Greater Whitsunday
Agribusiness Supply Chain Baseline Study

GW3D
GREATER WHITSUNDAY ALLIANCE
MACKAY ▶ ISAAC ▶ WHITSUNDAY

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CRCNA
DEVELOPING NORTHERN AUSTRALIA

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AGRICULTURAL SUPPLY CHAINS IN THE GREATER WHITSUNDAY REGION

Mackay ▶ Isaac ▶ Whitsunday

GREATER WHITSUNDAY AGRICULTURAL PROFILE

$1.4 BILLION
in Farm Production

LIVESTOCK

$635.4 M
1.0 million head

SUGAR CANE

$324.8 M
7.8 million tonnes

BROADACRE

$110.7 M
221,059 tonnes

HORTICULTURE

$231.6 M
82,994 tonnes

SEAFOOD

$59.6 M
3,611 tonnes

Market Analysis

- Global population growth driving demand for more food
- Sufficient depth in Australia's current markets to export more
- Numerous import replacement opportunities

Agricultural Supply Chains

- Agricultural product is moved outside of the region mainly by road to processors and fresh markets.
- Sugar and grain utilise industry owned export facilities
- Key challenge for agricultural producers is distance to market.

Supply Chain Infrastructure

- Port of Mackay (with bulk sugar and grain facilities)
- 2 x freight-capable airports (Whitsunday Coast & Mackay)
- 5 x sugar mills and sugar refinery
- 3 x livestock saleyards
- 2 x meat works
- 1 x up-country grain aggregation facility

Farm Margin Analysis

Land-based aquaculture and irrigated horticulture generate considerably higher economic benefit per ha of production compared to the same land used for cattle grazing.

Higher Value Opportunities

- Aquacultural Development Areas (ADAs).
- Rotational cropping with sugarcane.
- Feedlot industries.
- Developing good quality agricultural land (including new irrigation schemes)

Alternative Supply Chain Opportunities

- Cost of road transport to Brisbane is a small component of the total cost of exporting from Australia to international markets.
- Direct air freight to overseas markets is likely too expensive option for most high volume, low margin agricultural produce.

Supply Chain Infrastructure Needed

- Containerisation facilities at Port of Mackay
- Road train access along Peak Downs Highway and Mackay-Slade Point Road to Port of Mackay
- Expanded rail siding at Bakers Creek
- Water supply and distribution (Urannah Dam, Collinsville Irrigation Scheme, Bowen Pipeline, Connors River Dam and Dysart Irrigation Scheme, Burdekin to Moranbah Pipeline Duplication)
- Common User Infrastructure opportunities including:
  - Freight distribution facilities at a regional airport
  - Phytosanitary treatment facilities
  - Multi-modal rail access in Bowen
  - Broadacre aggregation facilities in sugarcane farming areas

Pathway to New Markets

- Low risk options include contract production and exporting through existing product exporters. Producers can also leverage government-led programs.

Recommendations

- Advocate for policy change that supports development of alternative supply chains, increase in agricultural output and reduces the price of fuel in the supply chain
- Support new water infrastructure proposals in the region, and converting grazing land to broadacre or irrigated horticulture
- Support commercial fishing enterprises to take advantage of under utilised quotas
- Support cane farmers to incorporate rotational cropping into the sugarcane farming system
- Encourage the development of new aquaculture enterprises
- Promote local value adding industries to investors including:
  - Feedlotting
  - Chickpea Processing
  - Fruit and Vegetable Processing

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CRCNA

Preferred Export Markets

SOUTH KOREA
Current product opportunities
• Beef • Corn
Alternative Product Opportunities
• Wheat • Soybeans
• Coffee • Bananas

JAPAN
Current product opportunities
• Beef • Prawns • Fish • Sugar • Wheat
Alternative Product Opportunities
• Soybeans • Coffee • Bananas
• Offal • Prepared Fruit • Frozen Vegetables

USA
Current product opportunities
• Beef • Fish • Sugar • Tomatoes
• Capsicums • Beans • Mangoes
Alternative Product Opportunities
• Coffee • Prepared Fruit
• Avocados • Bananas • Grapes

ARAB GULF
Current product opportunities
• Livestock • Beef • Fish • Watermelons
• Mangoes • Wheat • Chickpea • Sugar
Alternative Product Opportunities
• Rice• Bananas• Dates • Soybeans

TAIWAN
Current product opportunities
• Beef • Prawns • Mangoes • Beans
Alternative Product Opportunities
• Avocados • Soybean • Corn • Wheat • Cotton

SINGAPORE
Current product opportunities
• Beef • Prawns
• Mangoes • Tomatoes
Alternative Product Opportunities
• Avocados • Rice
• Bananas • Cocoa Beans.

GREATER WHITSUNDAY REGION

NEW ZEALAND
Current product opportunities
• Watermelons • Prawns • Mangoes • Beans
• Capsicums • Tomatoes • Wheat • Raw Sugar
Alternative Product Opportunities
• Soybeans • Prepared Fruit • Bananas

EXECUTIVE SUMMARY

About this Report

To support the development of the agricultural sector in the Mackay Isaac Whitsunday (MIW) region, the Greater Whitsunday Alliance (GW3), in partnership with the Cooperative Research Centre for Northern Australia (CRCNA), Bowen Gumlu Growers Association (BGGA), Regional Development Australia Greater Whitsundays (RDA GW), North Queensland Bulk Ports, Mackay Airport and Queensland Department of Agriculture and Fisheries (DAF) have co-funded an economic analysis to understand the market, export potential and any barriers to success.

The primary objective of this document is to present the technical analysis developed for this project. The report provides an overview of key products for export in the Greater Whitsunday region and the preferred markets for each commodity. The information contained in this report is intended to be used in the following ways:

- Shape current and future government policy to remove barriers to investment in agribusiness supply chains
- De-risk the development of infrastructure required to enable more efficient supply chains
- Detail how GW3 and the Agribusiness Futures Alliance project steering committee members can drive behaviour change within the regional grower community. The findings will be used to identify how organisations can support more local agribusinesses into new supply chains and value adding and consumer/market ready opportunities.

Regional Agricultural Profile

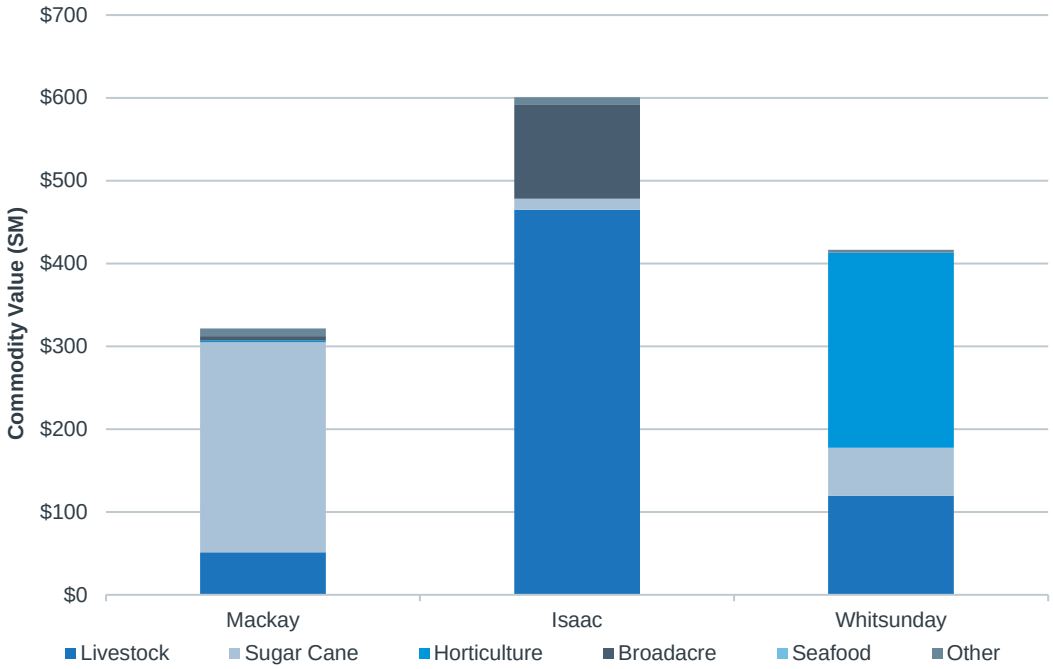
Agricultural production (Output) in the MIW region is estimated to be at $1.36 billion in 2019-20, contributing $462.7 million or 1.6% to the total GRP (agriculture contributes 2.2% to Queensland's Gross State Product). The Isaac LGA is the largest contributing LGA to agricultural output in the MIW region, with $604.9 million (43.1%), followed by Whitsunday with $421.65 million (30.0%) and Mackay $321.6 million (22.9%).

Livestock represents the largest industry by output value at $635.4 million, followed by sugarcane at $324.8 million, horticulture at $231.6 million, broadacre at $110.7 million and seafood at $59.6 million (aquaculture is valued at $55.1 million, compared to wild caught at $4.5 million).[1]

In addition to agricultural production, food manufacturing is also a key industry in the MIW region, contributing over $300 million to GRP in 2019-20. 44% of all manufacturing jobs in the Mackay LGA, 34% in Whitsunday LGA, and 3% in Isaac LGA are employed in food manufacturing. Food manufacturing is principally linked to the two major agricultural industries: livestock (for beef) and sugarcane (for sugar).

[1] There remain many gaps in data and understanding the true extent of horticultural production and value of horticultural production in Queensland and Australia. The data presented is the best available from the ABS.

Figure E.S.1 Contribution of Agriculture Sectors in MIW Region ($M)



Note:
- Other includes Hay, Nurseries, Cut flowers, Cultivated Turf and Livestock Products
- Aquaculture has been excluded as data is only available at the regional level

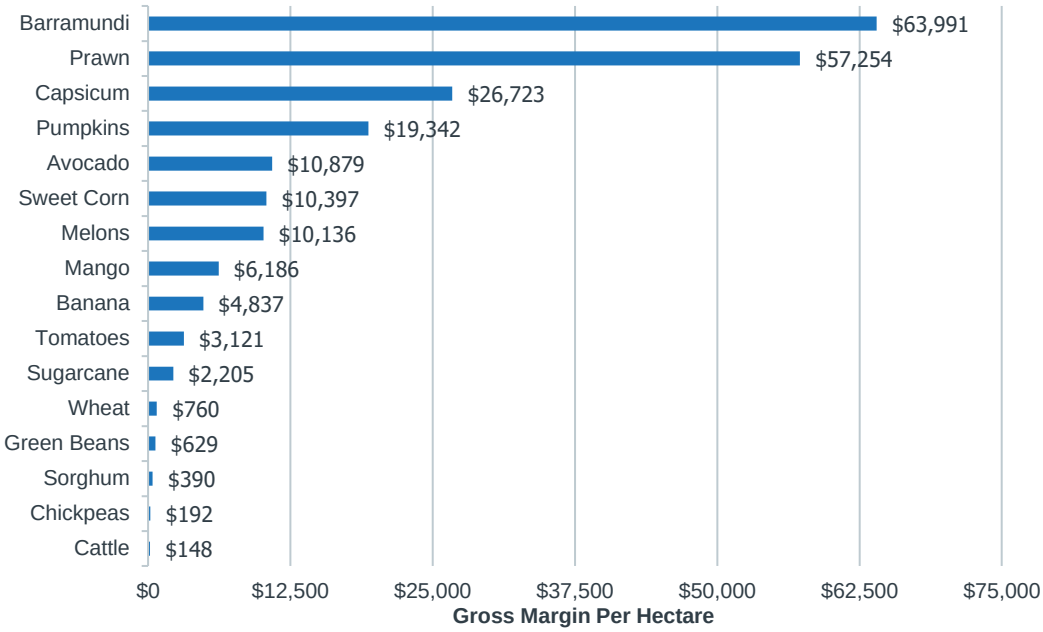
Source: AEC

Farm Margin Analysis

AEC prepared a gross margin analysis to explore the relative profitability of different types of agricultural production systems in the MIW region. The analysis shows that aquaculture produces the highest gross margin per hectare, followed by horticultural products, then sugarcane, broadacre and cattle.

It is important to note that the gross margin analysis does not incorporate return on and of capital invested.

Figure ES.2. Gross Margin Analysis (per Hectare) for Selected Commodities



Note:
- Cattle includes both breeding and backgrounding
- Gross margin only shows operating profit and does not incorporate return on or of capital in each enterprise

Source: AEC

Market Analysis

AEC assessed the market for key agricultural commodities produced in the MIW region. Broadly, the market assessment has found that:

- There is sufficient depth in Australia's existing export markets to support further exports to existing markets.
- Even in commodities with a declining per-capita consumption (such as beef and sugar), population growth means the global market for these products is expected to continue to grow.
- Australian consumption (on a per capita basis) of several commodities produced in the MIW region is substantially below global averages, presenting an opportunity to increase the domestic market for these products. Specific examples include: mangoes, tomatoes, capsicums and chillies, green beans and chickpeas.
- For most horticultural products, Australian producers are competing with countries with a lower cost basis, namely China, India, Brazil, Mexico and Turkey.
- Australia imports considerable volumes of seafood, a product which can be readily produced in the MIW region (both wild catch and land-based aquaculture).

Higher Value Production Opportunities

The MIW region has a number of opportunities to support higher value agricultural production. Across the Whitsundays and Isaac LGAs, there are numerous areas of contiguous good quality agricultural land that remain undeveloped. Developing these areas would not only increase the value of agricultural production, but the increased volumes (and potentially counter-seasonal production) could also support further development of the region's agricultural supply chains.

Aquaculture is a major development opportunity in the MIW region, with two designated Aquaculture Development Areas (ADAs) in the region – one being 316 hectares Northwest of Bowen and the other 2,126 hectares Northwest of Mackay. The MIW region also has considerable potential to develop commercial sea-based oyster and seaweed industries.

The Mackay LGA has two irrigation schemes (the Pioneer Valley Supply Scheme and the Eton Irrigation Scheme) that predominantly supply sugarcane farms. The certainty of water supply that comes with an irrigation scheme could support additional perennial cropping in the region, which may attract a higher return per hectare.

The MIW region has a number of proposed irrigation schemes and opportunities to expand irrigated agriculture. Combined, the irrigation opportunities that exist in the MIW region (such as the Urannah Dam and Collinsville Irrigation Scheme, Bowen Pipeline, Connors River Dam, a second pipeline from the Burdekin Dam to Moranbah, re-use of mine and gas affected water) could support an estimated additional 88,000 hectares of additional higher value irrigated broadacre or irrigated perennial cropping. For context, the existing irrigated horticultural production area in the MIW region is estimated to be 5,600 hectares – representing a 15-fold increase in potential irrigated agriculture production area.

The MIW region has considerable potential to incorporate rotational production of certain broadacre crops into the sugarcane production system, which can not only increase productivity of cane production, but also produce an alternative crop. Key opportunities include broadacre legumes (such as soybean).

The MIW does not have a significant feedlot industry despite having a large cattle herd and a major abattoir. Developing a local feed lotting industry could provide an opportunity to not only improve value in livestock in the region, but also provide a new market for additional broadacre production in the region.

Agricultural Supply Chains

As a major agricultural region, nearly all agricultural output is moved beyond the MIW region to processors and customers in both Australia's major population centres and internationally.

Agricultural commodities produced in the MIW region have established supply chains that work effectively to meet the region's needs. For example, horticultural produce from the Bowen region does have access to the required cold chain and road transport. Sugar and grains also have dedicated facilities both connecting to and at the Port of Mackay for storage and export.

The key challenge for producers in the MIW region is distance to market. Where product is grown closer to major domestic markets (and major produce export ports adjacent to these markets), MIW producers are relatively less competitive due to higher transport costs – a simple factor of distance, not an inefficiency in the transport value chain. This is true for most agricultural product in the region.

However, the MIW region has a number of products that are relatively closer to market/end use than other producing regions, such as sorghum and mangoes.

Supply Chain Infrastructure

The MIW region has high quality infrastructure that has been established to support efficient supply chain movement and value adding of agricultural product prior to export. The key value adding infrastructure in the MIW region includes the five sugar mills and a sugar refinery, as well as two abattoirs and a seafood processing plant (exclusively for Tassal product) near Proserpine. The dedicated supply chain infrastructure in the MIW region includes three livestock sale yards (which have very low throughput, relative to sale yards in nearby regions), upcountry grain receival and dedicated port storage and export facilities, as well as a sugarcane rail network, sugar receival, port storage and export facilities for the sugar industry.

Currently, all perishable produce (notably horticulture and live seafood) exported through air freight utilise either the Cairns or Brisbane airports. The MIW region has a number of airports that can support domestic air freight but require airline freight and ground handling capacity (including cold storage at the airport). The MIW region's airports would require infrastructure upgrades to support the wide-bodied aircraft used for international air freight.

The Port of Mackay currently supports bulk product export (principally grains and sugar). Agricultural product exported in containers (including refrigerated containers) utilise both the Port of Brisbane and to a lesser extent, the Port of Townsville, as these ports have regular access to international shipping lines. With the development of the required infrastructure (such as a container crane, multi-modal terminal and container farm), the Port of Mackay can be well placed to support coastal shipping, providing additional competition into the region's freight market, while providing direct wharf-side connectivity to export ports.

Beyond the physical supply chain, the MIW region has a number of gaps in the export value chain. The MIW region's lack of phytosanitary treatment providers, in-region freight forwarders and exporters mean local horticultural producers are, in most circumstances, committed to supplying product to the Brisbane markets.

Additional gaps in the MIW region's agricultural value chain includes:

- Livestock feedlotting and additional abattoir capacity in the beef industry
- A live export port
- Processing and packing capacity for chickpeas
- Broadacre aggregation facilities in coastal areas to support rotational cropping in the sugarcane industry.

Market Identification

A Multi-Criteria Assessment (MCA) is the formal market identification process used to identify export market opportunities for agricultural products in the MIW region. The criteria used in the MCA included an assessment of the market opportunity (whether the country was an importer of MIW produced agricultural commodities), existing trade relationships (and those currently under negotiation), direct air and sea connectivity, as well as a range of global economic indicators, such as GDP per capita (representing capacity to pay) and arable land per capita (representing need for food imports).

