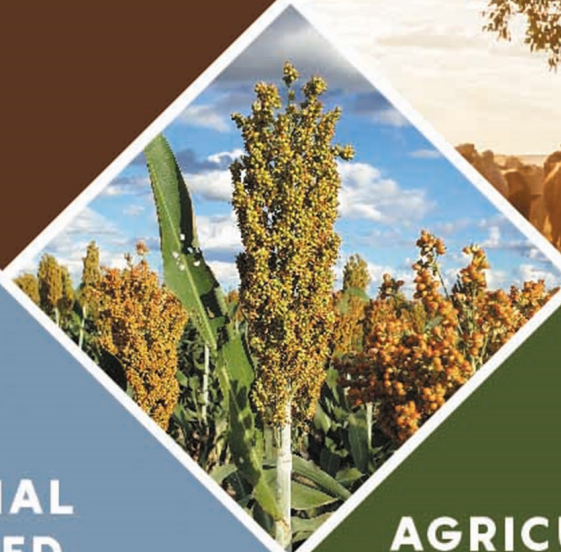


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**Regional Agricultural  
Supply Chain Baseline  
Framework and Mapping Tool:  
A Case of Central Queensland, Australia**

**SUMMARY REPORT**

**2023**

**CRCNA**  
DEVELOPING NORTHERN AUSTRALIA



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The author(s) confirm(s) that this document has been reviewed and approved by the project's steering committee and by its program leader. These reviewers evaluated its:

- › originality
- › methodology
- › rigour
- › compliance with ethical guidelines
- › conclusions against results
- › conformity with the principles of the Australian Code for the Responsible Conduct of Research (NHMRC 2018), and provided constructive feedback which was considered and addressed by the author(s).

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Primary Industries and  
Regional Development**

# Regional Agricultural Supply Chain Baseline Framework and Mapping Tool: A Case of Central Queensland, Australia

## SUMMARY REPORT



### Context & Purpose

Australia has diverse agricultural, fisheries and forestry sectors. The gross value of agricultural production has increased from \$59 billion in 2002 to \$93 billion in 2022, with around 72% of agricultural production being exported. Agriculture is the main income generating sector for rural and regional Australian communities. Despite Australia’s strong agricultural capability, the potential for further market diversification, value-added product development and increases in export share of agricultural commodities from the production regions are yet to be examined in terms of supply chain structure and efficiency. An in-depth understanding of the key products, supply chain features, structure and processes is the first step in planning for a well-coordinated and integrated supply chain in the Australian agricultural regions, particularly for central Queensland, north and far-north Queensland, Northern Territory, and northern Western Australia region. This study aims to develop an agricultural supply chain (ASC) baseline framework and mapping tool for agricultural supply chain characterisation focusing on selected commodities that are commercially important through a case study of the central Queensland (CQ) region. This summary of the CRCNA report shows how the supply chain for an agricultural region can be analysed systematically, an important first step in analysing opportunities for growth.

### Methodology

A mix of qualitative and quantitative methods was employed for conducting the research, consisting of a literature review, stakeholder consultation, workshops, interviews, and forums. The study begins with a literature review and stakeholder consultation for project scoping, followed by primary and secondary data collection, data analysis and mapping tool validation. The flow diagram for the project methodology is given in Figure 1.

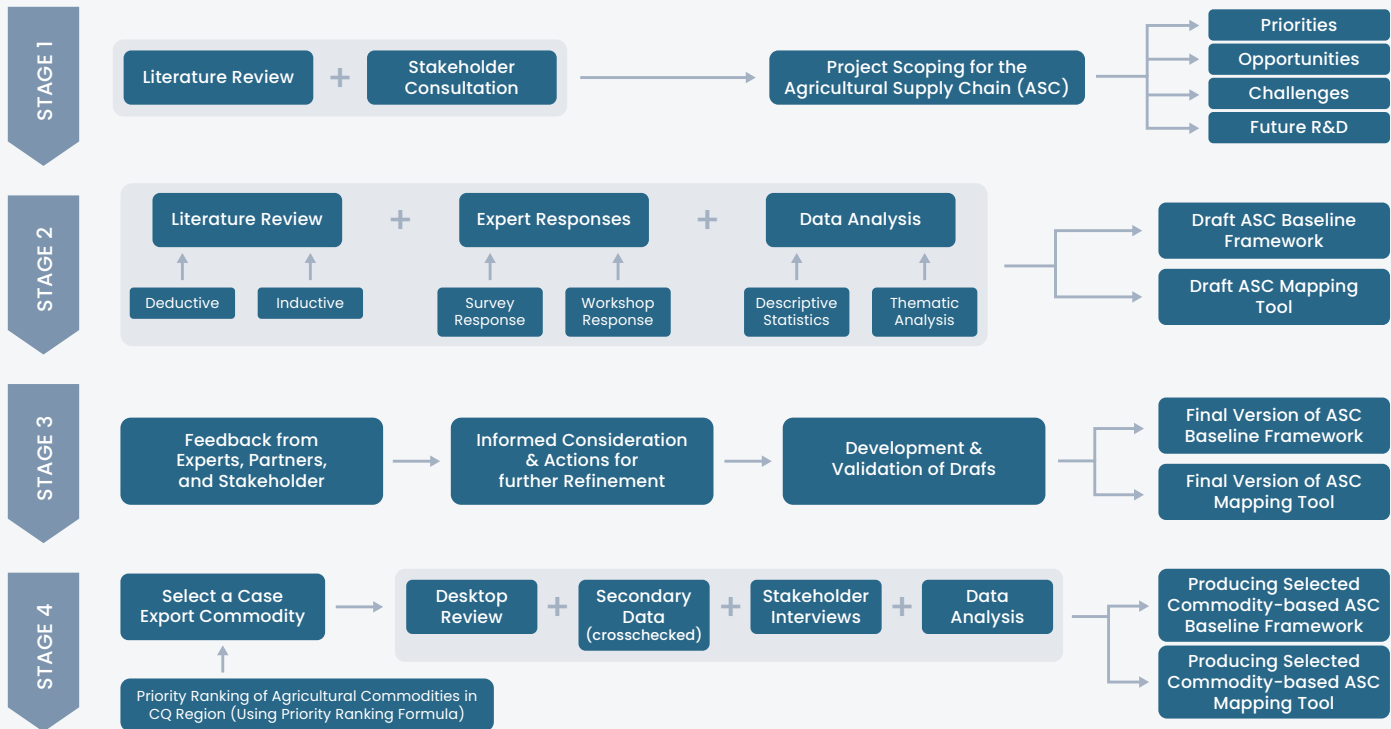


Figure 1. Methodology to develop ASC baseline framework and mapping tools for agricultural commodities.

