive the production of higher energy productions for the addition to a feeding ration for cattle.

There are currently small areas of production of rice, grain sorghum, maize, and sorghum for silage as well as an emerging production of irrigated peanuts in Central Australia. This may well expand relevance into the Western Davenport region as well as expanding interest in oil seed crops such as sesame in rain fed systems in the Northern Territory.

For a number of these commodities there is potential for increased Australian production to replace imports as well as to satisfy growing export demand. Peanuts, rice, soybeans, as well as relatively new crops such as sugar and industrial hemp, can all be seen in this category (Ash et al 2014).

The ambition to develop northern Australia will continue. However, history tells us that successful development of Australia's tropical rangelands and savannas is more likely to be realised by taking a long-term, steady growth pathway rather than some of the 'get big quickly' schemes of the past. By taking a measured, evidence based and socially inclusive approach, agricultural developments in the future will have the best chance of success.

### 11.4.2 Current Industry Production Value & Potential Growth

Like the cotton industry, the broadacre cropping industry has been present of decades in the Northern Territory but is only now emerging as real potential growth industry on the back of successful trials and initial commercial crops for new and improved varieties. Changes to regulations such as land clearing and non-pastoral use permits have also assisted in creating opportunity for development of the industry.

The emergence of cotton as a high value cropping option for the Northern Territory creates a pathway for other crop production through rotational cropping systems, which will see larger areas of broadacre cropping under production.

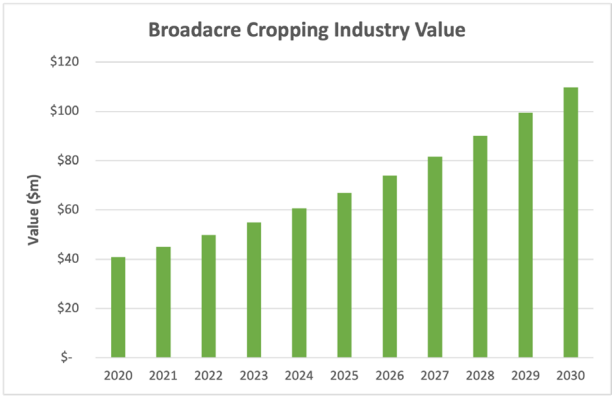



Figure 44. Current and predicted future value of Northern Territory broadacre cropping industry.

### 11.4.3 Industry Constraints

A total of thirty constraints were identified by stakeholders during interviews and consultation. Constraints were identified within all five categories (Figure 45), but supply chain infrastructure was the most significant (53%).

Road, rail, and port access featured heavily in the constraints identified by stakeholders, along with other infrastructure such as bulk handling and storage facilities and access to those, as well as digital connectivity infrastructure.

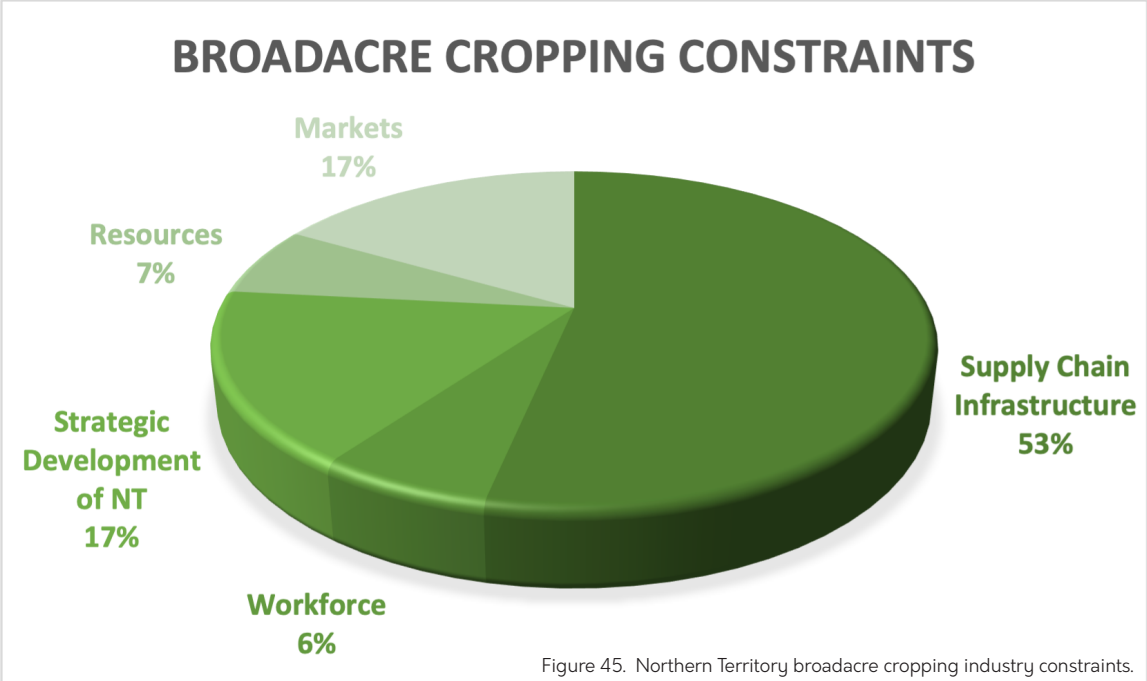



Figure 45. Northern Territory broadacre cropping industry constraints.

The key constraints identified by stakeholders are:

1. Rail infrastructure upgrades required in some regions.
2. Aging infrastructure in some parts of Northern Australia.
3. Limitations of food grade transport containers for sea freight.
4. High cost of all freight.
5. Access to rail, port, and airport.
6. Fragmented jurisdictional agricultural policies.
7. Lack of process and storage facilities (silos, mills, processing, storage, handling facilities).
8. Market access barriers.
9. Biosecurity challenges.
10. Small scale industry sector.
11. Regulatory and policy barriers.
12. Infrastructure gaps in connectivity for digital communications.
13. Overall cost of doing business is higher in Northern Australia.
14. Lack of investment in human capital and infrastructure.
15. Limited research, development, and extension activities.
16. High energy costs and access to power.
17. Digital technology uptake is low in some sectors.
18. Lack of sealed roads for all weather access.
19. Water access and water supply.
20. Lack of skilled labour and auxiliary service expertise.
21. Tropical climate provides challenges for some crops during a hot, humid summer, especially in relation to pests, diseases, and damage from high rainfall events
22. Farmers will not invest in the crop without a processing facility and businesses will not invest in the processing facility without some surety of supply. This highlights that innovation in 'green field' agricultural developments will require innovation not just at the farm scale but also in the institutions and policy at regional and national scales (Schut et al. 2016).
23. Niche markets are limited in size capacity.

### 11.4.4 Industry Trends

Eight industry trends were identified by stakeholders during interviews and consultations. Three categories of trends were identified (Figure 46), with strategic development of the Northern Territory the most significant category (50%). Trends in the markets category also featured prominently (38%).

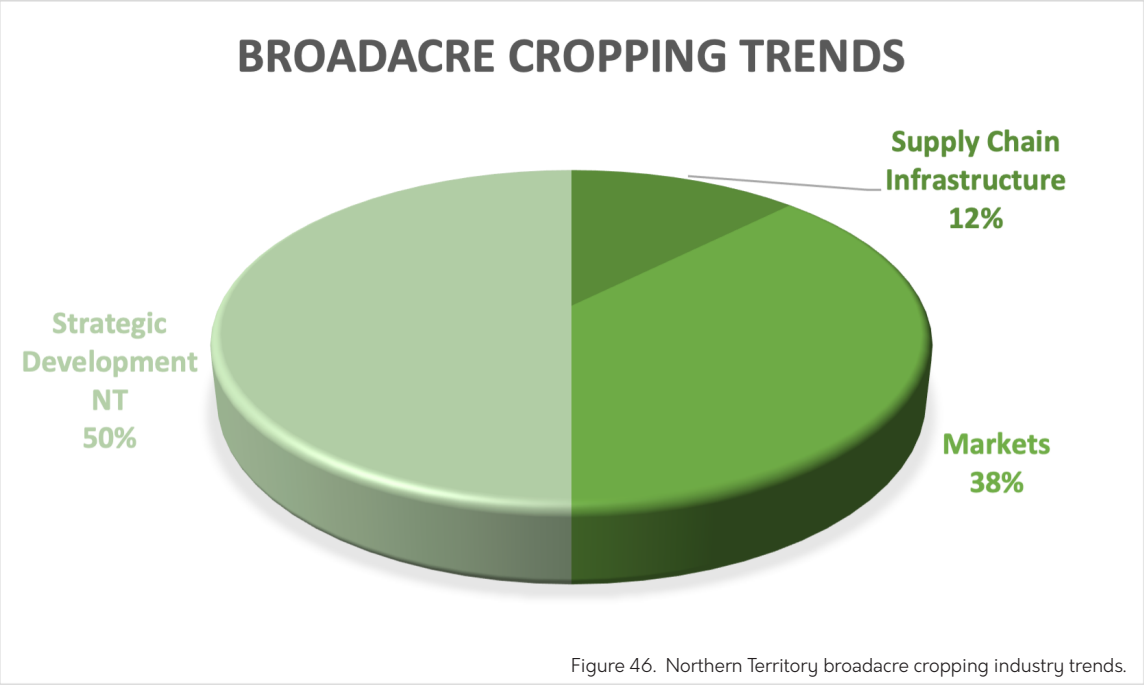



Figure 46. Northern Territory broadacre cropping industry trends.

Some of the key trends identified are:

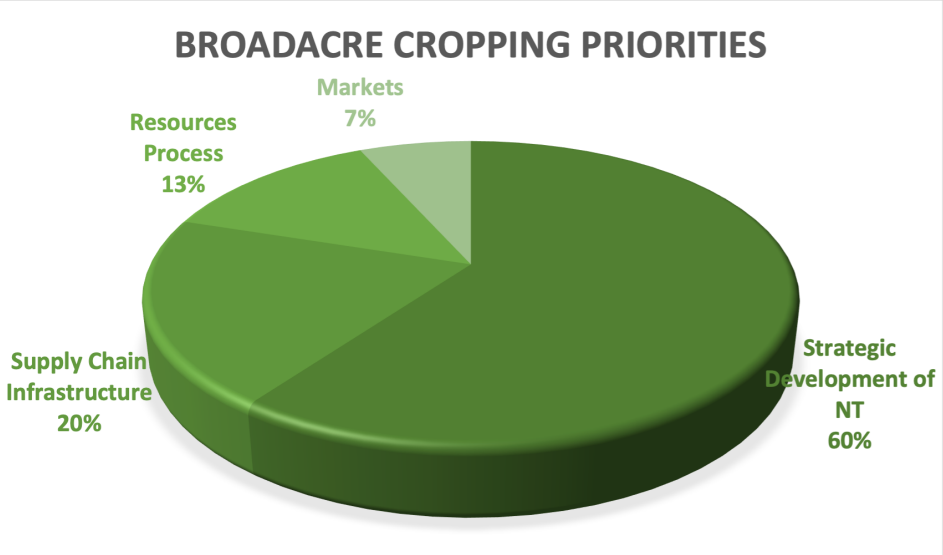
1. Global demand for food and fibre products is expected to increase significantly in the future due to global population growth.
2. Population growth in consumption is expected to come from Asia, providing export market opportunities for northern Australia agricultural production.
3. Australia leading the way in best practice management.
4. Global grain production is set to increase over the next five years due to anticipated increase in global grain pricing.

### 11.4.5 Priorities

A total of fifteen priorities were identified during interviews and stakeholder consultations and represented four of the five categories (Figure 47).

Strategic development priorities were the most prominent, with 60% of all priorities falling into this category.

Figure 47. Priorities for the Northern Territory broadacre cropping industry.




The most common priorities identified by industry stakeholders are:

1. There is a need to develop enterprise scale for significant private investment in green field agricultural developments with a business case that can demonstrate profitability and acceptable returns on investment in the absence of significant government support.
2. Growing crops profitably is a significant challenge when returns are weighed up against the high costs of production, marketing and freight associated with operating in more remote regions of northern Australia.
3. In addition to variable costs, 'green field' agricultural developments will incur significant capital costs. Petheram et al. found that gross margins needed to be at least AUD$3000–AUD$4000/ha to generate positive net present values for the underlying capital investment when using on-farm water storages for irrigation developments with capital costs in the order of AUD$10,000/ha (as quoted by Ash et at. 2017, 122).
4. Options to address the challenge of generating high enough gross margins for viable production including increasing returns and or reducing costs.
5. Integrated farming systems with a focus on profitable business models rather than an individual commodity.
6. Post farm gate processing development linked to integrated farm enterprises
7. Coordinated research, development and extension focused on constraints defined by producers.
8. Coordination of commodity led research functions to identify synergies and reduce producer fatigue.
9. Development of flexible cropping options to assist in agile management in response to variable rainfall.
10. Improved efficiency in gaining access to land and water to build scale.
11. Critical first stage processing infrastructure for potential base crops such as oilseeds or peanuts (ST Strategic Services and Pivotal Point Strategic Directions 2020).
12. Potential of niche products cropped for the domestic market including sesame, quinoa, peanuts, chia, and tropical pulses such as mung beans and soybean.
13. Prioritise and evaluate potential agricultural precincts with industry which provide a basis for shared planning and provide certainty for proponent and regulators.
14. Removal of import barriers to export i.e., tariff, quotas.
15. Opportunities to grow summer field crops during mild tropical winters.

### 11.4.6 Demand Driven Opportunities to Increase Supply

A total of twenty-seven opportunities to increase supply because of demand were identified by stakeholders during consultations and interviews.

Opportunities were identified across all five categories (Figure 48), with strategic development (33%), resources process (30%), and supply chain infrastructure (22%) the most significant.

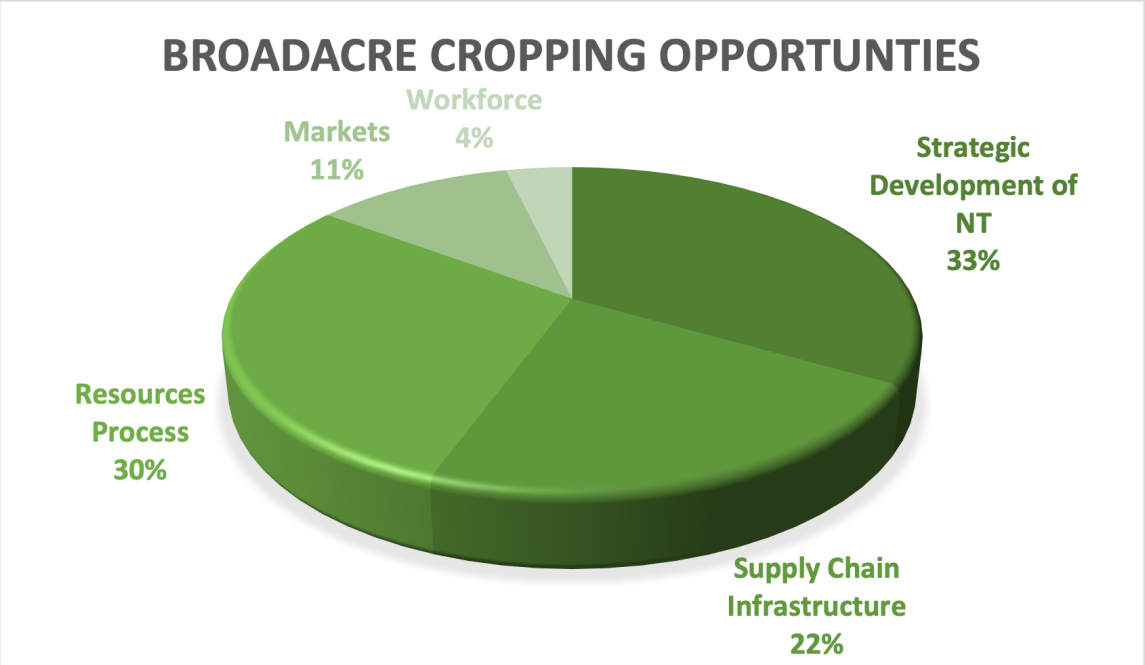



Figure 48. Opportunities driven by demand for the Northern Territory broadacre cropping industry.

The most significant opportunities identified for the industry are:

1. Develop an approach (particularly within precincts) to converting parts of pastoral leases to freehold to meet short timeframes and appropriate native title and environmental approvals.
2. Some regions such as the Douglas Daly in the Northern Territory is in a strong position to increase cropping of cotton, grains, and fodder whilst integrating cattle operations.
3. Development of rotational cropping of sorghum, rice, legumes, maize, and other high value crops (NT Farmers 2020).
4. Expansion of the peanut industry in the Northern Territory. Australian produce only a fraction of the local domestic market and demand and prices remain relatively stable throughout the year.
5. Development of an agricultural hub/precinct with the relevant machinery and capabilities of shared facilities to enable the growth of plant-based agricultural.
6. Develop a series of high technology small-scale mosaic irrigation projects (Chilcott 2009) or a few larger-scale schemes that are implemented gradually over decades rather than years.
7. Fully understand the constraints and opportunities imposed by climate, soils, and ecosystems.
8. Seek opportunities for Indigenous economic development.
9. Redefine and proactively navigate a pathway for approval processes.
10. Take a measured, evidence based and socially inclusive approach, for the future of agricultural development (Ash and Watson 2018).
11. Potential to grow crops in both the wet and dry seasons under irrigation has the potential to increase farm incomes through rotational cropping systems.
12. Crop yields could also be improved by further development of better adapted varieties and innovative agronomic management practices (Chapman et al. as

quoted by Ash et at. 2017, 122). One of the challenges in realizing such a potential is in being able to manage farm operations so that time of sowing and optimum crop windows can be matched with seasonal conditions, trafficability of soils etc. (Yeates et al., as quoted by Ash et al. 2017, 122).

13. Most industrial crops and some broadacre crops require local milling or shelling facilities in order to generate positive gross margins. Local processing facilities significantly reduce transport costs by reducing the quantity of non-saleable by-product requiring transport. For processing facilities to be viable there needs to be sufficient crop grown within a region and this brings into consideration aspects of regional development and coordination and economies of scale.
14. Broadacre cropping there a number of niche products for the domestic market. Niche markets are limited in size and when supply exceeds demand, the premium falls. While niche markets will continue to be a valuable aspect of potential broadacre cropping in the north, there are broadacre crops with the best potential application including cotton as well as animal feed and peanuts (ST Strategic Services and Pivotal Point Strategic Directions 2020).

### 11.4.7 Broadacre Cropping Supply Chain Map

**Key Issues:**

- None

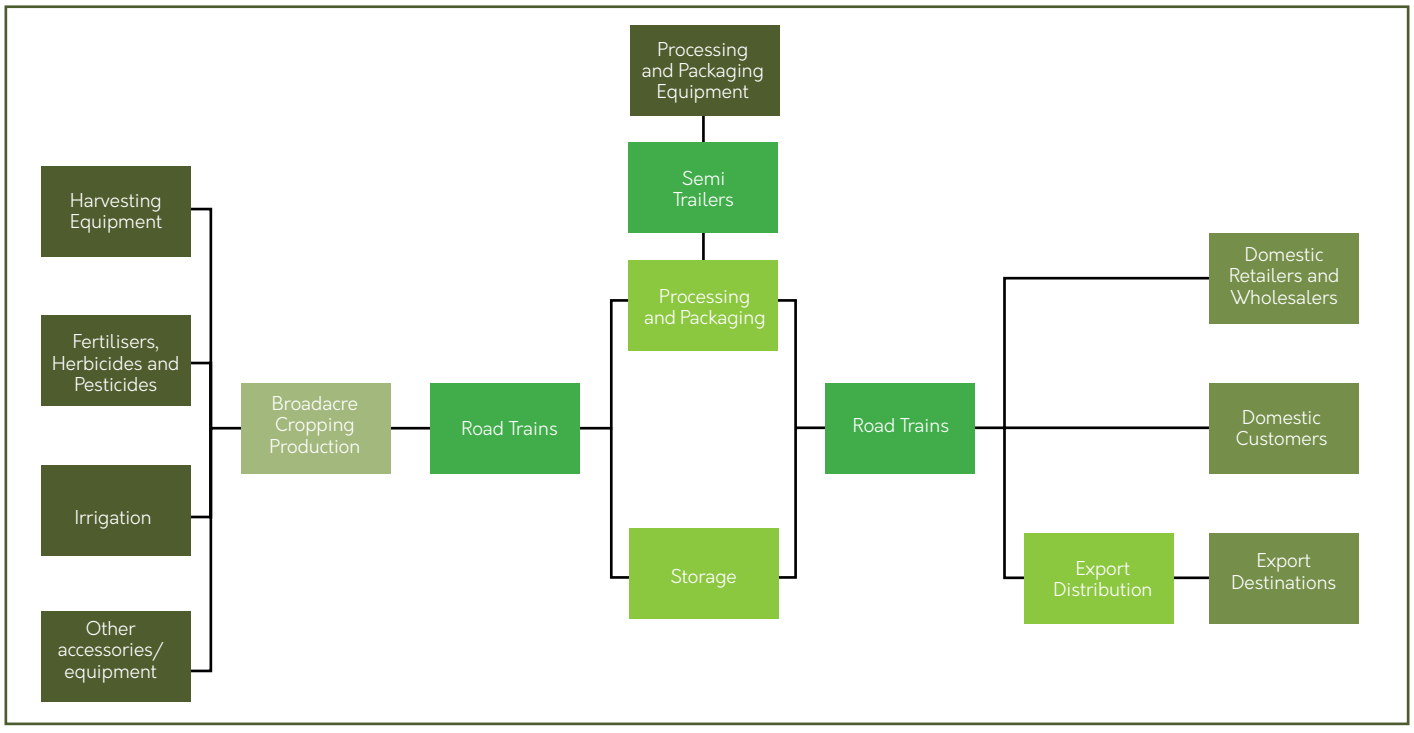



Figure 49. Northern Territory broadacre cropping industry supply chain map.

### 11.4.8 Broadacre Cropping Industry SWOT

| Strengths | Weaknesses |
|---|---|
| • Broadacre agricultural production in the Northern Territory since the 1820s.<br>• Global demand for food and fibre products is expected to increase significantly in the future.<br>• Expected increase in global grain prices.<br>• Australia is leading the way in best practice management of broadacre crops. | • NT broadacre cropping is currently very limited.<br>• Limitations of food grade transport containers for sea freight.<br>• Lack of processing and storage facilities.<br>• Limited water access and supply.<br>• Tropical climate provides challenges for some crops. |
| **Opportunities** | **Threats** |
| • Potential for increased Australian production to replace imports.<br>• Expansion in the Western Davenport region.<br>• Potential of niche products cropped for the domestic market.<br>• Opportunities to grow summer field crops during mild tropical winters of the NT.<br>• Development of rotational cropping. | • Lack of the sufficient processing facilities that are needed to encourage investment.<br>• Biosecurity and diseases.<br>• Social licence to operate is required to successfully implement large-scale production. |

## 11.5 Horticulture

### 11.5.1 Current State of the Industry

**Northern Territory**

The total Gross Value of Production (GVP) for plant-based agricultural and horticultural crops in the Northern Territory was $340 million in 2019. This represents an increase of over $89 million since 2016, or compound annual growth rate (CAGR) of 10.66%. The production of mangoes and melons is pivotal to the success of the Northern Territory horticultural industry. In 2019, the production of mangoes and melons was valued at $130 million and $69.4 million respectively, representing over 58% of the total GVP of plant-based agricultural and horticultural crops (NT Farmers 2020).

Agriculture in the Darwin catchments is currently dominated by a mixture of large-scale fruit tree plantations and smallholder farmers of Asian vegetables and mangoes. Intensive horticulture is already widely practised in the Darwin catchments, with an emphasis on Asian vegetable and melon production, with $25 million in production in 2015 (NT Farmers Association, 2016). Asian vegetables consist mainly of okra, snake bean, cucumber, and Asian melons (Ash et al 2018).

Mango production in the Darwin catchments is buffered somewhat against large-scale competition as its crop matures earlier than the main mango production areas in Queensland and it can achieve high returns. Increased mango production in the Darwin catchments over the last few decades is consistent with the entire Australian fruit and nut tree sector, which has been growing rapidly in Australia and in 2015–16, gross value of production was $4.74 billion out of a total value of $11.3 billion for horticulture in Australia (Horticulture Innovation Australia, 2017). In addition to well-established crops such as mango and banana, other tropical niche fruit trees such as dragon fruit are being commercially grown in the Darwin catchments. Prices received for dragon fruit can be very high when demand outstrips production, but the market is very sensitive to oversupply, particularly from cheaper overseas imports (Ash et al 2018).

Large-scale investment in irrigated horticulture commenced in the Katherine region in 1982 with the establishment of 300 ha of mangoes on Manbulloo Station. This development triggered increased investment by government and the private sector in the region, with the horticultural sector gradually expanding in subsequent decades.

Irrigated agriculture in Mataranka was initially focused on watermelon and pumpkin and now includes areas of mangoes. Irrigation water in this area is drawn from the Tindall aquifer. The present water allocation plans provide for 36 GL of water being available for irrigation per year, although high reliability can only be achieved with approximately 20 GL/year (Ash et al 2014).

The Northern Territory plant-based agricultural and horticultural industry will also catalyse FTE employment across the region. By 2030, the industry is forecast to employ over 3,500 FTEs. This employment is forecast to facilitate the creation of an additional 1,803 FTE roles in the Northern Territory. The number of FTE roles supported by the horticultural industry, both directly and indirectly, will exceed 5,300 by 2030. This, coupled with the forecast economic contribution of $1.5 billion p.a., confirms the vast potential associated with the Northern Territory's plant-based agricultural and horticultural industry (NT Farmers 2020).

Central Australia offers a unique combination of sunshine, low humidity, cool winter temperatures and freedom from most pests and diseases. These conditions are ideal for many crops. Extensive commercial production already exists for a wide variety of crops including, table grapes, dates, melons, mangoes, figs, olives, bush foods (from Australia's native plants) and vegetables. Central Australia is well suited with a unique combination of sunshine, low humidity, cool winter temperatures, freedom from most pests and diseases, combined with a strong reputation for producing quality produce (Northern Territory Government 2018).

### 11.5.2 Current Industry Production Value & Potential Growth

The value of the horticulture industry in the Northern Territory has increased steadily since it first emerged as a major industry in the 1980s. Year on year increase in both production and value of production has seen the industry become the second largest by gross value of production in the Northern Territory agribusiness sector.

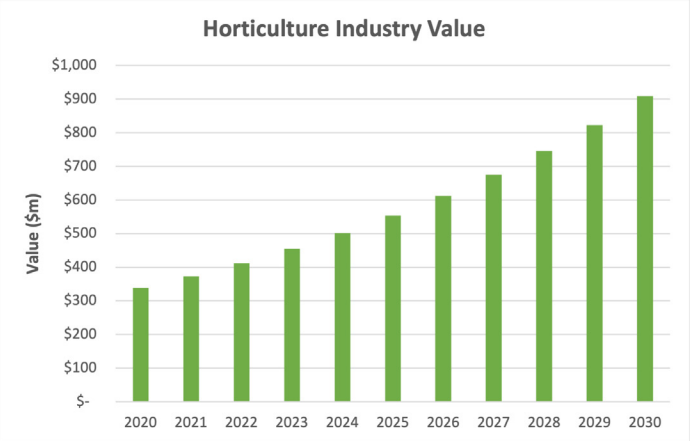



Figure 50. Current and predicted future value of Northern Territory horticulture industry.

### 11.5.3 Industry Constraints

A total of twenty-eight constraints were identified in the industry across all five categories (Figure 51). Supply chain infrastructure was the most significant (53%).

All weather road access, downstream processing facilities, and local value add capability were all strongly identified through interviews and consultations as important constraints to the industry that must be addressed.

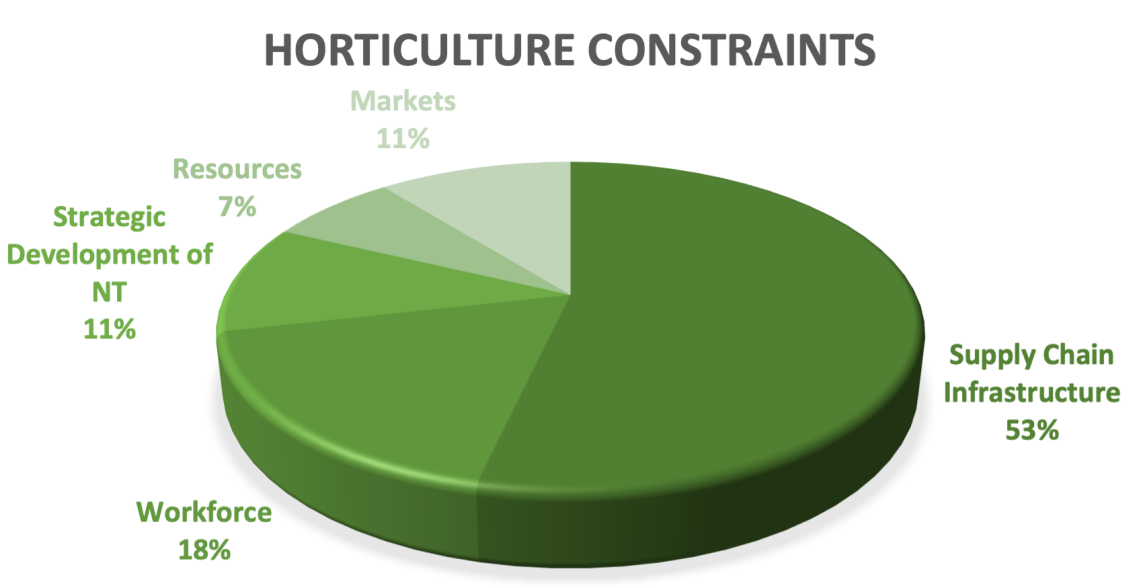



Figure 51. Northern Territory horticulture industry constraints.

The most significant constraints identified by the industry are:

1. Intensive horticultural production involves high labour costs, especially those associated with picking, and packing operations. Labour costs for these harvest and postharvest activities typically represent 20 to 30% of total production costs and, therefore, have a significant influence on net returns from horticulture.
2. Labour supply shortfalls during peak production periods.
3. Lack of skilled labour entering the industry.
4. Lack of auxiliary service expertise.
5. Bio-security incursions.
6. The majority of horticultural production from northern Australia is currently directed to supplying domestic markets.
7. Transport costs per hectare of production are high for all crops and are a significant percentage of the total costs of production for watermelons and rockmelons, although they are not as high for mangoes (Ash et al 2014).
8. Fruit production shares many of the marketing and risk features of intensive horticulture such as a short season of supply and highly volatile prices as a result of highly inelastic supply and demand. Managing these issues requires a heightened understanding of risks, markets, transport, and supply chain issues.
9. Export capacity to protocol markets has affected the ability of treatment facilities such as Vapour Heat Treatment and Irradiation facilities. The lack of phytosanitary facilities has been a major impost for the Northern Territory and WA industry. The completion of a VHT treatment facility has been completed in Darwin and will allow Northern Territory and Northern WA mangoes to be sent direct to export markets, enhancing export competitiveness for the most rapidly growing region in Australia (Cao et al 2020).
10. Pre, and post-harvest diseases across industries.
11. Climate and weather variability.
12. Some small-scale sectors in industry.
13. Water access and supply in some regions.
14. Limited research, development, and extension activities.
15. High energy costs and access to power.
16. Digital technology uptake is low in some sectors.
17. Lack of sealed roads for all weather access in some regions.
18. Tropical climate provides challenges for some crops during a hot, humid summer, especially in relation to pests, diseases, and damage from high rainfall events.
19. Limitations of food grade transport containers for sea freight.
20. High cost of all freight.
21. Access to rail, port, and airport for some regional growing areas.
22. Fragmented jurisdictional agricultural policies.
23. Increased geopolitical risks for exporting.
24. Native title and land tenure barriers.
25. The intensive horticulture focus, results in high regional costs of production. A significant component of this cost is attributed to labour issues, which provide both challenges and opportunities at a regional scale.