The following target markets have been identified as potential export opportunities:

Table ES.1 Summary of Market Identification

Country	Current Product Opportunities	Alternative Product Opportunities
Singapore	Beef, prawns, mangoes, tomatoes.	Avocados, rice, bananas and cocoa beans.
Japan	Beef, prawns, fish, sugar, and wheat	Soybeans, coffee, bananas, offal, prepared fruit and frozen vegetables

Country	Current Product Opportunities	Alternative Product Opportunities
USA	Beef, fish, sugar, tomatoes, capsicums, beans, and mangoes	Coffee, prepared fruit, avocados, bananas, and grapes
Taiwan	Beef, prawns, mangoes, and beans	Avocados, soybean, corn, wheat, and cotton
South Korea	Beef, corn	Wheat, soybeans, coffee, and bananas
Arab Gulf countries	Livestock, beef, fish, watermelons, mangoes, wheat, chickpea, and sugar	Rice, bananas, dates, and soybeans
New Zealand	Watermelons, prawns, mangoes, beans, capsicums, tomatoes, wheat, and raw sugar	Soybeans, prepared fruit, and bananas

Source: AEC

Despite being a large exporter of agricultural product, Australia continues to import large volumes of certain food products that could be produced in Australia. Key products produced in the MIW region that Australia imports include capsicum (from New Zealand) and large volumes of seafood (from South East Asia).

Food products that are currently imported but could potentially be produced and manufactured in the region include soybean cake, prepared fruit, coffee, rice, animal feed and beverages (both distilled alcoholic and non-alcoholic). The total market value of these products alone is estimated to be $3.5 billion (US$2.5 billion).

Alternative Supply Chains

To examine the potential viability of alternative supply chains, AEC explored the order of magnitude costs of transporting a product from the MIW region to an export port, then to target markets. The core transport costs such as road, sea and air movement (both freighter and cargo) were included, however common costs, such as phytosanitary treatment, agent costs and ground handling were excluded.

There are two key findings to this analysis:

1 Although it seems counter-intuitive to send products south from the MIW region (to Brisbane), only for them to travel north again to their ultimate destination, the cost of road transport is a small component of total cost of getting products to international markets.

2 On a direct comparison, air freight (especially dedicated air freight services) is generally more expensive than other options and is likely too expensive for most high volume, low margin agricultural produce.

It is important to note that although certain agricultural products (such as mangoes) may have a high value relative to other agricultural products, they are lower value when compared to the types of products that are usually moved by air freight, such as urgent machinery parts, medical equipment and high-value consumer products, such as jewellery. The seasonal nature of agricultural produce is also a challenge for freight providers.

Pathway to Market

There are a range of different pathways to market for local producers. While reaching further into the supply chain (such as direct exporting) may capture additional value, it can also come at high risk, which may be beyond the capacity of many small and medium-scale producers.

Lower risk export options include contract production for major food businesses in target markets (where food is produced in accordance with pre-agreed quality and price parameters) or to export through existing product exporters in established markets.

For producers interested in direct exporting, there are a range of government-led programs that can support business-to-business relationship development and ensure compliance with both export and import requirements.

Supply Chain Development Opportunities

Generally, the MIW region has efficient, fit-for-purpose supply chains. The primary driver for the region's higher cost supply chains is distance from market.

While the MIW region has a number of opportunities to increase the value of agricultural output, these opportunities are generally not constrained by problems in the supply chain.

When considering access to new markets, direct export opportunities are limited by the lack direct sea and air connections to international markets. Establishing these connections will require a cross-sectoral demand for the freight services and considerably higher volumes of production.

There are a number of specific trade barriers that may impede exports from the MIW region, but Australia does have market access to most key markets with established Free Trade Agreements (FTAs).

Australia imports a range of agricultural products. Supplying the domestic market is a lower risk option to pursuing new export markets.

There are several infrastructure investments and policy changes that the Queensland Government can make to support more efficient freight movement and increased agricultural production in the MIW region. These include:

- New public infrastructure, such as: containerisation (incl multi-modal container handling) at Mackay Port to support coastal shipping, road upgrades for improved port access, flood resilience and road safety, and the development of an international airport to support direct export opportunities.
- New common user infrastructure, such as: freight distribution facilities at a regional airport, phytosanitary treatment facilities, multi-modal rail access in Bowen, and broadacre aggregation facilities in sugarcane producing areas to support greater participation in rotational cropping opportunities.
- Water infrastructure, such as: Urannah Dam and Collinsville Irrigation Area, Raising Burdekin Falls Dam and the Bowen Pipeline, duplicating the Burdekin to Moranbah Pipeline, the Connors River Dam and irrigation scheme and water treatment and distribution of mine and gas affected water.
- Policy changes include: implementing stated coastal shipping policies, supporting international airline route development (in conjunction with the required infrastructure upgrades), reducing taxation of liquid fuels, improving the availability of soil suitability and market price data (especially for fruit and vegetables and seafood), proactively approving aquaculture developments within set performance frameworks, removing tree clearing restrictions on broadacre and livestock industries, replacing current Great Barrier Reef protection regulations with incentive programmes, and facilitating improvements to catchment water trading.

There are a range of private investment opportunities, across a range of commodities, in the region that can take advantage of identified supply chain opportunities.

Recommendations

As the MIW region's economic development organisation, there is a role for GW3 to pursue specific policy changes and infrastructure investments that can improve the economic performance of the MIW region. These include:

- Advocate for policy change that supports development of alternative supply chains (such as coastal shipping and international passenger route development)
- Advocate for policy change to enable increased agricultural output (such as removal of land management restrictions)
- Advocate for policy change to reduce the price of fuel throughout the agricultural supply chain, such as reducing taxes on fuels which account for approximately 40% of retail prices.

GW3 is also uniquely placed to de-risk specific investment opportunities and deliver a place-based, regional agribusiness investment attraction campaign for the whole region. Focus opportunities could include realising higher value opportunities, such as:

- Considering the opportunities associated with new water infrastructure proposals in there region, landholders could transition from cattle grazing only enterprise to a mixed grazing/broadacre or irrigated horticultural farming enterprise, which generate higher economic returns.
- Incorporating a rotational horticultural or broadacre crop in the sugarcane farming system
- Developing new aquaculture enterprises
- Developing local value adding industries, such as feedlotting, chickpea processing or fruit and vegetable processing

- Commercial fishing enterprises, to take advantage of under-utilised quotas

Industry associations in the MIW region (either commodity-based, such as AgForce or Queensland Seafood Industry Association or those with a specific geographic interest, such as Bowen-Gumlu Growers Association) have an opportunity to support their members realise additional development opportunities.

The specific lines of effort industry associations can offer include:

- Market development efforts (in partnership with national commodity associations and TIQ/Austrade)
- Regular provision of commodity price and production benchmarking data.

The CRCNA's future research program can support additional de-risking and development of both supply chain improvement and agricultural production opportunities identified in this research. Specific opportunities include:

- For supply chain development, research focus needs to expand to all freight products and two-way trade. Successful supply chain development requires multiple commodities and two-way freight volumes.
- For specific agricultural commodity market access, a pan-northern approach should be taken as major commodities are grown across geographical regions and success in market access will require geographic diversity in production.
- Explore the viability of alternate crop production in Northern Australia, specifically for raw and processed products that have an identified market opportunity in target markets (as outlined in Chapter 8), such as rice, dates, coffee and soybean, prepared fruit and frozen vegetables.

TABLE OF CONTENTS

1. INTRODUCTION

1.1 BACKGROUND

As part of the Australian Government's commitment to developing Northern Australia, the Cooperative Research Centre for Northern Australia (CRCNA) has co-funded the de-risking and development of agricultural export supply chains from Northern Australia. To date, agricultural export supply chain analysis has occurred in the Mackay, Isaac Whitsunday region (MIW) (in partnership with the Greater Whitsunday Alliance – GW3), North Queensland (in partnership with Townsville Enterprise) and Far North Queensland (in partnership with Advance Cairns).

The MIW report highlighted supply capacity constraints for the region's major commodities, however, it did not identify the key regional agricultural products for export. The report also did not consider the associated potential export markets for the key export commodities.

The export opportunities for MIW agricultural produce require further investigation to understand the market, export potential and any barriers to success. As a result, GW3 has engaged Australian Economic Consultants (AEC) to explore international demand for MIW agricultural produce and chart a pathway to realising the identified opportunities.

1.2 PURPOSE OF THIS REPORT

The primary objective of this document is to present the technical analysis developed for this project. The report provides an overview of key products for export in the Greater Whitsunday region and the preferred markets for each commodity. The information contained in this report is intended to be used in the following ways:

- Shape current and future government policy to remove barriers to investment in agribusiness supply chains
- De-risk the development of infrastructure required to enable more efficient supply chains
- Detail how GW3 and the Agribusiness Futures Alliance project steering committee members can drive behaviour change within the regional grower community. The findings will be used to identify how organisations can support more local agribusinesses into new supply chains and value adding and consumer/market ready opportunities.

1.3 APPROACH

The report is structured as follows:

- **Agricultural Production Profile (Chapter 2):** Outlines the Mackay Isaac Whitsunday (MIW) region's agricultural commodities and their production, as well as key productivity and price indicators.
- **Commodity Margin Analysis (Chapter 3):** Identifies the operating margin per hectare of production of key agricultural commodities in the MIW region. The operating margin is used to show both the relative profitability of the activity and the opportunity for highest and best value use of land.
- **Commodity Market Analysis (Chapter 4):** Provides an overview of global production, trade and consumption trends for key agricultural commodities.
- **Higher Value Production Opportunities (Chapter 5):** This section identifies where additional and higher value agricultural activity could occur across the MIW region.
- **Agricultural Supply Chains (Chapter 6):** Profiles and maps the key commodity supply chain. This section also explores the relative cost of the MIW supply chain, compared to other major producing regions in Australia.
- **Supply Chain Infrastructure (Chapter 7):** Profiles the exiting industry-specific value adding and industry specific logistics infrastructure. This section also profiles region's air and sea infrastructure that forms part of the export supply chains from the MIW region.
- **Market Identification (Chapter 8):** Identifies the potential market opportunities for the region's agricultural production through a Multi-Criteria Assessment (MCA). This section also identifies potentially favourable new commodities that could be produced in the region and exported to target markets.

- **Alternative Supply Chains (Chapter 9):** Explores the relative costs of different supply chain routes and methods for accessing potential markets.
- **Pathway to Market (Chapter 10):** Identifies ways producers in the MIW region can access new markets and different commercial supply methods that could be employed.
- **Supply Chain Development Opportunities (Chapter 11):** Identifies key findings of the analysis and opportunities to improve the value of agricultural supply chains from the MIW region with a focus on infrastructure, policy, trade and investment.
- **Recommendations (Chapter 12):** Provides a number of recommendations to GW3 and the CRCNA on how to implement the findings of this analysis.

2. REGIONAL AGRICULTURAL PROFILE

KEY TAKEAWAYS

Value of Agricultural Production

Agricultural production in the MIW region is estimated to be at $1.36 billion in 2019-20, contributing $462.7 million or 1.6% to the total GRP (agriculture contributes 2.2% to Queensland's Gross State Product).

The Isaac LGA is the largest contributing LGA in the MIW region, with $604.9 million (43.1%), followed by Whitsunday with $421.65 million (30.0%) and Mackay $321.6 million (22.9%).

In addition to agricultural production, food manufacturing is also a key industry in the MIW region, contributing over $300 million to GRP in 2019-20. 44% of all manufacturing jobs in the Mackay LGA, 34% in Whitsunday LGA, and 3% in Isaac LGA employed in food manufacturing. Food manufacturing is principally linked to the two major agricultural industries: livestock (for beef) and sugarcane (for sugar).

Livestock

The livestock industry is the largest contributor to the MIW region's agricultural production contributing $635.4 million in 2019-20 (46.7% of total agricultural value). The MIW Region accounts for 9.7% of industry value in Queensland and 4.4% in Australia.

The MIW region is home to a herd of approximately 1 million cattle, accounting for 9.7% of the Queensland herd or 4.3% of the Australian herd. The MIW region is the 7th largest cattle producing region in Australia. Despite having a relatively large herd, the region has a relatively low carrying capacity at 0.11 head per hectare with only 0.32% of the MIW region's grazing land mapped as improved pasture.

The Isaac LGA has the largest share of the regional herd with approximately 673,487 head of cattle (59.1% of region) and the balance in the Whitsunday (253,228 head, 22.2%) and Mackay (213,560 head, 18.7%) LGAs.

Prices received for livestock (and beef) have been increasing since 2013 and are now at record levels.

Sugarcane

Sugarcane is the region's second largest contributor to agricultural production in the MIW region, accounting for 24.9% of agricultural production ($324.8 million).

The Mackay LGA is the largest contributor (78.1%) at $202.9 million, followed by Whitsundays LGA/Proserpine milling area (17.8%) at $46.3 million and Isaac LGA/Plane Creek milling area (4.1%) at $10.5 million. The MIW region is the second largest sugarcane producing region, producing 27.3% of total Queensland production.

Sugarcane yields in the MIW region are below industry averages, but this is offset by higher than average sugar content in the cane (CCS), producing industry average yields of sugar per hectare (10-11 t/ha).

As global sugar prices have reached near record highs, cane prices are also at near record levels.

Horticulture

Horticulture contributed $231.6 million to the region's agricultural production in 2019-20, accounting for 17% of agricultural output by value. The Whitsundays region is the predominate horticultural area accounting for 99.9% of the total value.

The MIW region produces a range of horticultural products, but tomatoes, capsicums and sweet corn form most of the horticultural production value (50%, 21.7% and 14.4% of total value respectively). The MIW region is also the largest green bean producing region in Australia.

Prices received for horticultural products are generally flat with fluctuations driven by short-term supply and demand changes.

It is important to note that there remain many gaps in data and understanding the true extent of horticultural production and value of horticultural production in Queensland and Australia. The data presented is the best available from the ABS.

Broadacre

Broadacre cropping (not including sugarcane) contributed $110.7 million to the region's agricultural output in 2019-20. The Isaac LGA is the primary region for broadacre cropping accounting for 99.6% of the total value.

Chickpeas account for 46% of broadacre production value ($51 million), followed by sorghum at 30.5% ($33.7 million) and wheat at 23.5% ($26 million). Historically, sorghum has been the predominant broadacre crop in the region, until 2019-20 when surpassed by chickpeas. Wheat production in the region is highly variable. The MIW region is the second largest sorghum and chickpea producing region in Australia.

Broadacre crop yields in the MIW region are above the national average. Chickpea yields are consistently improving beyond the national average.

Prices received have been generally increasing across all broadacre products, with the exception of chickpeas which are currently around $700 per tonne, 20% below their 2015-16 peak of $1,100 per tonne, but still above long term average price of approximately $500 per tonne.

Seafood

Despite having considerable access to the East Coast Inshore Fishery across three ports (Bowen, Mackay and Airlie Beach), the value of wild caught seafood is estimated to be $4.5 million in 2019-20, considerably less than the value of aquacultural production, estimated at $55.1 million.

The key species farmed in the region include barramundi and tiger prawns. The key species caught in the region include Coral trout, Prawns, Barramundi, Spanish Mackerel and Red Throat Emperor. Red coral trout are a caught and exported live to Hong Kong.

Aquacultural yields in the MIW region are considerably higher than Queensland averages. However, quota utilization of most wild catch species in the MIW region is low and decreasing.

Prices received for fish species have been generally static over time, whereas crustacean prices have been slowly increasing.

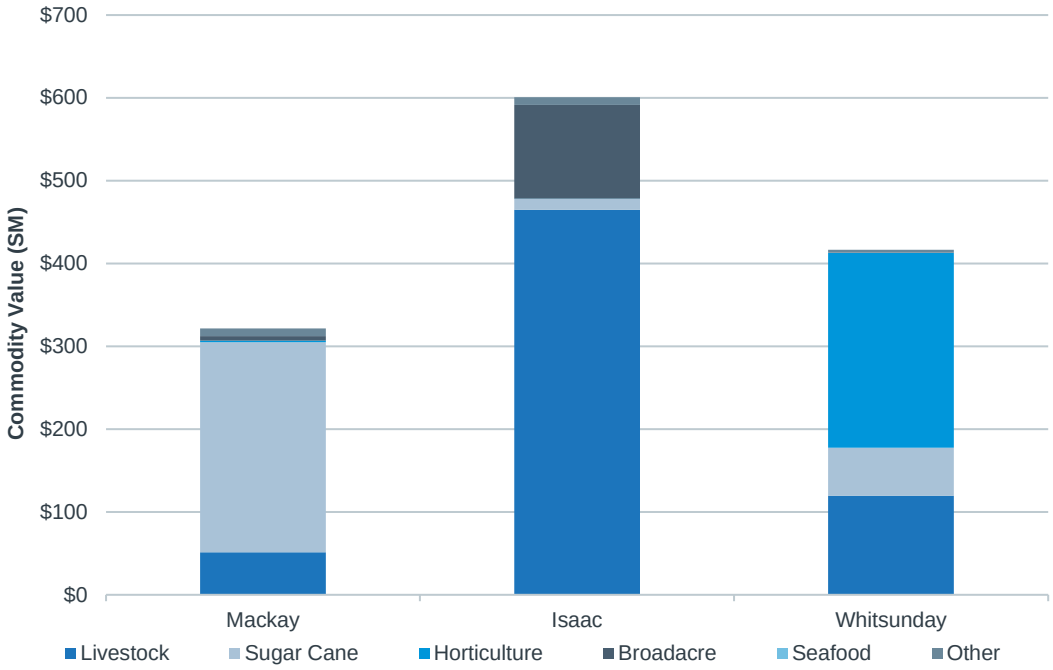
2.1 REGIONAL OVERVIEW

The Mackay-Isaac-Whitsunday (MIW) Region is home to a diverse range of agricultural industries producing a range of livestock, broadacre (including sugarcane), horticultural (both annual and perennial) and seafood products.