## Regional Profile of Central Queensland (CQ)

Central Queensland has a total land area of 117,588 km<sup>2</sup> and consists of six local government areas (LGAs) (Figure 2). However, Woorabinda Aboriginal Shire Council was not included in this study.

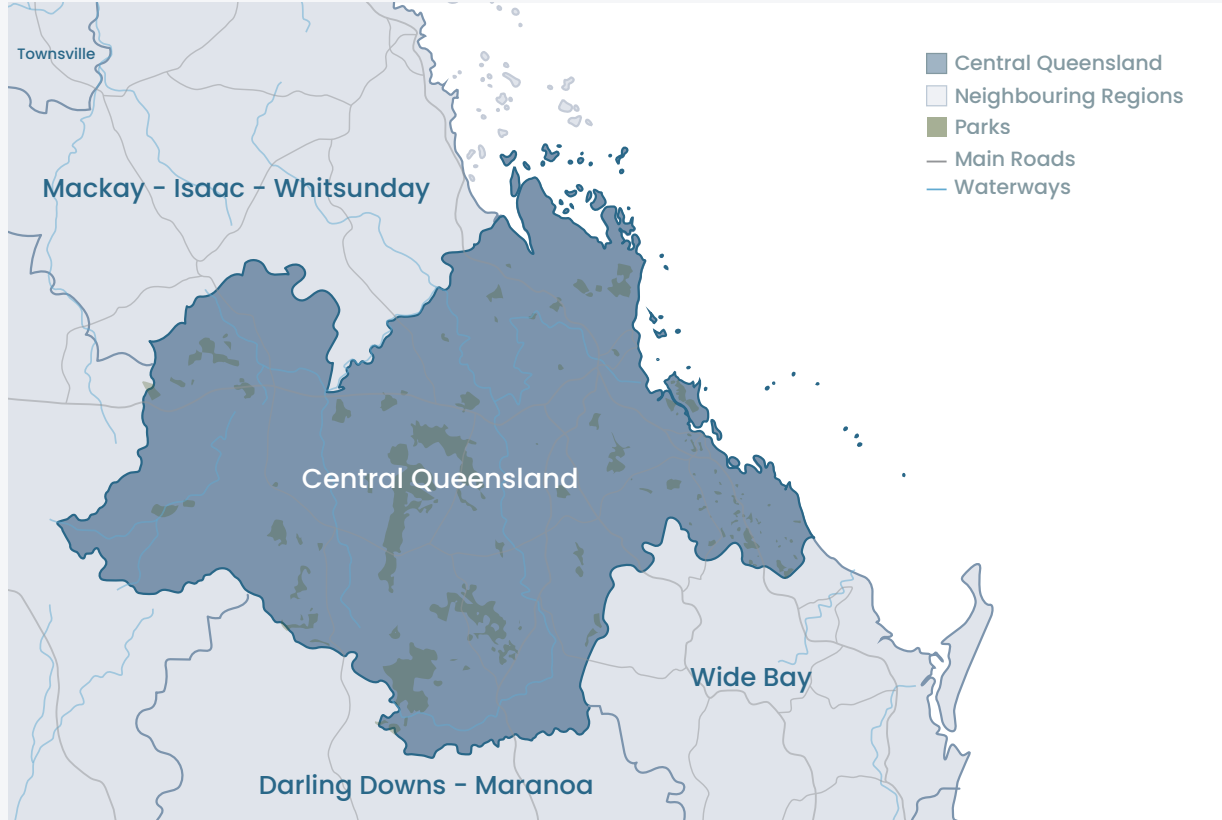
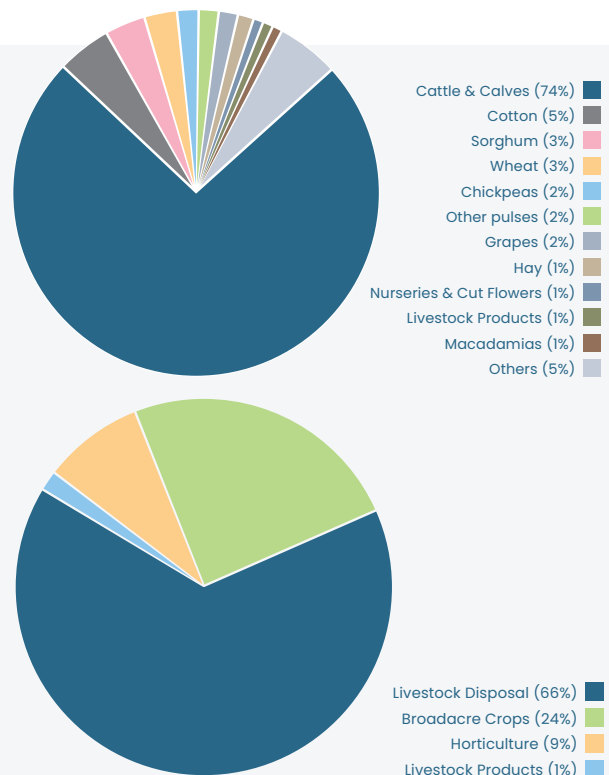


Figure 2: Map of central Queensland

- › As of 30 June 2021, the estimated population of CQ is 231,104 persons with an actual annual growth of 0.5%.
- › The agricultural industry represents about 5% of paid employment in CQ.
- › Agriculture in CQ contributes about 11% and 25% of the state's gross agricultural economic output and total exports, respectively.
- › The estimated agricultural GVP of the CQ region for 2023 is \$1,734 million (excluding fisheries and forestry), representing approximately 10% of Queensland's total GVP (Figure 3).