### 11.5.4 Industry Trends

A total of thirteen trends were identified through interviews and consultations with industry and supply chain stakeholders (Figure 52), with trends falling relatively evenly into three categories – markets (38%), supply chain infrastructure (31%) and strategic development of the Northern Territory (31%).

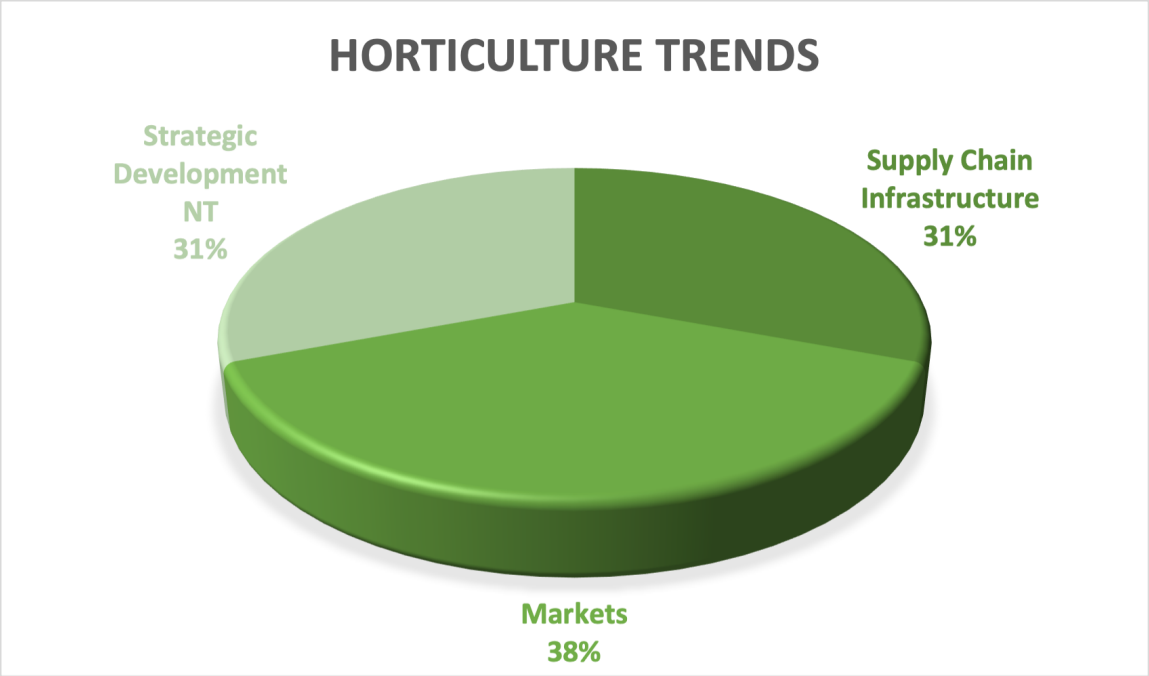



Figure 52. Northern Territory horticulture industry trends.

The key trends identified by stakeholders are:

1. Export market opportunities have increased in the last few years with the establishment of Free Trade Agreements (Cao et al 2020).
2. Consumer tastes and purchasing behaviours are changing in developing countries, particularly those in Asia, which are predicted to consume half the world's food by 2030. The imported fruit and vegetable markets in Asia are very competitive. Many countries and regions from outside are striving to send their products to these markets (Cao et al 2020).
3. Population growth in consumption is expected to come from Asia, providing export market opportunities for northern Australia agricultural production.
4. Industry commitment to reducing environmental and market impacts including reducing food fraud and increase provenance.
5. Large organisations are increasing automation.
6. Some sectors in industry are accelerating innovation.
7. Expansion of some fruit and vegetables utilising sea freight options due to reduction and cost of available air freight options.
8. Consolidation of mixed sea freight reefer container loads.

### 11.5.5 Priorities

Nine priorities were identified in total through interviews and consultations with industry stakeholders. These priorities were identified in all five categories (Figure 53), with strategic development of the Northern Territory (28%), supply chain infrastructure (27%) and resources process (18%) the most significant priorities. Agricultural precinct development is central to the priorities identified to facilitate the release of land unencumbered by regulatory processes for production expansion to meet growing global demand.

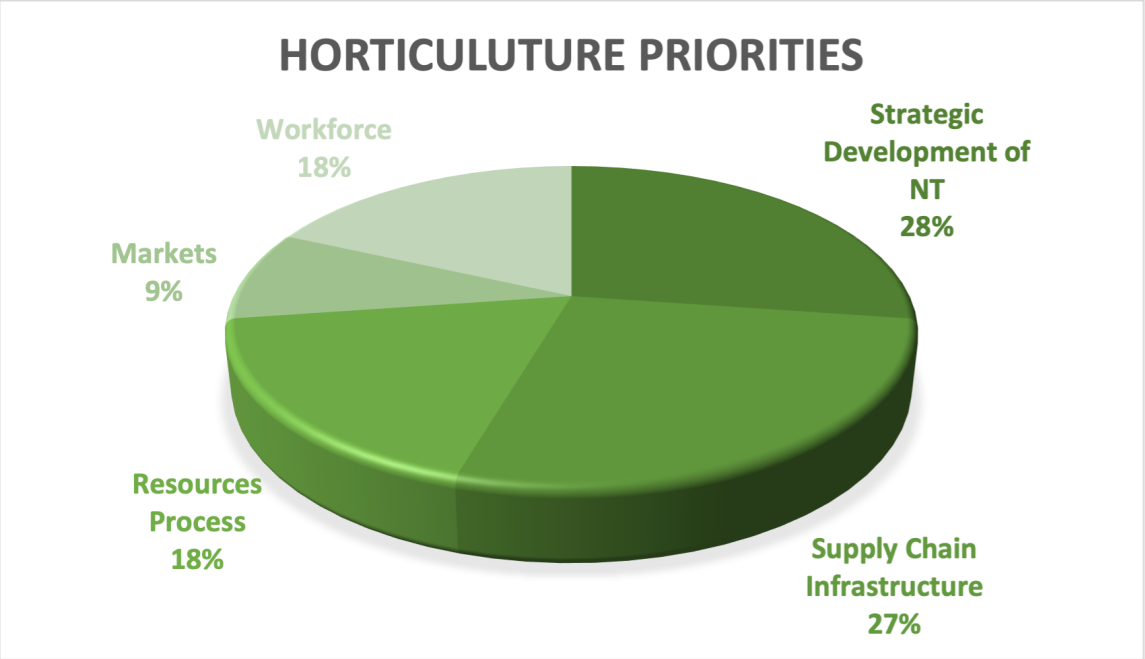



Figure 53. Priorities for the Northern Territory horticulture industry.

The top priorities identified by stakeholders are:

1. The Western Davenport Strategic Plan envisages the potential development of between 8,000 to 10,000 ha of irrigated agricultural land over the next 10 to 15 years. This development, valued at approximately $300 million, will likely lead to a significant increase to the region's agricultural production, forecast to be between 150,000 and 200,000 tonnes across a range of horticulture and broad acre crops. Furthermore, with this development and subsequent expansion of agricultural land and production, it is envisaged that 2,000 to 3,000 people will likely be employed (NT Farmers 2020).
2. Develop an approach (particularly within precincts) to converting parts of pastoral leases to freehold to meet short timeframes and appropriate native title and environmental approvals.
3. Development of an agricultural hub/precinct with the relevant machinery and capabilities of shared facilities to enable the growth of plant-based agricultural.
4. Workforce development and local employment opportunities for horticulture across the supply chain.
5. Advocacy priorities to streamline and strengthen public and political support for policies, programs, and regional development strategies that horticulture development including Government, Aboriginal landowners, Aboriginal organisations, and all industry stakeholder proponents.
6. To enable, support and complement the development of potential production areas, several plant-based agricultural and horticultural precinct developments have been identified and substantiated through extensive stakeholder consultation.

This includes Western Davenport, which was identified by Northern Territory Farmers, and Wildman River, Larrimah, and the Keep, all of which identified by Northern Territory Land Corporation. These horticultural developments are highly prospective agricultural land developments, covering an area greater than 710,000 ha. The developments will play a pivotal role to ensuring the long-term success and viability of the plant-based agricultural and horticultural industry in the Northern Territory (NT Farmers 2020).

7. Developing a wider range of export markets and overcoming the various regulatory and quarantine barriers. These barriers include both the time that might be taken up to negotiate new export protocols (more than ten years) and the potentially high costs of meeting quarantine requirements for the new markets (e.g., vapour heat treatment of mangoes) (Ash et al 2014).
8. Regionalised research, development, and extension activities.
9. Australia ranks poorly in global comparisons of productivity of freight and logistics (iMove, 2019). This is at least in part driven by inefficient supply chains that require far more transport modes and carriers and further distance than would seem optimal. The small proportion of mangoes and avocados produced in QLD and shipped out of Cairns, means the supply chain stretches from north QLD to Brisbane, Sydney, and Melbourne, before international shipment. Similar to mangoes produced in the NT, only 0.15% are directly shipped from Darwin. The long supply chain for north Australia's horticultural products not only leads to increased logistics costs, but also results in more handling, increasing the risk of reduced fruit quality upon arrival at their international destination. This is problematic when the price of Australian horticultural products is generally at the higher end. Limited freight capability and poor export facilities in the north are two constraints for direct exports from Cairns and Darwin, as indicated by the interviewed growers and exporters. To shorten the supply chain into Asia and facilitate exports from the production regions, freight capacity and export facilities should be considered for upgrade in the north (Cao et al 2020).
10. A larger seasonal labour force in the region will have flow-on benefits for the local economy, but sourcing the additional labour could be challenging, especially if other regions in northern Australia are also looking to expand horticultural production.
11. A digital inclusion in the supply chain would provide more visibility to growers and more importantly, enable them to hear the voice of the consumer.

### 11.5.6 Demand Driven Opportunities to Increase Supply

A total of thirty-four demand driven opportunities to increase supply were identified across all five categories (Figure 54). Markets (35%) were the dominant category, but resources process (24%) and strategic development of the Northern Territory also featured prominently.

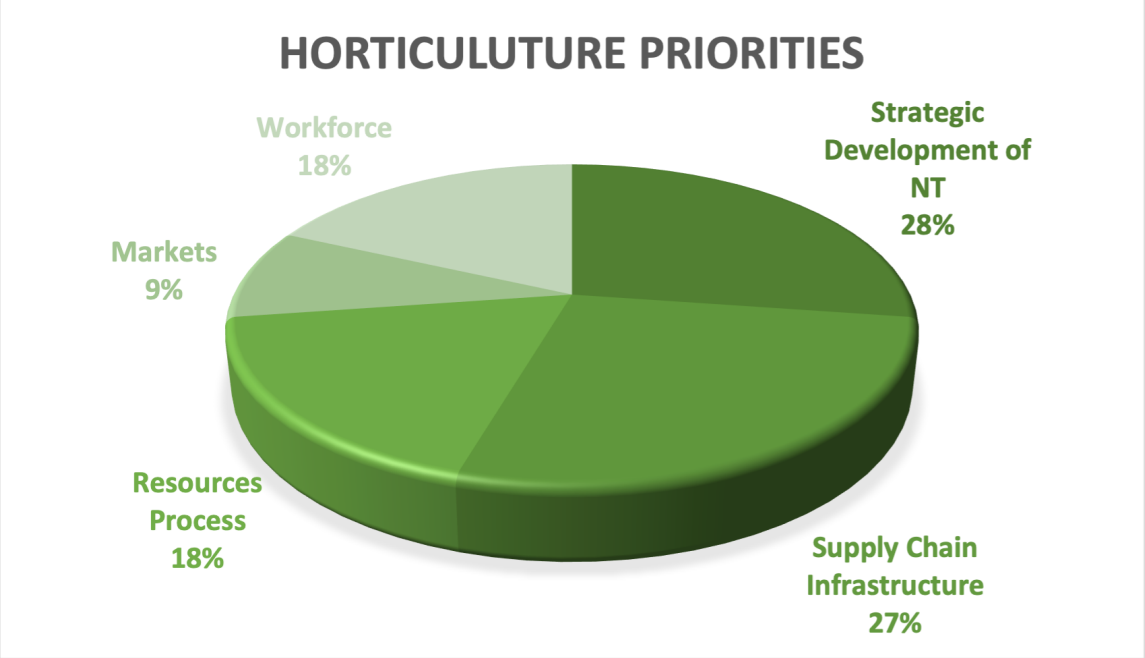



Figure 54. Opportunities driven by demand for the Northern Territory horticulture industry.

The critical opportunities identified by the industry are:

1. To enhance the productivity and quality of production in northern Australia, innovations in production, which include those which have emanated from the phases of pre-harvest, harvest, and post-harvest, are needed from both industry and farm levels to address these constraining factors (Cao et al 2020).
2. Successfully expanding horticultural production will require the development of new export markets, both in Asia and beyond, given the price sensitivity of existing domestic markets to oversupply (Ash et al 2014).
3. Establishing a reliable and regular refrigerated container service from Darwin has the potential to significantly reduce freight costs compared with land transport costs to existing southern-based markets, assuming that increased volumes of supply can reduce the current high costs of shipping agricultural commodities to Asia.
4. To further expand export growth, an export risk management mechanism could be developed to minimise/mitigate export risks and develop a mechanism to ensure the distribution of added value for each step in the export chain. In addition, with the group buying model evolving in the Asian market, a regional export hub would be a solution to directly connectivity with international customers.
5. Northern Australian Horticultural industries are not export-oriented in terms of export standardisation, with most industries not having an industry-guided export grading standard. These grading classes are developed to cater for domestic demand, without explicitly considering the need of international markets.
6. To further build strong awareness and acceptance of premium Australian fruit, Northern Territory should consider launching promotional and sales campaigns to attract consumer attention and improve the industry supply chain capability, ensuring the delivery of consistent quality.
7. Australian horticultural products are

perceived to be premium compared with products from other competitors. To increase market competitiveness, it is important for Australian/NT suppliers to understand what consumers value most, and then work closely with their downstream customers to deliver the value adding products to their consumers through the whole chain.

8. Five plant industry precincts with suitable soil and water have been identified. Highest priority precincts for development include Alice Springs, Ti Tree, and Western Davenport. Precincts for future development include Tennant Creek and Great Artesian Basin. A soil and water suitability assessment report published in 2014 identified regions with suitable soil and water for development (Northern Territory Government 2018).
9. While importers in the targeted Asian markets show no interest in farm acquisition in Australia, they intended to establish long-term partnerships. Through the partnership or close supply chain relationships, importers indicated they want their suppliers to share timely and correct information about supply chain details, including the date of picking and packing. This kind of supply chain information supports importers to make right decision-making in planning their sales and reducing waste and losses. To ensure sustainable exports, this requires Australian suppliers develop collaborative relationships with supply chain actors that can help ensure quality and consistent products are delivered to end-consumers.
10. While Asian retailers still rely on the traditional supply chain to source fruit, newly emerging retailers are prone to implement a direct sourcing strategy to shorten their supply chains, thereby having more control over cost saving and fruit quality. However, they are discouraged by a minimum order quantity. As these retailers would like to deal with premium Australian fruit, existing supply chain operations need to be transformed and upgraded with demand aggregation capability to supply those retailers who have a direct sourcing strategy. Directly supplying retailers could help Australian suppliers to hear the voice of the consumer.
11. Supply chain constraints affect the efficiency in delivering consistent fresh horticultural products into the Asian markets, these include cold chain gaps, expensive shipping from northern Australia. Some of this constraint could be resolved by increasing air freight infrastructure in the Cairns and Darwin airports.
12. Central Australia's unique hot and dry climate and well-drained soil means crops of superior quality are produced in this region; key examples are table grapes and melons. Australian grape growing regions Central Australia's unique hot and dry climate and well drained soils means crops of superior quality are produced in this region; key examples are table grapes and melons.
13. There are other real opportunities to expand production for both domestic and export supply (Northern Territory Government 2018) of:
    - Asparagus
    - Citrus – oranges, mandarins, and lemons
    - Dates
    - Figs
    - Melons
    - Onions – white, spring
    - Pumpkins
    - Stone fruits
    - Sweet potato
    - Table grapes
    - Almonds
    - Aloe vera

### 11.5.7 Horticulture Cropping Supply Chain Map

**Key Issues:**

- Depending on the type of crop prodiced, the NT lacks the following
  - Cold storage facility for transportation to domestic and international markets
  - Canning and juicing facility, which are important products for international markets
  - Controlled atmosphere container facility which is required to transport fresh product to international markets

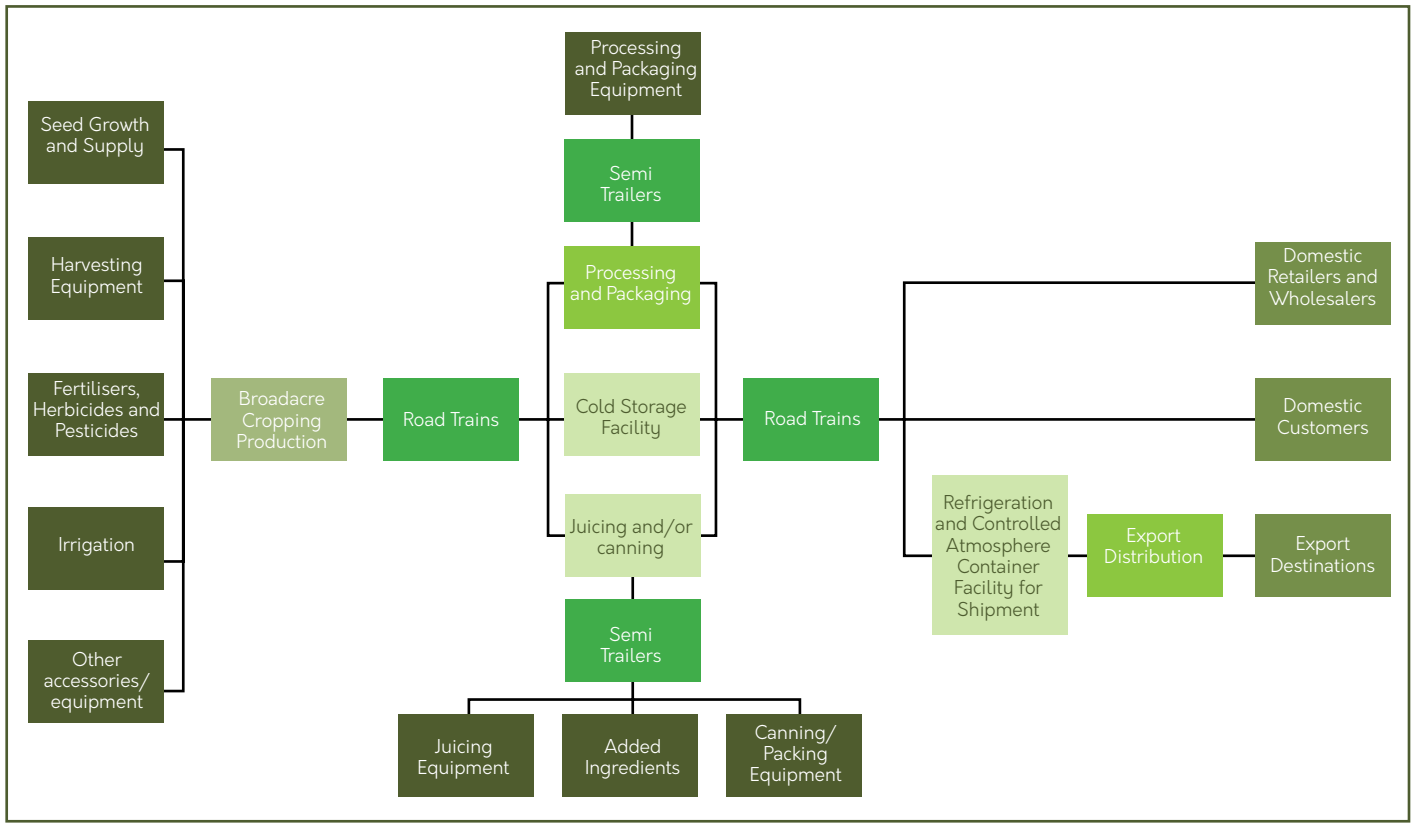



Figure 55. Northern Territory horticulture industry supply chain map.

### 11.4.8 Broadacre Cropping Industry SWOT

**Strengths**

- Plant-based agricultural and horticultural crops in the Northern Territory have recently experienced high levels of growth.
- Extensive commercial production already exists for a wide variety of crops.
- Export market opportunities have increased in the last few years with Free Trade Agreements.

**Weaknesses**

- Intensive horticultural production involves high labour costs.
- Transport costs per hectare of production are high for all crops.
- Grading classes are developed to cater for domestic demand without considering international markets due to a lack of export standardisation within industries.

**Opportunities**

- A VHT treatment facility has been commissioned in Darwin and will facilitate the direct export of mangoes.
- Development of irrigated agricultural land in the Western Davenport region.
- Development of agricultural hubs/ precincts with shared facilities to enable the growth of plant-based agriculture.

**Threats**

- COVID-19 exacerbated the shortfalls in labour supply during peak production periods.
- Bio-security incursions such as pests and pre-harvest and post-harvest diseases.
- Increased geopolitical risks for exporting.

## 11.6 Beef and Live Cattle Industry

### 11.6.1 Current State of the Industry

The northern cattle industry is a stand-out success story. Northern Australia's beef herd comprises 12.5 million cattle and contributes approximately 90 per cent of Australia's live cattle exports (CSIRO, 2014). In 2010-11 the gross value of agricultural production in the north reached $5.2 billion (ABARES, 2013) around $3 billion of which was from cattle.

However, the industry is particularly exposed to the costs of moving cattle — the longest land transport distances of any Australian commodity. Cattle in the Northern Territory travel, on average, just under 1,000 km between farm to market, and sometimes as much as 2,500 km to abattoirs on the east coast (Higgins, as quoted by Australian Government 2015, 72).

The Territory beef and cattle industry is a long-standing, established sector. Beef is the most important agricultural commodity in the Northern Territory based on the gross value of agricultural production at $823.5 million in FY19, accounting for 65% of the total value of agricultural production in the Northern Territory.

Cattle production in the Northern Territory occurs in three main areas: the Central Australia region; the Darwin and Katherine areas; and the Barkly area. There were 152 beef cattle stations in the Northern Territory FY18. The average pastoral lease is 2,500 km2 and carries an average of 8,000 head of cattle. The Darwin Port is one of the busiest live cattle export ports in the world and is ideally located to capitalise on growing demand for red meat in the Asian region. The Northern Territory sells around 600,000 head of cattle per year, with 400,000 sold live to South-East Asia, and a further 200,000 head sold into domestic markets in eastern and southern Australia (KPMG 2021).

The beef industry is a critical component of the economy of northern Australia. It represents the largest economic land use, covering 60% of the land area. The comprehensive assessment of economic value of the industry estimated its worth at approximately $5.03 billion, of which $3.7 billion was production at farm gate and $1.3 billion in first stage processing, The industry is largely export focussed. Around 1 million live animals per year are exported into South-East Asian markets, with 59% into Indonesia. Breeding and grazing properties in northern Australia are part of the beef export and domestic supply chains that include feedlots and processing facilities in South-East Queensland (Chilcott et al 2020).

Although cattle production currently dominates, interest in expanding and diversifying agricultural production and therefore developing the northern Australian rural economy is increasing. Factors driving this interest include favourable demand prospects for Australia's food and fibre production, and proximity to emerging international markets, particularly in Asia, where food demand is growing rapidly. As a result of these perceived opportunities, the Australian Government and northern jurisdictions are striving to develop policy environments that encourage the agricultural sector to take advantage of growing food demand and develop regional economies in northern Australia (Ash et al 2014).

The production systems are mostly extensive grazing of rangelands consisting of 'unimproved' native and natural grasses, herbs, forbs, and shrubs. Production is largely dependent on seasonal rainfall and given the location in the tropics, is vulnerable to seasonal variability. The low-input, low-cost approach has been the strength of the industry for decades, but recent increases in input costs and market disruptions have not been matched with productivity gains, making many properties financially marginal at best (Chilcott et al 2020).

### 11.6.2 Current Industry Production Value & Potential Growth

Growth in the value of the livestock industry has historically been relatively linear with incremental growth year on year seen over the long term. The future values shown in Figure 56 were determined by reviewing previous valuations from sources such as ABARES and Northern Territory Government publications and applying a 4% annual growth rate.

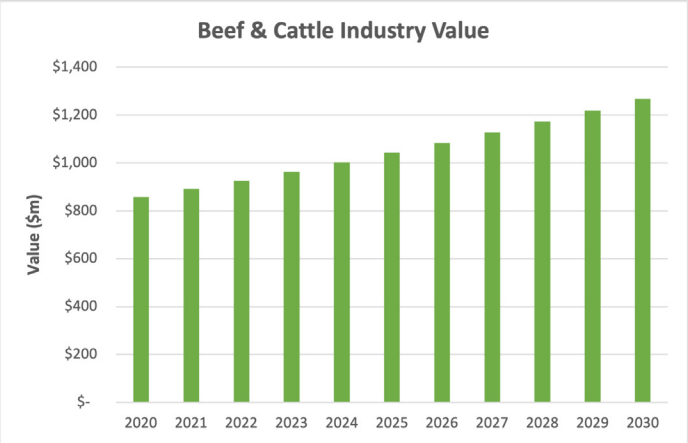



Figure 56. Current and predicted future value of the Northern Territory beef and cattle industry.

### 11.6.3 Review of Industry Constraints

A total of fifteen industry constraints were identified through stakeholder consultations and review of relevant literature. All five categories of constraints were represented in the findings (Figure 57) with supply chain infrastructure (46%) and strategic development (27%) the most prominent constraint categories.

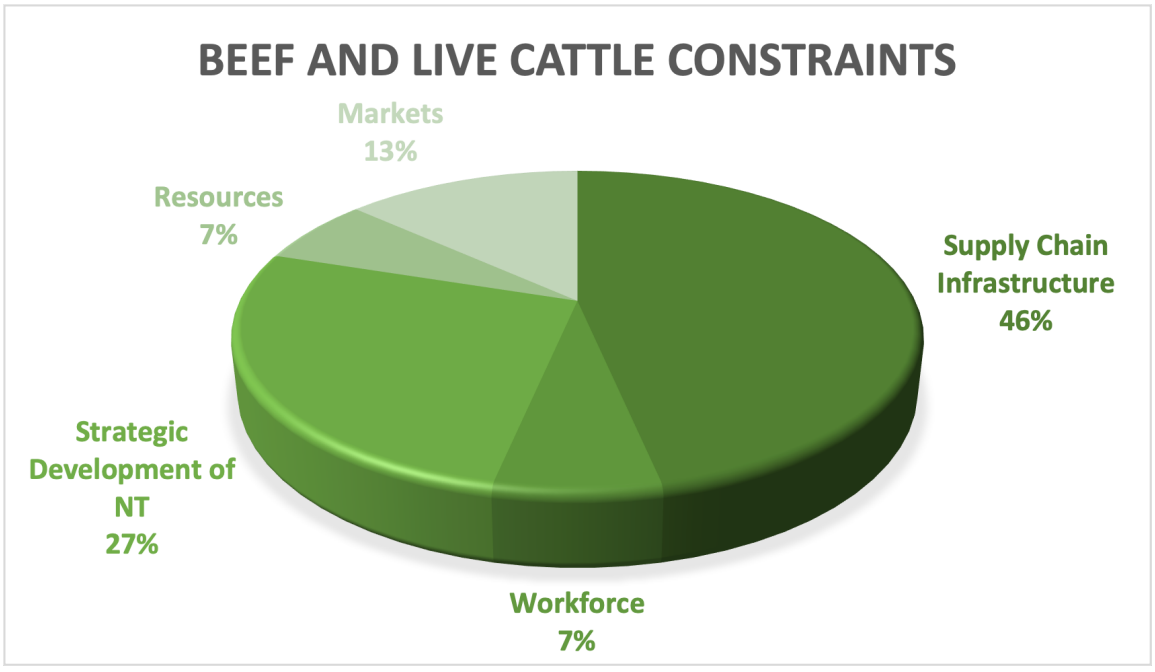



Figure 57. Northern Territory beef and cattle industry constraints.

The top constraints identified by the literature and through stakeholder consultations are:

1. The current and future (expected) relative importance of beef and live cattle exports for Northern Australia justifies its prominence in the review, which by necessity must pay some attention to the key structural challenges facing that sector. The opportunity of increasing 'protein demand' stemming from projected socio-demographic and economic transformations among Australia's immediate Northern neighbours (in ASEAN in particular and Asia in general) warrant the level of attention given to live cattle and beef products exports which are sometimes treated as competing propositions, other times as complements. In contemplating the diverse options and barriers to their expansion, as well as the implications for supply chain development, it makes sense to discuss both products, yet it is necessary to highlight how strategic expansion in one direction will affect the other (Ash et al 2014).
2. Effective improvement will require significant changes across the industry, and individual producers will have to want to change before performance will improve. There needs to be a good understanding of what are and what are not, the drivers by producers and the R&D community.
3. 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 AUD$100m Beef Roads Program, AUD$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 (Dale et al 2020).
4. Darwin and Townsville are the current key live cattle ports, which benefit from dedicated infrastructure, vessels and equipment and other specialized facilities usually not sharable with other commodities. They constitute the central nodes connecting lengthy road and track interior networks to ASEAN port facilities, distribution infrastructure and markets.
5. Most reports claim that the stock of road infrastructure in Northern is inadequate, even when considering jointly privately-owned tracks/roads and public roads. Those roads are often shared with many types of users and suffer from slow network expansion, rare upgrades and deficient maintenance deemed to constitute a key limitation on potential growth rates for the sector. Significant investment is currently taking place around upgrading transport infrastructure supporting cattle trade (i.e., AUD$100 million Northern Australia Beef Roads Program to upgrade high priority roads) to improve its reliability, productivity, and the resilience of cattle supply chains.
6. The Northern Australia road network is identified as extensive and characterised by long isolated roads and low daily traffic volumes, as well as major national highways. In some industries, there is significant over-reliance on road networks, such as the cattle industry (Ash & Watson, 2018). Significant proportions of Northern Australia's agricultural market are not serviced by any other freight options other than roads (Reed, as quoted by Babacan, Tremblay and McHugh 2020, 11). The quality of road links across Northern Australia is varied with large portions of the road in WA, Northern Territory and western QLD being unsealed. Climate conditions challenge road reliability, especially during floods and annual monsoons. Limited road options are most often manifested in inadequate quality and reliability and are the main source of uncertainty for the delivery of many key commodities commonly resulting

in excessive freight costs, as well as related impacts in the form of road deterioration, and time delays getting products to market.