Value of Agricultural Production

The total value of agricultural production (Output) in the region is estimated at $1,356 million in 2019-20. As shown in Figure 2.1 below, the Isaac LGA contributes the highest value of agricultural production in the region at $542.9 million, followed by Whitsunday at $300.1 million and Mackay $255 million. Livestock represents the largest industry by output value at $635.4 million, followed by broadacre at $443.6 million (notably sugarcane at $324.8 million), horticulture at $231.6 million. Although not graphed below, Aquaculture contributed $55.1 million to the MIW agricultural production in 2019-20 with seafood contributing $4 million.

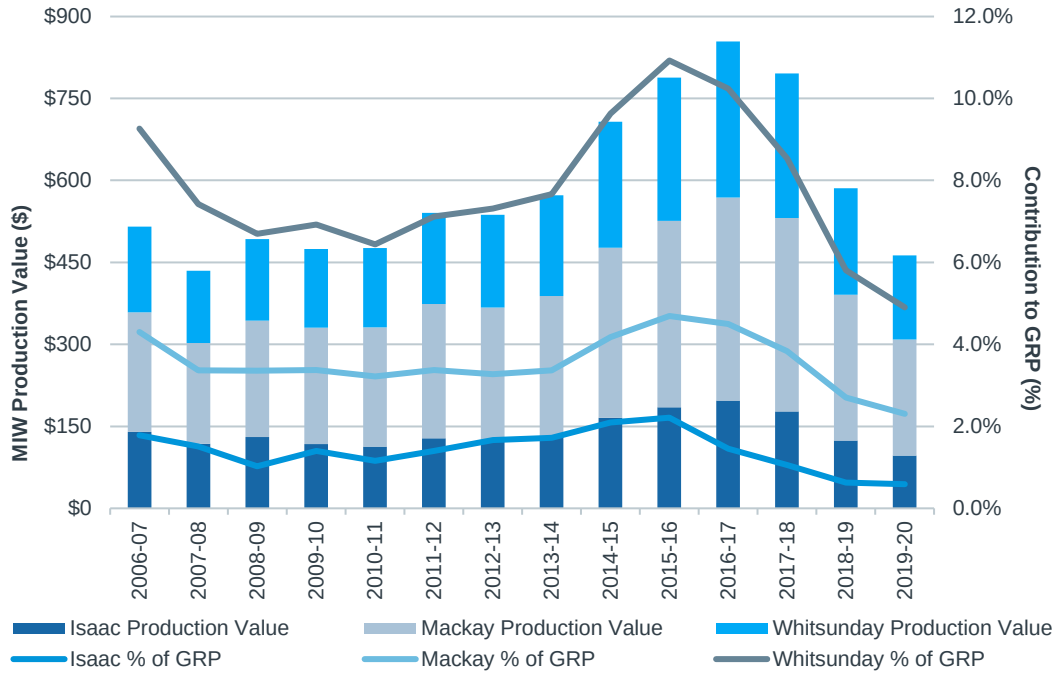
Figure 2.1. Breakdown of the value of MIW Agricultural Industries by LGA



Source: ABS (2017)

As demonstrated in Figure 2.2, the value of agricultural production in the MIW Region has fluctuated over time. Notably, the proportional contribution of the agricultural sector to the region's economy has declined over time as the value of other sectors have grown faster than agriculture (principally coal mining).

Figure 2.2. Breakdown of the value of MIW Agricultural Industries by LGA

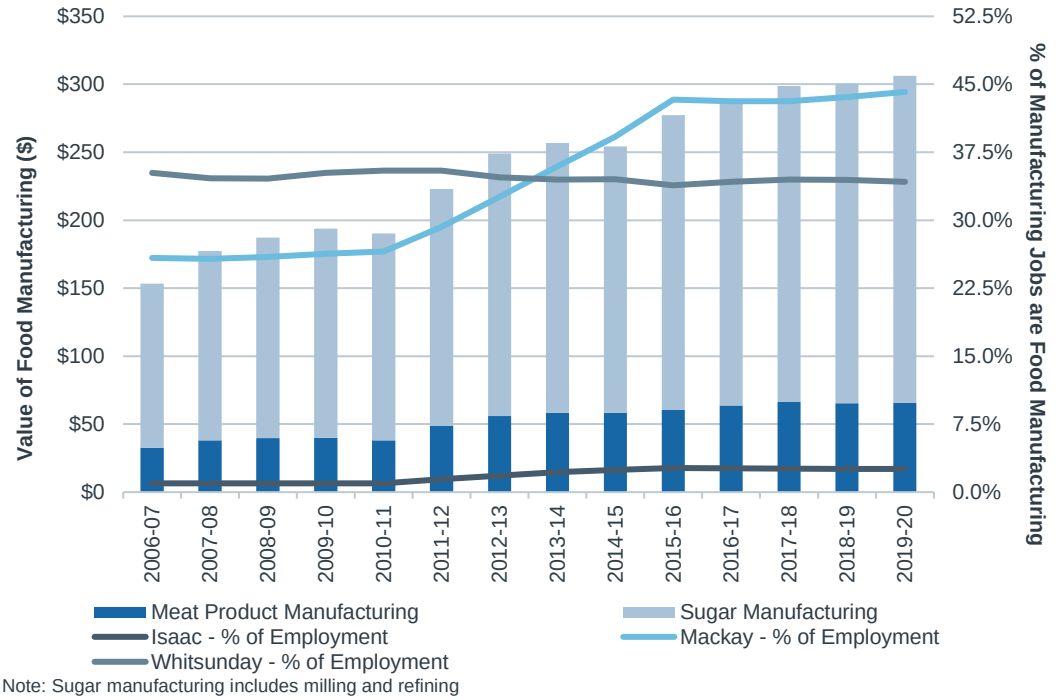


Source: AEC (unpublished).

Value of Food Manufacturing

The MIW Region is home to a number of food manufacturers (e.g. sugar mills and meat processors), which form an important part of the region's agricultural supply chains. Figure 2.3 below shows the estimated value of food manufacturing in the region and the change in importance of food manufacturing to the region's manufacturing sector.

Figure 2.3. Breakdown of the value of MIW Agricultural Industries by LGA



Note: Sugar manufacturing includes milling and refining
Source: AEC (unpublished).

2.2 LIVESTOCK

2.2.1 Production

Regional Value

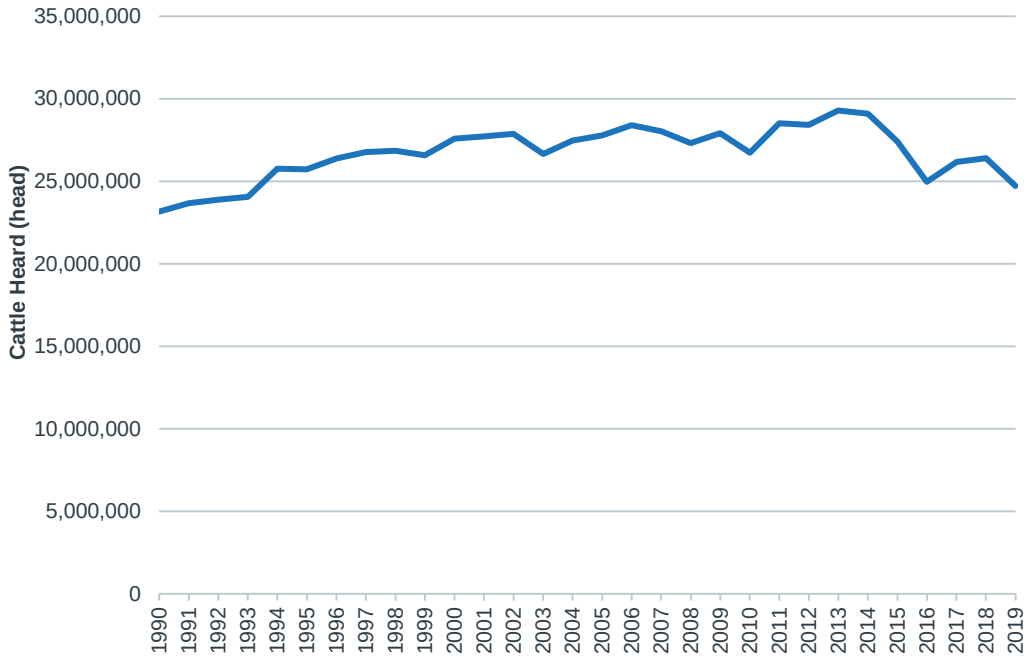
The livestock industry is the largest contributor to the region's agricultural sector, contributing $635.4 million in 2019-20 (47.4% of total agricultural value). The MIW region accounts for 9.7% of industry value in Queensland and 4.4% in Australia.

In the MIW region, the livestock industry is dominated by beef cattle production, accounting for 99% of industry value. The remaining value is attributed to local milk production, which is not a regionally significant industry.

Australian Production

Australia's cattle herd experienced a peak in 2013, totalling 29.3 million heads. From 2013 to 2016 saw a large decrease in the national herd size by a decrease of 4.3 million seeing the largest drop in 30 years. This is largely a result of the flood driven herd losses over 2015 and 2016 particularly in south-east Queensland. The floods, combined with the drought, have placed continued pressure on herd numbers since 2016. Additionally, the 2019 floods in Townsville and the north-west had a significant impact on the cattle herd.

Figure 2.4. Cattle Herd (head), 1990 to 2019



Source: FAO (2021a).

Production by State

In 2019-20, approximately 49% of Australia's meat cattle herd was situated within Queensland. New South Wales was the second largest state/territory for meat cattle numbers, with a herd totalling approximately 17% of Australia's total herd numbers.

Table 2.1. Beef Cattle Numbers by State (2019-20)

State	Livestock - Beef Cattle
QLD	10,381,265
NSW	3,602,633
VIC	2,045,367
WA	1,922,969
NT	1,798,845
SA	908,138
TAS	480,248
ACT	2,371
Total	**21,141,836**

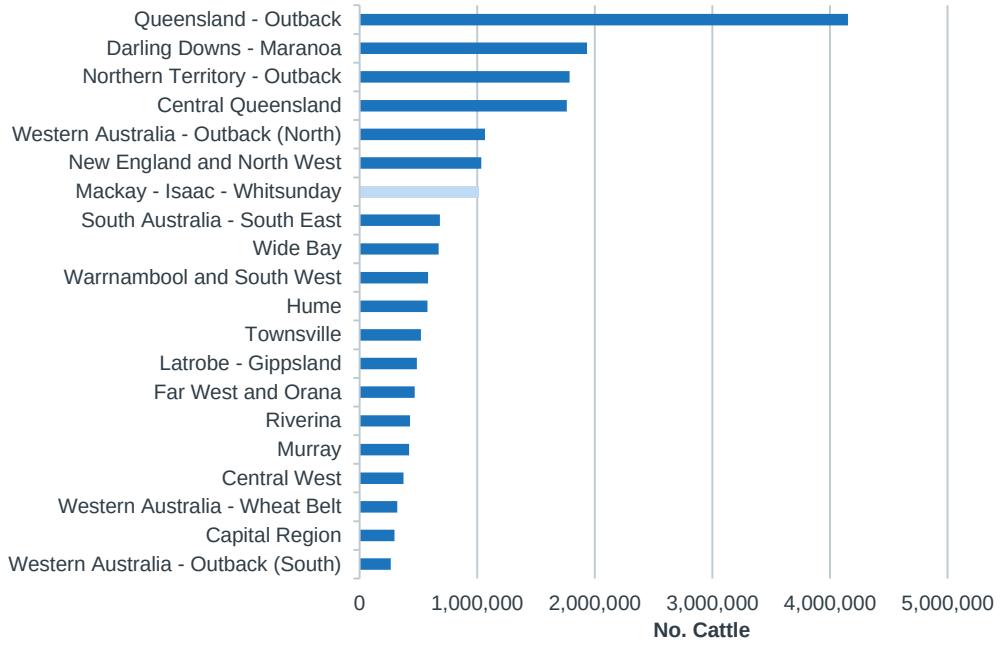
Source: ABS (2021).

Production by Region

The MIW region has a herd of approximately 1 million cattle, 9.7% of the Queensland and 4.3% of the Australian herd (ABS, 2021). Most of the regional herd is in the Isaac LGA (673,487 head, 59.1%) and the balance in the Whitsunday (253,228 head, 22.2%) and Mackay (213,560 head, 18.7%) LGAs.

Figure 2.5 below shows the relative strength of the MIW region herd compared to other major producing regions and the local distribution of the herd.

Figure 2.5. Primary Beef Cattle Producing Regions (SA4) in Australia 2019-20



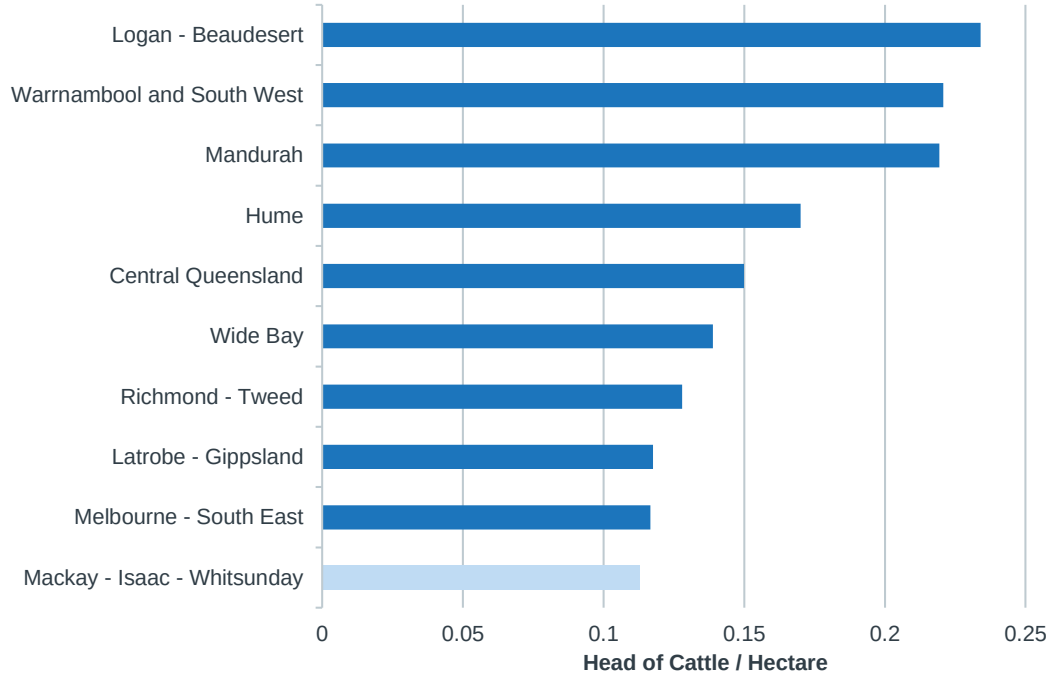
Source: ABS (2021).

2.2.2 Productivity

Livestock Carrying Capacity

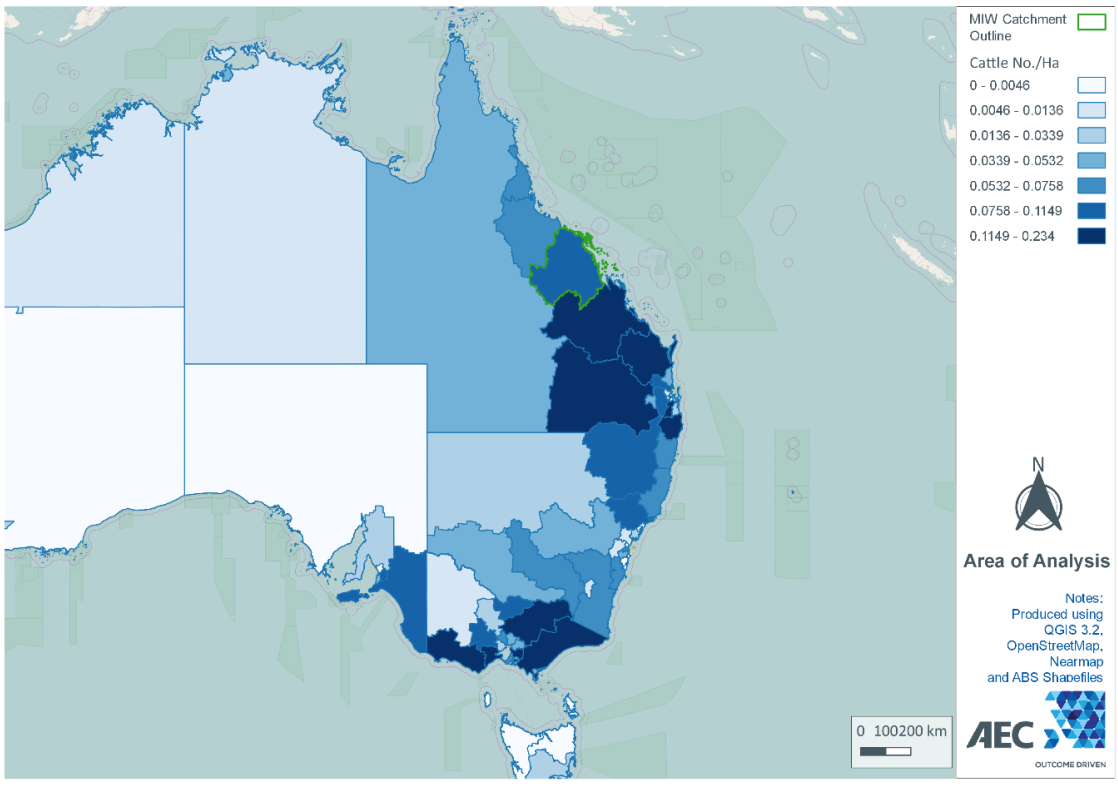
A key measure of beef industry production capacity is carrying capacity, which is defined as the number of livestock that can be sustained in a landscape (either natural or improved). Figure 2.6 and Figure 2.7 show the relative productivity of beef cattle production in the MIW region.

Figure 2.6. Relative Productivity of Beef Cattle Producing Regions (SA4) in Australia 2019-20



Source: ABS (2021).

Figure 2.7. Relative Productivity of Beef Cattle Producing Regions (SA4) in Australia 2019-20



Source: ABS (2021).