Figure 3. Share of gross value of agricultural production (GVP) by agricultural commodities and groups of commodities in the CQ region.





## Key Findings

### Framing agricultural supply chain complexity: A baseline framework

The key domains identified in the agricultural supply chain (ASC) were product, infrastructure, process, and factors (Figure 4). These have become the key ingredients for a proposed “Agricultural supply chain baseline framework”. This approach provides a theoretical model for describing, analysing and evaluating supply chains for any agricultural commodity, as well as a basis on which to build a mapping tool for the relevant commodities.

### Priority commodity selection techniques

We identified the priority commodities of the CQ region by applying a mathematical formula and using data relating to production value, volume and production area. The selected commodities are beef, wheat, chickpeas, sorghum, and cotton. We have also identified two niche commodities, citrus and table grapes, which have high export potential but are not well reflected in the Australian Bureau of Statistics (ABS) datasets for this region.

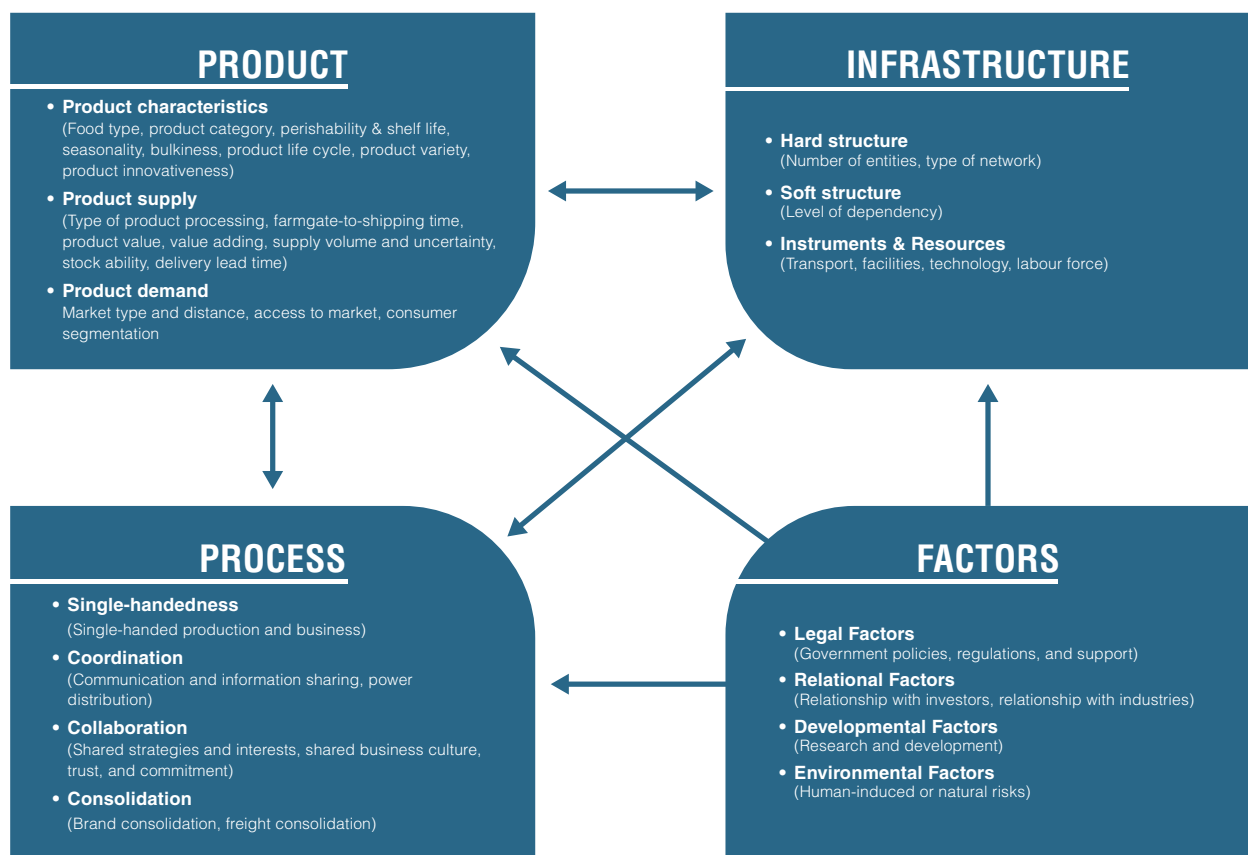
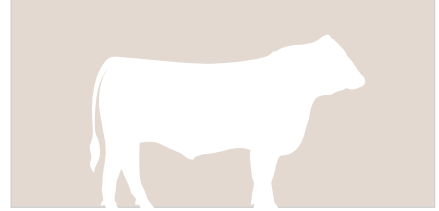


Figure 4. Agricultural supply chain (ASC) baseline framework



# Supply chain baseline framework for selected agricultural commodities

## BEEF

### SUPPLY CHAIN BASELINE FRAMEWORK FOR BEEF IN THE CQ REGION

#### Products:

- › QLD produces 47% of Australian beef cattle, while CQ produces 17% of QLD production.
- › About 60% of QLD beef is exported.

#### Infrastructure:

- › Matured processing industry
- › Good road and rail network
- › Readily available technology infrastructure for cattle management.

#### Process:

- › Mostly family-based business structure for beef production.
- › Moderate level of coordination among supply chain actors.
- › Limited communication and data sharing in the supply chain.

#### Factors:

- › Structured regulations and certifications process required for production and classification.
- › Strong research programs in regional universities and MLA.
- › Unavailability of processing and export data sharing platform.