7. The level of service the road network is able to provide is impacted by a number of factors including the climate (wet and dry seasons), levels of economic activity and the configuration of the road e.g., sealed, unsealed, weight restrictions (Infrastructure Australia 2015).
8. In the context of agriculture, Ash et al. and Higgins et al. state that "supply chains and associated transport logistics and infrastructure such as roads and ports, processing facilities and power are all significant challenges for establishing a larger-scale agricultural sector in northern Australia" (as quoted by Ash and Watson 2018, 302, in Babacan, Tremblay and McHugh 2020, 15).
9. The report examining ASEAN opportunities (AustCham ASEAN 2019) notes that foreign investments into Northern Australia by beef importers originating from ASEAN countries in assets supporting simultaneously is live cattle supply chain efficiency as well as beef intensification and could create contradictory inducements for and against live cattle exports growth.
10. Efforts by Australian exporters (and government agencies) to support processing and distribution capabilities in key ASEAN markets aim to tackle animal mortality and mistreatment concerns across stages of the supply chain otherwise outside their control (abroad transport to feedlots, abattoirs, refrigerator car or 'reefers', etc.). It has been observed that foreign government influence or interventions sometimes pushes those supply chain initiatives where they seek to create economic activity, which can be away from the main urban centres where rapidly growing demand for the product is located.
11. The proper management of those markets also require that those activities be certified by Australia's Exporter Supply Chain Assurance System (ESCAS) and applied consistently in ways that can be monitored by export country authorities without creating undue red tape if logistical expansion occurs (Ash et al 2014).
12. Key challenges exist in the rail freight system with no consistency around rail gauges or axle load limits, affecting the efficiency of general freight and bulk commodity movements (Reed, as quoted by Babacan, Tremblay and McHugh 2020, 14). Studies have shown that increased efficiencies can be achieved via improvements to the railways such as narrow gauge in Central Queensland (ACIL Allen, 2020).
13. Roads form a major consideration in the freight task for Northern Australia and for connecting industries with economic activity. The Northern Australia road network is identified as extensive and characterised by long isolated roads and low daily traffic volumes, as well as major national highways. In some industries, there is significant over-reliance on road networks, such as the cattle industry (Ash & Watson, 2018). Significant proportions of Northern Australia's agricultural market are not serviced by any other freight options other than roads (Reed, as quoted by Babacan, Tremblay and McHugh 2020, 14).
14. 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, as quoted by Dale et al 2020, 32).
15. Producers must weigh the need to grow production and supply networks (to achieve more efficient scales) against the lack of consistency and integration along the value chain once live cattle exit Australian shores. Current Northern Australian exporters identify the excessive purchasing power of a few buyers overseas, the inadequate facilities abroad (which limits the sectors' control over product quality and reputation abroad), as well as sporadic attempts by Indonesian and Vietnamese governments to reduce their trade deficits as the main challenges preventing significant scaling up of live cattle production and exports

which would allow them to increase their productivity (Ash et al 2014).

16. For much of Northern Australia, the supply of quality feed is likely to constitute the most significant hurdle for the development of sustainable intensive beef industry. The high costs of transporting grain and roughage are a critical barrier unless local grain production can be increased in specific sub-regions. The proximity and linkages with a variety of crop production are likely to become important determinants of competitiveness. This highlights the possibility that inadequate road access will likely constitute one of the most potent constraints on the development of abattoirs and other key supply chains in regional areas across north Australia. All reports considering cattle and beef industry challenges note that rural roads are not developed to a standard suitable for the high volume of heavy vehicles required by a busy abattoir. The costs 15 associated with the upgrade of these roads may prohibit the realisation of transitional and differentiation aspirations unless sufficient investment is secured (Ash et al 2014).

### 11.6.4 Review Industry Trends

A total of eleven industry trends were identified through stakeholder consultations and review of relevant literature. The trends identified represented three of the five categories – strategic development of the Northern Territory (46%), markets (36%) and supply chain infrastructure (18%).

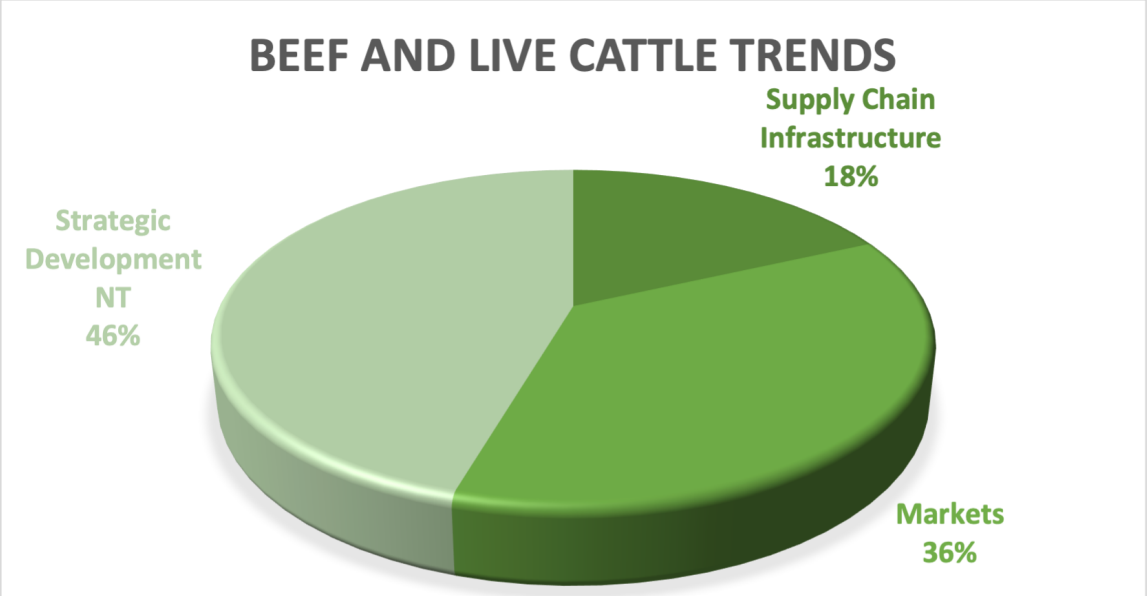



Figure 58. Northern Territory beef and cattle industry trends.

The top industry trends identified in the review of literature and through stakeholder consultations are:

1. Global meat consumption is increasing
2. Global demand for Australian beef is strong, with consumer preference trends driving an increase in branded beef with a provenance story. Consumer trends include the appeal of branded product ranges from a sense of wellbeing when buying something that's been produced in line with their ethical beliefs or social circles and expectations (KPMG 2021).
3. Increased community interest in the impact of red meat production on the environment, animal welfare and diet has heightened the focus on the sustainability in the industry
4. Increasing digital uptake and collaboration to improve data-driven decision making and supply chain efficiency, traceability, and visibility.
5. Emerging enhanced production methods and models that are understandable and relatable to communities.
6. Emergence of diversified income streams through carbon sequestration projects and carbon markets.
7. Current megatrends (a less predictable planet, health on the mind, choosey customers, one world and smarter food chains) conclude the Australian agribusiness sector has the potential to strengthen its position as a small but significant exporter of sustainable, authentic, healthy, high-quality, and consistent products.

### 11.6.5 Priorities

A total of eleven priorities were identified through the review of literature and stakeholder interviews and consultations. All five categories were represented in the data (Figure 59) with strategic development of the Northern Territory (42%) and markets (34%) the most prominent.

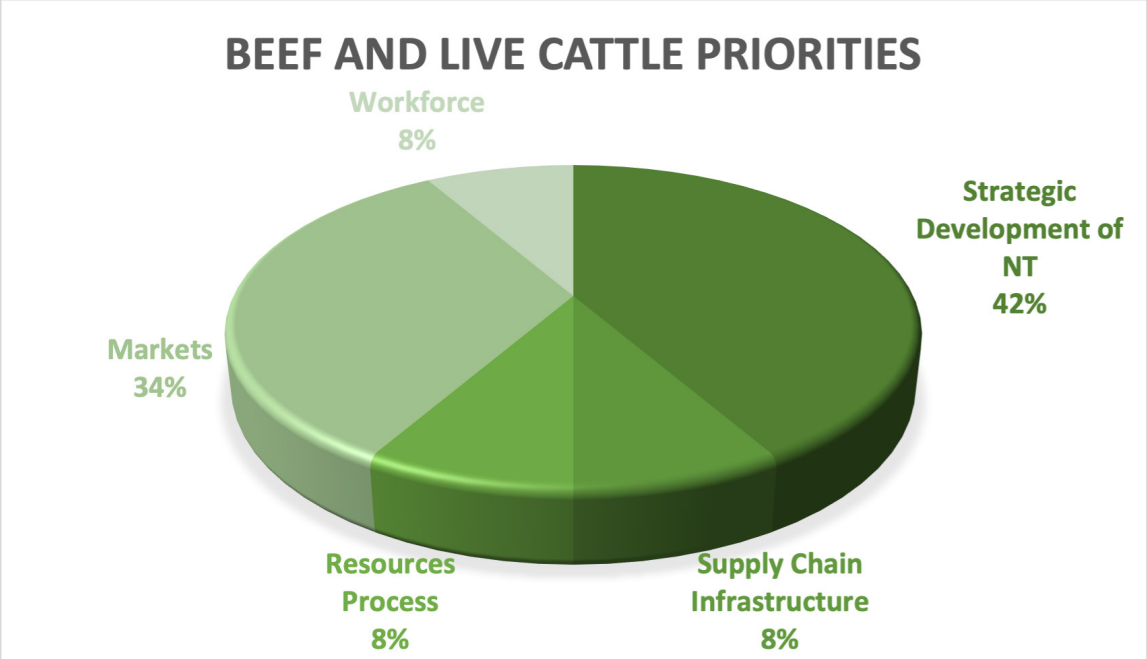



Figure 59. Priorities for the Northern Territory beef and live cattle industry.

The top priorities identified through the review of literature and stakeholder consultations are:

1. A key finding is that in the short/medium term, there is a significant opportunity to increase the volume of both live cattle and beef trade towards ASEAN nations, by far the largest opportunities for the immediate future in terms of potential trade value. That report (AustCham ASEAN 2019) refers to accelerated export growth where "the products with highest untapped export potential and supply feasibility in Northern Australia are live cattle [highest] and beef, with a potential "upside" opportunity of AUD$13 billion. The major country opportunities for live cattle and for beef in ASEAN are Vietnam (71%), followed by Indonesia (13%) and Malaysia (7%)" (Ash et al 2014).
2. Increasing demand for protein, R&D breakthroughs or new technologies cannot be relied on to improve industry performance. A good understanding of, and clear focus on, the fundamentals of profitable beef production will improve performance regardless, as well as position producers to benefit from any advances that may occur (Chilcott et al 2020).
3. Through improving the value-add utilisation of the whole animal, the stakeholders seek to deliver a premium product that utilises by-product waste, reduce food miles for consumers and improve animal welfare to consistently deliver uniquely branded beef products to the local community (KPMG 2021).
4. There is a great opportunity for the industry to utilise the Emissions Reduction

Fund which provides positive incentives to businesses across the economy to reduce emissions at lowest cost and contribute towards Australia's 2020 emissions reduction target. Opportunities in northern Australia include reducing emissions from savanna burning and beef cattle production (Australian Government 2015).

5. Live cattle have been considered to have the highest untapped annual export demand at AUD$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, as quoted by AustCham ASEAN 2019, 7).
6. Increased community interest in the impact of red meat production on the environment, animal welfare and diet have heightened the focus on the sustainability in the industry. Supported by the development of the Beef Sustainability Framework, the industry has looked to take a proactive stance on these issues (Food Agility CRC 2020).
7. There is a large diversity in business performance across northern Australia beef operations. This has been highlighted in the Australian beef report (Holmes et al., 2017), which surveyed family owned beef operations across Australia. The top 25% of producers had considerably better performance than the bottom 75% with the distinguishing features of the top 25% of producers being: better herd productivity, targeted herd expenditure to achieve the most gain per dollar spent, efficient use of labour, and more operating scale. The picture is similar for the top 25% of pastoral companies that had greater herd productivity compared with the bottom 75% (McLean et al., as quoted by Chilcott et al 2020, 7).
8. The need to improve the translation of proven R&D to farm practice for most of the Northern Australia beef industry.
9. 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 (Dale et al 2020).
10. Follow the developed impact pathway that sets out the plausible steps of how research activities/outputs will contribute to an outcome (or outcomes). It explains the causal links between outputs, outcomes, and impacts. It covers the different phases of work, the stakeholders who need to be involved to achieve the desired changes, the flow of resources and the progressive integration of different forms of knowledge into outcomes (changes in behaviour) and impacts (the result of the behaviour change). The implementation pathway for the recommendations is:
11. Implementing proven R&D
12. Investing in R&D for profitability and productivity gains for top businesses
13. Investing in infrastructure and supply chains
14. Future proofing and de-risking (Chilcott et al 2020).

### 11.6.6 Demand Driven Opportunities to Increase Supply

A total of eighteen opportunities to increase supply driven by demand were identified in the review of literature and through stakeholder consultations. Four of the five categories were represented (Figure 60), with strategic development of the Northern Territory the most significant (50%) and markets (33%) also prominent.

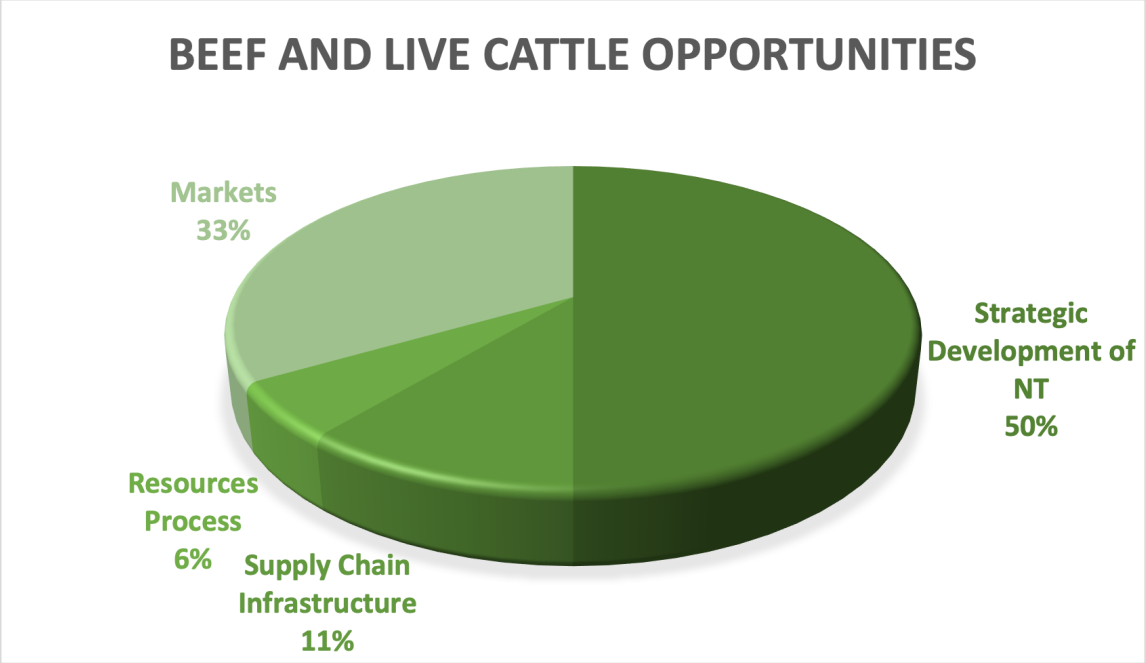



Figure 60. Opportunities driven by demand for the Northern Territory beef and live cattle industry.

The top opportunities identified are:

1. The competitive advantages of the northern Australian beef industry are its production systems, low-cost base and geographic positioning allows it to take advantage of the South-East Asian markets (Chilcott et al 2020).
2. For Association of Southeast Asian Nations (ASEAN) member states as a whole, the real value of beef consumption is expected to be 120% higher by 2050 (Ash et al 2014).
3. The industry roadmap was refined to take into account current megatrends (a less predictable planet, health on the mind, choosey customers, one world and smarter food chains) conclude the Australian agribusiness sector has the potential to strengthen its position as a small but significant exporter of sustainable, authentic, healthy, high-quality and consistent products. It challenges the notion of being an Australian Food bowl and to more realistic expectation of being a 'delicatessen of high-quality products for the informed and discerning customer' (Chilcott et al 2020).
4. There are opportunities to integrate crop production with the beef industry to create a value-add in both sectors. Broadacre grain and forage crops are not viable where large domestic transport distances are required.
5. There are opportunities to use grains such as maize and sorghum, and high-quality hay in more intensive local beef-feeding systems. When used locally, both grains and forage hay crops could generate positive gross margins. For example, gross margins for maize in the Katherine region could be increased by around $500/ha through incorporation into beef feeding systems, even with an assumption of lower returns per tonne (selling as feed rather than food). This not only provides a market for such grains within the region but offers some market diversity for the beef industry, which is strongly dependent on the live export trade in these regions (Ash et al. 2014).
6. There is a need to support the northern

Australia beef industry to transform from its current state to a higher productivity state and ensure future viability. The competitive advantages of the northern Australia beef industry are it's adapted production systems, low-cost base and geographic positioning that allows it to take advantage of South-East Asian markets. However, the inherent low productivity, high capital costs and over-reliance on a small number of markets make it vulnerable to market shocks.

7. Collaboration across the value chain (sharing information for mutual benefit – production, supply chain and consumer facing participants).
8. Strengthen social licence to operate by working towards Carbon Neutrality 2030 (CN30) goal for red meat production, lot feeding and processing (MLA, 2020).
9. Maintain 'high value and premium' products to avoid competing with 'commoditised red meat' in international markets.
10. Diversified capital streams and models to support business growth and entry.
11. Stronger recognition of quality assurance programs across the supply chain and stronger in-market partnerships (Food Agility CRC 2020).
12. In conjunction with stakeholders and industry partners, one of the four strategic recommendations developed to reduce barriers to trade in ASEAN nations and to increase production or supply of produce from Northern Australia to ASEAN markets to Develop a "farm-to-fork" supply chain diagnostic tool to analyse beef and live 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) (Dale et al 2020). Addressing in specific sub-regions and incentivise investment towards select partners such as Indonesia, Vietnam, and Thailand, with the intention of complementing work on priority trade routes currently driven by the ASEAN Secretariat under the Masterplan for ASEAN Connectivity 2025 (ASEAN, 2016).
13. It is imperative to find a way to improve freight and related transport infrastructure, particularly roads, in ways that could accommodate the short-term intensification opportunity (AustCham ASEAN 2019) and the long-term conversion scenario (Chilcott et al. 2020). This would entail: Supporting intensification in the short run so as to exploit the safest and highly valuable upside opportunities connected with ASEAN markets, with Indonesia and Vietnam identified as offering particularly profitable prospects; Helping the region's most likely candidates for scaling beef production (and achieve price competitiveness) as well as already equipped with abattoirs and other beef processing equipment to intensify and develop new markets, with a view to slowly scale up in countries appreciating North Australia's beef product exports; and planning strategically for a sequence (based on regional readiness) of systematic industry conversions from live cattle towards intensive production and widespread beef product processing capabilities (with multi-use refrigerated facilities located nearby water access, feedlots and grain storage facilities, abattoirs, modern wastewater treatment, packing, shipping, handling and holding equipment and infrastructure). This would have to be done in ways that allow producers to test products, learn from consumers in foreign markets, and develop new technical certification standards, when necessary, etc.
14. All the equipment, services and technical capabilities need to be relatively close to regional centres with suitable amenities given the need for sustainable skilled workforces, at a time when the agribusiness sector is struggling to attract workers.

### 11.6.7 Beef and Live Cattle Supply Chain Map

**Key Issues:**

- Depending on the type of crop prodiced, the NT lacks the following
  - Cold storage facility for transportation to domestic and international markets
  - Canning and juicing facility, which are important products for international markets
  - Controlled atmosphere container facility which is required to transport fresh product to international markets

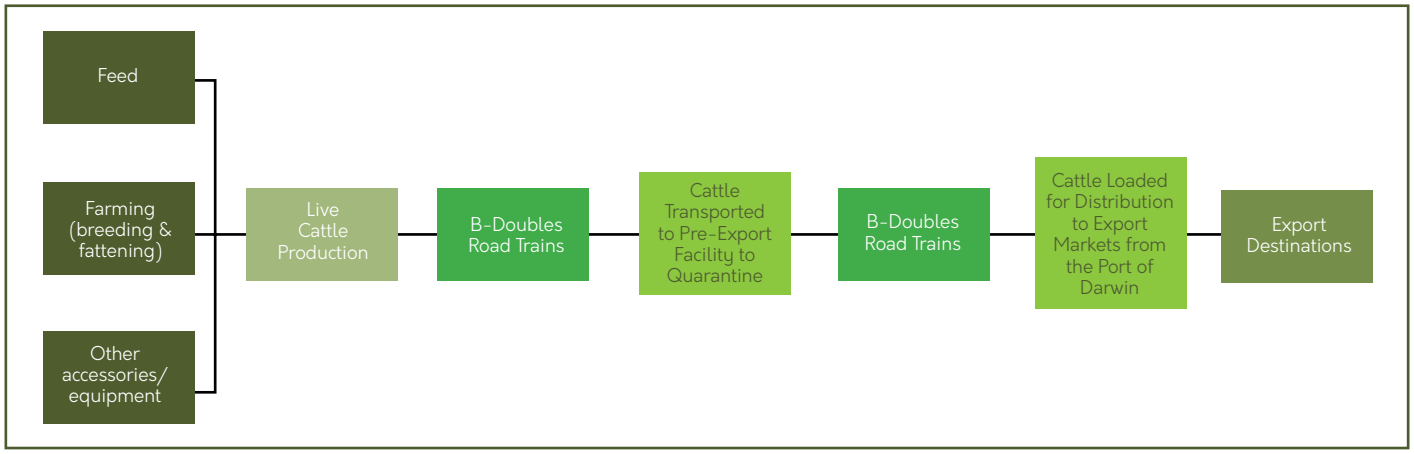



Figure 61. Northern Territory beef and live cattle industry supply chain map.

### 11.6.8 Beef and Live Cattle SWOT

**Strengths**

- Northern Australia's beef herd comprises 12.5 million cattle and contributes approximately 90% of Australia's live cattle exports.
- Darwin Port is ideally located to capitalise on growing demand for red meat in the Asian region.
- Multi-generational knowledge and expertise throughout the cattle industry.

**Weaknesses**

- The cattle industry is particularly exposed to the costs of transport.
- Climate conditions challenge road reliability (floods and annual monsoons).
- It is currently very expensive to export via Darwin Port.
- Underdevelopment of key elements in the beef value chain such as abattoirs.

**Opportunities**

- Significant opportunity to increase the volume of both live cattle and beef trade towards ASEAN nations.
- Opportunity for the industry to utilise emissions reduction incentives.
- Opportunities to integrate crop production with the beef industry to create a value-add in both sectors.

**Threats**

- Northern Australia and the NT's high capital costs and reliance on a small number of markets make it vulnerable to market shocks.
- Increased community interest in the impact of red meat production on the environment, animal welfare and diet.
- Lack of skilled abattoir workers.
- Potential biosecurity incursions.

## 12. STAKEHOLDER SURVEY

The survey formed a key component of the stakeholder engagement process. The survey was able to capture data from a broad range of industry stakeholders, with the results validating the findings made in the data from other engagement activities. Refer to Appendix E for full survey results.

There were twenty-nine respondents to the survey, representing business owners, researchers, contractors, investors, labour providers, industry suppliers, industry associations, consultants, and government representatives (see Figure 62).

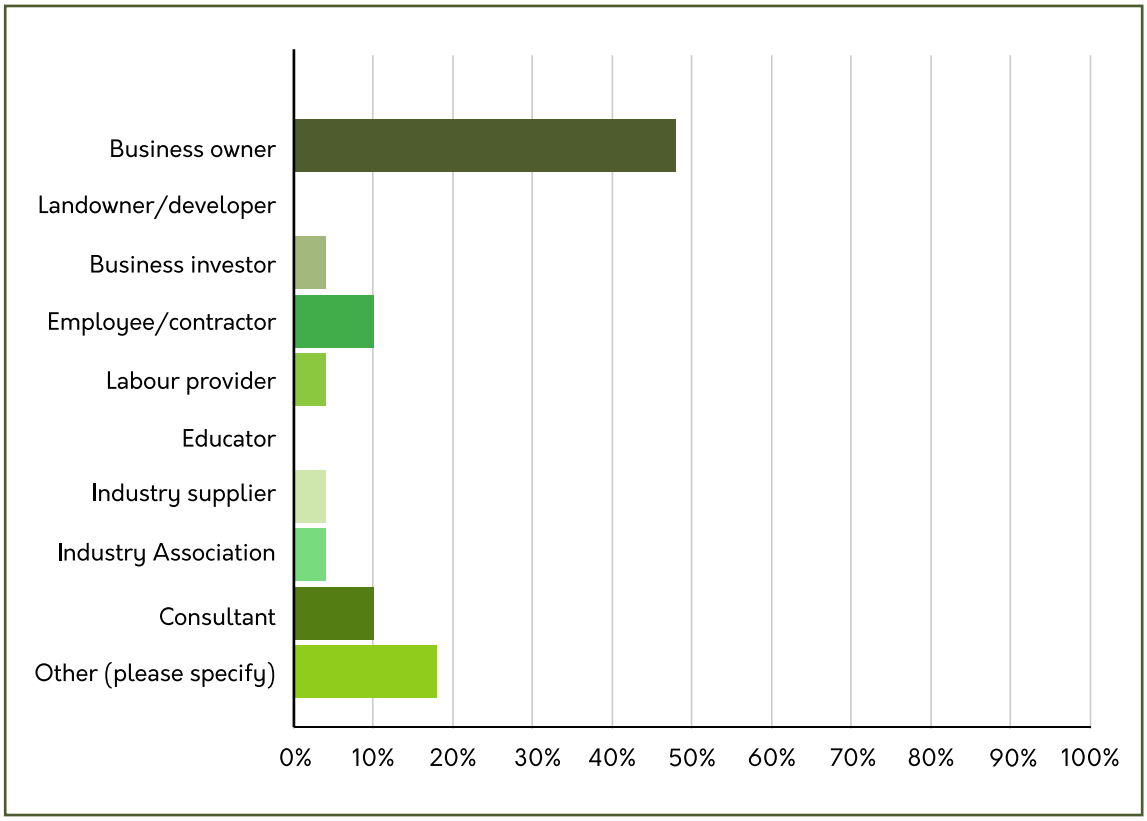



Figure 62. Areas of primary production which survey respondents are involved in.

The constraints identified by the respondents (see Figure 63) as being the most important were:

- Affordability of freight,
- Constraints and barriers in policy and regulatory processes, and
- Lack of remote, regional, and local infrastructure.

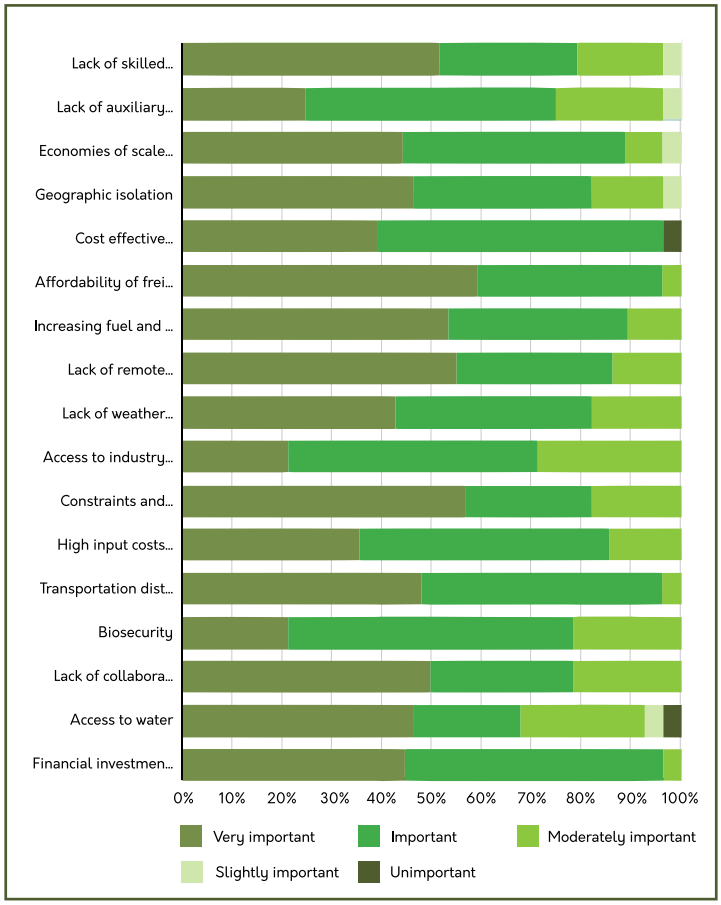



Figure 63. Respondents' perspectives on the importance of constraints in agribusiness supply chains.

Respondents in the survey identified the highest priority actions for local, Territory and Commonwealth governments to develop agricultural supply chains in the Northern Territory (see Figure 64) as

- Support industry gaining market access both domestically and internationally,
- Invest in improved or required infrastructure for road, rail, sea, and air,
- Co-invest with the private sector in infrastructure.

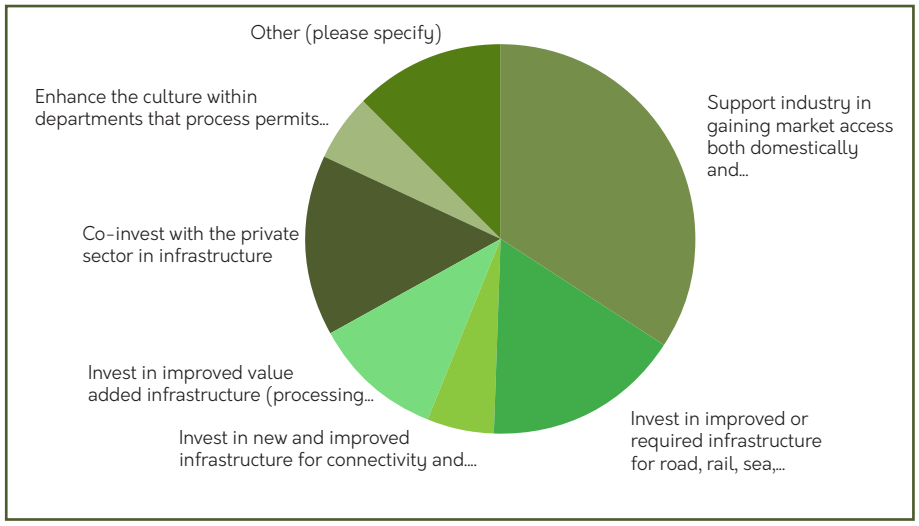



Figure 64. Respondents' perspectives on the priorities for all levels of government to develop agribusiness supply chains in the Northern Territory.

The survey also identified that most important opportunity to grow and develop industries in the agribusiness sector, according to respondents, was for the Northern Territory Government to focus on improving critical inputs for agribusiness namely water, infrastructure, and improvement to supply chains, increase resilience of the workforce and enable producers to capitalise on emerging technologies (see Figure 65).

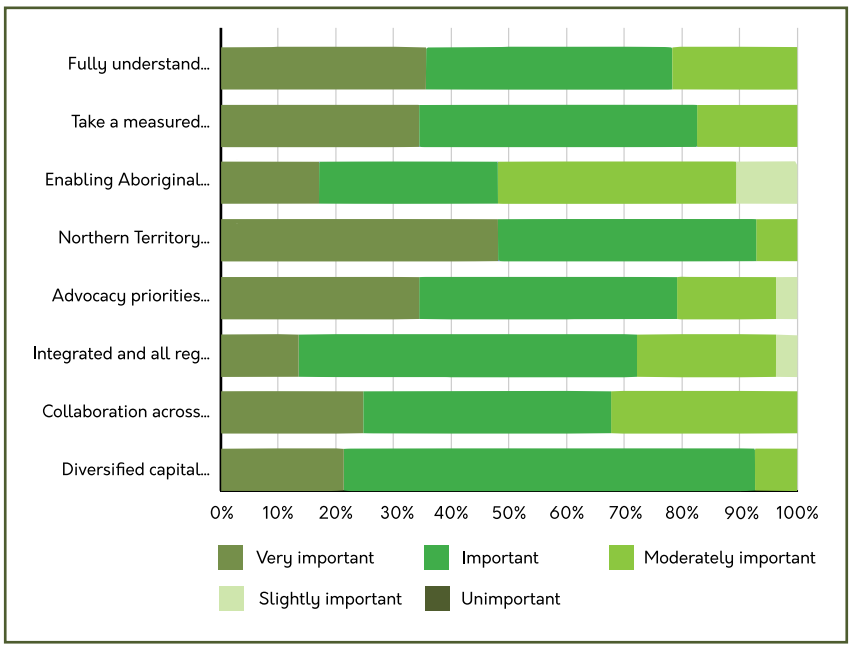



Figure 65. Respondents' perspectives on the importance of opportunities to grow and develop industry in the Northern Territory.