Improved Pastures

The MIW region has an improved pasture percentage of 0.32% which is less than the neighbouring Central Queensland which has improved pasture percentage of 1.16%. Outback areas of Northern Territory and Western Australia (North) have lower improved pasture percentages with 0.20% and 0.01% respectively while Queensland – Outback has improved pasture percentage of less than 0.01%. The Darling Downs - Maranoa region has an improved pasture percentage of 0.17%.

Table 2.2. Improved Pastures, SA4 Regions Australia

Region	% Grazing Land is Improved Pastures
New England and North West	29.13%
Central Queensland	1.16%
Mackay-Isaac-Whitsunday	0.32%
Northern Territory - Outback	0.20%
Darling Downs - Maranoa	0.17%
Western Australia - Outback (North)	0.01%
Queensland - Outback	<0.01%

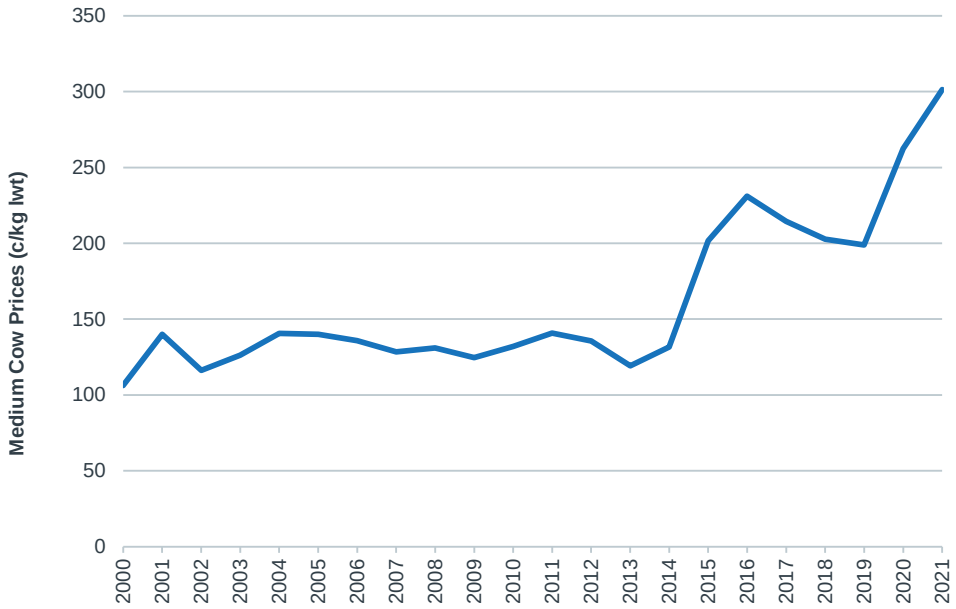
Note: Only includes regions with > 1,000,000 cattle.
Source: ABARES (2021e).

2.2.3 Commodity Prices

Cattle Prices

The chart below shows that in 2021, medium cow prices at Queensland saleyards totalled 301.4c/kg lwt. This is by far the highest price achieved over the entire 21-year analysis period.

Figure 2.8. Queensland Saleyard Indicator, 2000 to 2021

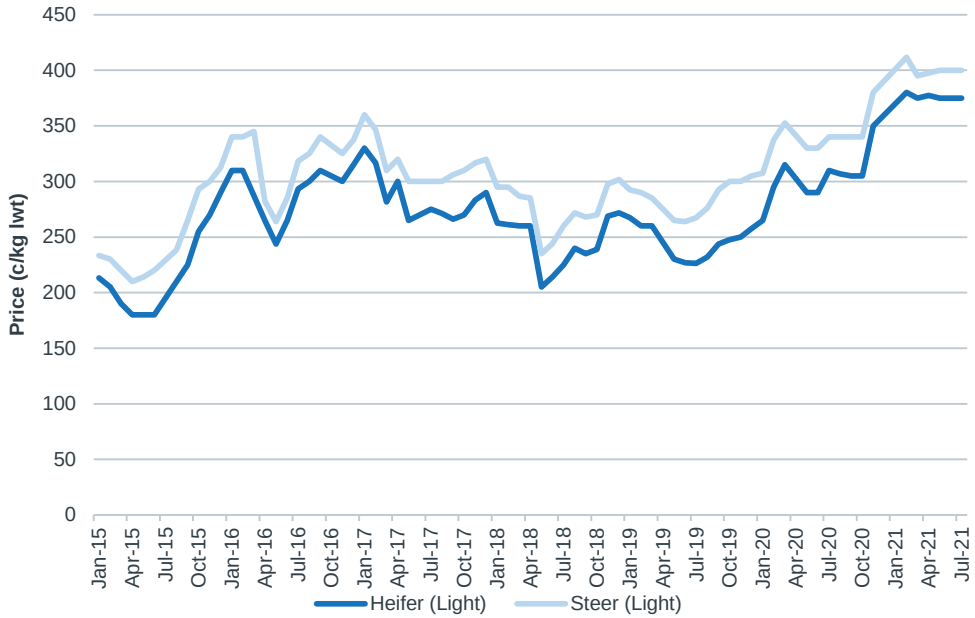


Note: 2021 data is reported up until the 9th November 2021.
Source: MLA (2021a).

Live Export Prices

The chart below shows that live export prices have been increasing in line with prices at Queensland saleyards.

Figure 2.9. Live Export Prices at Port of Townsville, 2015 to 2021

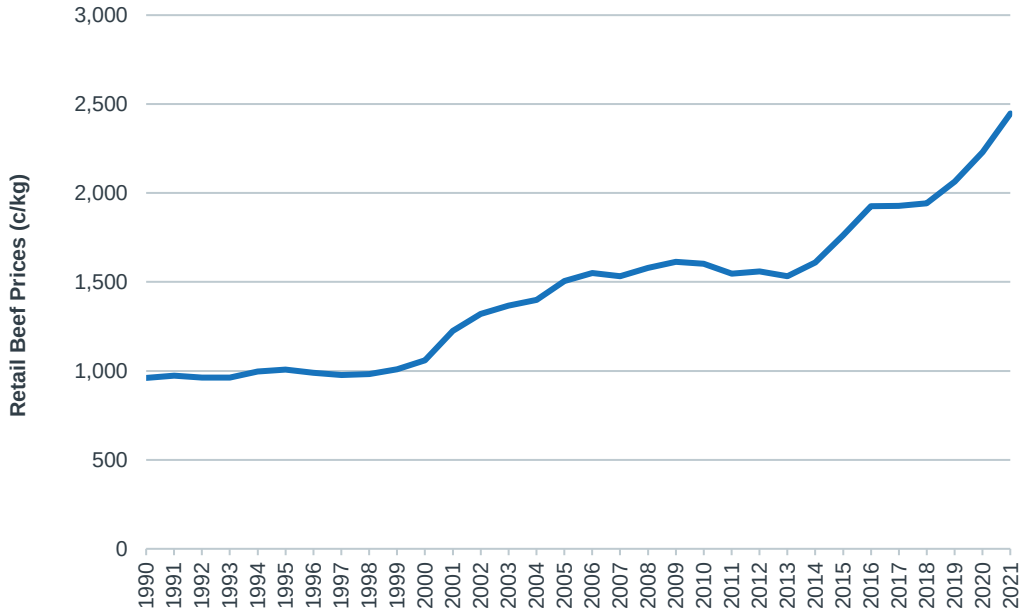


Source: MLA (2021)

Beef Prices

From 1990 to 2000, the prices of beef remained relatively steady. Since 2000, prices have steadily risen due to drought, now reaching a high point of 2,446 c/kg, reflecting pricing trends in Queensland's sale yards.

Figure 2.10. Retail Beef Prices (c/kg)



Source: MLA (2021a).

2.3 SUGARCANE

2.3.1 Production

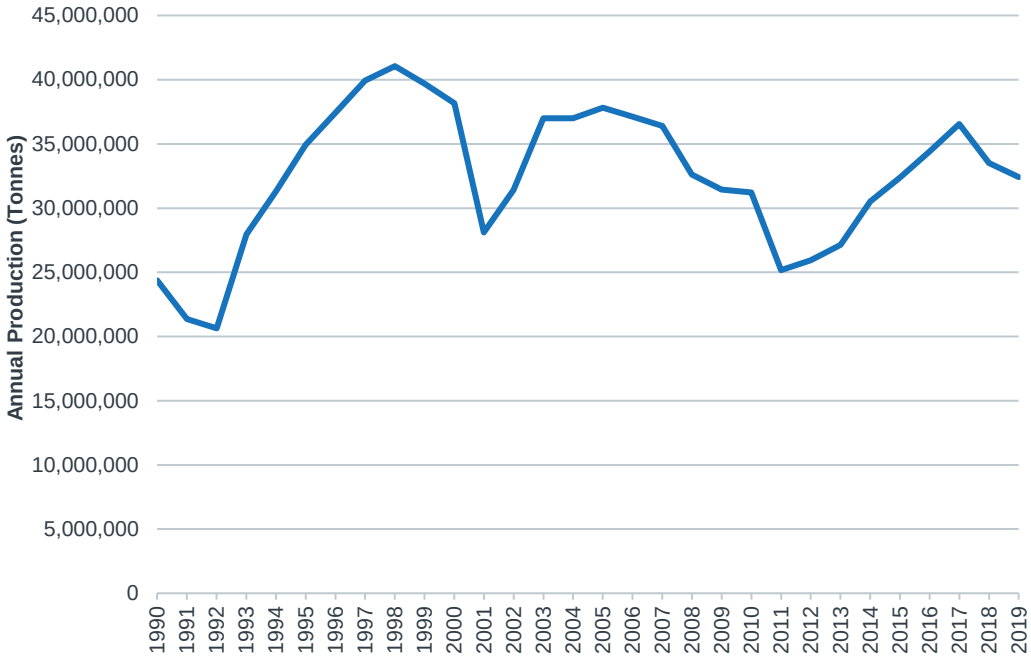
Production Value

In 2019-20, sugarcane production was valued at $324.8 million, 24.3% of the total value of MIW agricultural production. The Mackay LGA provides the largest contribution (78.1%) at $202.9 million, followed by Whitsundays LGA/Proserpine milling area (17.8%) at $46.3 million and Isaac LGA/Plane Creek milling area (4.1%) at $10.5 million. Sugarcane production in the MIW region contributes 27.3% of total Queensland production.

Australian Production

Australia's production of sugarcane experienced a peak in 1998, totalling 41.1 million tonnes. Growth of sugarcane production was strong in the early 1990's, however growth has softened throughout the 2000's. Since 2010, the average annual growth rate of sugarcane production in Australia was 0.4% per annum through to 2019.

Figure 2.11. Australian Production (Sugarcane), 1990 to 2019



Source: FAO (2021a).

Production by State

In 2019-20, Queensland was the largest producer of Australian sugarcane, accounting for 95% of Australia's total production. This was followed by New South Wales which accounted for the remaining 5% of total production in 2019-20.

Table 2.3. Sugarcane Production by State (2019-20)

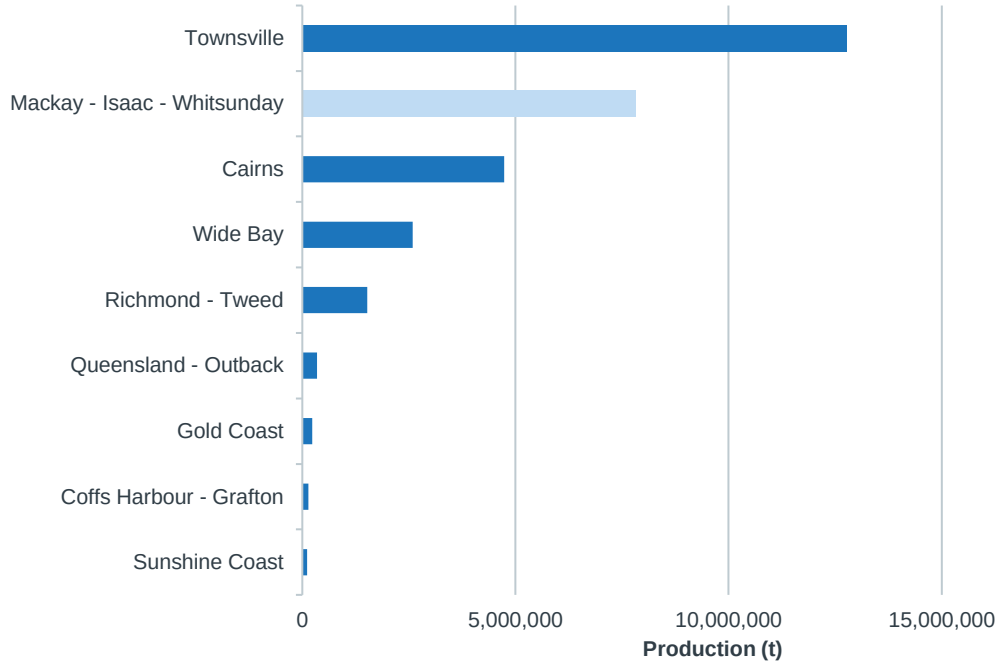
State	Production (t)	Total area (ha)
QLD	28,621,034	382,558
NSW	1,662,423	21,608
Total	**30,283,457**	**404,166**

Note: States/Territories that are not included do not have any values attributed to the crop.
Source: ABS (2021).

Production by Region

The MIW region is the second highest producing sugar cane region in Australia with an annual production of 7.8 million tonnes or 25.8% of the annual national production during 2019-20. Townsville was the highest producing region in the state and produced 12.8 million tonnes or 42.2% of the annual national production.

Figure 2.12. Primary Sugarcane Producing Regions (SA4) in Australia 2019-20



Source: ABS (2021)

The MIW region has five sugar mills including, Proserpine, Farleigh, Marian, Racecourse and Plane Creek that are spread across three milling regions that include Proserpine, Mackay and Plane Creek.

Seasonality

Harvest of sugar cane is generally observed between the months of July and December with harvest dependent on weather conditions. Planting of sugar cane takes place in March and April with the cane not being able to be harvested until a year after growing.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sugar Cane												
Cycle	Harvest		Planting									

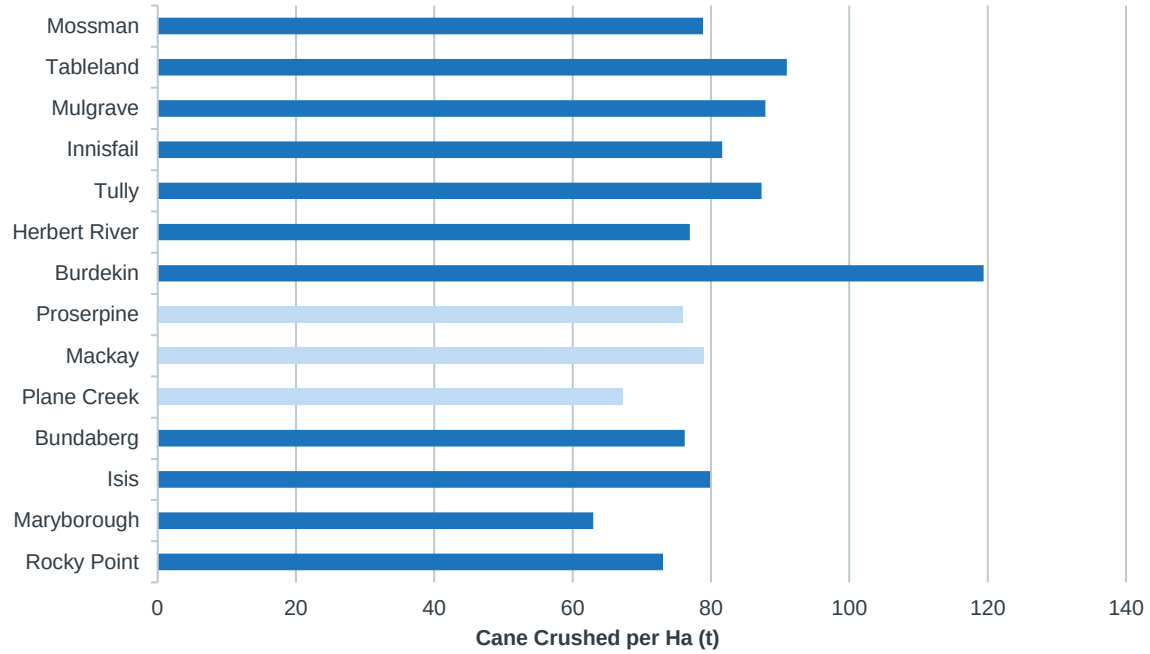
Source: AEC (unpublished)

2.3.2 Productivity

Cane Yields

The Mackay milling region had the best cane yields in the MIW region with 78.9 tonnes of cane crushed per hectare followed by Proserpine with 75.9 and Plane Creek with 67.2. The Burdekin milling region, which is comprised of Invicta, Kalamia, Pioneer and Inkerman mills, has the highest cane yield per hectare at 119.4, which is superior to the next best performing region of Tablelands which has a yield of 90.9 tonnes per hectare.