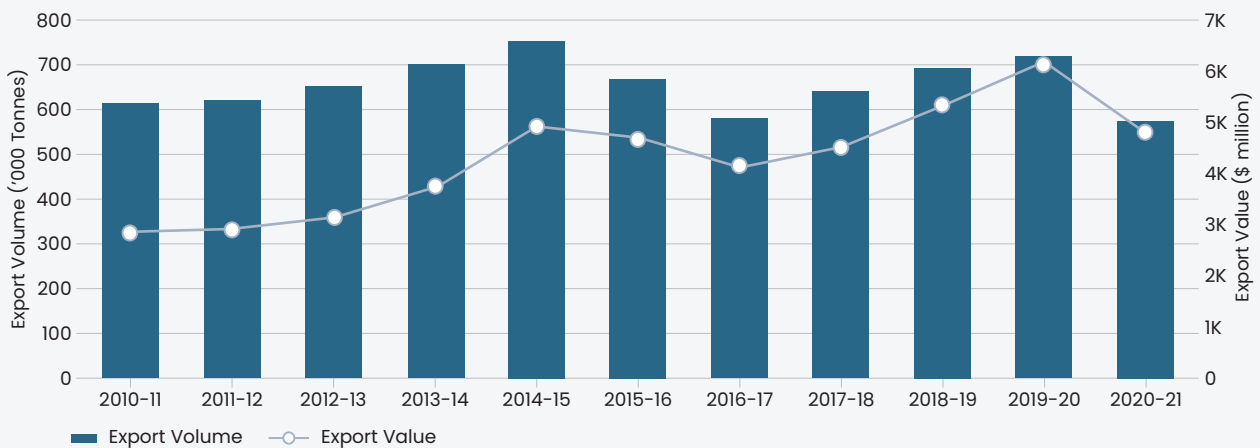


Figure 5. QLD beef export volume and value.

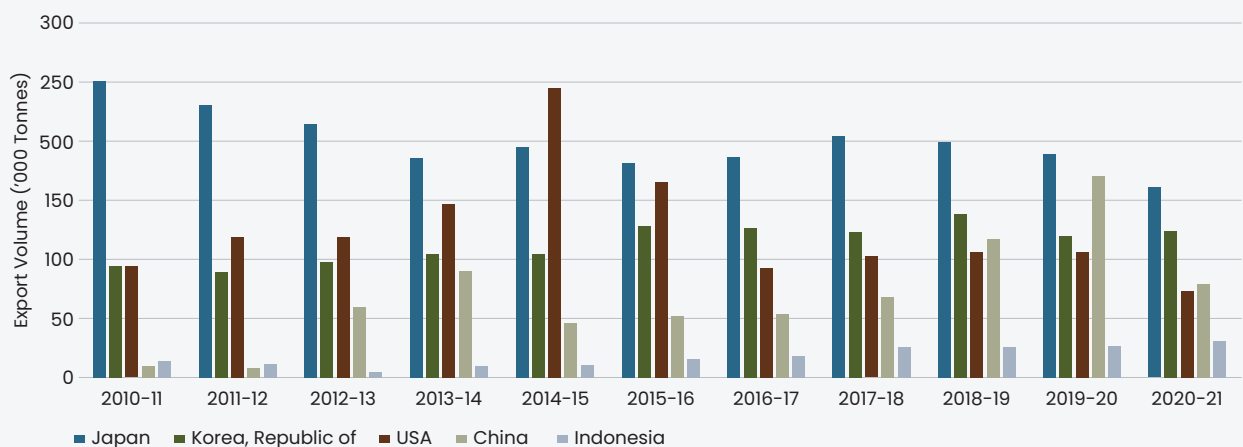


Figure 6. Major export destinations for QLD beef



## GRAINS AND LEGUMES (wheat, sorghum, and chickpeas)

### SUPPLY CHAIN BASELINE FRAMEWORK FOR GRAINS AND LEGUMES IN THE CQ REGION

#### Products:

- › CQ produces about 8%, 15% and 18% of QLD's wheat, sorghum, and chickpeas respectively.
- › Established export market in South and Southeast Asia.
- › Underdeveloped value-adding industry in CQ.

#### Infrastructure:

- › Good storage facilities in CQ, with most operated by GrainCorp.
- › Good road network but transportation costs have increased recently.
- › Shortage of labour force.

#### Process:

- › GrainCorp is the leading agency with processing, storing, handling and marketing capabilities.
- › Strong coordination and communication exist between producers and GrainCorp.
- › Gladstone Port has a grain handling facility, but it is underutilized.

#### Factors:

- › Structured regulations exist to meet export protocol.
- › Strong research programs in GRDC, DAF, ABARE and regional universities.
- › Extreme weather events are major challenges for producers.

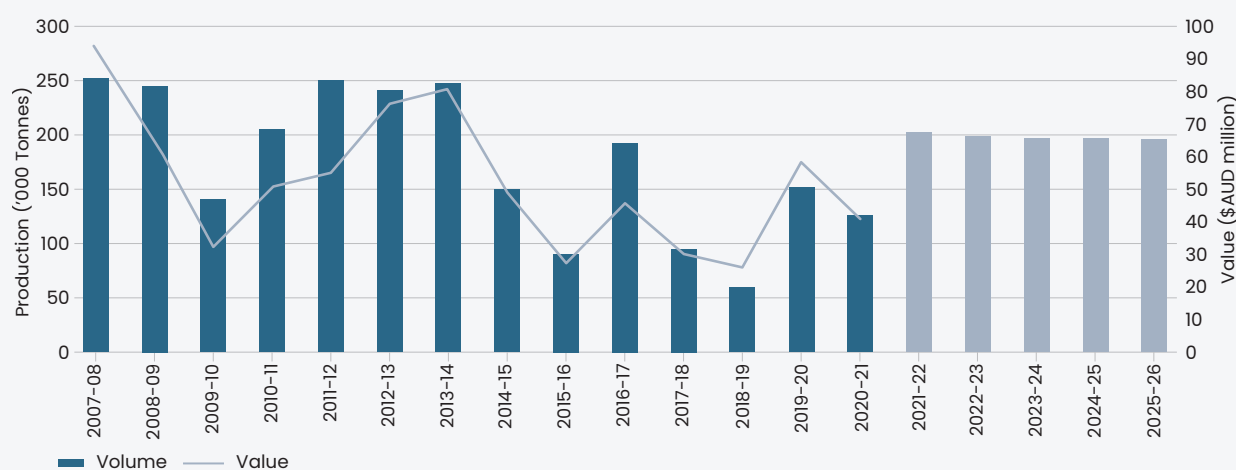


Figure 7a. Production volume and value of Wheat in Queensland with forecasted production presented with light blue bars in the figures.