# 13. CASE STUDIES

## 13.1 Australian Agricultural Company (Beef and Live Cattle)

### 13.1.1 Background & Location

Formed in 1824, the Australian Agricultural Company (AACo) is Australia's largest cattle and beef producer and is the oldest continuously operated company in Australia. It is publicly listed on the ASX. The company formed in Port Stephens, NSW, with the primary objective of feeding and clothing the colony and sending wool back to the UK. Since then, AACo has developed many industries in Australia including the coal mining industry around Newcastle, Australia's first railway line and the founding of Tamworth.

Today AACo owns and operates stations in Queensland and the Northern Territory, with a total area of 6.4 million hectares – approximately 1% of Australia's landmass. AACo's holdings consist of twenty-six cattle stations, feedlots, and an abattoir (currently mothballed).

### 13.1.2 Summary of Operations

Nationally, AACo sends 340,000 head of cattle to market annually. These supply 16 major domestic markets and international markets. The AACo model starts cattle on the northern properties then moves south through to their Qld feedlots ready for market. The cattle are put through third party processors and distributors then into the domestic market. The cattle on the properties in the Victoria River Downs region are sent north to on-sellers and into the live export market.

On the stations there is a fluctuating workforce that reaches up to 450 staff. Year round the skeleton crew on the stations will consist of a manager/ manager couple, bore runners, station hands and mechanics. The corporate staff in the head office cover the executive, finances, human resources (HR), logistics, safety and marketing positions. Corporate staff aren't too difficult to attract, neither are seasonal station hands. Skilled positions on stations are more difficult to fill but this has been an ongoing part of the cattle industry in the Northern Territory.

### 13.1.3 Issues, Impediments and Future Trends in Supply Chains

Issues with transport and logistics infrastructure contribute to the cost of doing business. Northern Territory roads are large part of the supply chain impediments for all of AACo's properties. Most of the roads that link their properties are seasonal gravel roads that are cut off during the wet season. Bad roads cause more damage to vehicles over time so extra expense needs to be factored in for running costs. The running costs and the difficulty of navigating the road networks combined with the long distances make up the largest problems.

Market for the cattle could be more accessible. It is too expensive to export quality packaged beef out of Darwin port on a large scale due to the lack of numbers. The costs associated with using Darwin Port can be two to three times more expensive per container than Brisbane Port. AACo is working with Northern Territory Government to address these costs as the success of the Livingstone processing facility relies on exports. Competition for transport and logistics services and infrastructure also impacts AACo's supply chains, including competition for warehousing and road freight.

Sparse and unreliable telecommunications infrastructure limit access to evolving digital opportunities. Of the 1% of Australian landmass owned and operated by AACo, only 1% is connected to the internet. Any internet coverage available on AACo properties is thanks to each property using a 'cobbled together' system. Virtual fencing and other digital opportunities which would mitigate supply chain issues cannot be considered until internet connectivity is addressed, because they simply are not possible without reliable internet.

Sustainability is expected to play a significant role in supply chains and is a major focus area for AACo over the next 12 months, both due to customer demand and to reflect the values of the company. There are growing expectations from consumers, animal welfare groups, and environment and sustainability groups that agriculture becomes sustainable. AACo released a sustainability framework to guide the direction of the company, what sustainability looks like in agriculture and how it supports sustainable models for the climate,

communities, and local Traditional Owners. Sustainability will also support the high-value provenance of AACo's product.

Innovation and technology will play a large role in sustainability. Work has been done to reduce cattle methane emissions using asparagopsis (seaweed), and further work is underway to test asparagopsis on wagyu cattle. However, further opportunities can be explored to make farming more efficient and sustainable, such as long fed cattle, carbon farming, and genetic modification. Partnerships with other companies will continue to produce new sustainability opportunities. AACo worked with Cibo Labs in 2018 to develop a satellite-based pasture biomass assessment tool, before road-testing the tool in 2019 and full incorporating it into AACo's processes in 2020-21.

AACo expects that Australia's reputation for high quality beef will benefit it as demand for high quality protein continues to grow, particularly as global population growth increases demand for protein and meat.

## 13.2 Nutrano (Horticulture)

### 13.2.1 Background & Location

Nutrano Produce Group started out as a banana and fruit market stand in the Brisbane, Sydney, and Melbourne markets. It was purchased by FC Capital Management Fund and set up to lease and manage land. All farms across Australia under the Nutrano Produce Group banner are leased for 25 years, this includes farms in NSW, QLD, Victoria, and WA. In 2017 FC Capital purchased the Sevenfields farm in the Venn south of Katherine. Still trading as Sevenfields, Nutrano Produce Group heads this operation. Sevenfields is an established 500-hectare farm across two parcels. The primary crop is mangoes, putting out 220 000 trays a year. They also have citrus that produces 80 ton per year. There is a new plantation of lemons going in that is expected to produce 40 ton to the hectare by 2025. The water allocation is 1200ML from the Tindal Aquifer which provides all the irrigation for the orchards.

### 13.2.2 Summary of Operations

Nutrano's primary crop is mangoes, putting out 220 000 trays a year. Nutrano also produces 80 ton per year of citrus. There is a new plantation of lemons going in that is expected to produce 40 ton to the hectare by 2025. The water allocation is 1200ML from the Tindal Aquifer which provides all the irrigation for the orchards.

The produce from Sevenfields is destined for the domestic market is predominately going to Woolworths, a smaller portion to Coles and some into the wholesale markets. Mangoes are also sent to Korea, Japan, and the US. The export protocol for the US can be challenging so this is an on and off market. The citrus is exported to New Zealand, Japan, Asia, Indonesia, Canada and sometimes to the US. Sevenfields under Nutrano Group's management, as well as planting the lemons, will be looking for other crops to diversify their operations.

Nutrano employs six full time staff in the Northern Territory. Twelve seasonal workers during the year for general orchard maintenance and subcontract up to 60 seasonal workers for the mango season. The orchard needs a range of skilled workers, machinery operators, irrigation technicians, mechanics, agronomists, administration and accounting and a packing shed manager. Being a relatively isolated place, it can be difficult to attract and keep staff. The mango industry as a whole has been looking for options to move into robotic picking machines. Prototypes have been developed and will one day be available. This removes the need for seasonal workers and the uncertainty that comes with them. Packing equipment will also be fully mechanised one day as well. Currently scanning equipment is becoming more sophisticated, which is leading to higher quality fruit leaving the farm and more profits returning.

### 13.2.3 Issues, Impediments and Future Trends in Supply Chains

The Vapour Heat Treatment Plant at the Pakfresh facility at Darwin Airport has opened up access to the Asian markets. Having this option provides the security of definite markets and competitive prices. Access to Asia will be the key to a successful export market for Nutrano. The VHT plant can only

handle two pallets at one time. This has been a great start but if the market continues to expand a larger facility will need to be built. Depending on the negotiations and enthusiasm, this is something Nutrano may have to do themselves. Katherine has one road in and one road out to the domestic markets. This road is subject to natural disasters and seasonal blockage. The logistics around moving produce from the packing shed is done on site in conjunction with Gilberts and ABC trucking companies for Woolworths. Nutrano is getting involved with the Department of Industry, Tourism and Trade (DITT) to develop the cold chain processors by contributing to R&D.

The Venn, where the farm is situated has decent phone coverage. Although difficult to organise being in a remote area, NBN via cable is set to be linked up to the packing shed in the first half of 2022. NBN via satellite is available in the office but the connection is patchy and slow. The ability to connect between the packing sheds in Qld and Katherine will be a game changer for the farm. Being so far from suppliers and markets means the cost of doing business is approximately 8% more expensive than the southern farms. This takes into account the added freight costs to inputs like fertiliser, chemicals and packaging. The local suppliers are few and face the same supply issues of lateness, distance, and low stock. Global politics and the Covid 19 pandemic have also affected prices and continuity of supply. Diesel supply hasn't really been a problem but the power to the farm has been sporadic, forcing the farm to be run off generator. Irrigation systems are being upgraded to make them more efficient, this is expected to cut the costs associated with pumping water as well as free up more water for use on other crops.

Consumer demand is the main driver of the industry trends. Consumers are tending away from Kensington Pride and towards R2E2. Demanding on the permanency of this change the orchard may need to be converted over to the other variety. Seedless citrus is quickly becoming more popular. The new trees planted have taken this into account. Orchard behaviour management is beginning to be more of a focus. High density plantings are being explored. The mango industry has continued to grow over the past five decades, just now the volumes are beginning to overrun the capacity for mangoes. This will have flow on effects for the export markets.

A few years ago citrus canker spread through the Northern Territory's citrus farms. Since then the Northern Territory DITT biosecurity team has been very proactively monitoring for any further outbreaks.

## 13.2 African Mahogany Australia (Forestry)

### 13.2.1 Background & Location

African Mahogany Australia (AMA) manages the high value timber forestry and agricultural operations in the Northern Territory for The Rohatyn Group (TRG) and HVT Cremorne Capital.

AMA was established in 2006 to specifically manage forests of African Mahogany. Partnering with TRG, they have selected, purchased, and developed land in the Northern Territory ideally suited for African Mahogany production. TRG is a large, New York-based, investment corporation with one portfolio of their investments dedicated to agriculture and foresty, with their southern hemisphere headquarters located in New Zealand.

AMA manages 13,500 hectares of African Mahogany and 2000 hectares of fodder hay production area. The properties "Kumbyechants," "Stray Creek Station," "Gypsy Springs," "Whatfor" and "Mentabie" are in the Douglas Daly region and "Rocktear Park" is near Katherine.

### 13.2.2 Summary of Operations

"Whatfor" is the only property with a water allocation while the other production areas are supported by annual wet season rainfall. There is currently no commercial harvest of mahogany because the forests are yet to mature. It is envisaged that harvesting will commence in 2026-27.

"Mentabie" produces 1000 tonnes of Jarrah hay and 1400 tonnes of Cavalcade hay per year. "Rocktear Park" produces 1200 tonnes of Jarrah and 6500 tonnes of Cavalcade per year. Between the Douglas Daly properties and "Rocktear Park" the company agists 3400 head of cattle every year. AMA is in the process of developing domestic and international markets for its timber. The end uses for high value products will include furniture, instruments, boats building, flooring, staircase and fit-outs, trims, and architectural features in buildings. This market needs to be developed early in the process and supplied judiciously as the trees mature. The hay produced on the properties is predominantly for the local market. Droughts and prices can push the market further out to the surrounding states.

The next five to ten years will see development in the forestry sector. Harvesting of the mature trees will drive growth in the local region and the Territory. More workers will be needed, timber will need to be freighted, a sawmill built and staffed. Offshoots associated with forestry will be given a chance to establish. Carbon capture and storage, farm forestry and silvopastoral systems and potentially engagement from indigenous groups exploring native forestry options.

At this stage in the life cylcle of the forests, there are mainly inputs and very few outputs. The largest input is fertilizer which is ordered up to three months in advance to combat the seasonally accessible roads and annual wet season. "Kumbyechants" and "Rocktear Park" are the only properties that are serviced by a sealed road. The other properties need to have the required fertiliser delivered before the roads are inaccessible between December and March. The large volumes and timing of inputs required on the properties creates a complex logistics operation, with the furthest property taking first delivery in September. The properties are gradually serviced through October, with those least accessible serviced first. While long term storage of fertiliser isn't ideal economically it is the only way to secure the product needed and provide the necessary buffer in case of issues in the supply chain. The same process applies for herbicide and hay seed to a lesser extent and nearer to the use date. AMA has a company policy of supporting local suppliers first, to help strengthen the local supply chain. These local suppliers are comparatively small, so their supply is often difficult to secure and price competitively. Covid-19 and global political issues habe added extra strain to the supply chain on these goods. An import facility in Darwin with a direct supply to Katherine, using the train or trucks, would make the process simpler and more reliable.

AMA is staffed year-round by two full time employees in the Northern Territory. Contractors are used to supply specialist services as required. This minimises capital investment in machinery and equipment and the need to keep a large workforce

employed all year round. Most contractors are sourced locally, so there are a few businesses with the specialist equipment available in the local area. As a result of the live cattle export ban in 2011 many cattle producers were out of work, so AMA approached local cattlemen offering work, with many of these relationships still standing today. Labour is commonly sourced through labour hire contractors, which is a simpler arrangement for the industry which commonly struggles to attract workers largely due to the tropical climate and more recently during the Covid 19 pandemic. The PALM labour scheme has just added forestry to the list of workplaces available for access. Forestry work is carried out over the eight dry months and ceases over the wet season when it is too unsafe to work due to flooding and lightening risk. For continuity of employment the forestry industry will have to establish agreements with other industries to create year-round employment. Skilled labour is much harder to find.

Most people with forestry experience are from New Zealand. The industry in NZ is growing and the climate is too extreme in the Northern Territory to attract the workers. Wage increases, though necessary, is damaging to the bottom line in a long-term project like forestry.

### 13.3.3 Issues, Impediments and Future Trends in Supply Chains

The main issue facing forestry in the Douglas Daly is lack of adequate road infrastructure. Without improving the road network no industry will be able to expand. On the farms the next largest issue is connectivity. In the Douglas Daly there isn't any true mobile-phone coverage. "Stray Creek" Station can use Skymuster by connecting via satellite, but this is a notoriously unreliable connection that can't support the demands for staff and business operations. A big part of attracting and retaining staff is providing good internet and phone coverage, which has been successful for AMA in the past.

All the mahogany plantations are on freehold land. This is the most ideal situation in the Northern Territory as it is the only land tenure truly suited to agricultural development. There isn't any more available freehold land in the region. Expansion would require buying or subleasing a pastoral lease and going through the process of applying for a Non-Pastoral Use Permit to develop the new forest.

The Northern Territory is remote and things taking time to arrive and getting done is part of the culture. Distance and time are the main factors behind this issue. This has financial impacts on a business that is proactively participating in modern-day industry. Work does not get done on time, stock and products don't arrive, service is low to non-existent in the local area. The businesses and suppliers who are the exception to this culture are generally preferred and supported. Some of the large suppliers have business models that don't encourage their staff to work with the industry. It is seen as an "expense" to have an item in stock (sometimes staff are penalised) so stores tend to not keep stock on hand. When the item is required in an emergency or a breakdown then it must be ordered from southern states. This comes with a wait time and usually at cost to the buyer. This costs valuable time and money for farmers. This kind of model would work in places where the main supply isn't far away. But for remote places like the Northern Territory this is a barrier to development. Higher local demand would help solve this problem but without solving the problem then development will be stunted. Until then the Northern Territory is reliant on outsourcing to the other states.

Biosecurity is generally not in the forefront of the day-to-day decision making. But there is always the threat of disease or insect damage. For AMA and forestry the biggest threat is weeds. Controlling weeds like Gamba grass takes up time and resources. Weeds are moved by people, feral and domestic animals, and vehicles. There is a borer insect present in the Top End plantings of other owners. South of Adelaide River this borer doesn't appear to be an issue. Some lesser active pathogens have been sporadically detected and AMA is working with the DITT to learn their impacts and possible control measures. There have been instances where a lack of common sense at the government level has cost the company time and money – movement of seedlings and logs have encountered unnecessary bureaucratic red tape. Biosecurity is a real issue but working with the grower and protecting the assets of that grower should be taken into account as a priority.

The future of the forestry and high value timber industry is promising. Many consumers are now willing to buy products that make full use of the timber, which reduces waste and provides a better return to the grower. Technology and innovation will play a part in developing better and more efficient management techniques. LiDAR scanning and drones are being used as monitoring tools, and as these processes mature, there will be a reduction in some aspects of field work, but skilled hands-on technicians with an intimate knowledge of forest will always be required. Technology is a great tool, but it will need to be used in conjunction with people on the ground. The real world is more flexible than just data.

## 13.4 Wild Barra Fisheries (Fisheries & Aquaculture)

### 13.4.1 Background & Location

Wild Barra Fisheries is a privately owned business with two directors that has been operating for three years out of Darwin. The three-boat fleet is based in Darwin with the head office in Perth. Their focus is wild caught seafood from the Northern Territory coastline. Their primary catch is predominately made up of barramundi and king threadfin. 2021 was the first year the company has been at full capacity, utilising all three of its boats and subcontracting two other boats. Wild Barra Fisheries approximately occupies 70% of the wild caught fishery in the Northern Territory.

### 13.4.2 Summary of Operations

Wild Barra Fisheries supplies fish to the local Darwin restaurants and wholesale/retail sellers in Darwin. They are developing a premium wild seafood brand which supplies pre-packaged barramundi to restaurants and resellers Australia wide. Wild Barra is currently changing the landscape of the barramundi fishery in Northern Australia. Implementing initiatives such as better working conditions for their employees, HACCP food safety procedures, marketing premium quality fish, value adding and full utilization of the fish and engagement with Northern Territory and Commonwealth governments to better manage the regulations, Wild Barra is proving itself as an industry leader in the Northern Territory.

### 13.4.3 Issues, Impediments and Future Trends in Supply Chains

A common use seafood processing facility would assist Wild Barra Fisheries in streamlining its current processing arrangements. This could also be a part of solving the logistics issues. Like all fisheries businesses in Darwin Wild Barra manages all of their own interstate and local logistics, Bulk products are processed onboard and value-added products are processed through a contract processor. The facility at Winnellie is utilised as a dispatch facility for product being shipped around. Inputs such as cleaning products, nets and supplies are also handled by the individual businesses. The entire wild caught fisheries industry is in the same place within the Darwin area. Cost effective facilities near to the port managed by a third party or as a cooperative would be a sensible and achievable way to strengthen the industry and allow for more affordable processing and would streamline the logistics. Freight costs are largely reflective of the distances that goods must travel and the current fuel prices.

Much of the Northern Territory is remote, fishing off the remote coasts adds a layer of safety costs to their operations. All boats in Australia need to adhere to Australia's Maritime rules so much of the safety equipment is the same as elsewhere, but in the event of an emergency it is very expensive to get a staff member to health care either by medivac or bush taxi.

Wild Barra Fisheries has invested significantly in improving the connectivity on their boats. All three vessels have satellite communications. This has improved the living conditions for their staff, made staff retention easier and made doing daily business more convenient and timelier. The head office and the port are in well-connected cities, so this isn't an issue for them.

Wild Barra works hard on the issue of staff retention. They do this by helping their staff through the required qualifications, coxswains and master's tickets, providing high standard living facilities and renumerating their staff well. The boats have four crew members on each, with the sub-contracting boats the workforce in the fishing fleet stands at 20. The sub-contractors must adhere to the standards set by Wild Barra

Fisheries to be able to work with them. Wild Barra Fisheries has four shore-based staff between the Darwin and Perth offices with some staff travelling between both places. There are several conditions that must be met to operate a fishing vessel in the Northern Territory. Staff must hold an Approved Operator Certificate issued by the Department of Industry Tourism and Trade. This is at a cost to the operator. There aren't any guidelines for selecting an Approved Operator which can make the process of hiring staff difficult. Wild Barra Fisheries is currently working with NTG to make this a clearer process.

About 80% of the barramundi and king threadfin caught are further processed by Wild Barra with 20% sold in whole fresh form.

Currently the market for Wild Barra Fisheries is entirely domestic. A permit is required to export a native Australian fish. There also isn't a developed seafood export route from Darwin so the process of obtaining a permit is not yet cost efficient. Wild Barra is working on developing their export markets in the background.

Wild Barra Fisheries are striving to set the standard of the industry. They are proactively engaging with the regulators to contend with barriers to development. The regulatory framework is overseen by the NTG Fisheries department. The Fisheries Act and regulations are from 1988 and haven't been properly reviewed or updated. This kind of regulation should be reviewed every five years to keep up with the changes to the industry, the environment and technology. By reviewing the act and developing an updated framework the industry will be able to make their harvest strategies with more certainty. All costs incurred by the industry are paid for on a user pay basis. This is industry standard for Australia but the Northern Territory regulation in incurring a lot of extra costs. There are only so many fish in the sea. The size of the catch is strictly regulated by the Northern Territory Government, who make their decision by the fisheries surveys and from the catch data recorded on board the fishing vessels.
It is mandatory for all fishing vessels to carry a Vessel Monitoring System (VMS) at a cost to the operator. They are currently updated manually by the operator and checked by the Fisheries regulator. This is a process that could easily be automated. The catch is audited and checked through an electronic log system as well as by a Fisheries officer on routine inspections. This again could be automated, and the catch could be monitored more efficiently and accurately with a camera. The management plan for these processors were set up prior to the VMS systems and before the technology became available. Added to this the entire Northern Territory fishing fleet is only eight boats, such a small industry could develop a level of trust with the regulators. The processes should be simple and not over regulated.

Large expenses are required for the fishing fleet, diesel, safety equipment, PPE, packaging, crew supplies and cleaning bought in Darwin. Nets are brought in. These items are essential, but the cost of doing business in the Northern Territory takes away from the profitability of their business. Likewise skilled tradesmen to carry out repairs and maintenance are hard to come by and organise for a time sensitive industry like seafood.

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# PART III – Appendices


Northern Territory
Agricultural Supply Chains
and Export Opportunities
PwC and Northern Territory Farmers Association
December 2021
pwc
NT FARMERS

# Acknowledgement of Country

# Agenda

| Item | Activity | Who | Time |
|---|---|---|---|
| 1 | Introductions | All | 1pm - 1:15pm |
| 2 | Project background | NT Farmers and PwC | 1:15pm - 1:45pm |
| 3 | Model build overview | PwC | 1:45pm - 2:00pm |
| | *Afternoon tea* | | *2:00pm - 2:15pm* |
| 4 | Strategic needs and options discussion | All | 2:15pm - 3:30pm |
| 5 | Close and next steps | PwC | 3:30pm - 3:45pm |

# 2 Project background

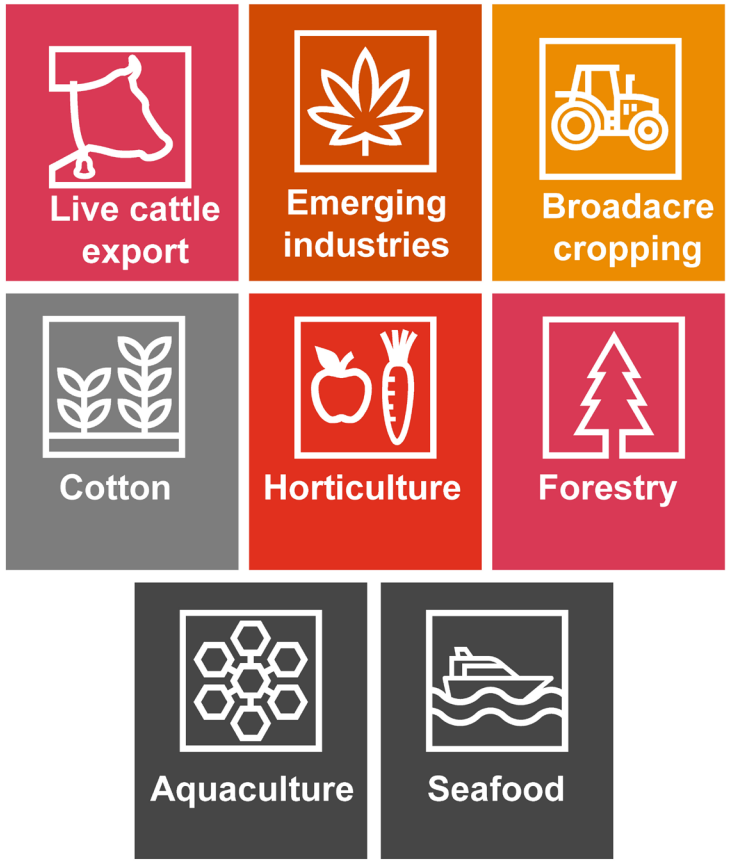
# Project overview

## Background

Despite the Northern Territory's (NT) proximity to international markets and rich agricultural produce, the geography of the region combined with the small, nascent production sector creates **unique challenges when it comes to the opportunities of effectively and efficiently supplying international markets.**

This partnership-based project aims to support the NT's key export and supply chain stakeholders to **identify how the Territory can take advantage of its unique geographic location to become a preferred leading export hub** and to sell its bulk agricultural and processed food products to world markets.

It will focus on the food, fibre and forestry commodities produced across the NT.



# Project overview

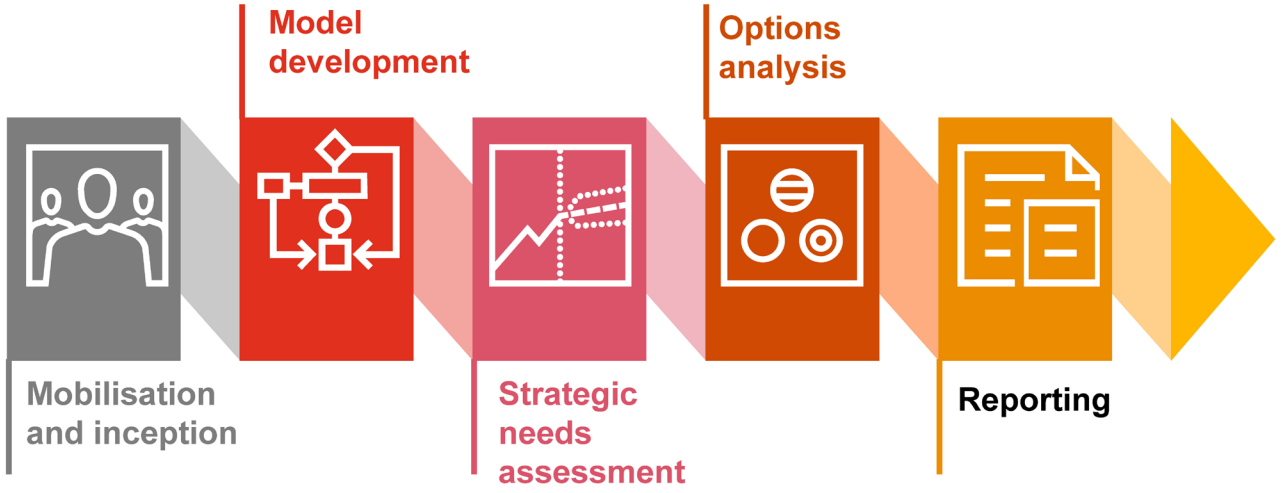
## PwC scope

### Project Overview

PwC has been engaged to **determine infrastructure gaps and barriers to market for NT producers and the implications of those constraints**. PwC will **identify and prioritise the most impactful options** to improve supply chains and logistics across NT industries and sectors.

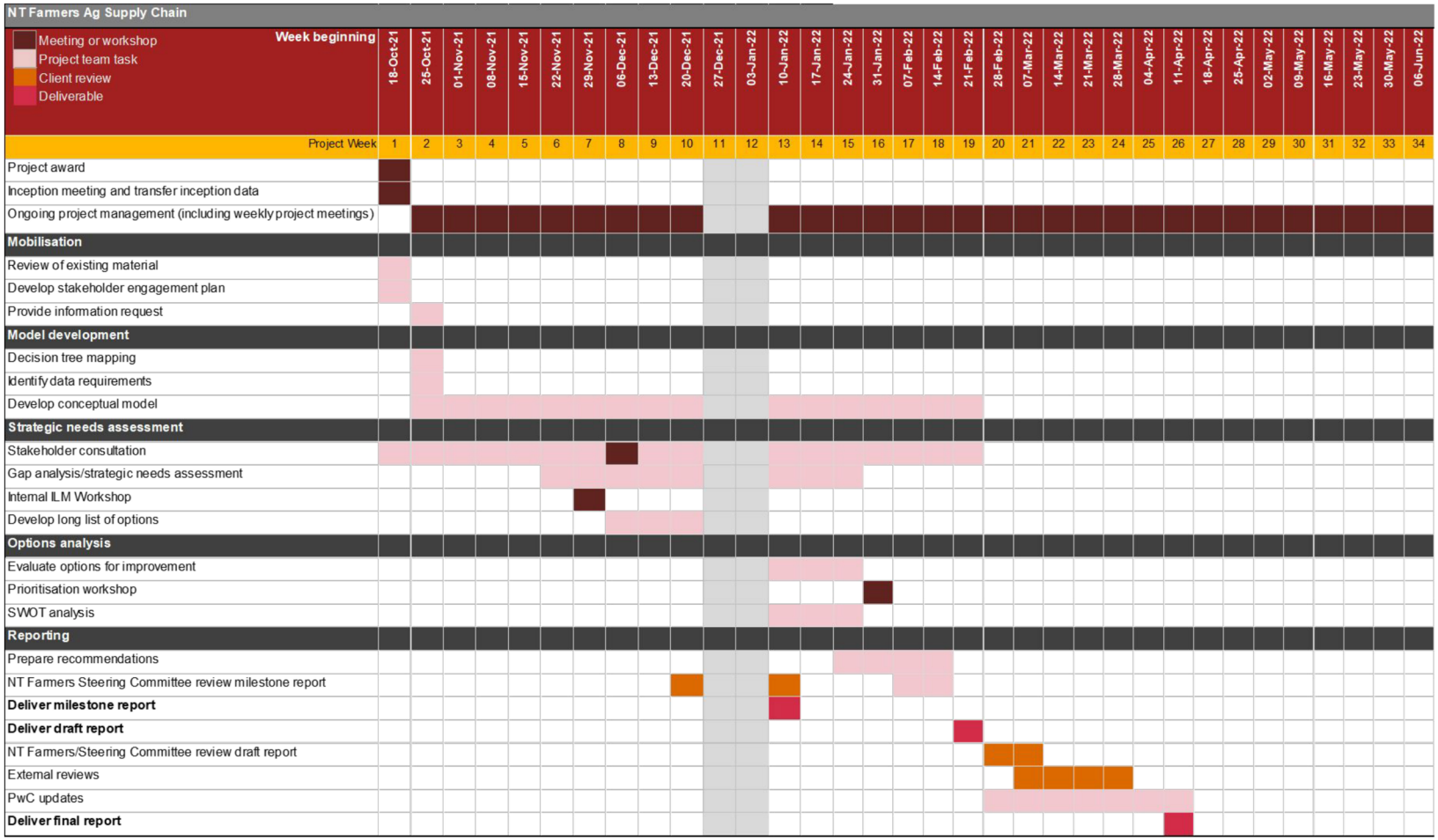
The findings will be evidence-based and supported by data to give NT industries the tools they need to advocate for investment and reforms which support industry growth.

The project has five key phases:



# Project background

## Program



# Project overview

## Stakeholder engagement overview

### Stakeholder engagement

**Organisations consulted:**

- NT Farmers
- NT Seafood Council
- NT Live Exporters Association
- NT Road Transport Association
- NT Forestry Association
- Airport Development Group
- PakFresh
- Darwin Port
- Ord Co
- Humpty Doo Barra
- Desert Fruit Farm
- Quintis

**Upcoming consultation:**

- Neutral Junction
- NT Cattlemen's Association
- NT Cotton Association
- PAE Mariana
- Seaswift
- Land councils
- NT Hay, Seed and Grain
- Toll, Qube

**Key themes:**

- ➔ Connectivity issues in regional and remote areas presents challenges
- ➔ Many producers have low visibility of the supply chain
- ➔ Interstate exporters leverage their existing relationships
- ➔ Power costs
- ➔ Frequency of ship and plane departures
- ➔ Labour
- ➔ Road quality
- ➔ Seasonality
- ➔ Scale
- ➔ Availability of supplies and expertise

# 3 Model build overview

# Model build overview

## Model build overview

**Purpose:**

Develop a model for agricultural producers to give insight into downstream supply chains (farm gate to customer) for key products. The model aims to:

- Present key information, including drivers, about industries
- Provide analysis of downstream markets
- Identify key export markets and related demand
- Identify key domestic sources of demand and potential market size considerations
- Provide an insight into costs related to export markets
- Provide an insight into road freight cost structures to key domestic markets.

Data availability may limit functionality. Benchmarks will be used where possible.