Figure 2.13. Cane Crushed (t) per Ha, Milling Regions Queensland

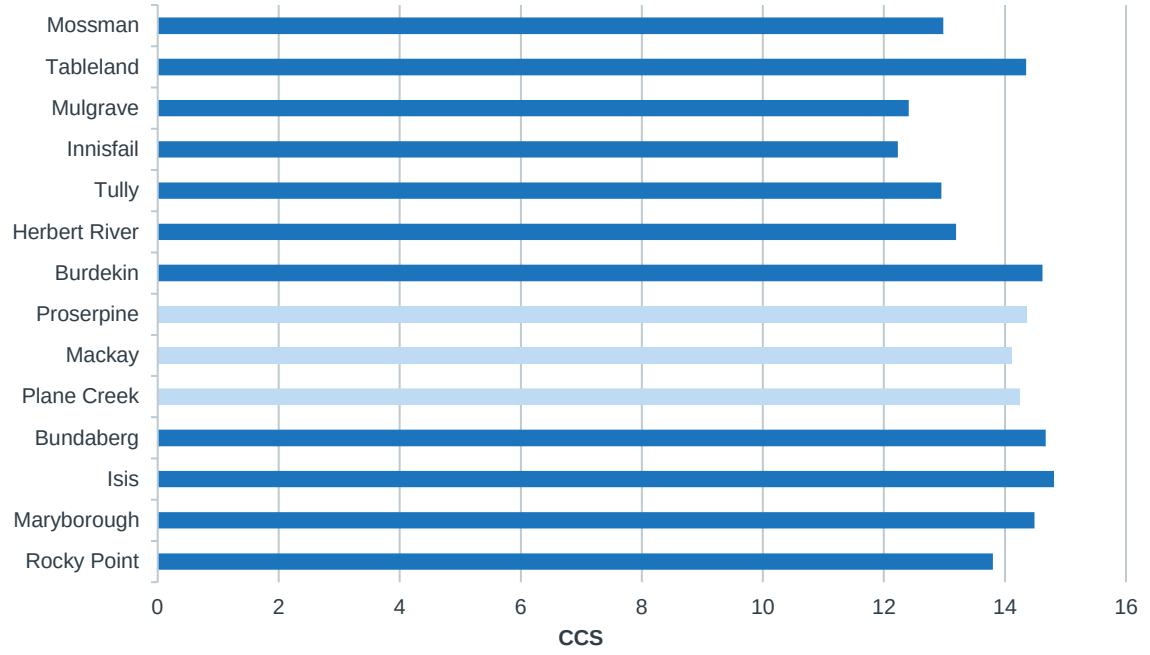


Source: Canegrowers (2021)

Commercial Cane Sugar (CCS)/ Cane Sugar Content

Milling areas in the MIW all produced CCS higher than the average of 13.8 with Proserpine producing the highest CCS in the MIW region with 14.4 followed by Plane Creek with 14.3 and Mackay with 14.1. Isis in the Wide Bay region produced the highest CCS in Queensland last crushing season with a CCS of 14.8 followed by Bundaberg and Burdekin with CCS of 14.7 and 14.6 respectively.

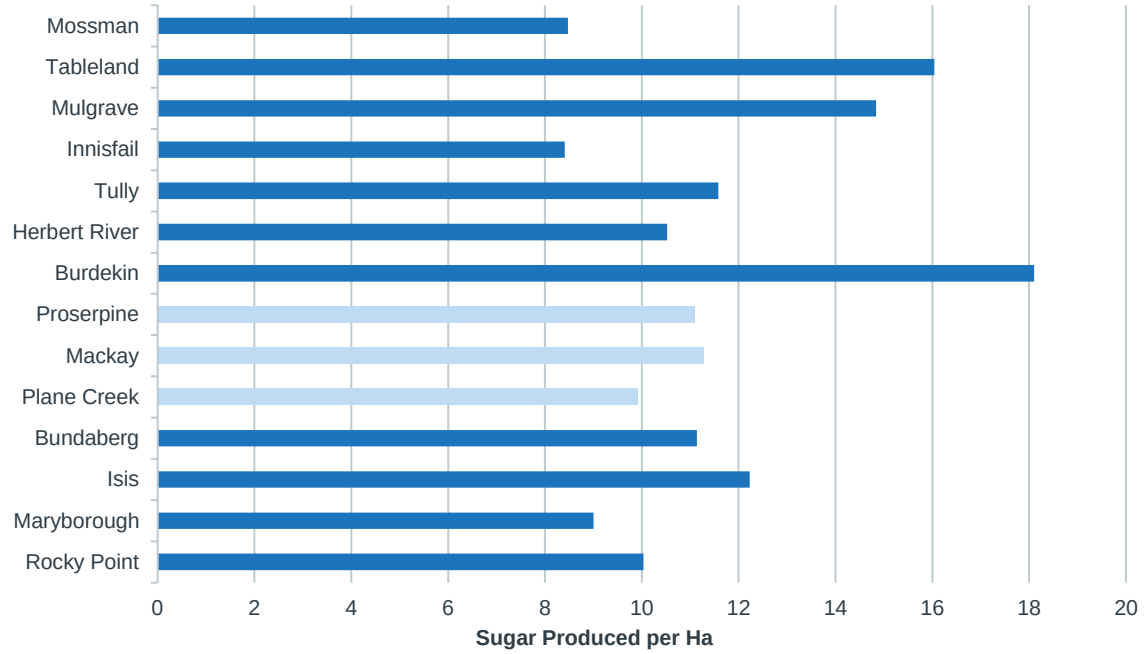
Figure 2.14. CCS, Milling Regions Queensland



Source: Canegrowers (2021)

Mackay was the most productive region in MIW with a ratio of 11.3 followed by Proserpine with 11.1 and Plane Creek with 9.9. Burdekin produced the most sugar per Ha in the last crushing season with a ratio of 18.1 with the Tablelands having a productive season with a ratio of 16.0.

Figure 2.15. Sugar Produced per Hectare (t), Milling Regions Queensland

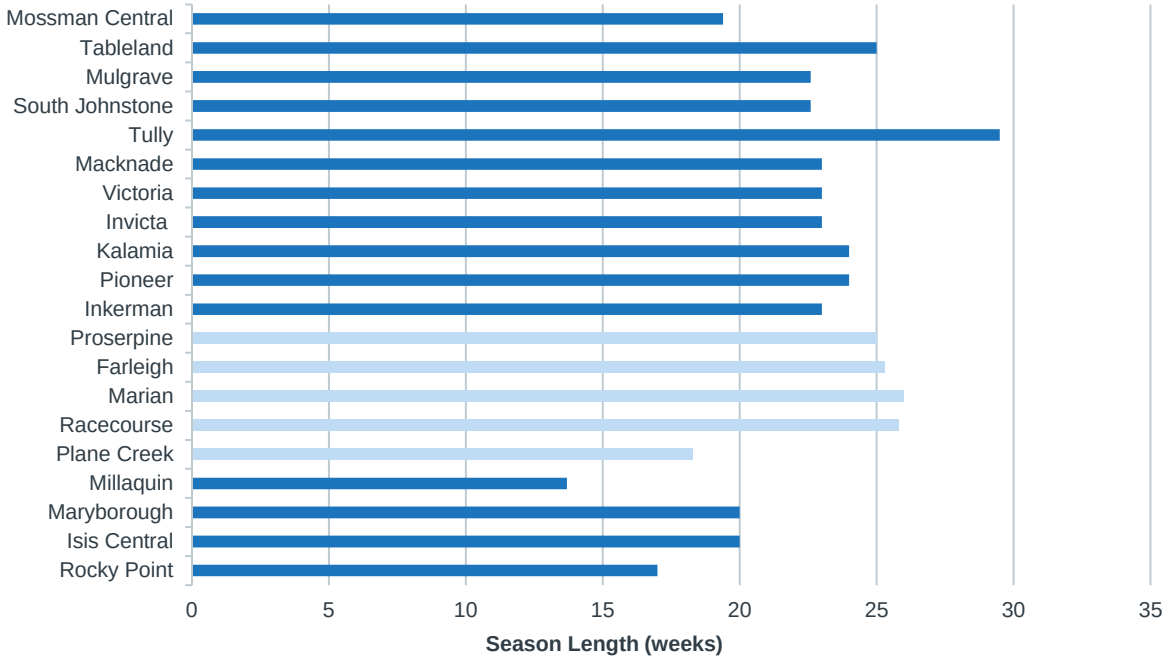


Source: Canegrowers (2021)

Season Length

Season length is an important indicator in sugar mill efficiency and optimum sugar extraction. The average season length in Queensland was 22.5 weeks in the 2020 crushing season. The Tully region required 29.5 weeks to get through their sugar cane due to severe delays due to wet weather (North Queensland Register 2020). Contrary to this, the Millaquin mill in Bundaberg had the shortest crush season at 13.7 weeks with the mill running at just over half its available capacity due to sugar cane shortages in the region (ABC 2020). Mills in the MIW region all took longer than average to get through their crush with mills seasons lengths ranging between 25 and 26 weeks due to wet weather in the region (Mackay Sugar 2021).

Figure 2.16. Season Length by Queensland Sugar Mills

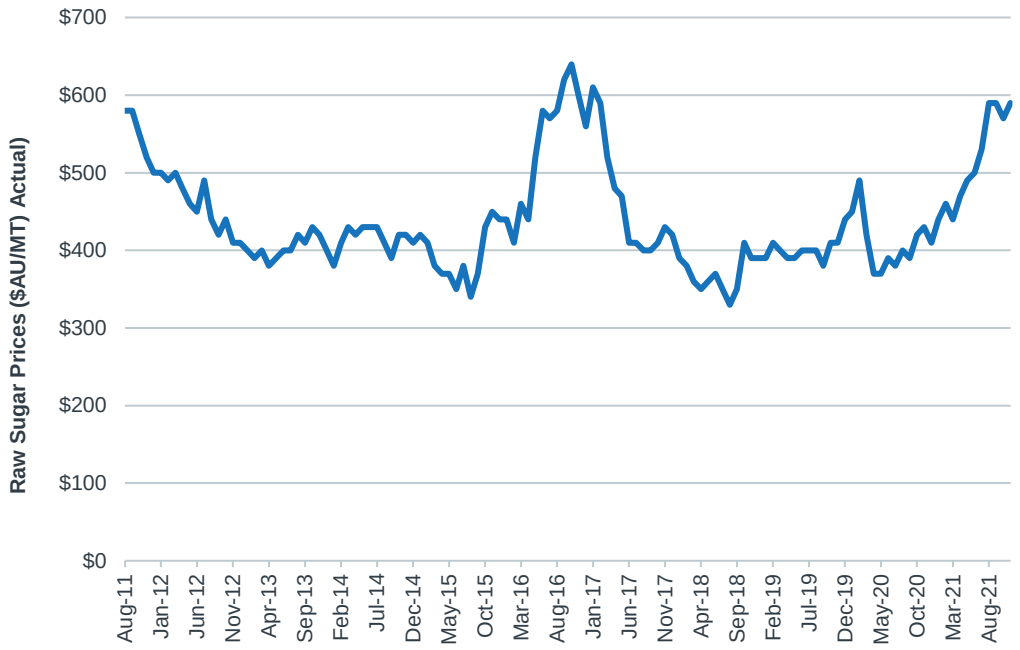


Source: Canegrowers (2021)

2.3.3 Commodity Prices

Sugar Prices

Figure 2.17. Raw Sugar Prices

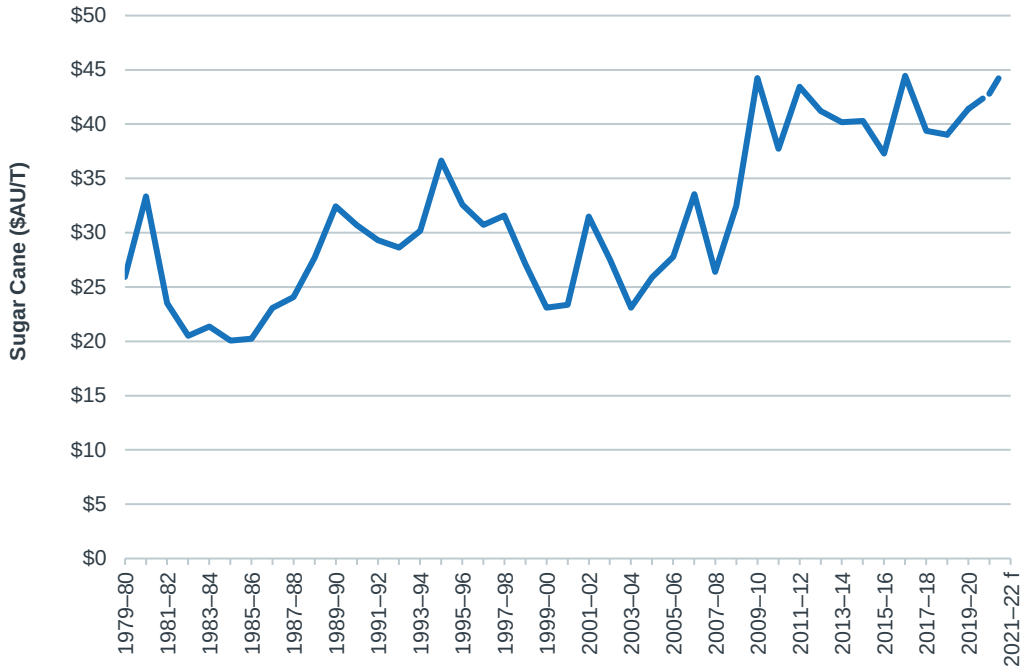


Source: Index Mundi (2022).

Cane Prices

In 2019-20 the price received for sugarcane (cut for crushing) totalled approximately $41.4 per tonne. In 2021-22, ABARES estimate that the price for sugarcane could increase to $46 per tonne.

Figure 2.18. Sugarcane (Cut for Crushing)



Source: ABARES (2021b).

2.4 HORTICULTURE

2.4.1 Production

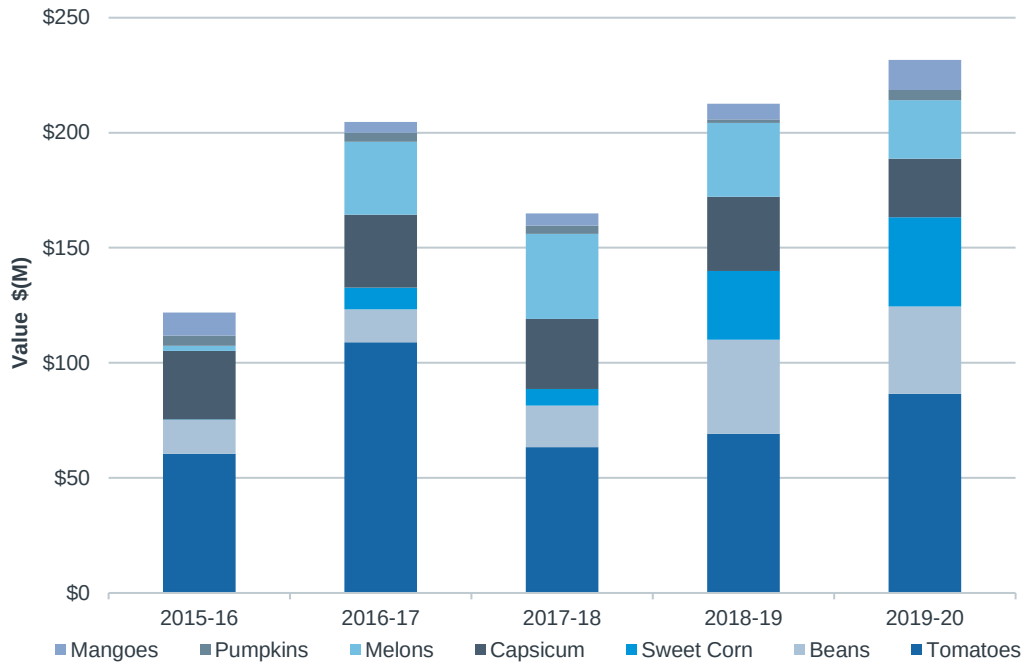
Production Value

Horticulture production in the MIW region has grown from a total of $121.91 million in 2015-16 to $231.62 million in 2019-20 growing at an average of 17% per annum since 2015-16. The Whitsundays region is the predominate growing area for horticulture production accounting for 99.9% of the total value.

Mangoes, Pumpkins, Melons, Capsicum, Sweet Corn, Beans and Tomatoes are the contributors to the horticulture production value in the MIW region. Tomatoes are the largest contributor to total horticulture production value making up 37.4% in 2019-20. Sweet corn saw the largest growths in production value growing from $68,000 in 2016 to $38.8 M in 2020 with capsicum seeing the largest decline from $29.7 in 2016 to $25.4 in 2019-20.

It is important to note that there remain many gaps in data and understanding the true extent of horticultural production and value of horticultural production in Queensland and Australia. The data presented is the best available from the ABS.

Figure 2.19. Horticulture Production Value ($M)

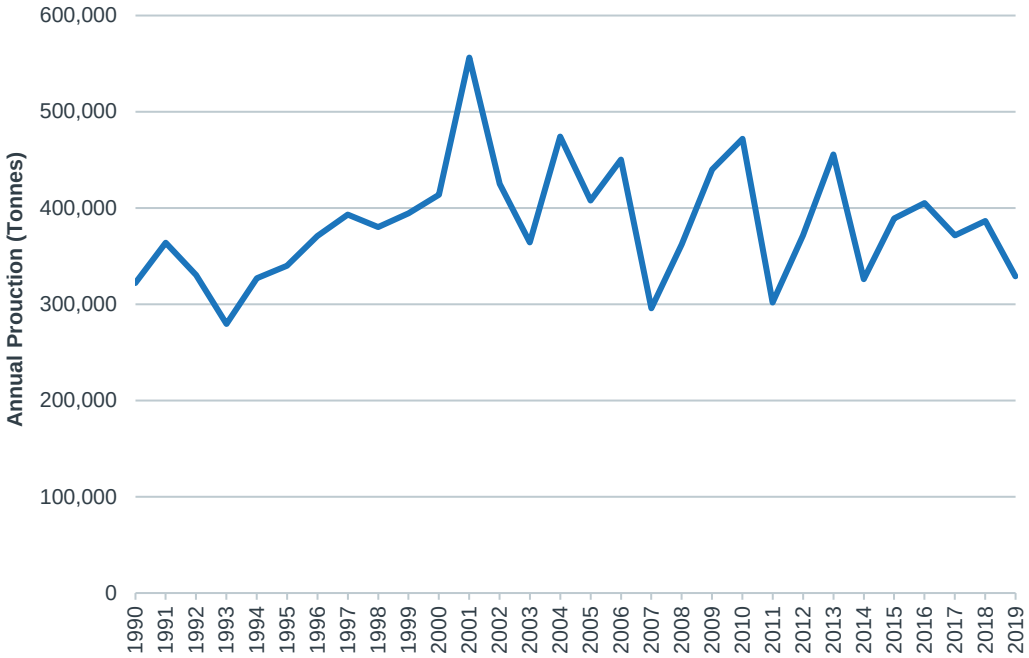


Note: Growth Rate used for 2017-18, Beans, Capsicum and Melon data.
Source: AEC, ABS (2021)

Tomatoes

Australia experienced a peak in tomato production in 2001, totaling over 550,000 tonnes. From 1993 to 2001, tomatoes experienced a strong growth in production, however has never recovered near its peak and currently has been fluctuating between 300,000 to 475,000 tonnes since. Since 2010, the average annual growth rate of tomato production in Australia has been declining at a rate of 3.9% per annum through to 2019.