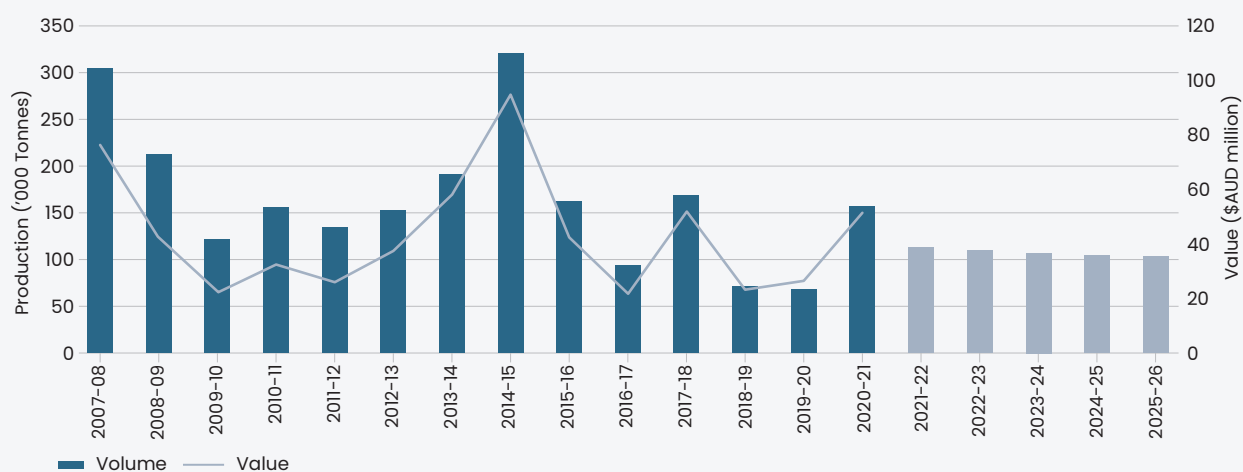


Figure 7b. Production volume and value of Sorghum, in the CQ region and in Queensland with forecasted production presented with light blue bars in the figures.

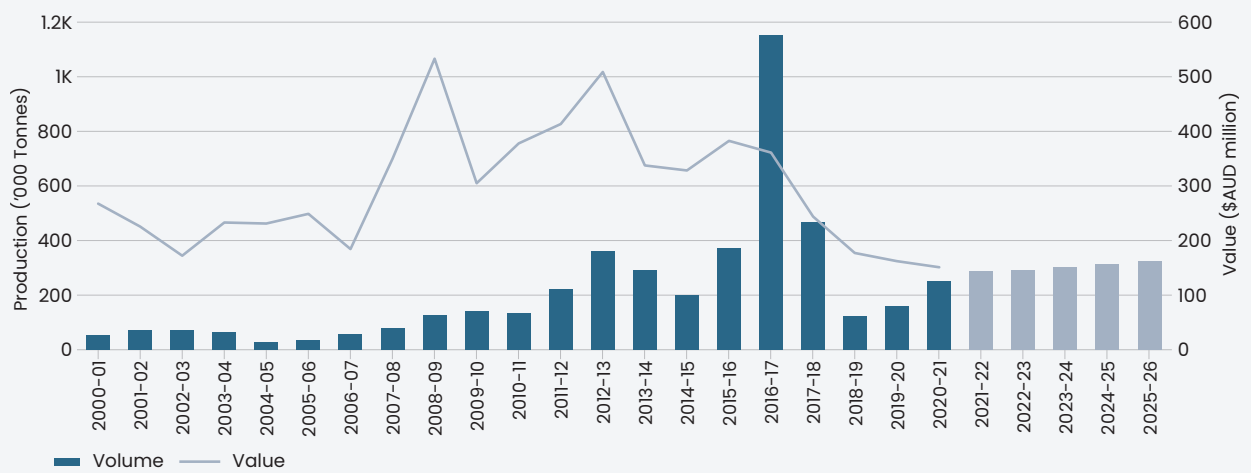


Figure 7c. Production volume and value of Chickpeas in Queensland with forecasted production presented with light blue bars in the figures.







## COTTON

### SUPPLY CHAIN BASELINE FRAMEWORK FOR COTTON IN THE CQ REGION

#### Products:

- › In 2020-21, CQ produced about 13% of QLD cotton.
- › Established export market in South and Southeast Asia.
- › Over 95% of CQ cotton is exported.

#### Infrastructure:

- › Established cotton gin operations.
- › Good road network and exporting port facility at Brisbane.
- › Nonexistence of weaving mills for further processing of cotton domestically.

#### Process:

- › Cotton Australia is the leading industry body.
- › Cotton Grower Associations in different regions often work from the Cotton Australia platform.
- › Strong coordination and communication exist between the producers and cotton gins.

#### Factors:

- › Structured regulations exist to meet export protocol.
- › The cotton industry has strong relations with the beef industry because of the use of cotton seed as a stockfeed.
- › Extreme weather events are major challenges for the producers.