**Process:**

1. Undertake situational analysis of markets
2. Develop understanding of market relationships
3. Establish functionality requirements of the model
4. Develop the conceptual framework of the model
5. Identify data gaps and limitations
6. Undertake stakeholder consultation and engagement with industry to:
    a. address data gaps (ie. the known unknowns)
    b. Identify constraints (ie. the unknown unknowns)
7. Develop model and revisit framework if required.

# Model build overview

## Objectives

**Objective:**

Develop a model for agricultural producers to give insight into downstream supply chains (farm gate to port/customer) and the cost to meet demand for their products.

**Limitations:**

The model is not a forecasting tool for aggregate demand or future trends and drivers, and is informed only by the data available.

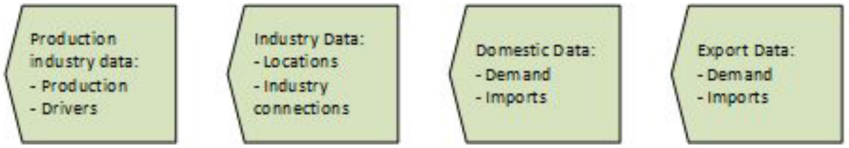
Data availability may limit functionality. Benchmarks will be used where possible.

Where constraints and drivers of historical growth are identified, these will be clearly referenced and identified as informative historical information only.

**Outputs:**

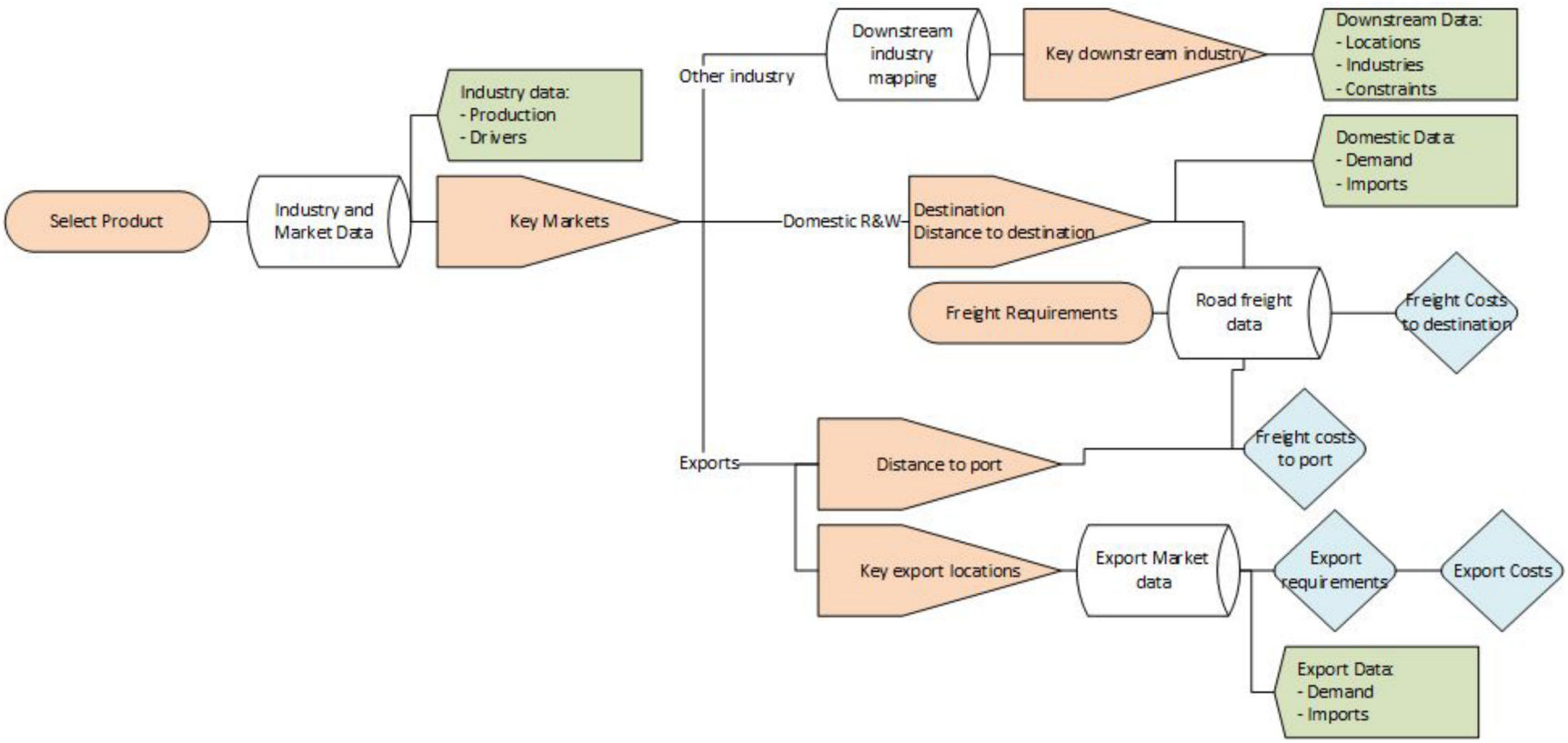
The model will provide estimates of:


And information relating to:



# Model build overview

## Model architecture - Structure



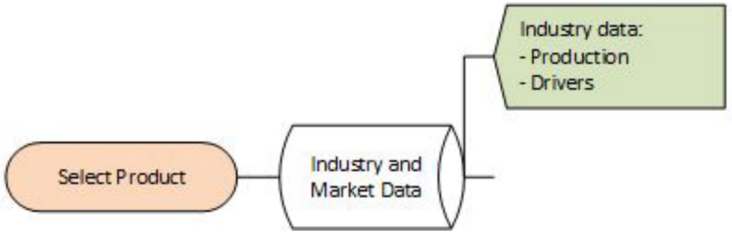
# Model build overview

## Model architecture - Industry overview

Industry overview will provide an insight into the scale of production of a product (where available), and/or related industry.

It will identify high level drivers and constraints, ranked by impact where available.

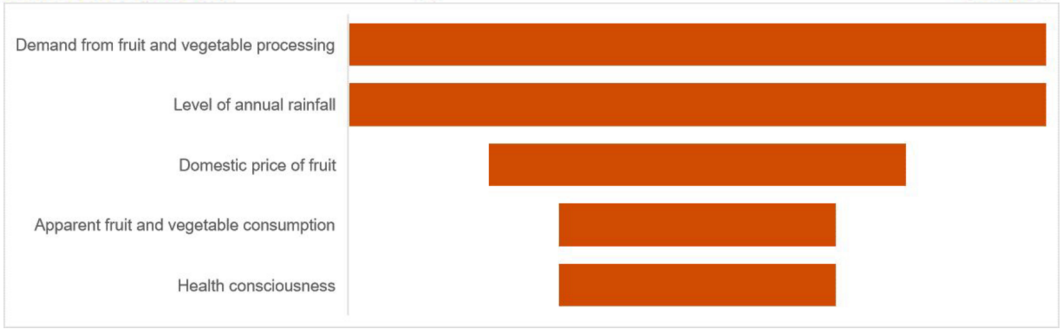
It will also show the total domestic demand, imports and key indicators of competition.




**Industry Overview**

| | |
|---|---|
| Industry | A0139 |
| Industry Name | Citrus Fruit, Nut and Other Fruit Growing in Australia |

| | | |
|---|---|---|
| Revenue $m | $ | 122.10 |
| Production | $ | - |
| IVA $m | | 29.06 |
| Establishments | | 194.63 |
| Enterprises | | 189.09 |
| Employment | $ | 398.41 |
| Exports $m | $ | 30.08 |
| Imports $m | $ | 11.73 |
| Wages $m | $ | 12.82 |
| DomesticDemand $m | $ | 103.76 |

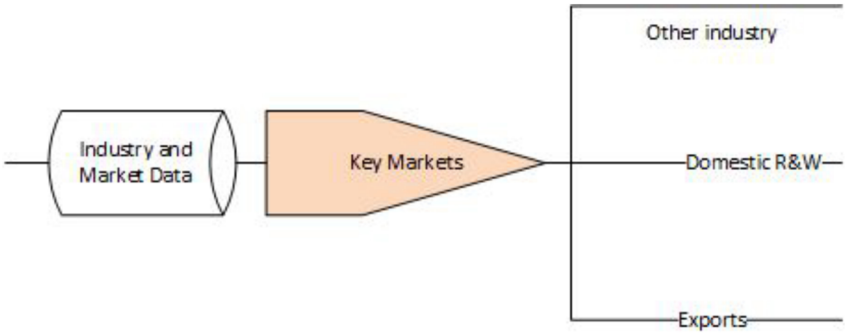


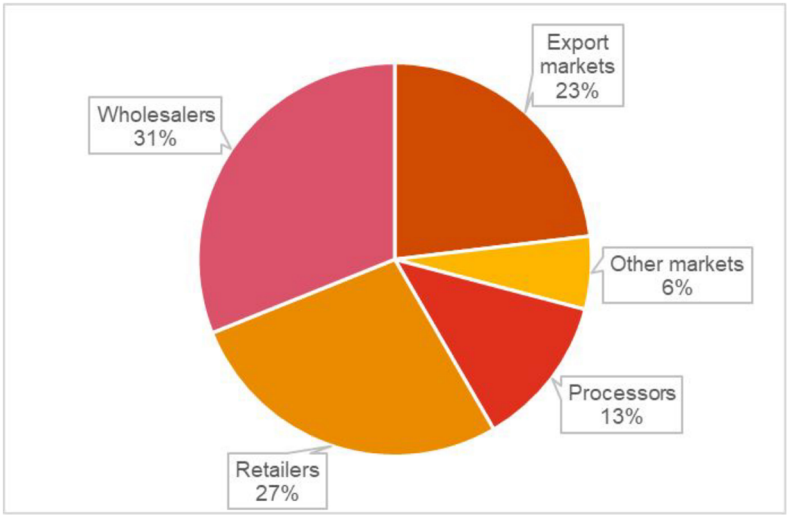
# Model build overview

## Model architecture - Market awareness

Users will be provided with an opportunity to select different markets. Initial proportions will be based on industry level data.

This will enable a “what if” analysis and high-level awareness of alternative potential customers.




**Markets**

| | |
|---|---|
| Industry | A0139 |
| Industry Name | Citrus Fruit, Nut and Other Fruit Growing in Australia |

| Markets | Proportion |
|---|---|
| Export markets | 23.10% |
| Other markets | 6.00% |
| Processors | 12.50% |
| Retailers | 27.30% |
| Wholesalers | 31.10% |

# Model build overview

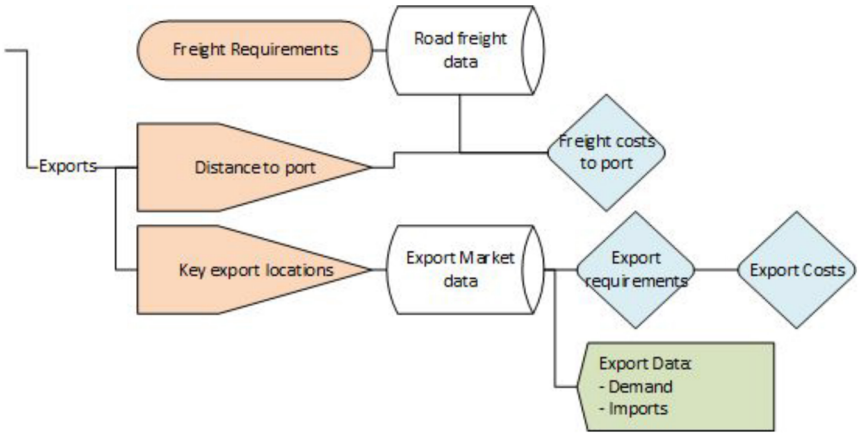
## Model architecture - Exports

Users will be able to change key export markets. Initial data will be based on industry information.

Information on the potential size of export markets and any key constraints will be provided.

Export market data includes any requirements to export which may occur additional costs. Indicative figures of these will be given.

Indicative road freight costs to port will will be identified, based on freight requirements and distance from port.




| Export market | |
|---|---|
| China | 44.89% |
| Japan | 19.69% |
| Republic of Korea | 8.53% |
| United States | 4.90% |
| India | 5.40% |
| New Zealand | 3.33% |
| Singapore | 3.53% |
| Taiwan | 4.13% |
| United Kingdom | 2.63% |
| Malaysia | 2.97% |

# Model build overview

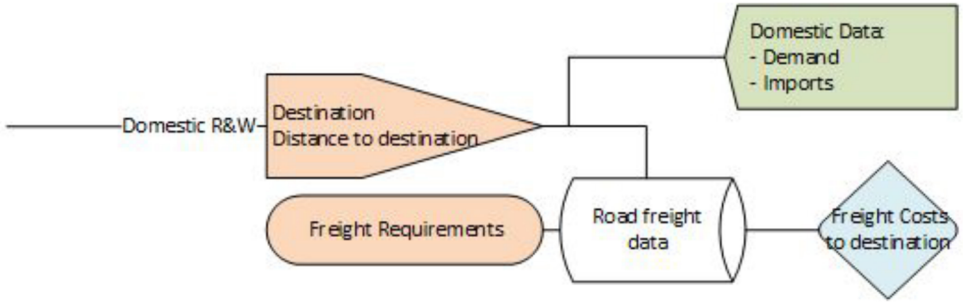
## Model architecture - Domestic retail and warehousing

Users will be able to change key domestic demand locations (by state). Initial data will be based on industry information.

Information on the potential size of markets and any key constraints will be provided.

Indicative road freight costs to port will will be identified, based on freight requirements and distance from port.

**This is a critical area of data collection at this stage.**



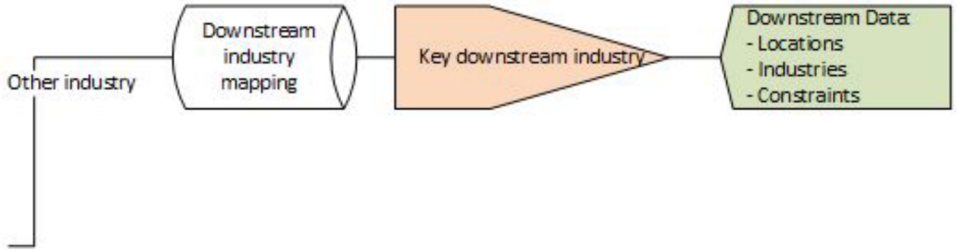
# Model build overview

## Model architecture - Other Industries

The assessment will provide a view of the potential downstream industries which use agricultural products as inputs.

Information regarding the potential market size and constraints will be provided.

Information for these markets will not be a forecast of growth opportunities. High level relationships only will be identified to inform future considerations.



# Model build overview

## Data investigations

| | |
|---|---|
| Downstream industry mapping | Industry level data of downstream opportunities.<br>Information regarding proposed / cancelled projects wanted |
| Industry and Market Data | Demand by key destination states TBD.<br>Demand for products with a smaller market share (eg asian greens) appreciated. |
| Road freight data | All industry road freight studies are appreciated. |
| Export Market data | Demand for products with a smaller market share (e.g Asian veg) appreciated. |

# 4

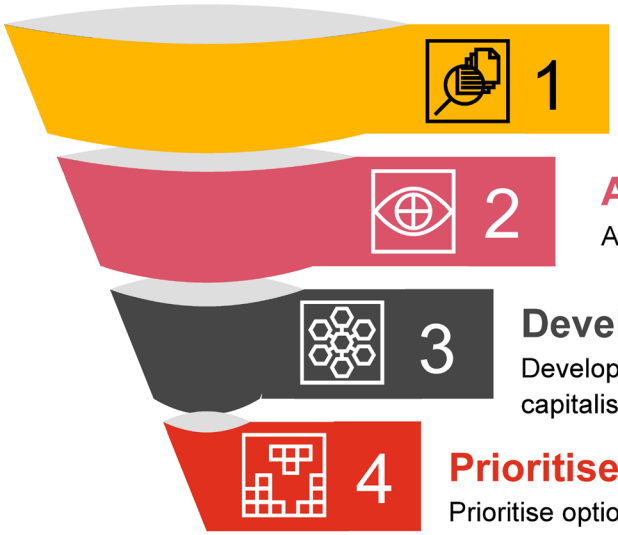
# Strategic needs and options discussion

# Strategic needs assessment and options analysis

## Purpose

### Process

The best way to solve the problem is through a robust discussion with stakeholders that are informed from an industry and government perspective.




**Review materials**

Discuss literature review and undertake stakeholder engagement to understand internal and external factors affecting the agricultural export industry in the NT.

**Articulate opportunities and challenges**

Articulate the key opportunities and challenges facing the industry.

**Develop options**

Develop infrastructure and non-infrastructure options to overcome challenges and capitalise on opportunities.

*This discussion*

**Prioritise**

Prioritise options for further consideration by key decision makers.

# Strategic needs assessment and options analysis

## Problems and opportunities - discussion

Does the smaller scale of agricultural operations in the NT (compared to other jurisdictions) limit investment in associated supply chain and facilitating infrastructure?

Options:

- Comparative advantage: abundant land and water.
- Major projects (e.g. Seadragon) can drive increased scale through adjacent industries.
- Land use permits may become a challenge when scale increases, specifically non-pastoral use permits. Carbon farming would require amendments to permits.
    - Singleton a likely test case
- Water plans needed (updates)
- Need to understand opportunities for alternative income streams from land e.g. Carbon farming. Risks need to be considered and well-managed.
- Development of net-zero supply chains will be key. Impacts transport choices.
- Infrastructure and policy choices need be 'future-proofed' to consider upcoming requirements and expectations.
- Cattle: can scale up by intensifying production - nutrition is key to this, in addition to herd health and genetics. Needs to be considered as part of a system → relationship with other industries (cotton seed providing feed).
- Technology not always being taken up. Outcomes of R&D not implemented.

# Strategic needs assessment and options analysis

## Problems and opportunities - discussion

Does the geographic isolation and seasonal factors in the NT limit the competitiveness of the agricultural industry in both exports and the domestic market?

Options:

- Insufficient collaboration between university, industry and govt. Also cases where competition exists amongst institutions.
- Industry should decide, drive and manage research priorities.
- Tropical agriculture precinct - eg Gunn Pt
- Govt has a role to investigate and identify productive land and provide support for development
- Potential for technology to overcome some issues of isolation (ie. drones) however the appropriate expertise is required.
- Tech also has a bigger role in training and education than it currently does (ie. wrt animal husbandry).
- Development of tech requires collaboration - upcoming NT Farmers initiative will look to address this.
- Drones - national policies in development, but incredibly complex.

# Strategic needs assessment and options analysis

## Problems and opportunities - discussion

Is there is an increasing geopolitical need to improve capability and onshore production of food processing and the supply chain infrastructure to support distribution?

Options:

- Regional food security especially is a focus due to risks of isolation. These need to be developed to take advantage of the region's inherent advantages.
  - Domestic diesel supply heightens tyranny of distance
  - Critical need to supply food to isolated communities
- Gaps in NT production - i.e. not producing a lot of carbohydrates that would be a main component of packaged food. Currently trialling potatoes. Viability of moderate-value, moderate-input crops is not proven in NT
  - USTO work will develop strategies to address this.
- Military rations - opportunity to be developed on-shore.
- Global shipping challenges and port congestion are having a major impact. NT has location advantage.
- Shared, multi-user facility needed. E.g. Irradiation can be used for agriculture and medical supplies.

# Strategic needs assessment and options analysis

## Problems and opportunities - discussion

Is there an opportunity to leverage planned investments (Middle Arm, Beetaloo, AROWS, Sun Cable, Western Davenport, cotton gin) in the NT to develop agriculture and improve supply chain infrastructure?

Options:

- These major projects can address the scale issues. Greater shipping activity, therefore greater opportunity to move products from the NT.
- NT has advantage of short supply route to port.
- Opportunities for development of plastics (for packaging) from food waste. Leverage outputs of AROWS, Sun Cable, Beetaloo etc.)
  - Japan currently purchasing produce to develop plastics.
- Colocation of food production facilities with major other processing facilities (for inputs or complementary outputs) and export facilities e.g. at Middle Arm

**Key considerations**

- What is the effect of the problem?
- What evidence is there for this effect?
- What will happen if we do nothing?
- What trigger has made us think that we need to respond now?
- Is it within our power or influence to respond to the problem?
- What strategic actions/solutions will respond to the problems/opportunities?

# Strategic needs assessment and options analysis

## Problems and opportunities - discussion

What, if any, infrastructure improvements would you like to see that you think would create a step change or materially improve NT agribusiness supply chains and logistics?

Options:

- All-weather roads on main conduits. 75% unsealed. $1m/km. Issue of prioritisation.
  - Road safety policies require dual carriageways.
- Lack of Aboriginal agricultural land developments. S19 complex, slow. Requires strong Aboriginal participation in the economic developments.
- Freight consolidation in NT. Challenge is that strong relationships are key to this → time.
- Potential for freight equalisation policies, subsidies. To get support it will need to demonstrate that it drives increased capability and efficiencies in the NT.--> A transition scheme. (In progress with TL).
- Speak further with Tracey about the above.
- Strategies and decisions should include North WA.
- Irradiation facility
- Coolroom infra at Livingstone not utilised.
- Not currently a sound **national** approach to infra.
- Intermodal terminal or better rail access within NT.

**Key considerations**

- What is the effect of the problem?
- What evidence is there for this effect?
- What will happen if we do nothing?
- What trigger has made us think that we need to respond now?
- Is it within our power or influence to respond to the problem?
- What strategic actions/solutions will respond to the problems/opportunities?

# 5 Next steps

# Next steps

- Refine key problems and opportunities based on today's feedback
- Continue to gather data and validate industry findings
- Continue stakeholder engagement
- Prioritise options for future consideration
- Develop recommendations.

16. APPENDIX B - LITERATURE REVIEW

# *An evaluation of Northern Territory Supply Chains & Export Opportunities*

***A.1819055***

## Literature Review Summary

Identification of current analysis, near-term supply chain constraints, industry trends, industry prioritisation, and demand driven activities to growing the primary agricultural, fisheries and aquaculture and forestry industry sectors in the Northern Territory.

**CRCNA Project Manager**
Ian Biggs

**Project Lead**
Paul Burke

**Project Lead Support**
Camilla Philip

## Fisheries and aquaculture

### *Current state of the Northern Territory fisheries and aquaculture industry*

The gross value add for the Northern Territory fisheries and aquaculture industry was $136m in 2017/2018 split between direct fishing ($47.8m), aquaculture ($25.5m) and processing (approximately $8m) creating approximately 940 local jobs.[46] Total Gross Value for the NT $143m and total gross value product $120m [47]. The industry has more than 200 commercial fishing licences and 190 registered fishing vessels operating across 15 different wild harvest and two major aquaculture operations. The trade and processing sector on average harvests 7300 tonnes of fish and aquatic life annually.[48] The industry provides important resources to develop small-scale inshore fisheries, larger offshore fishing operations and a growing aquaculture sector and ornamental trade. The industries economic significance extends well beyond coastal communities, involving wholesalers, processors, and retailers. The industry has committed through the development of the NTSC strategic plan to proactively advise sectors about key emerging risks and opportunities by providing clarity and transparency to their members and stakeholders.

Seafood exports contribute only .04% to Australia's overall export seafood value with .2% of the overall volume of NT product being exported.[49] In the analysis by Ogier et al. (2019) that the Northern Territory export is valued at $.6m with volumes of mud crabs at 14 tonnes and other fish volumes at 4 tonnes.[50] Fisheries in the Northern Territory contribute approximately 10.8% of production value to the overall key agribusiness sectors.[51]

### *Current state of Northern Australia fisheries and aquaculture industry*

The northern Australia aquaculture industry for 2017 had an annual GVP of $223m, predominately made up in three areas, barramundi 33%, prawns 32%, pearls 31% and other species of red claw, tropical rock oysters, and other finfish at 3%. [52] In 2016-2017 the northern Australia aquaculture industry produced approximately 11,182 tonnes with a GVP of $223m and direct employment in aquaculture was approximately 520 in 2016. Within the three sectors barramundi totalled 6970 tonnes with a value of $74.8m, prawns 3980 tonne with a value of $72.4m, and pearls $70.4m.[53] Since 2006/2007 the northern Australia aquaculture production has increased at a steady rate of 3.7% per annum.

In all the reports reviewed, a common theme was evident across fisheries and aquaculture for the future investment development requirements – research, development and extension, regulatory framework and pathways, market development and access, biosecurity, public perception, environmental and sustainability performance, infrastructure investment support, and workforce development planning (education and training).

[46] (KPMG and Northern Territory Government, 2020)
[47] (Ogier, 2019)
[48] (KPMG and Northern Territory Government, 2020)
[49] (KPMG and Northern Territory Government, 2020)
[50] (Ogier, 2019)
[51] (KPMG and Northern Territory Government, 2020)
[52] Northern Australia Aquaculture Situational Analysis, 2020
[53] Northern Australia Aquaculture Situational Analysis, 2020

***Industry constraints***

- A portion of local communities opposed to the NT seafood industry
- Lack of a skilled workforce entering the industry and low salaries across the supply chain
- Declining number of skippers that have experience operating in the NT
- Lack of succession planning and workforce
- Aboriginal communities are not effectively involved in the industry
- There is a gap of understanding the overall supply chain risks and opportunities from the industry and government perspectives
- Complexed issues to secure market access and access to fishing grounds
- Current supply chain limitations persist through challenges of backfilling trucks to interstate markets, airfreight, and air route availability with no opportunity for sea freight options
- Small product volumes and industry fragmentation limiting economies of scale required to support freight routes and be cost competitive against south-eastern ports
- Geographically isolated
- Cost effective, dependable, and sustainable catching and growing of products in variable climate and environmental conditions
- Frequency and affordability of airfreight
- Most products are processed and exported out of eastern states
- No seafood processing facilities with significant scale
- Current processing facilities is limited to filleting, battering, and crumbing at small scale with local operators
- Value added processes are performed currently closer to markets
- Current processing is reliant on access to labour, and constrained by lack of processing space at current sites and lack of equipment investment
- High volume fishers currently send whole or frozen products to southern markets for processing
- Competition of road freight during other agricultural seasons
- Increased fuel prices may affect cost competitiveness
- Securing export licenses and vessel export accreditation
- Increased geopolitical risks for exporting
- Maritime infrastructure in Darwin has deteriorating issues
- Unloading areas require covering to enhance product and packaging integrity
- Lack of regional, and remote cold storage and processing and service facilities
- Underutilisation of Maningrida fish processing facility by commercial fisheries
- Improvements are required to remote communications infrastructure
- High barge logistic costs
- Main barge has limited capacity and expensive access
- Limited and inconsistent data availability
- Lack of all-weather access roads increasing product time to market due to barge timings and limitations
- Competition from cheap imported products
- Environmental approvals
- Native title
- Constrained by access to research and development
- Constrained by seasonality to supply all year round for securing of supply chains hence leakage of product to southern ports for export
- Absence of breeding programs and brood stock supply and quality (prawns)
- High cost of inputs (i.e.: feed, power, labour, parts and services, and supply chain components)

### *Industry Trends*

- Industry commitment on reducing environmental and market impacts including reducing food fraud and increase provenance
- Large organisations are increasing automation
- Some sectors in industry are accelerating innovation
- Growing domestic and global demands for an alternative natural source of protein and health and ethical reasons
- Growing demand to provide consumers with sustainable, consistent, and high-quality seafood

### *Prioritisation*

- Feasibility studies have shown options for a seafood processing facility in the NT. A processing facility would increase uptake of industry best practices that promote consistency and quality of product, higher standards, export opportunities, industry collaboration and cooperation, co-branding development and creating research and development prospects
- Targeting and opening new market access for export
- Workforce development - upskilling of workforce
- Attract and retain people into the industry
- Inter-industry collaboration for scalability
- Improved road access
- Improved coverage and closure line markers
- NBN satellite ability for remote and offshore service
- Future risk proof the industry against global, environmental, and geopolitical challenges
- Licensing and regulatory approval navigation pathways that create greater investment certainty
- Continuing the significant role of biosecurity for securing and growing international markets
- Focused research, development, and extension activities

### *Demand driven opportunities for increased supply*

- Industry recognition of value through support of a local 'NT Caught' promotion
- Export opportunities for high value, high quality seafood products and value- added products further into Asia markets with a focus on China, Vietnam, Japan, Hong Kong, Singapore, and Indonesia
- Export capability and capacity building programs for industry to increase export knowledge gap
- Investment required for all weather road access
- Leverage of new cold store facilities for export out of Darwin as airfreight capacity becomes available
- Collaboration between like-minded producers to consolidate volume for expansion (including export)
- Fully functional cross supply chain coordination function to deliver export growth objectives
- NTG to prioritise focus on improving critical inputs for agribusiness namely water, infrastructure, and improvement to supply chains, increase resilience of the workforce and enable producers to capitalise on emerging technologies
- Advocacy priorities to streamline and strengthen public and political support for policies, programs, and regional development strategies that enable seafood/aquaculture development including Government, Aboriginal landowners, Aboriginal organisations, and all industry stakeholder proponents.

- Abundant and valuable natural resources and has exceptional investment and growth potential
- Relatively young industry to capitalise on new opportunities
- Global growing protein demand to provide sustainable, consistent, and high-quality seafood
- Unique/niche seafood opportunities

## Forestry

***Current state of the Northern Territory forestry industry***

For the Northern Territory, which is currently an emerging industry for the NT, is made up presently of total Native Forest 18.7million ha of indigenous ownership or management, 13.5million ha of private and 9.3million ha of leasehold and approximately 51,000ha of plantation forest.[54] The industry harvests $115million worth of timber per year, manages $1.32billion in plantations and employs approximately 170 FTE's. [55] Forestry is based around three regional growing areas, Douglas Daly/Katherine, Tiwi Islands, and East Arnhem which provides and will continue to provide future employment and income generation opportunities. Plantation operations are categorised into three major varieties, African Mahogany (Khaya senegalensis), Indian Sandalwood (Santalum album), and Black wattle (Acacia mangium).

The Australian Government has recently provided support to develop a Regional Forestry Hub in the Northern Territory, Forestry Association of the Northern Territory (FIANT) will assist in underpinning the growth in Australia's renewable timber and wood-fibre industries and assist policy drivers to reduce barriers to forestry expansion. FIANT will provide value to existing infrastructure and processing and identify key investment infrastructure opportunities as the industry evolves. Building capability and capacity, research and development resources and being the industry voice will assist with fostering industry collaboration and public support and awareness.