Figure 2.20. Australian Production (Tomatoes), 1990 to 2019

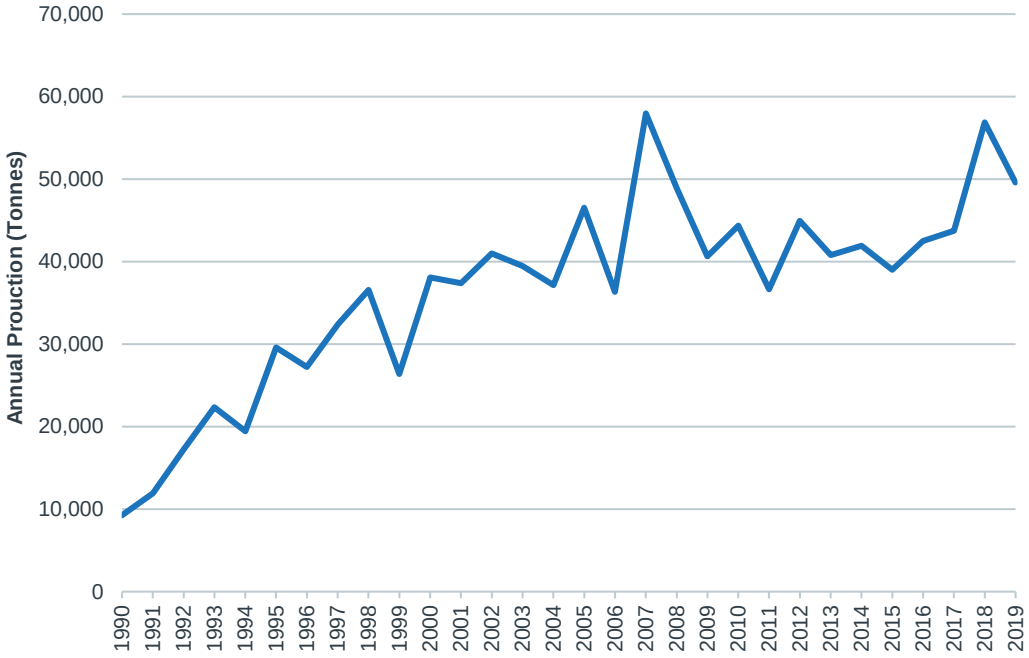


Source: FAO (2021a).

Mangoes, Mangosteens & Guavas

Mango production in Australia has seen large improvements in production totals with the largest of the growths seen between 1990 to 2005. Mangoes experienced a peak in production in 2007 where approximately 60,000 tonnes of mangoes were produced. Since 2010, Mangoes have seen growth at an average annual rate of 1.3% to 2019.

Figure 2.21. Australian Production (Mangoes, Mangosteens & Guavas), 1990 to 2019

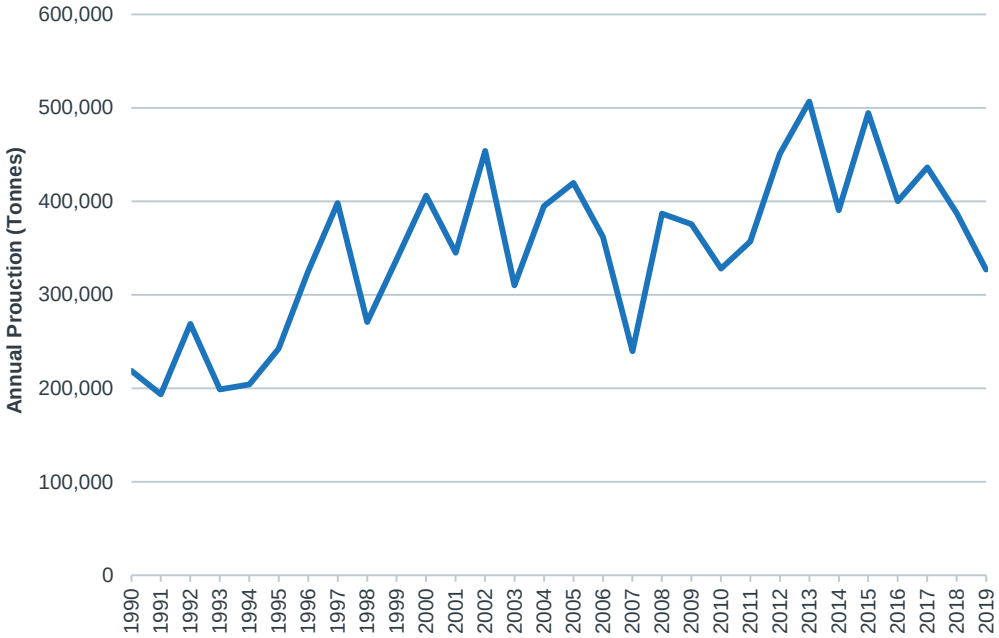


Source: FAO (2021a).

Corn

Corn experienced a dramatic increase in production between the years of 1993 and 1997 where production of the commodity doubled. Despite seeing a peak in production in 2013 where production was just over 500,000 tonnes, corn has since returned to 2010 productions levels.

Figure 2.22. Australian Production (Corn), 1990 to 2019

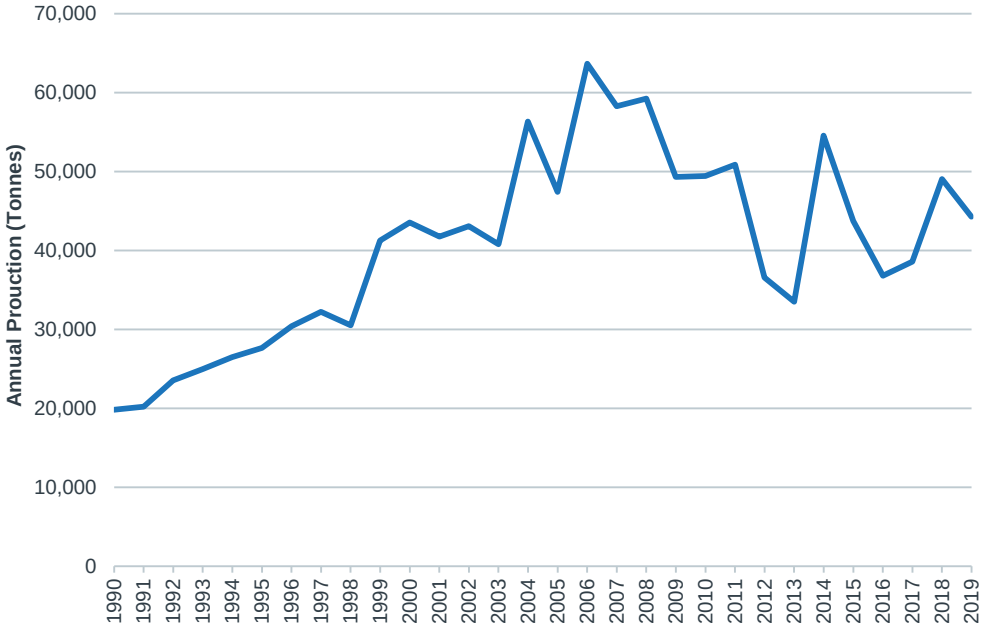


Source: FAO (2021a).

Capsicums

Capsicum production in Australia saw good growth between 1990 and 2000 growing at an average annual rate of 8.2% per annum. After 2006 where production peaked at over 63,000 tonnes, production decreased at an annual average rate of -8.8% per annum till 2013. 2019 data saw production at 44,302 tonnes.

Figure 2.23. Australian Production (Capsicums), 1990 to 2019

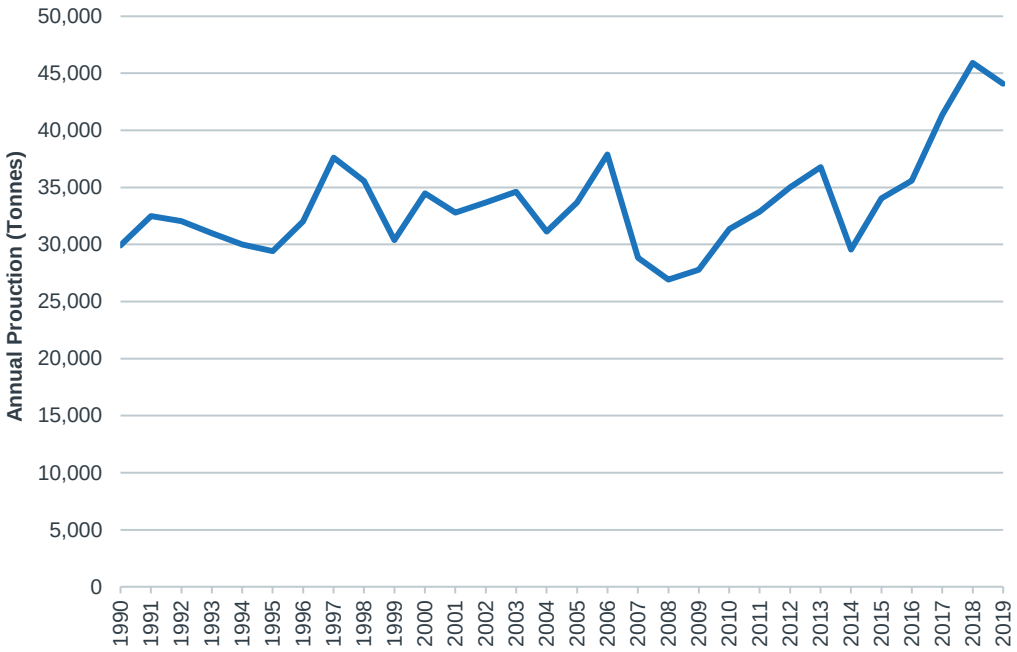


Source: FAO (2021a).

Beans

Australian production of beans has seen good growth in recent times growing at an average annual rate of 3.9% between 2010 and 2019. Production peaked in 2018 where it reached a record high of approximately 45,900 tonnes.

Figure 2.24. Australian Production (Beans), 1990 to 2019

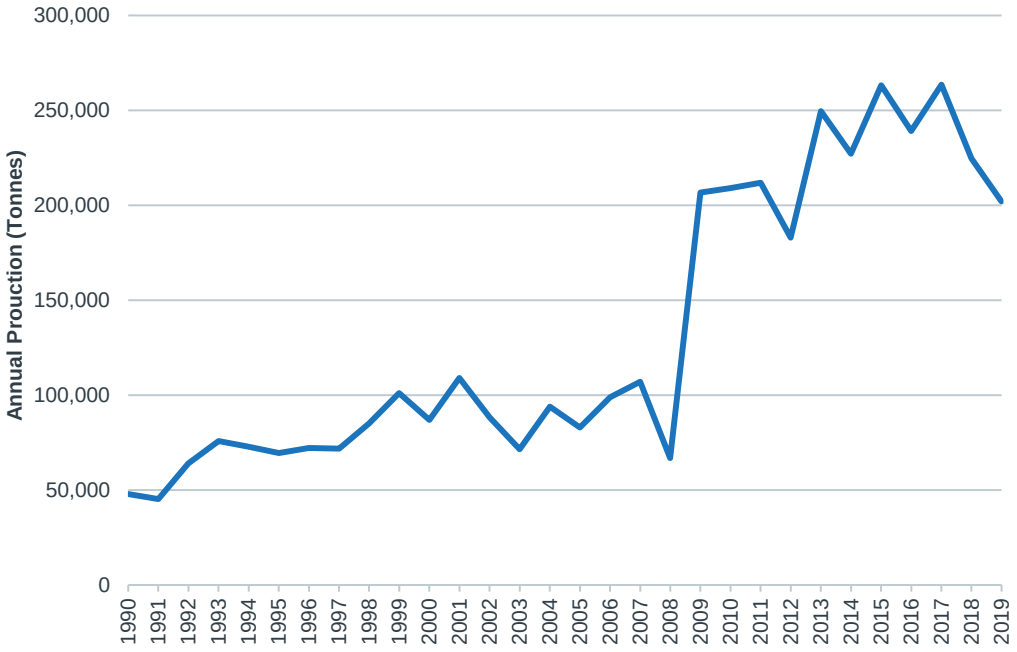


Source: FAO (2021a).

Melons

Melons saw a dramatic increase in production in 2009 where production skyrocketed 209% from the year before. Melons saw decent growth between 2012 and 2018 reaching a peak in production in 2019, however, has seen a decrease in recent years falling 23.3% between 2017-2019.

Figure 2.25. Australian Production (Melons), 1990 to 2019

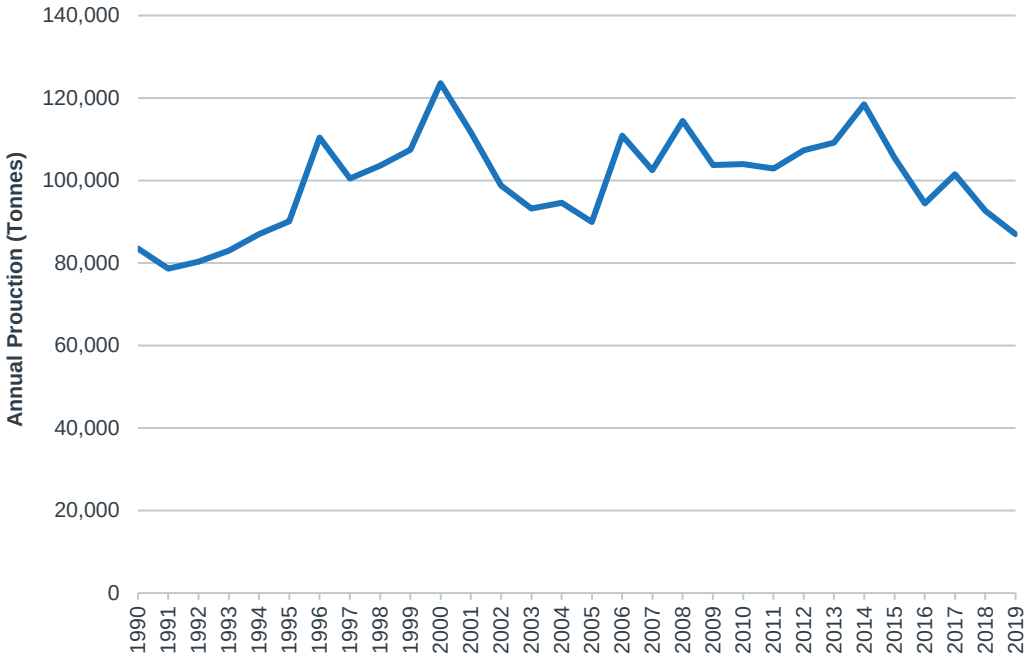


Source: FAO (2021a).

Pumpkins

Pumpkin production in Australia peaked in 2000 when production levels were approximately 123,600 tonnes. Up to this period, production saw good sustained average annual growth of 5.1% since 1991. Recent production levels have seen a decrease of 2.05% between 2010 and 2019.

Figure 2.26. Australian Production (Pumpkins), 1990 to 2019



Source: FAO (2021a).

Production by State

Detailed production and farmed area for horticulture crop values for states can be found below in **Table 2.4** and **Table 2.5**.

Despite having the largest production area for tomatoes with 1,640 hectares, Queensland is the second largest producer of tomatoes with 62,202 tonnes or 20.9% of the annual national production. Victoria accounts for approximately 57.0% of the annual national production and is the second largest growing area in Australia.

Queensland accounts for 67.4% of the national annual production of Mangoes with 42,221 tonnes being produced by 964,301 mango trees. Northern Territory was the second largest producer of the fruit producing 18,903 tonnes or 30.2% of the annual production being produced by 565,448 trees.

Queensland is the primary state for sweet corn production in Australia. During the 2019-20 year, Queensland produced 74.7% of the national annual production producing 54,570 tonnes of the vegetable on 4,801 hectares. Victoria was the second largest producing region producing 12.1% of the national production followed by New South Wales producing 10.5% of the national production.

Queensland is the largest production state of capsicums producing 26,491 tonnes on 1,603 hectares and contributing 65.3% to the national production total. This is followed by Victoria producing 5,508 tonnes on 114 hectares contributing 13.6% to the national production total and New South Wales producing 5,256 tonnes on 100 hectares contributing 13.0% to the national production total.

Queensland produces approximately 58.7% of the national annual production of beans producing 20,376 tonnes on 4,183 hectares in 2019-20. This is followed by Tasmania which accounts for 21.0% of the total national production and by New South Wales which is responsible for 13.1% of the total national production.

In 2019-20, approximately 43.0% of Australia's Melons were produced in Queensland on 2,733 hectares of land. This was followed by New South Wales producing 25.9% of the national total production on 1,608 hectares,

Northern Territory producing 17.6% of the national total on 829 hectares of land and Western Australia producing 11.9% of the national total on 562 hectares.

Queensland is the largest producer of Pumpkins producing 52,430 tonnes and accounting for 57.7% of the annual national production on 2,675 hectares. This was followed by New South Wales accounting for 17.2% of the national production on 959 hectares and by Victoria accounting for 5.2% of the national production on 211 hectares.

Table 2.4. Horticultural Production (tonnes) by State (2019-20)

State	Tomatoes	Mangoes	Sweet Corn	Capsicums	Beans	Melons	Pumpkins
QLD	62,202	42,221	54,570	26,491	20,376	87,830	52,430
NSW	23,057	158	7,640	587	1,667	52,964	15,645
VIC	169,703	-	8,804	5,508	4,552	2,516	4,717
WA	17,115	1,318	1,943	5,256	594	24,353	-
SA	25,238	3	-	1,947	221	901	-
TAS	145	-	50	785	7,299	-	681
NT	16	18,903	23	-	23	35,918	-
Total	**297,474**	**62,603**	**73,030**	**40,574**	**34,732**	**204,483**	**90,940**

Note: States/Territories that are not included do not have any values attributed to the crop.
Source: ABS (2021).