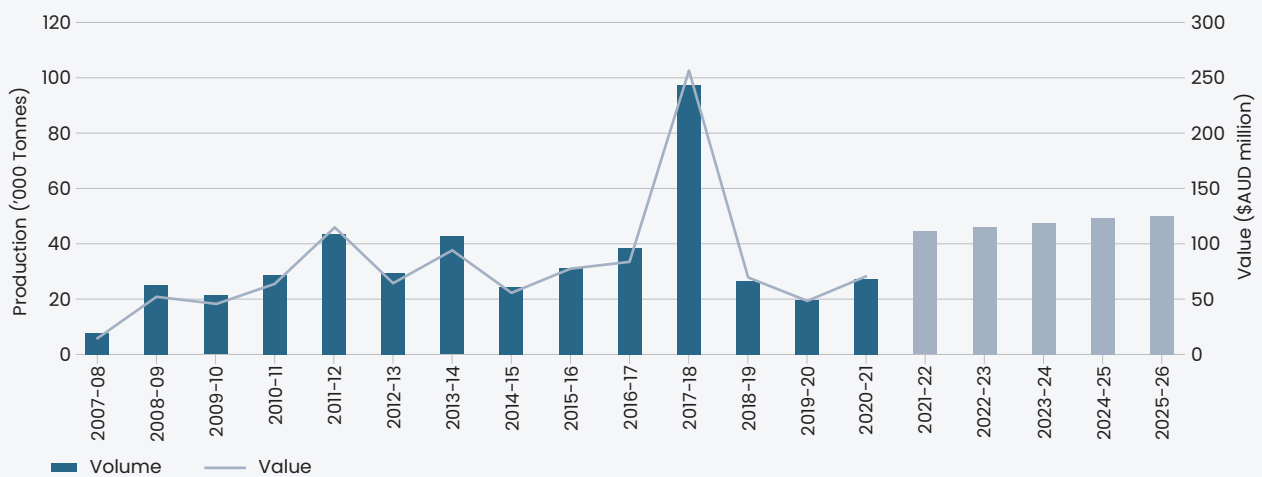


Figure 8: Central Queensland cotton production with five-year forecast (in light blue columns)

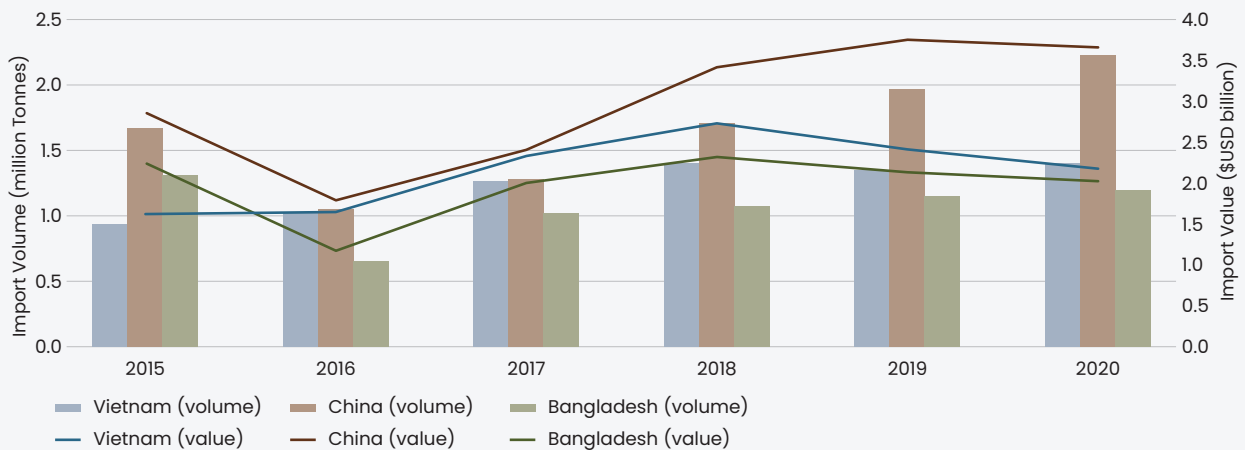


Figure 9: Volume and value statistics for the world's major cotton importers



## FRUITS (mandarin and table grapes)

### SUPPLY CHAIN BASELINE FRAMEWORK FOR FRUITS IN THE CQ REGION

#### Products:

- › Mainly produced in Emerald.
- › A major portion of CQ mandarins goes to the export market, while table grapes are destined for the domestic market.
- › Production and export data for CQ mandarin are heavily understated in ABS.

#### Infrastructure:

- › Producers are heavily dependent on input providers and merchants/agents for distribution.
- › Small and medium producers engage in freight consolidation.
- › The major export port is Brisbane.

#### Process:

- › No contractual collaboration exists among producers and other supply chain actors.
- › Strong communication exists between the producers and other supply chain actors.

#### Factors:

- › Standard export protocol exists for both products.
- › Extreme weather events have a major impact on product quality and quantity.
- › Highly potential to grow both industries in the Rockhampton region because of the new availability of water from Rockwood Weir.

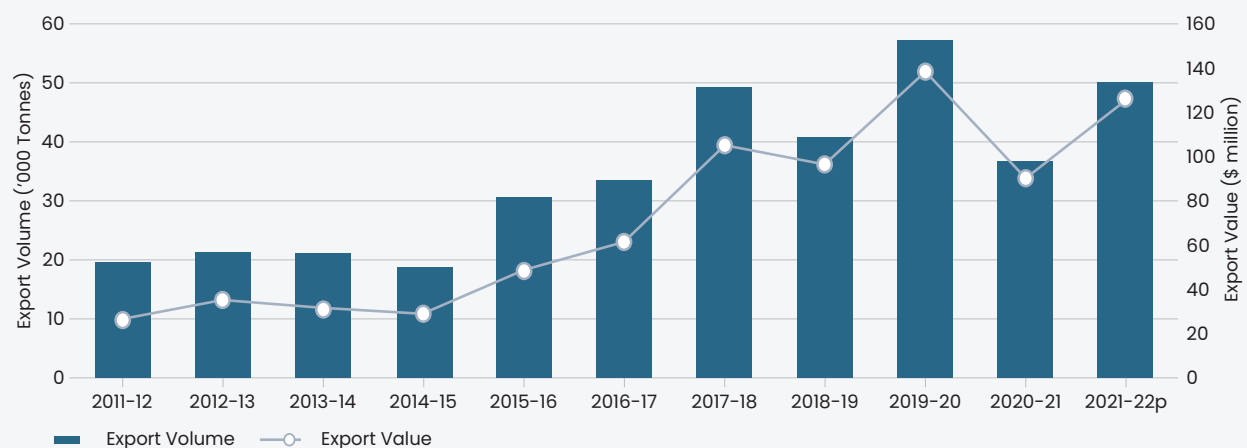


Figure 10: Trends in QLD mandarin export volume and value



## Agricultural supply chain mapping tool: A tool for end-users

An agricultural supply chain mapping tool has been developed based on the ASC baseline framework with a deep-dive approach. The key functions of the agricultural supply chain mapping tool are:

- › To provide supply chain actors with an overview of inter-organisation supply chain structure and a better understanding of their own business within that structure
- › To identify ways to make supply chains more flexible, monitor supply chain strategies, and enhance communication for generating ideas.
- › To contribute to facilitating strategic planning process, ease of distribution of information, clarifying channel dynamics, and identifying common perspectives.