***Current state of Northern Australia forestry industry***

Northern Australia makes up 48% of total forests in Australia and has an annual production value of $80million. This has created approximately 1240 direct jobs and 1860 indirect jobs within the industry. Overall hectares are categorised into 3 areas consisting of 13million ha of native forest with commercial potential, 22million ha of private native forest and 100,000 ha of plantation forest. Other than Northern Territory, Northern Australia is divided into several regions, Cape York, and Far North Queensland with a total of native forests of 24.2million ha of indigenous ownership or management, 23.6million ha leasehold, 7.7million ha private and approximately 38,500ha of plantation forests. Northern Western Australia (Ord River-southern Kimberley) has a total of native forests of 3.2million ha of indigenous ownership or management and approximately 10,000ha of plantation forest.[56]

With some plantations of African Mahogany, Indian Sandalwood and Acacia approaching harvest maturity Northern Australia is forecasted over the next 5-10 years to double or treble output up to a value of $300million.[57]

***Industry constraints***

- Limitations of resources and inconsistency of accurate data and collection
- Remote geographical locations
- All weather access roads
- Transporting distances to wood processing facilities, ports, and population centres
- Native title and land tenure barriers
- Economies of scale

[54] Northern forestry & forest products industry situation analysis, 2020
[55] NT Farmers Association, 2021
[56] Northern forestry & forest products industry situation analysis, 2020
[57] Northern forestry & forest products industry situation analysis, 2020

- Security of access to supply of resource
- Pest and diseases
- Limited forestry skills in industry
- Inconsistent rainfall (highly seasonal)
- Lack of collaboration between government, Traditional Owners, pastoralists, and mining sector
- High energy costs
- Processing technologies for African Mahogany not fully evaluated
- Limited access to maintenance and technical support
- Australia's tropical savannas are highly flammable
- Water availability
- ERF barriers to carbon market access
- Wood product processing and value chain activities currently small scale and fragmented
- Policy and regulatory impediments

***Industry Trends***

- Silviculture and silvopastural production systems
- Carbon farming initiatives for ERF forestry participants
- Mine site revegetation
- Continued growth in domestic and global demand for hardwood fibre
- Well established growth in Australia for sawn wood products
- New technologies that can convert the volume of smaller diameter or lower quality logs to high performance engineered wood products

***Prioritisation***

- Workforce development and local employment opportunities of forestry across the supply chain
- Market access and export market connectivity
- Improving and having clear pathways for securing native forests and plantations
- Removing carbon market access barriers
- Building improved engagement models with stakeholders
- Reducing and changing CFI policy regulation
- Support expansion of indigenous forestry and wood products manufacturing
- Support of harvesting opportunities of native forests on all tenures
- Infrastructure mapping to develop wood product supply chains in northern Australia forestry regions
- Mining land rehabilitation

***Demand driven opportunities for increased supply***

- Rehabilitation activities leveraging existing mining sites
- Reduction of economic impact through understanding implications of climate and weather-related events
- Further exploration of domestic processing and value adding opportunities

- Generating sustainable local employment and incomes through increase supply of wood products
- Increasing silvicultural production systems throughout Northern Australia
- Transforming forestry management practices using space-based technologies
- Domestic and international market development and analysis
- Product branding opportunities
- Financial investment models and access to insurance opportunities to assist with major climatic events (i.e., Cyclones)
- Integrated and regional development approach
- Infrastructure development for major processing facilities in conjunction with plantation expansion to assist with geographical and logistic remoteness
- Applied research in silvopastural systems to test commercial benefits
- Improved native forest inventory and assessment of commercial viability
- Value-add development of products and downstream infrastructure to support ceremonial, pharmaceutical and personal care products
- Supply to local and export markets that are distant from other building materials
- Cross jurisdictional collaboration to promote development of forestry industry across northern Australia
- Development of climatically suited plantation species
- Increase productivity of future hardwood pulp fibre plantations

## Cotton

***Current state of the Northern Territory cotton industry***

Cotton in the Northern Territory over the last several years has ignited significant interest locally, interstate and internationally for investment. With current successful cotton trials has resulted in grower expandability with a forecast of reaching around 400,000 bales over the next decade[58]. Australian cotton produces close to 3 million bales and with 90% exported it has a global reputation as being an industry leader. The increase in the demand from the Northern Territory for cotton production and processing and with our proximity to export markets compared to southern ports, increased consumer demand for natural fibres, climatic conditions and land, water and environmental sustainability will continue to provide the diversification of the agricultural industry to expand and capitalise on the economic prosperity that cotton may provide. Cotton processing locally has additional benefits in producing cottonseed, a valuable high-protein meal for cattle, fed either as whole cottonseed or as cottonseed meal. There would also be export potential for cottonseed meal.[59]

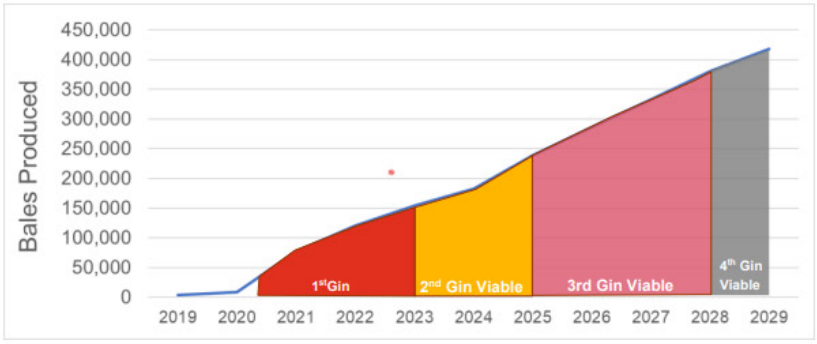



Figure 1: Northern Territory projected cotton bales

Figure 1 depicts the projected cotton bale production in Northern Australia (across the Northern Territory and Kimberley region) as well as indicating when and how many cotton gins may be viable in the region. These figures are based on engagement with over 40 landowners and growers in the region.[60]

Currently Northern Territory grown cotton is shipped back to Queensland for processing (ginning) and shipped and traded from southern ports. The 2022 NT cotton harvest will be processed through new facilities which are currently being constructed allowing for a positive cost benefit to growers across the NT and Northern Western Australia (Kununurra). However, with increased global sea freight costs there would be benefit of understanding how updated costings may or may not affect the cost benefit from directly exporting out of the Darwin Port.

The Northern Territory now has the opportunity to capitalise on the current and potential benefits of a highly prospective Northern Australian cotton industry, with the gin taking supply from local Northern Territory growers and Kimberley regional growers. With an ever-improving grower skillset, favourable climate, and soil conditions, as well as proximity to

[58] Business Case for the Construction of a cotton gin in the Northern Territory (NT Farmers)
[59] Northern Australia: Food & Fibre Supply Chains Study
[60] Business Case for the Construction of a cotton gin in the Northern Territory (NT Farmers)

export markets, investment is needed to provide the infrastructure that will propel the industry and provide stimulus across the Northern Territory economy.[61]

***Current state of Northern Australia cotton industry***

Dryland and irrigated cotton production are already well established in Australia, with the annual area grown generally changing in response to water availability. Commercial cotton production has been tried a number of times in northern Australia and the early attempts encountered major challenges due to capital limitations, climatic adaptability, and pest control. Since the introduction of genetically modified (GM) cotton in 1996, yields and incomes from cotton crops have increased in most regions of Australia, with the key benefits of GM cotton (compared with conventional cotton) being savings in insecticide and herbicide use, and improved tillage management.

In 2019 there was approximately 62,400 tonnes of cotton produced in North Queensland.[62] Northern Territory production commenced in 2019 with cotton being ginned on the east coast and Northern Western Australia were in their second year of production with cotton being ginned also on the east coast.

***Industry constraints***

- Crop genetics – research and developed required for performance of growing dryland cotton
- Remote geographical locations
- All weather access roads required
- Native title and land tenure barriers
- State and federal regulation and policy impediments
- Access to water
- Lack of collaboration between Government, Traditional Owners, and pastoralists
- Limitation of a skilled workforce and auxiliary services in Northern Australia
- Significant issues in supply chain. For example, opening-up new areas to a crop that requires processing facilities, such as a cotton gin, requires both large scale cropping and financial investment to support the processing infrastructure
- High capital required for investment demands that water reliability needs to be close to 100%. Aligning these two objectives in time and space can be difficult to achieve, given the significant risks for both growers and processors.[63]
- Increased global sea freight costs
- Road freight costs are a high percentage of the value and total cost of production
- Load capacity constraints due to high volume per unit weight
- Gins need to be regionally located for commercial production viability
- Current lack of warehousing ability
- Access to suitable land for clearing and prepared in the short term for dryland cropping

[61] Business Case for the Construction of a cotton gin in the Northern Territory (NT Farmers)
[62] State of the North, 2020
[63] Developing the north: learning from the past to guide future plans and policies

***Industry Trends***

- The emergence of high value products (such as cotton) is crucial in driving new supply chains.[64]
- Gins need to be regionally located for commercial production viability
- Current lack of warehousing ability
- Major driver for southern producers looking at expanding in the north due to continued drought conditions in main eastern production areas as well as the reduction in purchasing power of water in the Murray Darling Basin for competing crops.[65]
- Global cotton consumption average 1.1% year on year growth from 2021 to 2030
- Australian export market share has the potential to grow from approximately 4% in 2021 to 10% in 2030
- Support for local growers to be involved
- Local industry commitment in Northern Territory and Northern WA to the building of cotton gins by 2023 season
- The Port of Darwin is currently equipped with rail connections from Katherine directly to the Port, which significantly reduces a level of double handling of shipping containers

***Prioritisation***

- Cotton has been identified as the cornerstone crop going forward in NT plant-based agricultural and horticultural crop developments
- The development of the cotton industry will generate significant economic activity in the NT
- Development of the cotton industry will support employment of up to 424 full time employees (FTE's) which represent a total wage and salary contribution of $29.6m per annum [66]
- Developing complimentary rotational crops
- Access and maintaining quality labour and technical staff
- Securing water and land development
- Installation of infrastructure
- Market and value chain development – commercially viable freight, logistics and ginning
- Building capacity and knowledge in pastoral operations
- Advocacy priorities to streamline and strengthen public and political support for policies and regulatory frameworks

***Demand driven opportunities for increased supply***

- Unlocking land for agricultural development
- Enabling Aboriginal agricultural development
- Infrastructure to facilitate agricultural development
- Unlock regulatory barriers to agricultural development
- Supportive development environment
- Allow irrigation development to gain scale

[64] Reframing Smart Supply Chains in Northern Australia
[65] Rabobank 2020
[66] NT Agricultural Economic Impact Analysis

- Improving relationships and culture between government, industry, pastoralists, and Traditional Owners
-

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## Broadacre irrigated and dryland agriculture

***Current state of the Northern Territory Broadscale irrigated and dryland agriculture industry***

There has been successful broadacre agricultural production in the Northern Territory since the early 1820's, unfortunately there has not been continuity in many productions systems which has led to stop start production and lacking the ability to achieve constant learning and improvement to maintain a viable cropping system outside of fodder production to service the NT Livestock sector. NT broadacre cropping is currently very limited and largely consists of hay, a small amount of sorghum, maize, peanuts, and mung bean production.[67]

| | Hay & Fodder | Grain and oils seeds | Pasture seed | Total |
|---|---|---|---|---|
| **2019** | **136,670t**<br>**16,720ha** | **1320t**<br>**370ha** | **70t**<br>**65ha** | **138,060t**<br>**17,155ha**[68] |

Figure 2: NT Farmers statistics - 2019

There is significant area of production under broadacre production, with the majority being dryland fodder production in the top end. On the back of the now expanding cotton production there is momentum to develop a broadacre cropping system that will include a wider range of crops to complement the potential addition of protein from the cotton seed. As the cotton seed becomes more readily available it will drive the production of higher energy productions for the addition to a feeding ration for cattle.

There are current small areas of production of rice, grain sorghum, maize, and sorghum for silage as well as an emerging production of irrigated peanuts in Central Australia. This may well expand relevance into the Western Davenport region as well as expanding interest in oil seed crops such as sesame in rain fed systems in the Northern Territory.

For a number of these commodities there is potential for increased Australian production to replace imports as well as to satisfy growing export demand. Peanuts, rice, soybeans, as well as relatively new crops such as sugar and industrial hemp, can all be seen in this category.[69]

The ambition to develop northern Australia will continue. However, history tells us that successful development of Australia's tropical rangelands and savannas is more likely to be realised by taking a long-term, steady growth pathway rather than some of the 'get big quickly' schemes of the past. place uncertainties remain but by taking a measured, evidence based and socially inclusive approach, agricultural developments in the future will have the best chance of success.

***Industry Constraints***

- Rail infrastructure upgrades required in some regions
- Aging infrastructure in some parts of Northern Australia
- Limitations of food grade transport containers for sea freight

[67] Northern Australia Cropping Situation Analysis
[68] NT Farmers production statistics 2020
[69] Northern Australia: Food & Fibre Supply Chains Study

- High cost of all freight
- Access to rail, port, and airport
- Fragmented jurisdictional agricultural policies
- Lack of process and storage facilities (silos, mills, processing, storage, handling facilities)
- Market access barriers
- Biosecurity challenges
- Small scale industry sector
- Regulatory and policy barriers
- Infrastructure gaps in connectivity for digital communications
- Overall cost of doing business is higher in Northern Australia
- Lack of investment in human capital and infrastructure
- Limited research, development, and extension activities
- High energy costs and access to power
- Digital technology uptake is low in some sectors
- Lack of sealed roads for all weather access
- Water access and water supply
- Lack of skilled labour and auxiliary service expertise
- Tropical climate provides challenges for some crops during a hot, humid summer, especially in relation to pests, diseases, and damage from high rainfall events
- Farmers will not invest in the crop without a processing facility and businesses will not invest in the processing facility without some surety of supply. This highlights that innovation in 'green field' agricultural developments will require innovation not just at the farm scale but also in the institutions and policy at regional and national scales (Schut et al. 2016).
- Niche markets are limited in size capacity

***Industry Trends***

- Global demand for food and fibre products is expects to increase significantly into the future due to global population growth
- Population growth in consumption is expected to come from Asia, providing export market opportunities for northern Australia agricultural production
- Australia leading the way in best practice management
- Global grain production is set to increase over the next five years due to anticipated increase in global grain pricing

***Prioritisation***

- There is a need to develop enterprise scale for significant private investment in green field agricultural developments with a business case that can demonstrate profitability and acceptable returns on investment in the absence of significant government support.
- Growing crops profitably is a significant challenge when returns are weighed up against the high costs of production, marketing and freight associated with operating in more remote regions of northern Australia.
- In addition to variable costs, 'green field' agricultural developments will incur significant capital costs. Petheram et al. (2016) found that gross margins needed to be at least AUD$3000–AUD$4000/ha to generate positive net present values for the underlying capital investment when using on-farm water storages for irrigation developments with capital costs in the order of AUD$10,000/ha.

- Options to address the challenge of generating high enough gross margins for viable production including increasing returns and or reducing costs.
- Integrated farming systems with a focus on profitable business models rather than an individual commodity
- Post farm gate processing development linked to integrated farm enterprises
- Coordinated research, development and extension focused on constraints defined by producers
- Coordination of commodity led research functions to identify synergies and reduce producer fatigue
- Development of flexible cropping options to assist in agile management in response to variable rainfall
- Improved efficiency in gaining access to land and water to build scale
- Critical first stage processing infrastructure for potential base crops such as oilseeds or peanuts[70]
- Potential of niche products cropped for the domestic market including sesame, quinoa, peanuts, chia, and tropical pulses such as mung beans and soybean.
- Prioritise and evaluate potential agricultural precincts with industry which provide a basis for shared planning and provide certainty for proponent and regulators
- Removal of import barriers to export i.e., tariff, quotas
- Opportunities to grow summer field crops during mild tropical winters

***Demand driven opportunities for increased supply***

- Develop an approach (particularly within precincts) to converting parts of pastoral leases to freehold to meet short timeframes and appropriate native title and environmental approvals
- Some regions such as the Douglas Daly in the Northern Territory is in a strong position to increase cropping of cotton, grains, and fodder whilst integrating cattle operations
- Development of rotational cropping of sorghum, rice, legumes, maize, and other high value crops.[71]
- Expansion of the peanut industry in the Northern Territory. Australian produce only a fraction of the local domestic market and demand and prices remain relatively stable throughout the year.
- Development of an agricultural hub/precinct with the relevant machinery and capabilities of shared facilities to enable the growth of plant-based agricultural.
- Develop a series of high technology small-scale mosaic irrigation projects (Chilcott 2009) or a few larger-scale schemes that are implemented gradually over decades rather than years.
- Fully understand the constraints and opportunities imposed by climate, soils, and ecosystems
- Seek opportunities for Indigenous economic development
- Redefine and proactively navigate a pathway for approval processes
- Take a measured, evidence based and socially inclusive approach, for the future of agricultural development. [72]
- Potential to grow crops in both the wet and dry seasons under irrigation has the potential to increase farm incomes through rotational cropping systems
- Crop yields could also be improved by further development of better adapted varieties and innovative agronomic management practices (Chapman et al. 1996One of the challenges in realizing such a potential is in being able to manage farm operations so that time of sowing

[70] Northern Australia Cropping Situation Analysis
[71] Northern Territory Agricultural Economic Impact Analysis (NT Farmers)
[72] Developing the north: learning from the past to guide future plans and policies

and optimum crop windows can be matched with seasonal conditions, trafficability of soils etc. (Yeates et al. 1996).[73]

- Most industrial crops and some broadacre crops require local milling or shelling facilities in order to generate positive gross margins. Local processing facilities significantly reduce transport costs by reducing the quantity of non-saleable by-product requiring transport. For processing facilities to be viable there needs to be sufficient crop grown within a region and this brings into consideration aspects of regional development and coordination and economies of scale.
- Broadacre cropping there a number of niche products for the domestic market. Niche markets are limited in size and when supply exceeds demand, the premium falls. While niche markets will continue to be a valuable aspect of potential broadacre cropping in the north, there are broadacre crops with the best potential application including cotton as well as animal feed and peanuts.[74]

[73] Irrigated agricultural development in northern Australia: Value-chain challenges and opportunities
[74] Northern Australia Cropping Situation Analysis

## Horticulture

***Current state of the Northern Territory horticulture industry***

The total Gross Value of Production (GVP) for plant-based agricultural and horticultural crops in the NT was $340 million in 2019. This represents an increase of over $89 million since 2016, or compound annual growth rate (CAGR) of 10.66%. The production of mangoes and melons is pivotal to the success of the NT horticultural industry. In 2019, the production of mangoes and melons was valued at $130 million and $69.4 million respectively, representing over 58% of the total GVP of plant-based agricultural and horticultural crops.[75]

Agriculture in the Darwin catchments is currently dominated by a mixture of large-scale fruit tree plantations and smallholder farmers of Asian vegetables and mangoes. Intensive horticulture is already widely practised in the Darwin catchments, with an emphasis on Asian vegetable and melon production, with $25 million in production in 2015 (NT Farmers Association, 2016). Asian vegetables consist mainly of okra, snake bean, cucumber, and Asian melons.[76]

Mango production in the Darwin catchments is buffered somewhat against large-scale competition as its crop matures earlier than the main mango production areas in Queensland and it can achieve high returns. Increased mango production in the Darwin catchments over the last few decades is consistent with the entire Australian fruit and nut tree sector, which has been growing rapidly in Australia and in 2015–16, gross value of production was $4.74 billion out of a total value of $11.3 billion for horticulture in Australia (Horticulture Innovation Australia, 2017). In addition to well-established crops such as mango and banana, other tropical niche fruit trees such as dragon fruit are being commercially grown in the Darwin catchments. Prices received for dragon fruit can be very high when demand outstrips production, but the market is very sensitive to oversupply, particularly from cheaper overseas imports.[77]

Large-scale investment in irrigated horticulture commenced in the Katherine region in 1982 with the establishment of 300 ha of mangoes on Manbulloo Station. This development triggered increased investment by government and the private sector in the region, with the horticultural sector gradually expanding in subsequent decades.

Irrigated agriculture in Mataranka was initially focused on watermelon and pumpkin and now includes areas of mangoes. Irrigation water in this area is drawn from the Tindall aquifer. The present water allocation plans provide for 36 GL of water being available for irrigation per year, although high reliability can only be achieved with approximately 20 GL/year.[78]

The NT plant-based agricultural and horticultural industry will also catalyse FTE employment across the region. By 2030, the industry is forecast to employ over 3,500 FTEs. This employment is forecast to facilitate the creation of an additional 1,803 FTE roles in the NT. The number of FTE roles supported by the horticultural industry, both directly and indirectly, will be exceed 5,300 by 2030.This, coupled with the forecast economic contribution of $1.5 billion p.a., confirms the vast potential associated with the NT plant-based agricultural and horticultural industry. [79]

[75] Northern Territory Agricultural Economic Impact Analysis (NT Farmers)
[76] Agricultural viability: Darwin catchments (CSIRO)
[77] Agricultural viability: Darwin catchments (CSIRO)
[78] Northern Australia: Food & Fibre Supply Chains Study PROJECT REPORT
[79] Northern Territory Agricultural Economic Impact Analysis (NT Farmers)

Central Australia offers a unique combination of sunshine, low humidity, cool winter temperatures and freedom from most pests and diseases. These conditions are ideal for many crops. Extensive commercial production already exists for a wide variety of crops including table grapes, dates, melons, mangoes, figs, olives, bush foods (from Australia's native plants) and vegetables. Central Australia is ideal for horticulture with a unique combination of sunshine, low humidity, cool winter temperatures, freedom from most pests and diseases, combined with a strong reputation for producing quality produce.[80]

***Industry constraints***

- Intensive horticultural production involves high labour costs, especially those associated with picking, and packing operations. Labour costs for these harvest and postharvest activities typically represent 20 to 30% of total production costs and, therefore, have a significant influence on net returns from horticulture.
- Labour supply shortfalls during peak production periods
- Lack of skilled labour entering the industry
- Lack of auxiliary service expertise
- Bio-security incursions
- The majority of horticultural production from northern Australia is currently directed to supplying domestic markets.
- Transport costs per hectare of production are high for all crops and are a significant percentage of the total costs of production for watermelons and rockmelons, although they are not as high for mangoes.[81]
- Fruit production shares many of the marketing and risk features of intensive horticulture such as a short season of supply and highly volatile prices as a result of highly inelastic supply and demand. Managing these issues requires a heightened understanding of risks, markets, transport, and supply chain issues.
- Export capacity to protocol markets has affected the ability of treatment facilities such as Vapour Heat Treatment and Irradiation facilities. The lack of phytosanitary facilities has been a major impost for the NT and WA industry. The completion of a VHT treatment facility has been completed in Darwin and will allow NT and Northern WA mangoes to be sent direct to export markets. enhancing export competitiveness for the most rapidly growing region in Australia.[82]
- Pre, and post-harvest diseases across industries
- Climate and weather variability
- Some small-scale sectors in industry
- Water access and supply in some regions
- Limited research, development, and extension activities
- High energy costs and access to power
- Digital technology uptake is low in some sectors
- Lack of sealed roads for all weather access in some regions
- Tropical climate provides challenges for some crops during a hot, humid summer, especially in relation to pests, diseases, and damage from high rainfall events
- Limitations of food grade transport containers for sea freight
- High cost of all freight
- Access to rail, port, and airport for some regional growing areas
- Fragmented jurisdictional agricultural policies

[80] Investing in the horticultural growth of Central Australia (NTG, 2018)
[81] Northern Australia: Food & Fibre Supply Chains Study PROJECT REPORT
[82] Expanding Horticulture in Northern Australia (CRCNA)

- Increased geopolitical risks for exporting
- Native title and land tenure barriers
- The intensive horticulture focus, results in high regional costs of production. A significant component of this cost is attributed to labour issues, which provide both challenges and opportunities at a regional scale.

***Industry Trends***

- Export market opportunities have increased in the last few years with the establishment of Free Trade Agreements.[83]
- Consumer tastes and purchasing behaviours are changing in developing countries, particularly those in Asia, which are predicted to consume half the world's food by 2030. The imported fruit and vegetable markets in Asia are very competitive. Many countries and regions from outside are striving to send their products to these markets.[84]
- Population growth in consumption is expected to come from Asia, providing export market opportunities for northern Australia agricultural production
- Industry commitment on reducing environmental and market impacts including reducing food fraud and increase provenance
- Large organisations are increasing automation
- Some sectors in industry are accelerating innovation
- Expansion of some fruit and vegetables utilising sea freight options due to reduction and cost of available air freight options
- Consolidation of mixed sea freight reefer container loads

***Prioritisation***

- The Western Davenport Strategic Plan envisages the potential development of between 8,000 to 10,000 ha of irrigated agricultural land over the next 10 to 15 years. This development, valued at approximately $300 million, will likely lead to a significant increase to the region's agricultural production, forecast to be between 150,000 and 200,000 tonnes across a range of horticulture and broad acre crops. Furthermore, with this development and subsequent expansion of agricultural land and production, it is envisaged that 2,000 to 3,000 people will likely be employed. [85]
- Develop an approach (particularly within precincts) to converting parts of pastoral leases to freehold to meet short timeframes and appropriate native title and environmental approvals
- Development of an agricultural hub/precinct with the relevant machinery and capabilities of shared facilities to enable the growth of plant-based agricultural.
- Workforce development and local employment opportunities for horticulture across the supply chain
- Advocacy priorities to streamline and strengthen public and political support for policies, programs, and regional development strategies that horticulture development including Government, Aboriginal landowners, Aboriginal organisations, and all industry stakeholder proponents.
- To enable, support and complement the development of potential production areas, several plant-based agricultural and horticultural precinct developments have been identified and substantiated through extensive stakeholder consultation. This includes Western Davenport,

[83] Expanding Horticulture in Northern Australia (CRCNA)
[84] Expanding Horticulture in Northern Australia (CRCNA)
[85] Northern Territory Agricultural Economic Impact Analysis (NT Farmers)

which was identified by NT Farmers, and Wildman River, Larrimah and the Keep, all of which identified by Northern Territory Land Corporation. These horticultural developments are highly prospective agricultural land developments, covering an area greater than 710,000 ha. The developments will play a pivotal role to ensuring the long-term success and viability of the plant-based agricultural and horticultural industry in the NT.[86]

- Developing a wider range of export markets and overcoming the various regulatory and quarantine barriers. These barriers include both the time that might be taken up to negotiate new export protocols (more than 10 years) and the potentially high costs of meeting quarantine requirements for the new markets (e.g., vapour heat treatment of mangoes).[87]
- Regionalised research, development, and extension activities
- Australia ranks poorly in global comparisons of productivity of freight and logistics (iMove, 2019). This is at least in part driven by inefficient supply chains that require far more transport modes and carriers and further distance than would seem optimal. The small proportion of mangoes and avocados produced in QLD and shipped out of Cairns, means the supply chain stretches from north QLD to Brisbane, Sydney, and Melbourne, before international shipment. Similar to mangoes produced in the NT, only 0.15% are directly shipped from Darwin. The long supply chain for north Australia's horticultural products not only leads to increased logistics costs, but also results in more handling, increasing the risk of reduced fruit quality upon arrival at their international destination. This is problematic when the price of Australian horticultural products is generally at the higher end. Limited freight capability and poor export facilities in the north are two constraints for direct exports from Cairns and Darwin, as indicated by the interviewed growers and exporters. To shorten the supply chain into Asia and facilitate exports from the production regions, freight capacity and export facilities should be considered for upgrade in the north.[88]
- A larger seasonal labour force in the region will have flow-on benefits for the local economy, but sourcing the additional labour could be challenging, especially if other regions in northern Australia are also looking to expand horticultural production.
- A digital inclusion in the supply chain would provide more visibility to growers and more importantly to enable them to hear the voice of the consumer.

***Demand driven opportunities for increased supply***

- To enhance the productivity and quality of production in northern Australia, innovations in production, which include those which have emanated from the phases of pre-harvest, harvest, and post-harvest, are needed from both industry and farm levels to address these constraining factors. [89]
- Successfully expanding horticultural production will require the development of new export markets, both in Asia and beyond, given the price sensitivity of existing domestic markets to oversupply. [90]
- Establishing a reliable and regular refrigerated container service from Darwin has the potential to significantly reduce freight costs compared with land transport costs to existing southern-based markets, assuming that increased volumes of supply can reduce the current high costs of shipping agricultural commodities to Asia.

[86] Northern Territory Agricultural Economic Impact Analysis (NT Farmers)
[87] Northern Australia: Food & Fibre Supply Chains Study PROJECT REPORT
[88] Expanding Horticulture in Northern Australia (CRCNA)
[89] Expanding Horticulture in Northern Australia (CRCNA)
[90] Northern Australia: Food & Fibre Supply Chains Study PROJECT REPORT

- To further expand export growth, an export risk management mechanism could be developed to minimise/mitigate export risks and develop a mechanism to ensure the distribution of added value for each step in the export chain. In addition, with the group buying model evolving in the Asian market, a regional export hub would be a solution to directly connectivity with international customers.
- Northern Australian Horticultural industries are not export-oriented in terms of export standardisation, with most industries do not having an industry-guided export grading standard. These grading classes are developed to cater for domestic demand, without explicitly considering the need of international markets.
- To further build strong awareness and acceptance of premium Australian fruit, Northern Territory should consider launching promotional and sales campaigns to attract consumer attention and improving the industry supply chain capability, ensuring the delivery of consistent quality.
- Australian horticultural products are perceived to be premium compared with products from other competitors, to increase market competitiveness, it is important for Australian/NT suppliers to understand what consumers value most, and then work closely with their downstream customers to deliver the value adding products to their consumers through the whole chain.
- Five plant industry precincts with suitable soil and water have been identified. Highest priority precincts for development include Alice Springs, Ti Tree and Western Davenport. Precincts for future development include Tennant Creek and Great Artesian Basin. A soil and water suitability assessment report published in 2014 identified regions with suitable soil and water for development.[91]
- While importers in the targeted Asian markets show no interest in farm acquisition in Australia, they intended to establish long-term partnerships. Through the partnership or close supply chain relationships, importers indicated they want their suppliers to share timely and correct information about supply chain details, including the date of picking and packing. This kind of supply chain information supports importers to make right decision-making in planning their sales and reducing waste and losses. To ensure sustainable exports, this requires Australian suppliers develop collaborative relationships with supply chain actors that can help ensure quality and consistent products are delivered to end-consumers.
- While Asian retailers still rely on the traditional supply chain to source fruit, newly emerging retailers are prone to implement a direct sourcing strategy to shorten their supply chains, thereby having more control over cost saving and fruit quality. However, they are discouraged by a minimum order quantity. As these retailers would like to deal with premium Australian fruit, existing supply chain operations need to be transformed and upgraded with demand aggregation capability to supply those retailers who have a direct sourcing strategy. Directly supplying retailers could help Australian suppliers to hear the voice of the consumer.
- Supply chain constraints affect the efficiency in delivering consistent fresh horticultural products into the Asian markets, these include cold chain gaps, expensive shipping from northern Australia. Some of this constraint could be resolved by increasing air freight infrastructure in the Cairns and Darwin airports.
- Central Australia's unique hot and dry climate and well-drained soil means crops of superior quality are produced in this region; key examples are table grapes and melons. Australian grape growing regions Central Australia's unique hot and dry climate and well drained soils means crops of superior quality are produced in this region; key examples are table grapes and melons.

[91] Investing in the horticultural growth of Central Australia (NTG, 2018)

There are other real opportunities to expand production for both domestic and export supply of:

- Asparagus
- Citrus – oranges, mandarins, and lemons
- Dates
- Figs
- Melons
- Onions – white, spring
- Pumpkins
- Stone fruits
- Sweet potato
- Table grapes
- Almonds
- Aloe vera
- Avocado
- Chinese date (Jujube)
- Low chill pistachio nut
- Moringa
- Persimmon [92]

[92] Investing in the horticultural growth of Central Australia (NTG, 2018)

## Beef Production & Live Cattle Exports

***Current state of the Northern Territory beef production and live cattle export industry***

The northern cattle industry is a stand-out success story. Northern Australia's beef herd comprises 12.5 million cattle and contributes approximately 90 per cent of Australia's live cattle exports (CSIRO, 2014). In 2010-11 the gross value of agricultural production in the north reached $5.2 billion (ABARES, 2013) around $3 billion of which was from cattle.

However, the industry is particularly exposed to the costs of moving cattle — the longest land transport distances of any Australian commodity. Cattle in the Northern Territory travel, on average, just under 1,000 km between farm to market, and sometimes as much as 2,500 km to abattoirs on the east coast (Higgins, 2013). [93]

The Territory beef and cattle industry is a long-standing, established sector. Beef is the most important agricultural commodity in the Northern Territory based on the gross value of agricultural production at $612 million in FY19, accounting for 81% of the total value of agricultural production in the NT.

Cattle production in the NT occurs in three main areas: the Central Australia region; the Darwin and Katherine areas; and the Barkly area. There were 152 beef cattle stations in the NT FY18. The average pastoral lease is 2,500 km2 and carries an average of 8,000 head of cattle.