Table 2.5. Horticulture farmed area (ha) by State (2019-20)

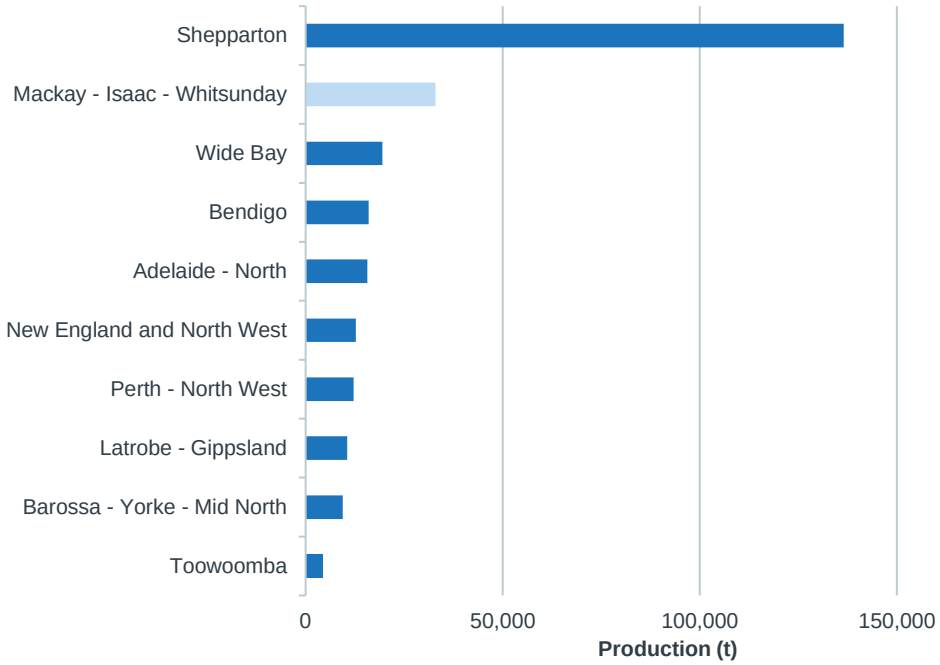
State	Tomatoes (Ha)	Mangoes (Trees)	Sweet Corn (Ha)	Capsicums (Ha)	Beans (Ha)	Melons (Ha)	Pumpkins (Ha)
QLD	1,640	964,301	4,801	1,603	4,183	2,733	2,675
NSW	152	8,366	501	87	308	1,608	959
VIC	1,567	488	693	114	839	81	211
WA	334	79,710	214	100	303	562	-
SA	220	6,451	-	152	122	200	-
TAS	2	-	13	3	647	-	45
NT	2	565,448	2	-	11	829	-
Total	**3,917**	**1,624,764**	**6,225**	**2,058**	**6,414**	**6,014**	**4,646**

Note: States/Territories that are not included do not have any values attributed to the crop.
Source: ABS (2021).

Production by Region

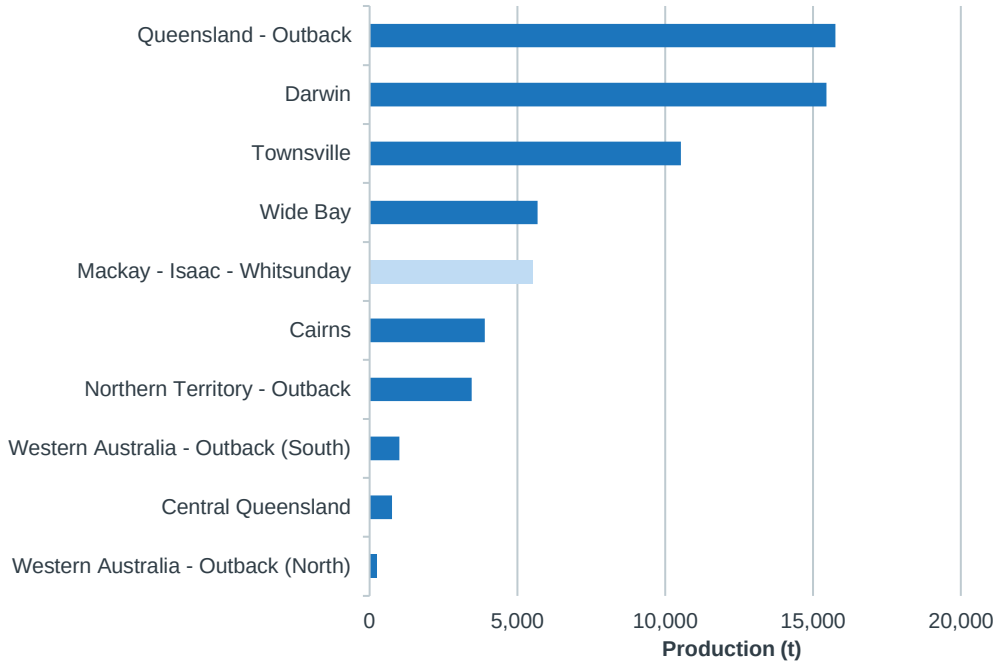
Figure 2.27 through to Figure 2.33 provide production comparisons of primary growing regions (SA4) for horticultural commodities in Australia during 2019-20.

Figure 2.27. Primary Tomato Producing Regions (SA4) in Australia 2019-20



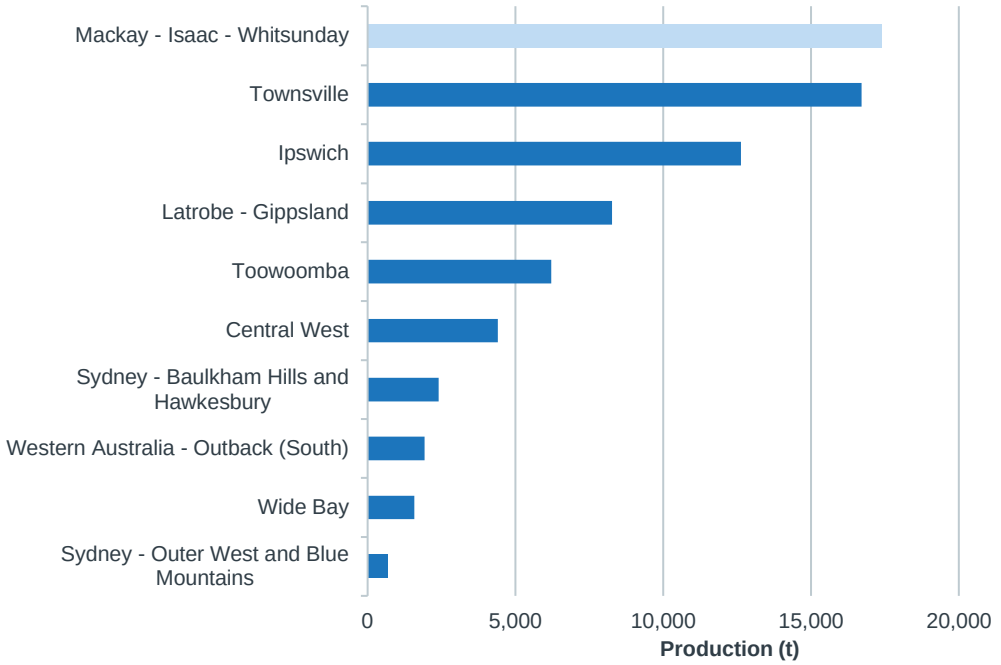
Source: ABS (2021).

Figure 2.28. Primary Mango Producing Regions (SA4) in Australia 2019-20



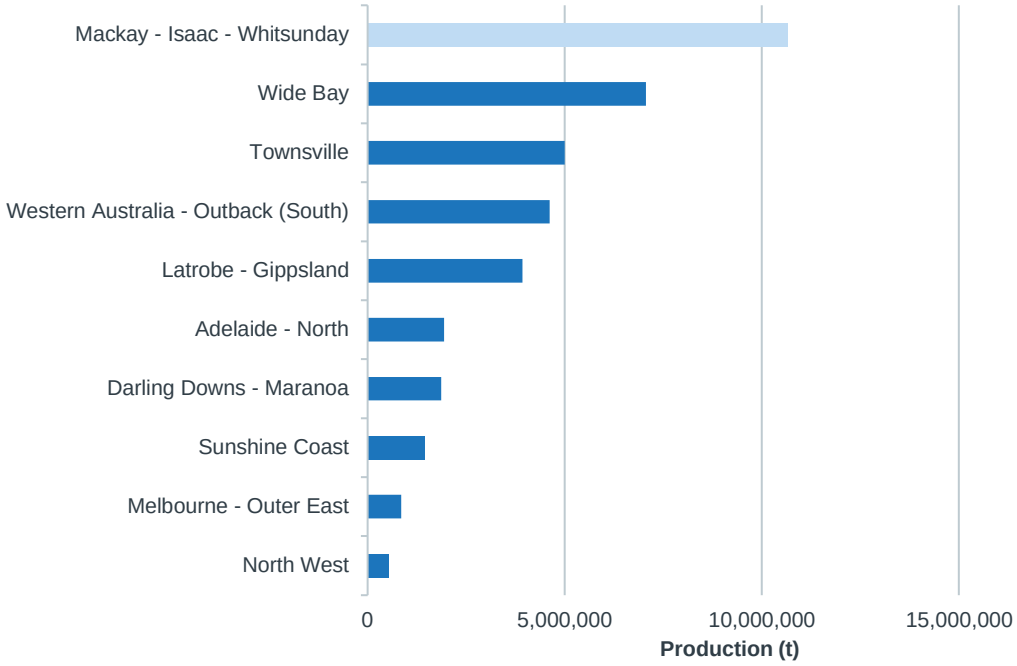
Source: ABS (2021).

Figure 2.29. Primary Sweet Corn Producing Regions (SA4) in Australia 2019-20



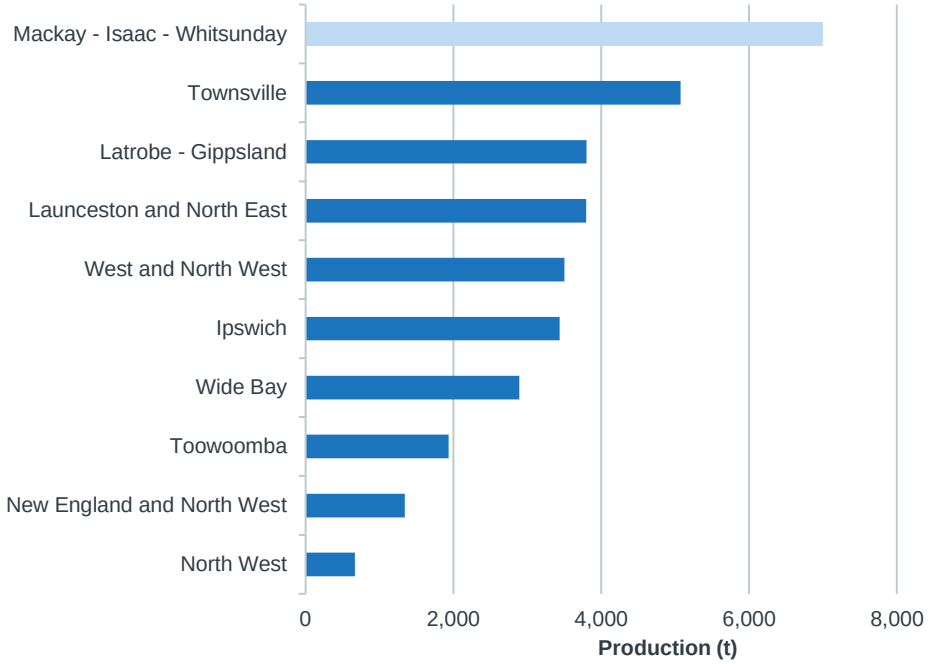
Source: ABS (2021).

Figure 2.30. Primary Capsicum Producing Regions (SA4) in Australia 2019-20



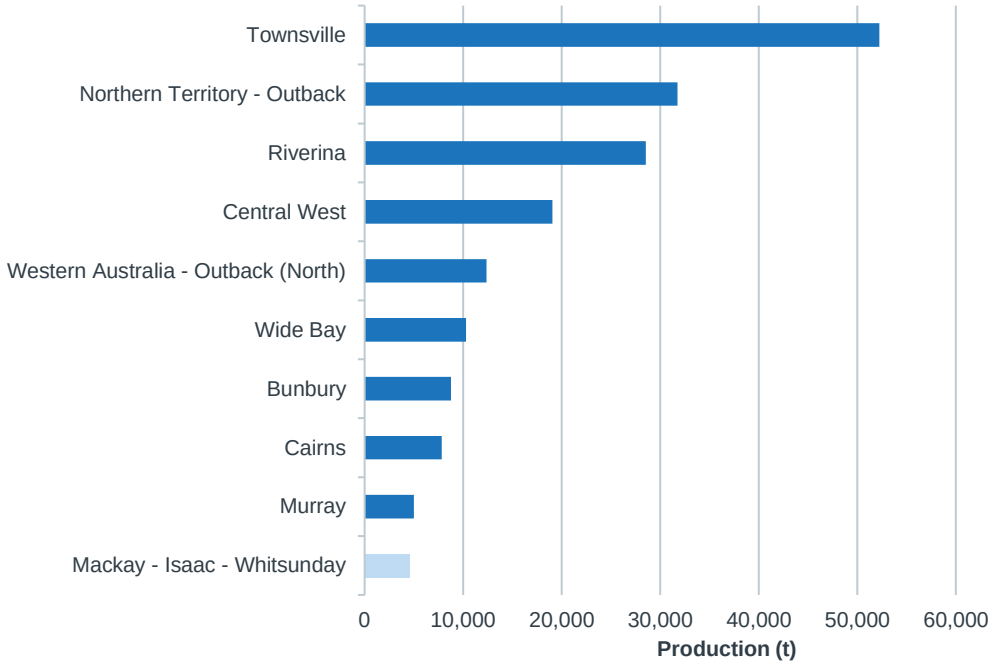
Source: ABS (2021).

Figure 2.31. Primary Bean Producing Regions (SA4) in Australia 2019-20



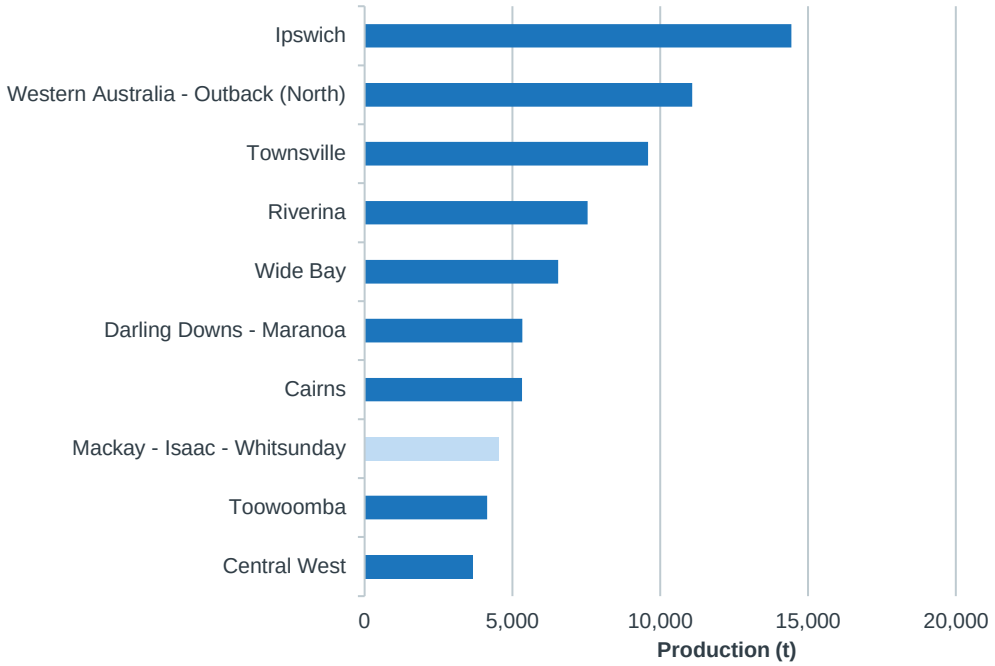
Source: ABS (2021).

Figure 2.32. Primary Melon Producing Regions (SA4) in Australia 2019-20



Source: ABS (2021).

Figure 2.33. Primary Pumpkin Producing Regions (SA4) in Australia 2019-20



Source: ABS (2021).

Seasonality

Australian mangoes are not produced in the month of April to June, however, they are prominent in the months of October to January. Queensland's peak supply months are slightly later in the year than other key producing states, particularly the Northern Territory. This indicates that once the Northern Territory's height of supply is over at the end of November, the market looks to Queensland for supply.

Table 2.6. Mango Seasonality by State

State	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
NSW												
QLD												
WA												
NT												
Availability	High	Medium	Low									

Source: Hort Innovation (2020a).

Australian tomatoes are produced all year round, with only Tasmania experiencing low availability throughout the year. Tomatoes are largely in season from July to September and April to June. It must be noted that Queensland has the highest availability of fresh tomatoes throughout the year, with high availability from April through to December.

Table 2.7. Fresh Tomatoes Seasonality by State

State	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
NSW												
VIC												
QLD												
WA												
SA												
TAS												
Availability	High	Medium	Low									

Source: AUSVEG (as cited in Hort Innovation 2020a).

The field tomato is the most produced variety of tomato, accounting for 40% of fresh production in 2019-20 (Hort Innovation, 2020a). This was followed by large truss tomatoes (30%) and cherry/grape tomatoes (24%) (Hort Innovation, 2020a).

Cherry/grape and large truss tomatoes have high availability year round as they can be grown outdoors and in greenhouses.

Table 2.8. Fresh Tomatoes Seasonality by Type

State	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Field												
Large Truss												
Cherry/Grape												
Roma												
Processing												
Availability	High	Medium	Low									

Source: AUSVEG (as cited in Hort Innovation 2020a).

Australian beans are produced all year round, with only high availability in Queensland from July to August and April to June. Both New South Wales and Victoria only have high availability in the month of June.