In the full project report, we have presented the sample mapping tool for seven selected commodities. Four data sources were used to populate the mapping tools, namely literature review, secondary data, primary data from the producers, and data from the relevant industries.

## Agricultural supply chain mapping tool – a case study of beef

SUPPLY CHAIN MAPPING TOOL FOR BEEF IN THE CQ REGION		
Date: 30 <sup>th</sup> September 2022		
Framework Components	Feature	Data entry and sources of data
<b>PRODUCT</b>		
Product Characteristics	Food type	Animal Protein
	Product category	Processed and comes in different cuts
	Perishability and shelf life	Highly perishable. Shelf life is about 3 to 5 days if refrigerated (below 5 °C). If it is kept in freezer (below 0°C) it can be consumed in up to 12 months.
	Seasonality	Available all year round
	Bulkiness	Depending on the packaging it could be categorized as bulky or non-bulky
	Product life cycle	Depending on the age of the cattle
	Product variety	Multiple varieties, because of different types of cattle and meat from different parts of the cattle
	Product innovativeness	Not many innovations in the Central Queensland region
Product Supply	Type of processing	Generally handled as chilled or frozen
	Farmgate-to-shipping time	Depending on the location of farm, it requires up to 1 day to supply cattle to the local abattoir. It would take another 1 day to transport processed beef from abattoir to the Brisbane port.
	Product value	Because of different cuts of beef, it is difficult to identify the average price
	Value adding	Value added products include Wagyu beef and organic beef which have significantly higher price compared with regular beef.
	Supply volume and uncertainty	Supply uncertainty is low. However, it can be affected due to extreme weather conditions (drought, flood)
	Stock ability	High
	Delivery lead time	Delivery lead time is minimal as the meat processing industry is located in this region.
Product Demand	Market type and distance	Local producers send their cattle to the abattoir and then the processed beef is sent to different markets. For export markets, most of the products go through Brisbane port which is about 700 km away.
	Access to market	CQ beef has access to the international markets.
	Consumer segmentation	There are consumers from different socio-economic backgrounds and the consumer segmentation is very diverse.

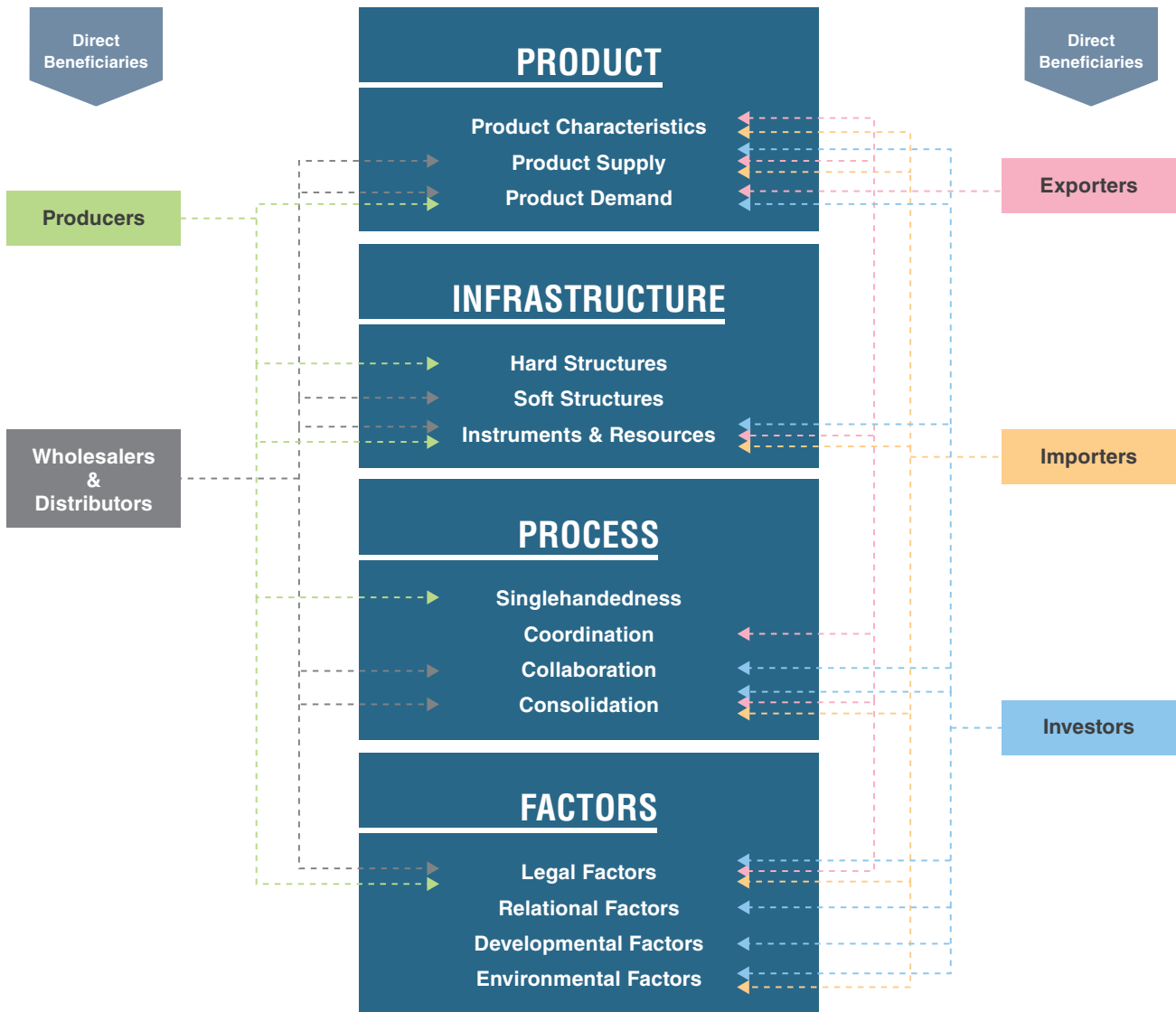
INFRASTRUCTURE		
Hard Structure	Number of entities	Supply chain structure is very complex and more like a web or network as the actors are connected in different ways. Depending on the individual supply chain, the number of actors ranges from 5 to 8.
	Type of Networks	The supply chain is organised vertically. However, no collaboration exists amongst the actors.
Soft Structure	Level of Dependency	Producers are heavily dependent on input providers and meat processors/ abattoirs. Producers are moderately dependent on feedlots but are generally in dependent of exporters, as it is the meat processors who conduct the trade deals with exporters.
Instrument & Resources	Transport	Cold and chilled transportation are required for processed beef. However, trucks and road trains are required for transferring live cattle to slaughterhouses.
	Facilities	A well-developed processing industry exists in the region.
	Technology	Digital technologies and IoT exist in the region, which are moderately affordable. However, internet connectivity is not strong in some parts of the region.
	Labour Force	Most producers have their own family business and permanent employers working on farm. Labour force is not a significant issue for the beef supply chain.
PROCESS		
Single-handedness	Single-handed production & business	The majority of the tasks associated with supplying beef are handled by producers in coordination with other supply chain entities.
Coordination	Communication and information sharing	Common among supply chain actors.
	Power distribution	Processors have the most power to control the market price. No visible power distribution exists within the supply chain.
Collaboration	Shared strategies and interests	None exists among supply chain actors.
	Shared business culture	There is some extent of shared values among producers.
	Trust and commitment	There is trust and commitment among producers and processors in an informal way.
Consolidation	Brand consolidation	Does not exist
	Freight consolidation	Does not exist
FACTORS		
Legal Factors	Government policies, regulations, and support	There are a lot of regulations and certifications in relation to production and classification.
Relational Factors	Relationship with investors	No external investors exist at the production level.
	Relationship with industries	There is a close relationship with industries which can provide fodder (grain, cotton seed etc.)
Developmental Factors	Research and development	Numerous research projects are ongoing in the regional Universities and MLA.
Environmental Factors	Natural or human-induced risks	Extreme weather conditions often affect the supply chain.