The Darwin Port is the busiest live export port in the world and is ideally located to capitalise on growing demand for red meat in the Asian region. The NT sells around 600,000 head of cattle per year, with 400,000 sold live to South-East Asia, and a further 200,000 head sold into domestic markets in eastern and southern Australia.[94]

The beef industry is a critical component of the economy of northern Australia. It represents the largest economic land use, covering 60% of the land area. The comprehensive assessment of economic value of the industry estimated its worth at approximately $5.03 Billion, of which $3.7 billion was production at farm gate and $1.3 billion in first stage processing, The industry is largely export focussed. Around 1 million live animals per year are exported into South-East Asian markets, with 59% into Indonesia. Breeding and grazing properties in northern Australia are part of the beef export and domestic supply chains that include feedlots and processing facilities in South-East Queensland.[95]

Although cattle production currently dominates, interest in expanding and diversifying agricultural production and therefore developing the northern Australian rural economy is increasing. Factors driving this interest include favourable demand prospects for Australia's food and fibre production, and proximity to emerging international markets, particularly in Asia, where food demand is growing rapidly. As a result of these perceived opportunities, the Australian Government and northern jurisdictions are striving to develop policy environments that encourage the agricultural sector to take advantage of growing food demand and develop regional economies in northern Australia.[96]

The production systems are mostly extensive grazing of rangelands consisting of 'unimproved' native and natural grasses, herb, forbs and shrubs. Production is largely dependent of seasonal rainfall and given the location in the tropics, is vulnerable to seasonal

[93] Our North, Our Future: White Paper on Developing Northern Australia
[94] Central Australian Beef Brand Business Case
[95] CRCNA Northern Australia Beef Situation Analysis
[96] Northern Australia: Food & Fibre Supply Chains Study

variability. The low-input, low-cost approach has been the strength of the industry for decades, but recently increases in input costs and market disruptions have not been matched with productivity gains, making many properties financially marginal at best.[97]

***Industry constraints***

- The current and future (expected) relative importance of beef and live cattle exports for Northern Australia justifies its prominence in the review, which by necessity must pay some attention to the key structural challenges facing that sector. The opportunity of increasing 'protein demand' stemming from projected socio-demographic and economic transformations among Australia's immediate Northern neighbours (in ASEAN in particular and Asia in general) warrant the level of attention given to live cattle and beef products exports which are sometimes treated as competing propositions, other times as complements. In contemplating the diverse options and barriers to their expansion, as well as the implications for supply chain development, it makes sense to discuss both products, yet it is necessary to highlight how strategic expansion in one direction will affect the other. [98]
- Effective improvement will require significant changes across the industry, and individual producers will have to want to change before performance will improve. There needs to be a good understanding of what are and what are not, the drivers by producers and the R&D community.
- 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 AUD$100m Beef Roads Program, AUD$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.[99]
- Darwin and Townsville are the current key live cattle ports, which benefit from dedicated infrastructure, vessels and equipment and other specialized facilities usually not sharable with other commodities. They constitute the central nodes connecting lengthy road and track interior networks to ASEAN port facilities, distribution infrastructure and markets.
- Most reports claim that the stock of road infrastructure in Northern is inadequate, even when considering jointly privately-owned tracks/roads and public roads. Those roads are often shared with many types of users and suffer from slow network expansion, rare upgrades and deficient maintenance deemed to constitute a key limitation on potential growth rates for the sector. Significant investment is currently taking place around upgrading transport infrastructure supporting cattle trade (i.e., AUD$100 million Northern Australia Beef Roads Program to upgrade high priority roads) to improve its reliability, productivity, and the resilience of cattle supply chains.
- The Northern Australia road network is identified as extensive and characterised by long isolated roads and low daily traffic volumes, as well as major national highways. In some industries, there is significant over-reliance on road networks, such as the cattle industry (Ash & Watson, 2018). Significant proportions of Northern Australia's agricultural market are

[97] CRCNA Northern Australia Beef Situation Analysis
[98] Northern Australia agribusiness supply chains
[99] Securing outcomes and measuring progress: A preliminary report into agricultural development and tropical health servicing in Northern Australia.

not serviced by any other freight options other than roads (Reed, 2017; Tremblay & Babacan, 2020). The quality of road links across Northern Australia is varied with large portions of the road in WA, NT and western QLD being unsealed. Climate conditions challenge road reliability, especially during floods and annual monsoons. Limited road options are most often manifested in inadequate quality and reliability and are the main source of uncertainty for the delivery of many key commodities commonly resulting in excessive freight costs, as well as related impacts in the form of road deterioration, and time delays getting products to market.

- The level of service the road network is able to provide is impacted by a number of factors including the climate (wet and dry seasons), levels of economic activity and the configuration of the road e.g., sealed, unsealed, weight restrictions (Infrastructure Australia, 2015).
- In the context of agriculture, Ash and Watson (2018:302) state that "supply chains and associated transport logistics and infrastructure such as roads and ports, processing facilities and power are all significant challenges for establishing a larger-scale agricultural sector in northern Australia".[100]
- The report examining ASEAN opportunities (AustCham ASEAN, 2019) notes that foreign investments into Northern Australia by beef importers originating from ASEAN countries in assets supporting simultaneously is live cattle supply chain efficiency as well as beef intensification and could create contradictory inducements for and against live cattle exports growth.
- Efforts by Australian exporters (and government agencies) to support processing and distribution capabilities in key ASEAN markets aim to tackle animal mortality and mistreatment concerns across stages of the supply chain otherwise outside their control (abroad transport to feedlots, abattoirs, refrigerator car or 'reefers', etc.). It has been observed that foreign government influence or interventions sometimes pushes those supply chain initiatives where they seek to create economic activity, which can be away from the main urban centres where rapidly growing demand for the product is located.
- The proper management of those markets also require that those activities be certified by Australia's Exporter Supply Chain Assurance System (ESCAS) and applied consistently in ways that can be monitored by export country authorities without creating undue red tape if logistical expansion occurs.[101]
- Key challenges exist in the rail freight system with no consistency around rail gauges or axle load limits, affecting the efficiency of general freight and bulk commodity movements (Reed, 2017:5). Studies have shown that increased efficiencies can be achieved via improvements to the railways such as narrow gauge in Central Queensland (ACIL Allen, 2020).
- Roads form a major consideration in the freight task for Northern Australia and for connecting industries with economic activity. The Northern Australia road network is identified as extensive and characterised by long isolated roads and low daily traffic volumes, as well as major national highways. In some industries, there is significant over-reliance on road networks, such as the cattle industry (Ash & Watson, 2018). Significant proportions of Northern Australia's agricultural market are not serviced by any other freight options other than roads (Reed, 2017; Tremblay & Babacan, 2020).[102]
- 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).[103]

[100] Reframing Supply Chains in Northern Australia
[101] Northern Australia agribusiness supply chains
[102] Reframing Supply Chains in Northern Australia
[103] Securing outcomes and measuring progress: A preliminary report into agricultural development and tropical health servicing in Northern Australia.

- Producers must weigh the need to grow production and supply networks (to achieve more efficient scales) against the lack of consistency and integration along the value chain once live cattle exit Australian shores. Current Northern Australian exporters identify the excessive purchasing power of a few buyers overseas, the inadequate facilities abroad (which limits the sectors' control over product quality and reputation abroad), as well as sporadic attempts by Indonesian and Vietnamese governments to reduce their trade deficits as the main challenges preventing significant scaling up of live cattle production and exports which would allow them to increase their productivity.[104]
- For much of Northern Australia, the supply of quality feed is likely to constitute the most significant hurdle for the development of sustainable intensive beef industry. The high costs of transporting grain and roughage are a critical barrier, unless local grain production can be increased in specific sub-regions. The proximity and linkages with a variety of crops production are likely to become important determinants of competitiveness. This highlights the possibility that inadequate road access will likely constitute one of the most potent constraints on the development of abattoirs and other key supply chains in regional areas across North Australia. All reports considering cattle and beef industry challenges note that rural roads are not developed to a standard suitable for the high volume of heavy vehicles required by a busy abattoir. The costs 15 associated with the upgrade of these roads may prohibit the realisation of transitional and differentiation aspirations unless sufficient investment is secured[105]

***Industry Trends***

- Global meat consumption is increasing
- Global demand for Australian beef is strong, with consumer preference trends driving an increase in branded beef with a provenance story. Consumer trends include the appeal of branded product ranges from a sense of wellbeing when buying something that's been produced in line with their ethical beliefs or social circles and expectations.[106]
- Increased community interest in the impact of red meat production on the environment, animal welfare and diet have heightened the focus on the sustainability in the industry
- Increasing digital uptake and collaboration to improve data-driven decision making and supply chain efficiency, traceability, and visibility.
- Emerging enhanced production methods and models that are understandable and relatable to communities.
- Emergence of diversified income streams through carbon sequestration projects and carbon markets.
- Current megatrends (a less predictable planet, health on the mind, choosey customers, one world and smarter food chains) conclude the Australian agribusiness sector has the potential to strengthen its position as a small but significant exporter of sustainable, authentic, healthy, high-quality, and consistent products.

***Prioritisation***

- A key finding is that in the short/medium term, there is a significant opportunity to increase the volume of both live cattle and beef trade towards ASEAN nations, by far the largest

[104] Northern Australia agribusiness supply chains
[105] Northern Australia agribusiness supply chains
[106] Central Australian Beef Brand Business Case

opportunities for the immediate future in terms of potential trade value. That report (AustCham ASEAN) refers to accelerated export growth where "the products with highest untapped export potential and supply feasibility in Northern Australia are live cattle [highest] and beef, with a potential "upside" opportunity of AUD$13 billion. The major country opportunities for live cattle and for beef in ASEAN are Vietnam (71%), followed by Indonesia (13%) and Malaysia (7%)".[107]

- Increasing demand for protein, R&D breakthroughs or new technologies cannot be relied on to improve industry performance. A good understanding of, and clear focus on, the fundamentals of profitable beef production will improve performance regardless, as well as position producers to benefit from any advances that may occur.[108]
- Through improving the value-add utilisation of the whole animal, the stakeholders seek to deliver a premium product that utilises by-product waste, reduce food miles for consumers and improve animal welfare to consistently deliver uniquely branded beef products to the local community.[109]
- There is a great opportunity for the industry to utilise the Emissions Reduction Fund which provides positive incentives to businesses across the economy to reduce emissions at lowest cost and contribute towards Australia's 2020 emissions reduction target. Opportunities in northern Australia include reducing emissions from savanna burning and beef cattle production.[110]
- Live cattle have been considered to have the highest untapped annual export demand at AUD$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).
- Increased community interest in the impact of red meat production on the environment, animal welfare and diet have heightened the focus on the sustainability in the industry. Supported by the development of the Beef Sustainability Framework, the industry has looked to take a proactive stance on these issues.[111]
- There is a large diversity in business performance across northern Australia beef operations. This has been highlighted in the Australian beef report (Holmes et al., 2017), which surveyed family- owned beef operations across Australia. The top 25% of producers had considerably better performance than the bottom 75% with the distinguishing features of the top 25% of producers being: better herd productivity, targeted herd expenditure to achieve the most gain per dollar spent, efficient use of labour, and more operating scale. The picture is similar for the top 25% of pastoral companies that had greater herd productivity compared with the bottom 75% (McLean et al., 2018).[112]
- The need to improve the translation of proven R&D to farm practice for most of the Northern Australia beef industry.
- 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.[113]
- Follow the developed impact pathway that sets out the plausible steps of how research activities/outputs will contribute to an outcome (or outcomes). It explains the causal links

[107] Northern Australia agribusiness supply chains
[108] CRCNA Northern Australia Beef Situation Analysis
[109] Central Australian Beef Brand Business Case
[110] Our North, Our Future: White Paper on Developing Northern Australia
[111] Mission Food for Life: AgriFood Supply Chain Resilience
[112] CRCNA Northern Australia Beef Situation Analysis
[113] Securing outcomes and measuring progress: A preliminary report into agricultural development and tropical health servicing in Northern Australia.

between outputs, outcomes, and impacts. It covers the different phases of work, the stakeholders who need to be involved to achieve the desired changes, the flow of resources and the progressive integration of different forms of knowledge into outcomes (changes in behaviour) and impacts (the result of the behaviour change). The implementation pathway for the recommendations is:

- Implementing proven R&D
- Investing in R&D for profitability and productivity gains for top businesses
- Investing in infrastructure and supply chains
- Future proofing and de-risking[114]

***Demand driven opportunities for increased supply***

- The competitive advantages of the of the northern Australian beef industry are its production systems, low-cost base and geographic positioning allows it to take advantage of the South-East Asian markets. [115]
- For Association of Southeast Asian Nations (ASEAN) member states as a whole, the real value of beef consumption is expected to be 120% higher by 2050.[116]
- The industry roadmap was refined to take into account current megatrends (a less predictable planet, health on the mind, choosey customers, one world and smarter food chains) conclude the Australian agribusiness sector has the potential to strengthen its position as a small but significant exporter of sustainable, authentic, healthy, high-quality and consistent products. It challenges the notion of being an Australian Food bowl and to more realistic expectation of being a 'delicatessen of high-quality products for the informed and discerning customer'.[117]
- There are opportunities to integrate crop production with the beef industry to create a value-add in both sectors. Broadacre grain and forage crops are not viable where large domestic transport distances are required.
- There are opportunities to use grains such as maize and sorghum, and high-quality hay in more intensive local beef-feeding systems. When used locally, both grains and forage hay crops could generate positive gross margins. For example, gross margins for maize in the Katherine region could be increased by around $500/ha through incorporation into beef feeding systems, even with an assumption of lower returns per tonne (selling as feed rather than food). This not only provides a market for such grains within the region but offers some market diversity for the beef industry, which is strongly dependent on the live export trade in these regions.[118]
- There is a need to support the northern Australia beef industry to transform from its current state to a higher productivity state and ensure future viability. The competitive advantages of the northern Australia beef industry are it's adapted production systems, low-cost base and geographic positioning that allows it to take advantage of South-East Asian markets. However, the inherent low productivity, high capital costs and overreliance on a small number of markets make it vulnerable to market shocks.
- Collaboration across the value chain (sharing information for mutual benefit – production, supply chain and consumer facing participants)
- Strengthen social licence to operate by working towards Carbon Neutrality 2030 (CN30) goal for red meat production, lot feeding and processing (MLA, 2020).

[114] CRCNA Northern Australia Beef Situation Analysis
[115] CRCNA Northern Australia Beef Situation Analysis
[116] Northern Australia: Food & Fibre Supply Chains Study
[117] CRCNA Northern Australia Beef Situation Analysis
[118] Northern Australia: Food & Fibre Supply Chains Study

- Maintain 'high value and premium' products to avoid competing with 'commoditised red meat' in international markets.
- Diversified capital streams and models to support business growth and entry.
- Stronger recognition of quality assurance programs across the supply chain and stronger in-market partnerships[119]
- In conjunction with stakeholders and industry partners, one of the four strategic recommendations developed to reduce barriers to trade in ASEAN nations and to increase production or supply of produce from Northern Australia to ASEAN markets to Develop 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).[120] Addressing in specific sub-regions and incentivise investment towards select partners such as Indonesia, Vietnam, and Thailand, with the intention of complementing work on priority trade routes currently driven by the ASEAN Secretariat under the Masterplan for ASEAN Connectivity 2025 (ASEAN, 2016);
- It is imperative to find a way to improve freight and related transport infrastructure, particularly roads, in ways that could accommodate the short-term intensification opportunity (AustCham ASEAN 2019, KPMG, 2019) and the long-term conversion scenario (Chilcott et al.,2020). This would entail: Supporting intensification in the short run so as to exploit the safest and highly valuable upside opportunities connected with ASEAN markets, with Indonesia and Vietnam identified as offering particularly profitable prospects; Helping the region's most likely candidates for scaling beef production (and achieve price competitiveness) as well as already equipped with abattoirs and other beef processing equipment to intensify and develop new markets, with a view to slowly scale up in countries appreciating North Australia's beef product exports; and planning strategically for a sequence (based on regional readiness) of systematic industry conversions from live cattle towards intensive production and widespread beef product processing capabilities (with multi-use refrigerated facilities located nearby water access, feedlots and grain storage facilities, abattoirs, modern wastewater treatment, packing, shipping, handling and holding equipment and infrastructure). This would have to be done in ways that allow producers to test products, learn from consumers in foreign markets, and develop new technical certification standards, when necessary, etc.
- All the equipment, services and technical capabilities need to be relatively close to regional centres with suitable amenities given the need for sustainable skilled workforces, at a time where the agribusiness sector is struggling to attract workers.

[119] Mission Food for Life: AgriFood Supply Chain Resilience
[120] Securing outcomes and measuring progress: A preliminary report into agricultural development and tropical health servicing in Northern Australia.

# 17. APPENDIX C – COMPLETE LIST OF CONSTRAINTS, TRENDS, PRIORITIES AND OPPORTUNITIES IDENTIFIED BY STAKEHOLDERS.

## 17.1 List of All Stakeholder Identified Industry Constraints

### 17.1.1 Supply Chain Infrastructure Constraints

1. Challenges of backfilling trucks to interstate
2. Air and sea freight route availability
3. Availability to rail freight
4. Affordability of airfreight
5. Affordability of sea freight
6. Affordability of road freight
7. Processing and exporting of product predominately done from eastern/southern/western states
8. Limited to no processing capability in the NT
9. Value added processes performed closer to major markets
10. Deteriorating infrastructure
11. Lack of regional and local infrastructure (including cold storage, mills, consolidation facilities, protocol treatment facilities and processing)
12. Lack of remote and regional communications infrastructure
13. Transportation distances to processing facilities and ports
14. Competition of road freight during other agricultural seasons
15. Load capacity constraints
16. Rail infrastructure upgrades
17. Limitations of food grade and reefer containers
18. Financial investment into infrastructure
19. Access to power
20. Low digital and innovation technology uptake
21. Increasing fuel and energy prices
22. Lack of all-weather access roads
23. High cost of inputs
24. Gap of understanding supply chain risks and opportunities

### 17.1.2 Strategic Development of the Northern Territory Constraints

1. Industry fragmentation
2. Economies of scale to support supply chain
3. Cost effective, dependable and sustainable farming in the NT environment
4. Opposed local community support
5. Indigenous communities not effectively involved in industry
6. Inconsistent collection of data
7. Access to research, development and extension
8. Seasonality of supply
9. Absence of breeding programs and brood stock supply
10. Limitations of resources
11. Seasonal climatic fluctuations
12. Lack of collaboration between Governments, TO's, pastoralists and mining sectors
13. High capital investment in development

### 17.1.3 Market Constraints

1. Geopolitical risks in exporting

2. Competition from imported products
3. Pests and diseases (biosecurity)
4. ERF barriers to carbon market access
5. Niche markets limited in size capacity
6. Market Access
7. Geographic isolation

#### 17.1.4 Resources Constraints

1. Constraints and barriers in policy and regulatory approval processes
2. Security of access to supply of resources
3. Access to water
4. Securing regulatory licences across the supply chain
5. Access to existing land and sea grounds

#### 17.1.5 Workforce Constraints

1. Lack of skilled workforce entering industry
2. Lack of auxiliary services
3. High cost of labour
4. Succession planning and workforce
5. Access to labour

### 17.2 List of All Stakeholder Identified Industry Trends

#### 17.2.1 Supply Chain Infrastructure Trends

1. Infrastructure needs to be regionally located for commercial production viability
2. Lack of infrastructure (warehousing) ability
3. Local industry commitment in NT and Northern WA to building infrastructure by 2023
4. Port of Darwin currently equipped with rail connections which reduces double handling of containers
5. Consolidation of mixed sea freight container loads
6. Diversification of freight options (sea versus air)
7. High value products in driving new supply chains

#### 17.2.2 Market Trends

1. Well established growth in Australia for sawn wood products
2. Global cotton consumption average 1.1% year on year growing from 2021-2030
3. Global demand for food and fibre products is expected to increase into the future due to global population growth
4. Population growth is expected to come from Asia providing opportunity for northern Australia
5. Export demand to grow from approx. 4% in 2021 to 10% in 2030
6. Global grain production set to increase over the next 5 years due to anticipated increase in global grain pricing
7. Export market opportunities have increased in the last few years through establishment of FTA's
8. Reducing environmental and market impacts including reducing food fraud, increase provenance & authenticity, high quality & consistent products, sustainability and ethical sourcing.
9. Domestic and global demands for alternative natural source of protein and health & ethical reasons

10. Consumer taste and purchasing behaviours are changing in developing countries
11. Sustainability of industry through environment, animal welfare and diets

#### 17.2.3 Strategic Development of the Northern Territory Trends

1. Increasing automation
2. Acceleration of innovation
3. New technologies that can convert the volume of smaller diameter or lower quality logs to high performance engineered wood products
4. Australia leading the way in best practice management
5. Increased digital uptake for improved data driven decision making across the supply chain
6. Carbon farming initiatives for ERF forestry participants
7. Diversified income streams through carbon sequestration projects and carbon markets
8. Emerging production methods and models that are understandable and relatable to communities
9. Silviculture & silovpastural production systems
10. Support for local growers to be involved in agriculture production
11. Diversification for Southern/Eastern producers to expand operations in the NT
12. Mine site revegetation

### 17.3 List of All Stakeholder Identified Industry Priorities

#### 17.3.1 Strategic Development of the Northern Territory Priorities

1. Mining land rehabilitation
2. The development of the cotton industry will generate significant economic activity in the NT
3. Developing complimentary rotational crops
4. Future risk proofing and de-risking the industry against domestic, global, environmental, and geopolitical challenges
5. Inter-industry collaboration for scalability
6. Focused regional research, development, and extension activities
7. Building improved engagement models with stakeholders
8. There is a need to develop enterprise scale for significant private investment in green field agricultural developments with a business case that can demonstrate profitability and acceptable returns on investment in the absence of significant government support
9. Options to address the challenge of generating high enough gross margins for viable production including increasing returns and or reducing costs
10. Integrated farming systems with a focus on profitable business models rather than an individual commodity
11. Coordination of commodity led research functions to identify synergies and reduce producer fatigue
12. Development of flexible cropping options to assist in agile management in response to variable rainfall
13. Potential of niche products cropped for the domestic market including sesame, quinoa, peanuts, chia, and tropical pulses such as mung beans and soybean
14. Opportunities to grow summer field crops during mild tropical winters
15. The Western Davenport Strategic Plan envisages the potential development of between 8,000 to 10,000 ha of irrigated agricultural land over the next 10 to 15 years.

16. To enable, support and complement the development of potential production areas, several plant-based agricultural and horticultural precinct developments have been identified and substantiated through extensive stakeholder consultation
17. Increasing demand for protein, R&D breakthroughs or new technologies cannot be relied on to improve industry performance. A good understanding of, and clear focus on, the fundamentals of profitable beef production will improve performance regardless, as well as position producers to benefit from any advances that may occur
18. The need to improve the translation of proven R&D to farm practice for most of the Northern Australia beef industry
19. 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

### 17.3.2 Supply Chain Infrastructure Priorities

1. Feasibility studies have shown options for a seafood processing facility in the NT. A processing facility would increase uptake of industry best practices that promote consistency and quality of product, higher standards, export opportunities, industry collaboration and cooperation, co-branding development and creating research and development prospects
2. Improved road access
3. NBN satellite ability for remote and offshore service
4. Support expansion of indigenous forestry and wood products manufacturing
5. Infrastructure mapping to develop wood product supply chains in northern Australia forestry regions
6. Installation of infrastructure
7. Market and value chain development – commercially viable freight, logistics and ginning
8. Growing crops profitably is a significant challenge when returns are weighed up against the high costs of production, marketing and freight associated with operating in more remote regions of northern Australia
9. Post farm gate processing development linked to integrated farm enterprises
10. Investing in infrastructure and supply chains
11. Development of an agricultural hub/precinct with the relevant machinery and capabilities of shared facilities to enable the growth of plant-based agricultural
12. To shorten the supply chain into Asia and facilitate exports from the production regions, freight capacity and export facilities should be considered for upgrade in the north
13. Critical first stage processing infrastructure for potential base crops such as oilseeds or peanuts
14. A digital inclusion in the supply chain would provide more visibility to growers and more importantly to enable them to hear the voice of the consumer

### 17.3.3 Resources Process Priorities

1. Improved coverage and closure line markers
2. Licensing and regulatory approval navigation pathways that create greater investment certainty
3. Reducing and changing CFI policy regulation
4. Support of harvesting opportunities of native forests on all tenures
5. Improved efficiency in gaining access to land and water to build scale

6. Prioritise and evaluate potential agricultural precincts with industry which provide a basis for shared planning and provide certainty for proponent and regulators
7. Develop an approach (particularly within precincts) to converting parts of pastoral leases to freehold to meet short timeframes and appropriate native title and environmental approvals
8. Advocacy priorities to streamline and strengthen public and political support for policies, programs, and regional development strategies that horticulture development including Government, Aboriginal landowners, Aboriginal organisations, and all industry stakeholder proponents
9. There is a great opportunity for the industry to utilise the Emissions Reduction Fund which provides positive incentives to businesses across the economy to reduce emissions at lowest cost and contribute towards Australia's 2020 emissions reduction target

### 17.3.4 Market Priorities

1. Targeting and opening new market access for export
2. Continuing the significant role of biosecurity for securing and growing international markets
3. Export market connectivity
4. Removing carbon market access barriers
5. Removal of import barriers to export i.e., tariff, quotas
6. A key finding is that in the short/medium term, there is a significant opportunity to increase the volume of both live cattle and beef trade towards ASEAN nations, by far the largest opportunities for the immediate future in terms of potential trade value
7. Through improving the value-add utilisation of the whole animal, the stakeholders seek to deliver a premium product that utilises by-product waste, reduce food miles for consumers and improve animal welfare to consistently deliver uniquely branded beef products to the local community
8. Live cattle have been considered to have the highest untapped annual export demand at AUD$7.5b in 2025. Northern Australia is 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
9. Increased community interest in the impact of red meat production on the environment, animal welfare and diet have heightened the focus on the sustainability in the industry

### 17.3.5 Workforce Priorities

1. Attract and retain people into the industry
2. Workforce development and local employment opportunities of forestry and horticulture across the supply chain
3. Access and maintaining quality labour and technical staff
4. A larger seasonal labour force in the region will have flow-on benefits for the local economy, but sourcing the additional labour could be challenging, especially if other regions in northern Australia are also looking to expand horticultural production
5. Building capacity and knowledge in pastoral operations

## 17.4 List of All Stakeholder Identified Industry Opportunities

### 17.4.1 Strategic Development of the Northern Territory Opportunities

1. NTG to prioritise focus on improving critical inputs for agribusiness namely water, infrastructure, and improvement to supply chains, increase resilience of the workforce and enable producers to capitalise on emerging technologies
2. Advocacy priorities to streamline and strengthen public and political support for policies, programs, and regional development strategies that enable seafood/aquaculture and agricultural development including Government, Aboriginal landowners, Aboriginal organisations, and all industry stakeholder proponents
3. Relatively young industry to capitalise on new opportunities
4. Reduction of economic impact through understanding implications of climate and weather-related events
5. Increasing silvicultural production systems throughout Northern Australia through applied research
6. Transforming forestry management practices using space-based technologies
7. Financial investment models and access to insurance opportunities to assist with major climatic events (i.e., cyclones)
8. Integrated and regional all of agricultural development approach
9. Improved native forest inventory and assessment of commercial viability
10. Cross jurisdictional collaboration to promote development of forestry industry across northern Australia
11. Development of climatically suited plantation species
12. Increase productivity of future hardwood pulp fibre plantations
13. Enabling Aboriginal agricultural development
14. Expansion of the peanut industry in the Northern Territory. Australian produce only a fraction of the local domestic market and demand and prices remain relatively stable throughout the year
15. Fully understand the constraints and opportunities imposed by climate, soils, and ecosystems
16. Take a measured, evidence based and socially inclusive approach, for the future of agricultural development
17. Potential to grow crops in both the wet and dry seasons under irrigation has the potential to increase farm incomes through rotational cropping systems
18. To enhance the productivity and quality of production in northern Australia, innovations in production, which include those which have emanated from the phases of pre-harvest, harvest, and post-harvest, are needed from both industry and farm levels to address these constraining factors
19. There are opportunities to use grains such as maize and sorghum, and high-quality hay in more intensive local beef-feeding systems. This not only provides a market for such grains within the region but offers some market diversity for the beef industry, which is strongly dependent on the live export trade in these regions
20. There is a need to support the northern Australia beef industry to transform from its current state to a higher productivity state and ensure future viability
21. Collaboration across the value chain (sharing information for mutual benefit – production, supply chain and consumer facing participants)
22. Strengthen social licence to operate by working towards Carbon Neutrality 2030 (CN30) goal for red meat production, lot feeding and processing
23. Diversified capital streams and models to support business growth and entry

### 17.4.2 Supply Chain Infrastructure Opportunities

1. Investment required for all weather road access
2. Leverage of new cold store facilities for export out of Darwin as airfreight capacity becomes available

3. Fully functional cross supply chain coordination function to deliver export growth objectives
4. Further exploration of domestic processing and value adding opportunities
5. Infrastructure development for major processing facilities to assist with geographical and logistic remoteness
6. Value-add development of products and downstream infrastructure to support ceremonial, pharmaceutical and personal care products
7. Infrastructure to facilitate agricultural development
8. Development of an agricultural hub/precinct with the relevant machinery and capabilities of shared facilities to enable the growth of plant-based agricultural
9. Develop a series of high technology small-scale mosaic irrigation projects (Chilcott 2009) or a few larger-scale schemes that are implemented gradually over decades rather than years
10. Most industrial crops and some broadacre crops require local milling or shelling facilities in order to generate positive gross margins. Local processing facilities significantly reduce transport costs by reducing the quantity of non-saleable by-product requiring transport. For processing facilities to be viable there needs to be sufficient crop grown within a region and this brings into consideration aspects of regional development and coordination and economies of scale
11. To further expand export growth, an export risk management mechanism could be developed to minimise/mitigate export risks and develop a mechanism to ensure the distribution of added value for each step in the export chain. In addition, with the group buying model evolving in the Asian market, a regional export hub would be a solution to directly connectivity with international customers

### 17.4.3 Market Opportunities

1. Industry recognition of value through support of a local NT branded products and promotion
2. Export opportunities for high value, high quality seafood products and value- added products further into Asia markets with a focus on China, Vietnam, Japan, Hong Kong, Singapore, and Indonesia
3. Export capability and capacity building programs for industry to increase export knowledge gap
4. Collaboration between like-minded producers to consolidate volume for expansion (including export)
5. Global growing protein demand to provide sustainable, consistent, high-quality seafood and agricultural products
6. Unique/niche seafood opportunities
7. Domestic and international market development and analysis
8. Supply to local and export markets that are distant from other agricultural competitors
9. Successfully expanding horticultural production will require the development of new export markets, both in Asia and beyond, given the price sensitivity of existing domestic markets to oversupply
10. Australian horticultural products are perceived to be premium compared with products from other competitors, to increase market competitiveness, it is important for Australian/NT suppliers to understand what consumers value most, and then work closely with their downstream customers to deliver the value adding products to their consumers through the whole chain
11. Central Australia's unique hot and dry climate and well-drained soil means crops of superior quality are produced in this region; key examples are table grapes and

melons. There are other real opportunities to expand production for both domestic and export supply

12. The competitive advantages of the of the northern Australian beef industry are its production systems, low-cost base and geographic positioning allows it to take advantage of the South-East Asian markets
13. The industry roadmap was refined to take into account current megatrends (a less predictable planet, health on the mind, choosey customers, one world and smarter food chains) conclude the Australian agribusiness sector has the potential to strengthen its position as a small but significant exporter of sustainable, authentic, healthy, high-quality and consistent products. It challenges the notion of being an Australian Food bowl and to more realistic expectation of being a 'delicatessen of high-quality products for the informed and discerning customer
14. Maintain 'high value and premium' products to avoid competing with 'commoditised red meat' in international markets
15. Stronger recognition of quality assurance programs across the supply chain and stronger in-market partnerships
16. In conjunction with stakeholders and industry partners, one of the four strategic recommendations developed to reduce barriers to trade in ASEAN nations and to increase production or supply of produce from Northern Australia to ASEAN markets to Develop 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)
17. To ensure sustainable exports requires Australian suppliers to develop collaborative relationships with supply chain actors that can help ensure quality and consistent products are delivered to end-consumers