Note: Agricultural mapping tool for other selected commodities are also available in the CRCNA full report.

## Direct beneficiaries of the supply chain framework and mapping tool

The producers, investors, wholesalers and distributors, exporters, and importers have been identified as the direct beneficiaries of the baseline framework and mapping tool. Figure 11 shows the components of the framework and their linkages to the beneficiaries.

Figure 11. Direct beneficiaries of the supply chain baseline framework and mapping tool



## Ground truthing of regional production data

Production and export-related statistics for the selected commodities are available in the data bank of ABS, ABARES, QGSO, QDAF and MLA. However, there are some inconsistencies and discrepancies in the regional production data. The key organisations may have more accurate regional data, and these are:

- › Beef: MLA, CQLX, JBS, TEYS, RRC, AgForce
- › Cotton: Cotton Australia board, Cotton Growers' and Irrigators Association, Cotton Gin
- › Chickpeas: Pulse Australia, GrainCorp, CQ Inland Port
- › Wheat and Sorghum: GrainCorp, GRDC, Australian Wheat Board, CQ Inland port

The followings are the key findings from the ground truthing exercise:

- › Beef data are apparently over 95% accurate at the state level. However, CQ-level data for beef production and export are not available from open-source repositories.
- › Wheat, sorghum, and chickpea data are available at the state and regional levels. However, small, and medium producers often send their products direct to the feedlot, and these production figures may not be captured in the available datasets.
- › Cotton production data was compared with the cotton gin data, and on average, there is about a 2% variation between cotton gin and ABS data at the state level (QLD) and about 25% variation at the CQ level.
- › Mandarin production data for the CQ region is heavily understated in ABS data, as identified through farm visits and from the CHDC economic reports.

## Translation of the project findings

The agricultural supply chain mapping tool will allow end-users to systematically collect relevant data/information to describe and explore certain agricultural supply chains in detail. Therefore, a knowledge-to-action framework (Figure 12) has been suggested to make a connection between the research outcome and its implementation pathway.

Figure 12. Translation pathway of the supply chain baseline framework and mapping tool



## Recommendations

The following are the key recommendations arising from the study, including those dealing with future research potential:

- › Undertake digitalisation of the mapping tool by developing an App or online platform. Commercialization of the mapping tool could also be possible.
- › Inform supply chain actors on how to utilize the tool to enhance the efficiency of the supply chain.
- › The utilisation of the mapping tool to build up collaboration among the supply chain actors, including the producers, processors, wholesalers and retailers.
- › Ensure mapping tool data are refreshed every 3-5 years, or as appropriate, to efficiently inform the producers and other supply chain actors about new opportunities and barriers to market their products.
- › Identify the custodian of the mapping tool and develop the management system, including the data updating responsibilities for the mapping tool.

A detailed report of the project can be found on the CRCNA research projects website:  
<https://www.crcna.com.au/research/projects/central-queensland-regional-agricultural-supply-chain-baseline-study>

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## Project Partners

- › Banana Shire Council (BSC),
- › Central Highlands Development Corporation (CHDC),
- › Gladstone Port corporation (GPC),
- › Gladstone Regional Council (GRC),
- › Livingstone Shire Council (LSC) and
- › Rockhampton Regional Council (RRC)

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