### 17.4.4 Resources Process Opportunities

1. Abundant and valuable natural resources and has exceptional investment and growth potential
2. Rehabilitation activities leveraging existing mining sites
3. Unlocking land for agricultural development
4. Unlock regulatory barriers to agricultural development
5. Supportive development environment
6. Allow irrigation development to gain scale
7. Develop an approach (particularly within precincts) to converting parts of pastoral leases to freehold to meet short timeframes and appropriate native title and environmental approvals
8. Redefine and proactively navigate a pathway for approval processes
9. Five plant industry precincts with suitable soil and water have been identified. Highest priority precincts for development include Alice Springs, Ti Tree and Western Davenport. Precincts for future development include Tennant Creek and Great Artesian Basin. A soil and water suitability assessment report published in 2014 identified regions with suitable soil and water for development

### 17.4.5 Workforce Opportunities

1. Generating sustainable local employment and incomes through increase supply of agricultural and seafood/aquaculture products

2. All the equipment, services and technical capabilities need to be relatively close to regional centres with suitable amenities given the need for sustainable skilled workforces, at a time where the agribusiness sector is struggling to attract workers

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## 18. APPENDIX D - STAKEHOLDER LIST

**Farm/Project Proponents**

| *Person Contacted* | *Organisation* | *Role* | *Project/Area* |
|---|---|---|---|
| Grant Williams | Supply Chain Consultant | Consultant | Western Davenport & Project Seadragon |
| Paul McLaughlin | Desert Farms | Managing Director | Western Davenport |
| Miles Toomey | Humpty Doo Barramundi | | Darwin - aquaculture |
| Ben Wall | Desert Fruit Farm & Tamara Co-Op | | Alice Springs |
| Charlie Frith | Neutral Junction Station | Owner | Western Davenport |
| Mic Jacobi | NT Hay Seed and Grain | Managing Director | Darwin |
| Johan Nortier | Quintis (sandalwood) | Operations Manager | Darwin/Katherine |

**Local Government**

| *Person Contacted* | *Organisation* | *Role* | *Project/Area* |
|---|---|---|---|
| Steve Moore | Barkly Council | CEO | Barkly Council |
| Dale Keehne | East Arnhem Regional Council | CEO | East Arnhem |
| Ian Bodill | Katherine Town Council | CEO | Katherine |
| Robert Jennings | Alice Springs Town Council | CEO | Alice Springs |

**Industry Organisations**

| *Person Contacted* | *Organisation* | *Role* | *Project/Area* |
|---|---|---|---|
| Katherine Winchester | Northern Territory Seafood Council | CEO | |
| Tom Dawkins | NT Live Exporters Association | CEO | |
| Will Evans | NTCA | CEO | |
| Paul Burke | NTFA | CEO | |
| Louise Bilato | NT Road Transport Association & NT Buffalo Industry Council | Executive Officer | |
| Bruce Connolly | NT Cotton Association | Chairman | |
| Frank Miller | NT Forestry Association | Chairman | |
| Greg Owens | Tropical fruit production | NTFA Industry Development | Darwin |

**Industry Stakeholders**

| *Person Contacted* | *Organisation* | *Role* | *Project/Area* |
|---|---|---|---|
| Allan Woo | Airport Development Group | Aviation Development Manager | Darwin |

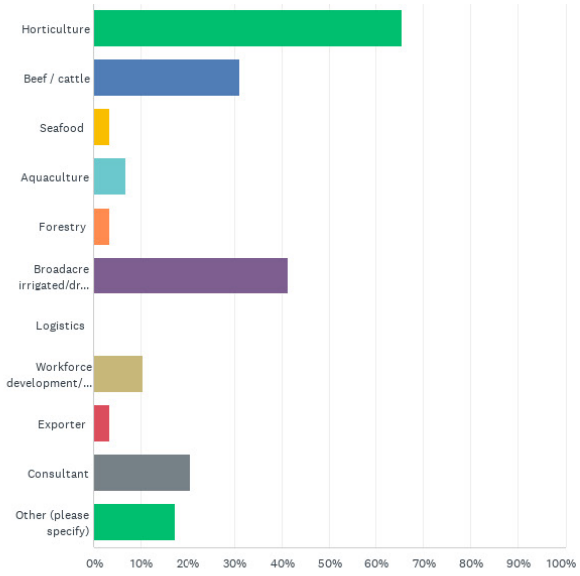
| | | | |
|---|---|---|---|
| Robert Hall | PakFresh Handling NT | General Manager | Top End |
| Peter Polovinka | Batchelor Abattoir | Area Manager | Darwin region |
| Kevin Mulvahil | Aus Asia Agribusiness | Director | Top End |
| Willem Westra van Holthe | Aus Asia North | Director | Top End |
| Ben Cheng | Darwin Port | Trade Access Coordinator | |
| Peter Dummett | Darwin Port | General Manager Trade and Property | |
| Mark Turner | PAE (Mariana Express Lines) | Northern Australia - International Container Shipping | Northern Australia |
| Mark McGrath | Forestry | Executive Officer | |
| Fritz Bolton | Ord Co | Chairman | |
| Colleen Dangerfield | VFS Exports | Export Manager | |

**Other Government Representatives**

| *Person Contacted* | *Organisation* | *Role* | *Project/Area* |
|---|---|---|---|
| Nicole Paas | NT DITT | Manager, Agribusiness Projects | Ag Precincts |
| Annalise Papadakis | NT DITT | Agri Development & Research Farms | Ag Precincts |
| Annie Feuerherdt | NT DITT | Agri Development & Research Farms | Ag Precincts |
| John Dong | NT DITT | Agri Development & Research Farms | Ag Precincts |

## 19. APPENDIX E - SURVEY QUESTIONS AND RESPONSES

**Q1: What areas of the primary production supply chain are you involved in?**




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Horticulture | 65.52% | 19 |
| Beef / cattle | 31.03% | 9 |
| Seafood | 3.45% | 1 |
| Aquaculture | 6.90% | 2 |
| Forestry | 3.45% | 1 |
| Broadacre irrigated/dryland | 41.38% | 12 |
| Logistics | 0.00% | 0 |
| Workforce development/education | 10.34% | 3 |
| Exporter | 3.45% | 1 |
| Consultant | 20.69% | 6 |
| Other (please specify) | 17.24% | 5 |
| Total Respondents: 29 | | |

| # | OTHER (PLEASE SPECIFY) | DATE |
|---|---|---|
| 1 | Potential investor | 2/22/2022 3:10 PM |
| 2 | Irrigated fodder (hay silage) and pastures in NW WA | 2/21/2022 3:33 PM |
| 3 | Crocodile Farming | 2/21/2022 2:36 PM |
| 4 | Biomass | 2/21/2022 12:21 PM |
| 5 | Importer fertiliser | 2/21/2022 11:16 AM |

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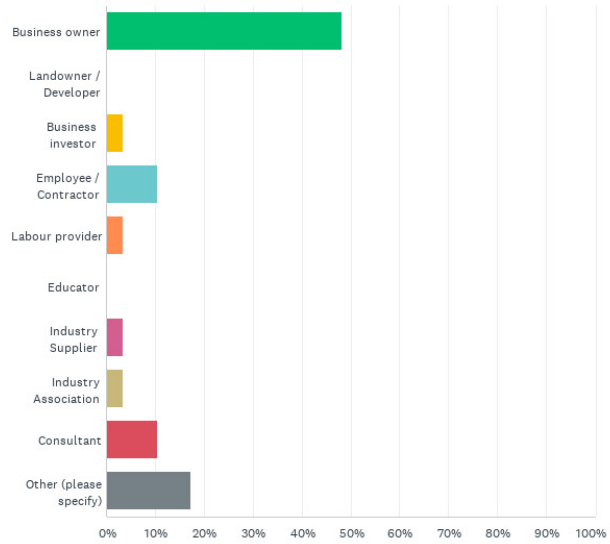
**Q2: What best describes your position in the industry?**




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Business owner | 48.28% | 14 |
| Landowner / Developer | 0.00% | 0 |
| Business investor | 3.45% | 1 |
| Employee / Contractor | 10.34% | 3 |
| Labour provider | 3.45% | 1 |
| Educator | 0.00% | 0 |
| Industry Supplier | 3.45% | 1 |
| Industry Association | 3.45% | 1 |
| Consultant | 10.34% | 3 |
| Other (please specify) | 17.24% | 5 |
| TOTAL | | 29 |

| # | OTHER (PLEASE SPECIFY) | DATE |
|---|---|---|
| 1 | researcher | 2/24/2022 7:38 PM |
| 2 | Research and development | 2/21/2022 3:54 PM |
| 3 | Development and research officer | 2/21/2022 3:33 PM |
| 4 | Research | 2/21/2022 1:13 PM |
| 5 | Timor-Leste Consulate General | 2/21/2022 11:16 AM |

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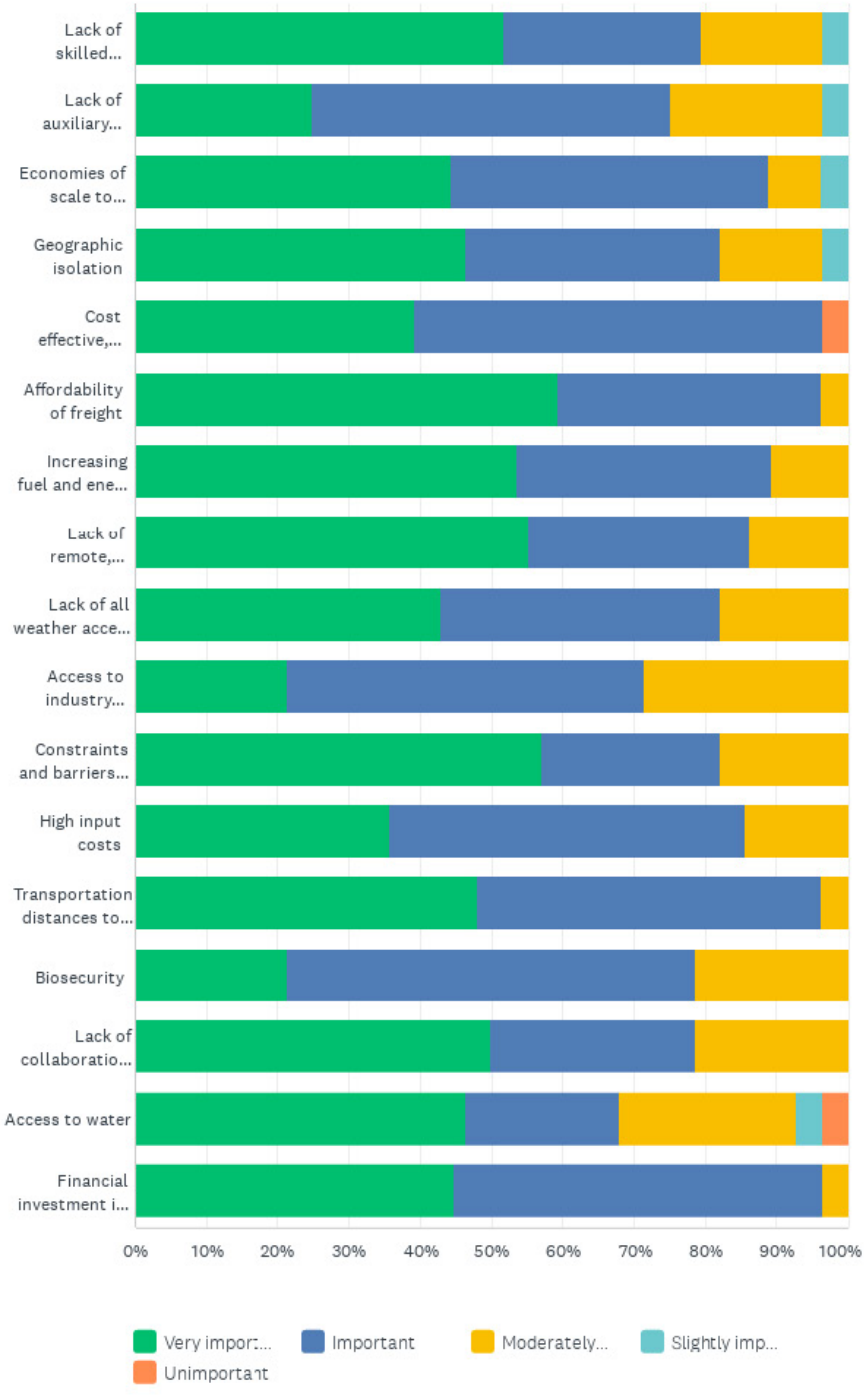
**Q3: Please rate the importance of the following industry constraints to the agricultural supply chain. Please provide a response to all lines.**

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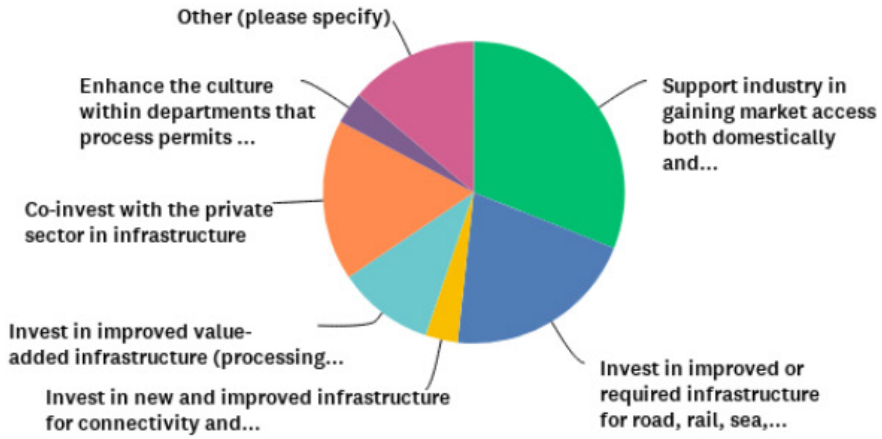
| | VERY IMPORTANT | IMPORTANT | MODERATELY IMPORTANT | SLIGHTLY IMPORTANT | UNIMPORTANT | TOTAL | WEIGHTED AVERAGE |
|---|---|---|---|---|---|---|---|
| Lack of skilled workforce entering the industry | 51.72% 15 | 27.59% 8 | 17.24% 5 | 3.45% 1 | 0.00% 0 | 29 | 1.59 |
| Lack of auxiliary services | 25.00% 7 | 50.00% 14 | 21.43% 6 | 3.57% 1 | 0.00% 0 | 28 | 1.89 |
| Economies of scale to support supply chain | 44.44% 12 | 44.44% 12 | 7.41% 2 | 3.70% 1 | 0.00% 0 | 27 | 1.56 |
| Geographic isolation | 46.43% 13 | 35.71% 10 | 14.29% 4 | 3.57% 1 | 0.00% 0 | 28 | 1.61 |
| Cost effective, dependable, and sustainable farming in the NT environment | 39.29% 11 | 57.14% 16 | 0.00% 0 | 0.00% 0 | 3.57% 1 | 28 | 1.71 |
| Affordability of freight | 59.26% 16 | 37.04% 10 | 3.70% 1 | 0.00% 0 | 0.00% 0 | 27 | 1.44 |
| Increasing fuel and energy prices | 53.57% 15 | 35.71% 10 | 10.71% 3 | 0.00% 0 | 0.00% 0 | 28 | 1.57 |
| Lack of remote, regional, and local infrastructure | 55.17% 16 | 31.03% 9 | 13.79% 4 | 0.00% 0 | 0.00% 0 | 29 | 1.59 |
| Lack of all weather access roads | 42.86% 12 | 39.29% 11 | 17.86% 5 | 0.00% 0 | 0.00% 0 | 28 | 1.75 |
| Access to industry required R, D & E | 21.43% 6 | 50.00% 14 | 28.57% 8 | 0.00% 0 | 0.00% 0 | 28 | 2.07 |
| Constraints and barriers in policy and regulatory processes | 57.14% 16 | 25.00% 7 | 17.86% 5 | 0.00% 0 | 0.00% 0 | 28 | 1.61 |
| High input costs | 35.71% 10 | 50.00% 14 | 14.29% 4 | 0.00% 0 | 0.00% 0 | 28 | 1.79 |
| Transportation distances to processing facilities and port | 48.15% 13 | 48.15% 13 | 3.70% 1 | 0.00% 0 | 0.00% 0 | 27 | 1.56 |
| Biosecurity | 21.43% 6 | 57.14% 16 | 21.43% 6 | 0.00% 0 | 0.00% 0 | 28 | 2.00 |
| Lack of collaboration between governments, Traditional Owner's, pastoralists and mining sectors | 50.00% 14 | 28.57% 8 | 21.43% 6 | 0.00% 0 | 0.00% 0 | 28 | 1.71 |
| Access to water | 46.43% 13 | 21.43% 6 | 25.00% 7 | 3.57% 1 | 3.57% 1 | 28 | 1.82 |
| Financial investment into infrastructure | 44.83% 13 | 51.72% 15 | 3.45% 1 | 0.00% 0 | 0.00% 0 | 29 | 1.59 |

**Q4: What should Local, Territory and Commonwealth Governments do to prioritise agricultural supply chain development in the Northern Territory?**




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Support industry in gaining market access both domestically and internationally | 31.03% | 9 |
| Invest in improved or required infrastructure for road, rail, sea, and air | 20.69% | 6 |
| Invest in new and improved infrastructure for connectivity and energy services | 3.45% | 1 |
| Invest in improved value-added infrastructure (processing facilities) | 10.34% | 3 |
| Co-invest with the private sector in infrastructure | 17.24% | 5 |
| Enhance the culture within departments that process permits and approvals | 3.45% | 1 |
| Other (please specify) | 13.79% | 4 |
| TOTAL | | 29 |

| # | OTHER (PLEASE SPECIFY) | DATE |
|---|---|---|
| 1 | all of the above | 3/1/2022 1:37 PM |
| 2 | The government needs to focus less on big picture political headlines and understand what development is like from a proponents perspective and use this learning to improve policy and process to come up with a better culture. This does not mean automatic approvals in 30 days for example, it is about a fair, clear and transparent process that delivers evidence based decisions with a balance between outcomes sought. Speedy outcomes that are poor decisions are not a good outcome in the long run. Developing unsustainable land is not a good outcome for industry. Lengthy confusing process and policy that is not delivering sustainable economic development is no good to anybody. | 2/21/2022 3:33 PM |
| 3 | I don't think this is a "choose one" question. Infrastructure investment is vital. I don't think government funding of processing facilities is advisable BUT relevant supply chain infrastructure (roads etc) to support such investment is key. Enhancing culture within departments is also VITAL! | 2/21/2022 1:37 PM |
| 4 | Essential infrastructure roads, communications. Support market development. Improve departmental attitudes towards industry approvals and cease over regulation. | 2/2[illegible]/2022 [illegible] AM |

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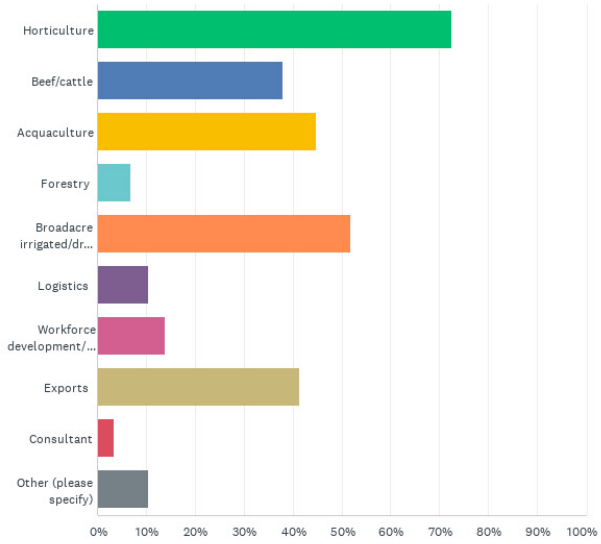
**Q5: Please select the industry sectors that you see has having the highest growth potential in the Northern Territory?**



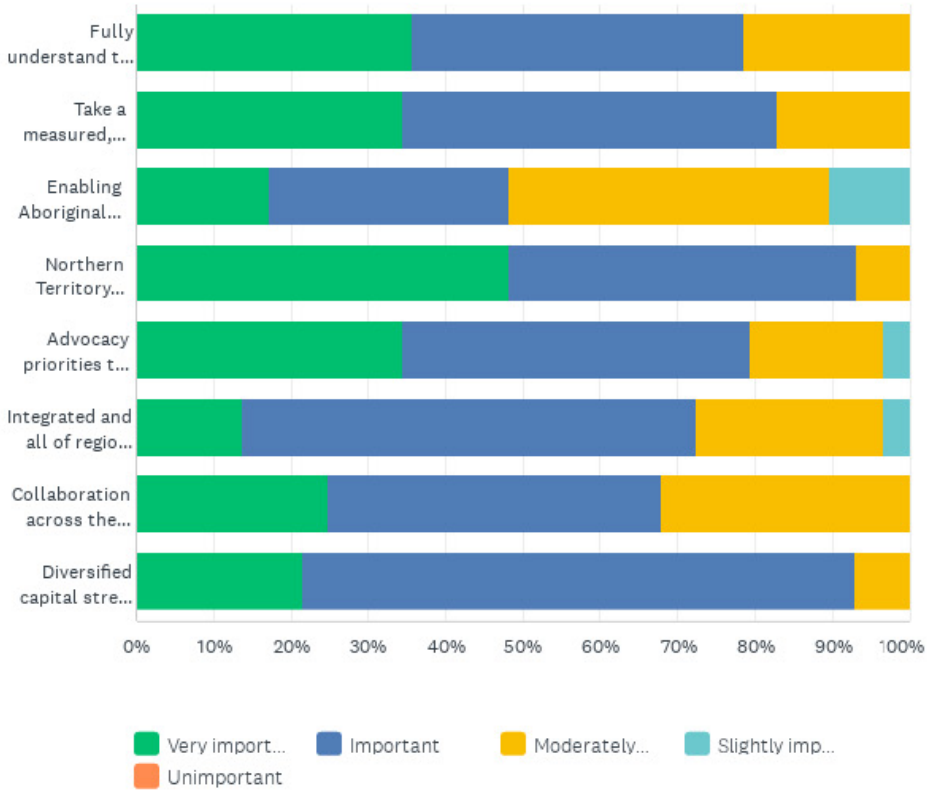

| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Horticulture | 72.41% | 21 |
| Beef/cattle | 37.93% | 11 |
| Acquaculture | 44.83% | 13 |
| Forestry | 6.90% | 2 |
| Broadacre irrigated/dryland | 51.72% | 15 |
| Logistics | 10.34% | 3 |
| Workforce development/education | 13.79% | 4 |
| Exports | 41.38% | 12 |
| Consultant | 3.45% | 1 |
| Other (please specify) | 10.34% | 3 |
| Total Respondents: 29 | | |

| # | OTHER (PLEASE SPECIFY) | DATE |
|---|---|---|
| 1 | Integrating systems that provide diversity - for example irrigated cropping and cattle. Systems that are efficient (fuel and fertiliser) are going to be more important than scale in the future.<br>Intensive systems that maximise outputs while minimising off site impacts, clearing and water use will be very important. Personally I think the return to broadacre, low yielding crops at a large scale is likely to be a very risky venture. The cost of environmental and TO approvals will outstrip the cost of clearing land in time and there are relatively high environmental impactsif the farming systems are discontinued in time. | 2/21/2022 3:33 PM |
| 2 | Importing/manufacturing/processing inputs. For example, phosphate based fertiliser and cattlesupplements. We have huge phosphate deposits on the Barkly which could service northern Australia... | 2/21/2022 1:37 PM |
| 3 | Biomass | 2/21/2022 12:21 PM |

**Q6: Do you currently export or have plans to export in the next 12 months? If so, what products and destinations would you be looking at?**

| # | RESPONSES | DATE |
|---|---|---|
| 1 | Wait and see! | 3/14/2022 7:18 AM |
| 2 | Yes to both. Mangoes to Singapore and we'd like to export to Hong Kong, S Korea and JapanMelons and pumpkins to Singapore and other SE Asia destinations Australian native bush foods to Singapore and beyond | 3/5/2022 12:44 PM |
| 3 | no | 3/1/2022 1:37 PM |
| 4 | Fresh quality herbs & mushrooms | 2/26/2022 6:44 AM |
| 5 | horticultural products to singapor and beyond | 2/25/2022 12:01 PM |
| 6 | no | 2/24/2022 7:38 PM |
| 7 | beef | 2/24/2022 10:48 AM |
| 8 | N/A | 2/22/2022 6:29 PM |
| 9 | No | 2/22/2022 3:10 PM |
| 10 | no | 2/21/2022 9:16 PM |
| 11 | Do not export at the moment | 2/21/2022 4:16 PM |
| 12 | NA | 2/21/2022 3:54 PM |
| 13 | With respect to fodder, our export is cattle and by creating diversity in the export cattle market, coupled with an abattoir has then created a local market and investment in irrigated fodder systems. The economics are different to the higher rainfall areas of the NT as the ability to grow rainfed pasture reduces with decreasing rainfall. In Horticulture our key markets are domestic by focussing on the off season production (grapes, asparagus, sweet corn, melons and beans mainly). OS export is complex from the NW, this will no doubt be different in the NT. | 2/21/2022 3:33 PM |
| 14 | N/A | 2/21/2022 2:36 PM |
| 15 | Some members of our industry will start to develop commercial cropping projects. Most, however, will remain focused of beef production. Further export of beef, both live and boxed,into not only SE Asia but US and European markets is within reach. | 2/21/2022 1:37 PM |
| 16 | N/A | 2/21/2022 1:13 PM |
| 17 | No not at this stage | 2/21/2022 12:00 PM |
| 18 | No | 2/21/2022 11:55 AM |
| 19 | N/A | 2/21/2022 11:42 AM |
| 20 | Consultancy and Labour Force | 2/21/2022 11:29 AM |
| 21 | have exported but not at present - will do so again as situation allows | 2/21/2022 11:21 AM |
| 22 | N/A | 2/21/2022 11:21 AM |
| 23 | Export of live cattle to all current destinations. | 2/21/2022 11:18 AM |
| 24 | The Ambassador is meeting with Mark Faulkner from Tradestart and is very keen to court NTExports and Timor Leste imports for the NT | 2/21/2022 11:16 AM |
| 25 | yes - cattle, buffalo, donkey, fruit (various) | 2/21/2022 11:16 AM |
| 26 | Beef | 2/21/2022 11:15 AM |
| 27 | Melons and mangos | 2/18/2022 1:08 PM |

**Q7: What are the opportunities for your industry to grow and develop? Please rate the following in order of importance.**

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| | VERY IMPORTANT | IMPORTANT | MODERATELY IMPORTANT | SLIGHTLY IMPORTANT | UNIMPORTANT | TOTAL | WEIGHTED AVERAGE |
|---|---|---|---|---|---|---|---|
| Fully understand the constraints and opportunities imposed by climate, soils, and ecosystems | 35.71% 10 | 42.86% 12 | 21.43% 6 | 0.00% 0 | 0.00% 0 | 28 | 1.86 |
| Take a measured, evidence based and socially inclusive approach for the future of agricultural development | 34.48% 10 | 48.28% 14 | 17.24% 5 | 0.00% 0 | 0.00% 0 | 29 | 1.83 |
| Enabling Aboriginal agricultural development | 17.24% 5 | 31.03% 9 | 41.38% 12 | 10.34% 3 | 0.00% 0 | 29 | 2.45 |
| Northern Territory Government to focus on improving critical inputs for agribusiness namely water, infrastructure, and improvement to supply chains, increase resilience of the workforce and enable producers to capitalise on emerging technologies | 48.28% 14 | 44.83% 13 | 6.90% 2 | 0.00% 0 | 0.00% 0 | 29 | 1.59 |
| Advocacy priorities to streamline and strengthen public and political support for policies, programs and regional strategies that enable seafood/aquaculture and agricultural development including Government, Aboriginal landowners, Aboriginal organisations, and all industry stakeholders | 34.48% 10 | 44.83% 13 | 17.24% 5 | 3.45% 1 | 0.00% 0 | 29 | 1.90 |
| Integrated and all of region agricultural development approach | 13.79% 4 | 58.62% 17 | 24.14% 7 | 3.45% 1 | 0.00% 0 | 29 | 2.17 |
| Collaboration across the value chain (sharing of information for mutual benefit – production, supply chain and consumer facing participants) | 25.00% 7 | 42.86% 12 | 32.14% 9 | 0.00% 0 | 0.00% 0 | 28 | 2.07 |
| Diversified capital streams and models to support business growth and entry | 21.43% 6 | 71.43% 20 | 7.14% 2 | 0.00% 0 | 0.00% 0 | 28 | 1.86 |

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**Q8: Do you have any other suggestions, issues or recommendations to Government or other industry stakeholders that may improve supply chains in the Northern Territory?**

| # | RESPONSES | DATE |
|---|---|---|
| 1 | No you have mentioned, most issues, and market forces will dictate air freight as usual. | 3/14/2022 7:18 AM |
| 2 | We require a rail system that can cope with an increase in products & freight | 2/26/2022 6:44 AM |
| 3 | work with industry not against us | 2/25/2022 12:01 PM |
| 4 | faster results to applications summited for improving land | 2/24/2022 10:48 AM |
| 5 | Simplify the layers of and security of land and water tenure. | 2/22/2022 3:10 PM |
| 6 | Seek to achieve sensible, staged outcomes that work, people often say agriculture 'fails' unless it is at large scale. History has shown time and time again that the successful people are the ones that persevere, adapt, overcome adversity and work at a scale they can manage.If we put 20% of the time, money and effort that has been wasted on the big schemes that dont stand the test of time, we would be much better off. It is a marathon, not a sprint. thanks for asking for our input. DPIRD NW WA. | 2/21/2022 3:33 PM |
| 7 | No, Thanks | 2/21/2022 3:23 PM |
| 8 | Infrastructure for temporary/seasonal labour accommodation. Be a leader in driving a collaborative approach by states and territories with local Gvvt | 2/21/2022 2:36 PM |
| 9 | I will comment that thus far, the Government has communicated messages of support for thebeef industry to develop and achieve economic growth. The "nitty gritty" reality of doing so in the NT is a different story. The NTG needs to decide if they are truly supportive of primary industry to expand and grow both in production and $$ for the NT. | 2/21/2022 1:37 PM |
| 10 | Need to have a good understanding of past failures in agricultural ventures in the NT, to stop them repeating and so resources are targeted towards areas with a high chance of success. The barriers that stop successful expansion of many sectors are still present in the NT and there has already been a lot of research into the reasons, that I feel gets overlooked. In addition, new potential crops and industries in the NT, get oversold in the media without properscrutiny of the many looming challenges that may present themselves (Peanuts in Katherine for example) and just tend to fade away. The long term viability of these new industries need tobe scrutinised, this can be achieved if relevant government agencies are allowed to produce research that is unbiased and not reliant on receiving founding from other third parties. | 2/21/2022 1:13 PM |
| 11 | Government to implement policy that enables, encourages and supports new and emergingindustries that require significant investment to commit to long term renewable industries. Industry bodies to introduce value chain options and potential partners for long-term sustainable integrated development. | 2/21/2022 12:21 PM |
| 12 | Government are there to enable not to control- the issue now is NT Govt sees themselves asabove industry and want control every thing we do | 2/21/2022 12:00 PM |
| 13 | Open up more land for horticulture, cut the red tape and make it simple for aussies from alllevels of income to start and have a go at farming. | 2/21/2022 11:55 AM |
| 14 | Work closely in collaboration with Federal Government departments like DFAT, Immigration tobring more people from overseas to cover labour and skills shortages within the entire supply chain. | 2/21/2022 11:29 AM |
| 15 | no | 2/21/2022 11:21 AM |
| 16 | N/A | 2/21/2022 11:21 AM |

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