Table 2.9. Fresh Beans Seasonality by State

State	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
NSW												
VIC												
QLD												
WA												
TAS												

State	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Availability	High	Medium	Low									

Source: AUSVEG (as cited in Hort Innovation 2020a).

Australian capsicums are produced all year round, however, they are largely in season between January and March each year. Out of all states, fresh capsicums are more widely available in Queensland with high availability spanning over three months compared to two, which is the case for most other states.

Table 2.10. Fresh Capsicums Seasonality by State

State	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
NSW												
VIC												
QLD												
WA												
SA												
TAS												
Availability	High	Medium	Low									

Source: AUSVEG (as cited in Hort Innovation 2020a).

Australian pumpkins are not produced in the months of November to December in most states except Queensland, although during these months' availability is low. Western Australia has the earliest peak supply compared to other states and territories, with peak supply beginning in February.

Table 2.11. Fresh Pumpkin Seasonality by State

State	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
NSW												
VIC												
QLD												
WA												
SA												
TAS												
NT												
Availability	High	Medium	Low									

Source: Hort Innovation (2020a).

The table below highlights the seasonality of watermelons by state. Of significant note, Queensland is the only state/territory which supplies watermelons year-round. Peak supply for watermelons in Queensland spans over the months of December to February.

Table 2.12. Seasonality of Fresh Watermelons by State

Citrus	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
NSW												
VIC												
QLD												
WA												
SA												
NT												
Availability	High	Medium	Low									

Source: Hort Innovation (2020a).

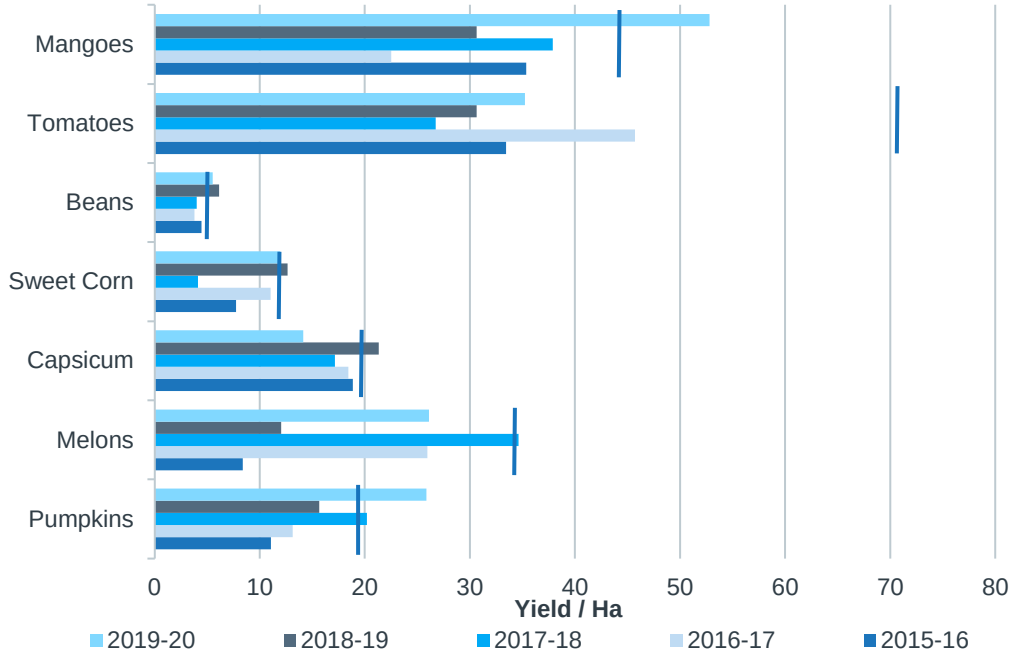
2.4.2 Productivity

Crop Yields

Mangos are the most productive horticultural crop in the MIW per tonne and are at a five year high of 52.80t/ha which is above national yields of 42.35t/ha. Tomato yields in the region in 2019-20 were at 35.24t/ha well below the national yield of 75.96t/ha. Tomatoes saw their best yield in five years in 2016-17 where yields were at 45.7t/ha. Beans in 2019-20 were producing 5.52t/ha which is below the national yield of 5.41t/ha. 2018-19 were the most

productive years for bean growth in MIW with yields at 6.1t/ha. Sweet Corn yields in MIW of 11.95t/ha in 2019-20 were above the national yields of the year at 11.73t/ha, with the highest yields seen in 2018-19 where yields were at 12.65t/ha. Capsicum yields in the MIW region were the worst in five years with 14.15t/ha in 2019-20, well below the national yields of 19.71t/ha. Production was most efficient in recent times in 2018-19 where the yield for the region was 21.34t/ha. Melon yields in the region in 2019-20 of 26.11t/ha were below the national yields of the same period of 34.00t/ha. 2017-18 saw a five year high for melon productivity with a yield of 34.62t/ha. Pumpkin yields in the MIW region were at a five year high in 2019-20 at 25.85t/ha well above the national yield of 19.57t/ha.

Figure 2.34. Farm Productivity, Horticulture Yield (t/ha)



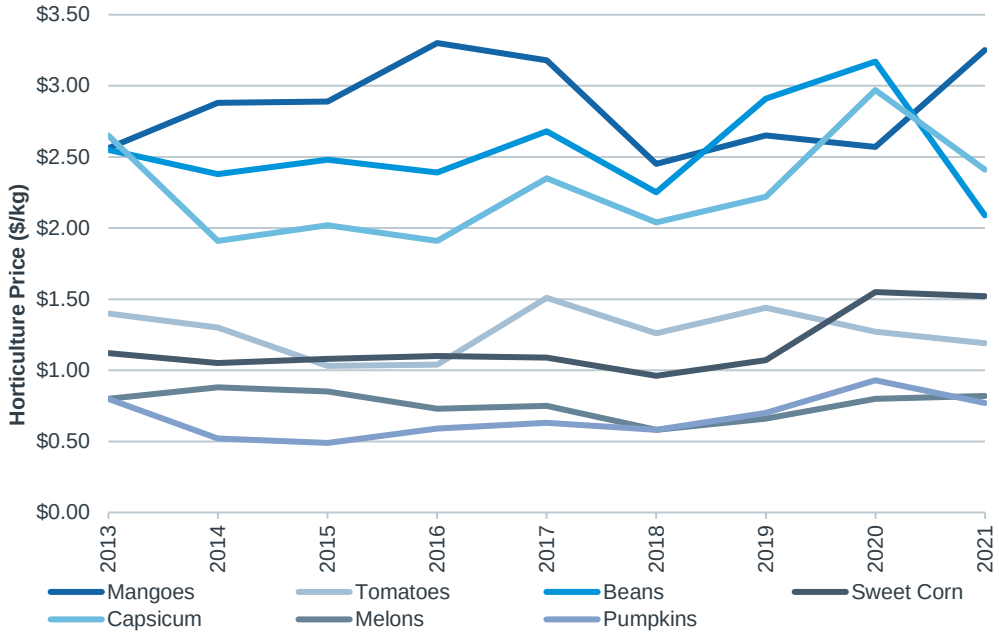
Note:
- Growth Rate used for 2018, Beans and Capsicum data
- Lines indicate National Yield Figures for 2019-20

Source: AEC, ABS (2021)

2.4.3 Commodity Prices

The price performance of key horticultural commodities in the MIW region is profiled in the chart below.

Figure 2.35. Horticultural Commodity Prices ($/kg), 2013 to 2021



Source: Hort Innovation (2021)

2.5 BROADACRE CROPS

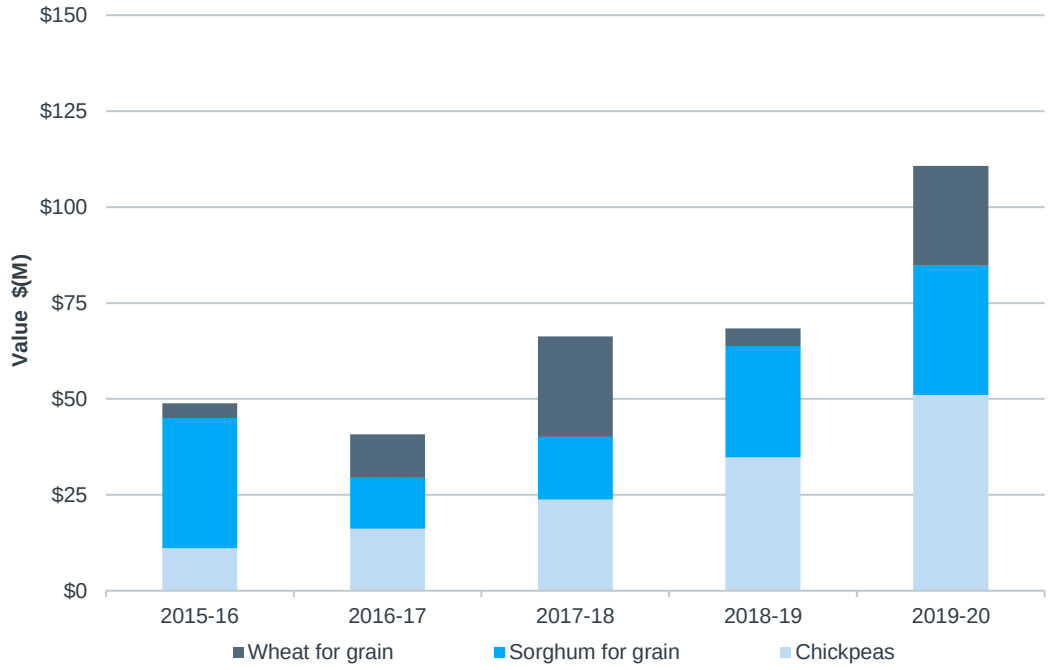
2.5.1 Production

Production Value

Broadacre cropping production value in 2019-20 was valued at $110.7 million, growing at an average annual rate of 22.7%. The Isaac LGA is the primary broadacre production area in the MIW region accounting for 99.6% of the total value. Wheat, sorghum and chickpeas are the main broadacre crop types in the MIW region.

Chickpeas has seen a large growth in value and is now the largest contributor to broadacre cropping in the region, valued at $51 million or 46.1% of total broadacre value. Sorghum has historically been the largest contributor to broadacre cropping and is now worth $33.7 million or 30.5% of broadacre value. Wheat for grain has grown from a value of $3.8 m in 2015-16 at an average annual rate of 61.6% to a value of $26 million as of 2019-20 contributing 23.5% to broadacre cropping value.

Figure 2.36. Broadacre Production Value ($M)

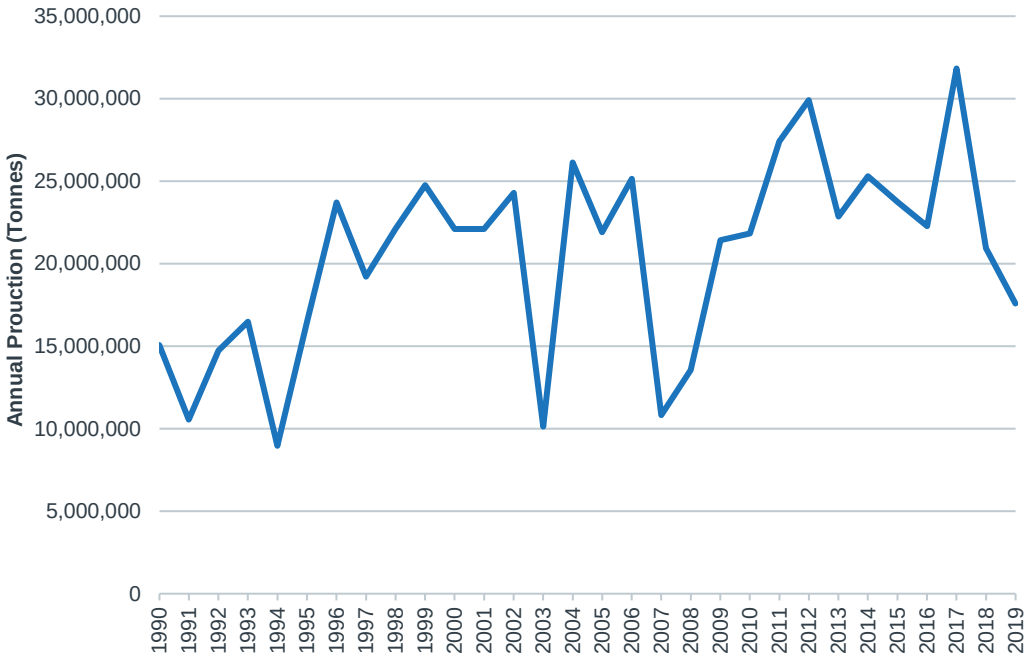


Note: Growth Rate used for 2016-17 to 2018-19 Chickpea data.
Source: AEC, ABS (2021)

Australian Production

Australian wheat production has fluctuated frequently over the past 30 years experiencing a peak 31.8 million tonne peak in 2017 with current 2019 production values totalling 17.6 million tonnes. The strongest growth of the commodity can be seen between the years 2007 and 2012 where it grew at an annual average rate of 22.5%.

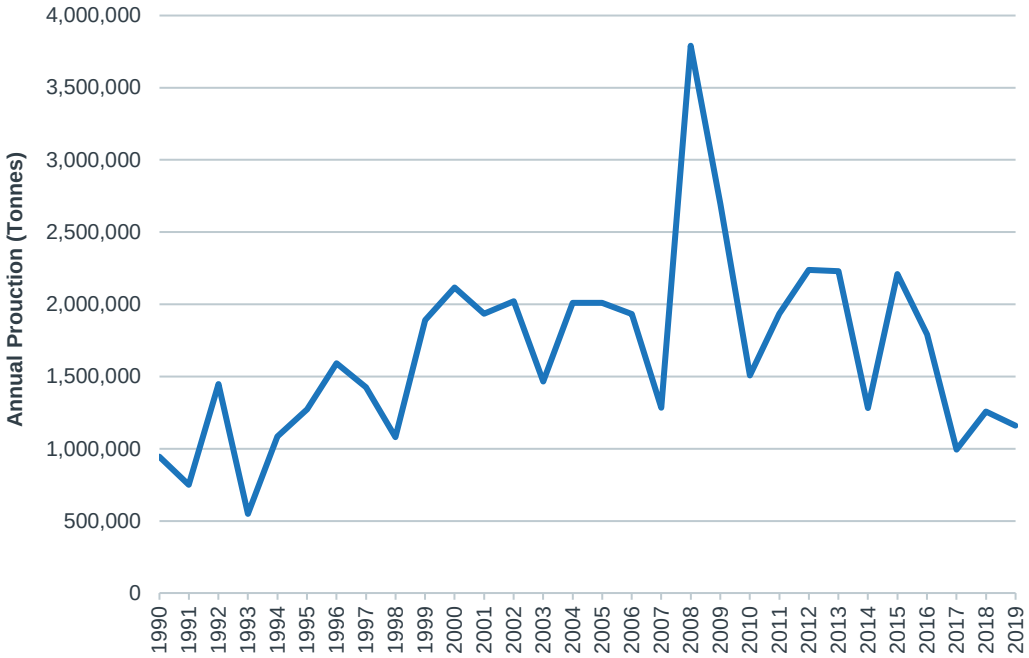
Figure 2.37. Australian Production (Wheat), 1990 to 2019



Source: FAO (2021a).

Sorghum production has fluctuated over the past 30 years with a dramatic increase in production in 2008, totalling 3.8 million tonnes. Of recent times, sorghum's production has decreased and the 2019 production year only totalled 1.2 million tonnes produced.

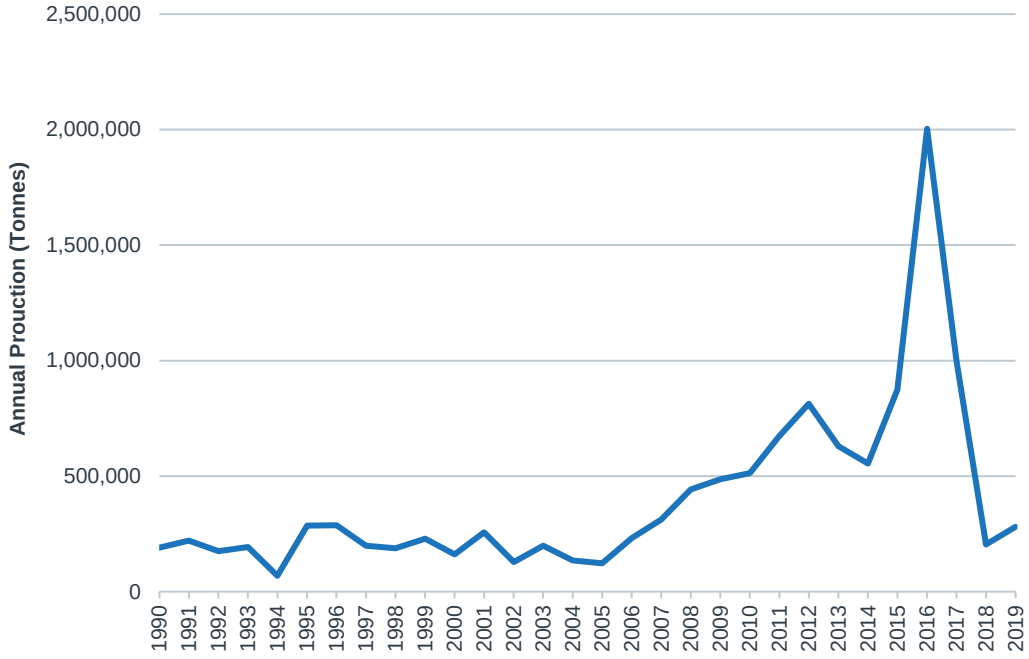
Figure 2.38. Australian Production (Sorghum), 1990 to 2019



Source: FAO (2021a).

Australia experienced a spike in chickpea production in 2017, peaking at a total of 2 million tonnes. This increase can be contributed to significant demand from India driving an increase in prices along with unusually warm winter temperatures and good moisture levels causing an extended growing period (Australian Pulse, 2016). Overall, chickpea production experienced strong growth between 2005 and 2012 but has decreased production quite dramatically in recent years to 281,000 tonnes in 2019.

Figure 2.39. Australian Production (Chickpeas), 1990 to 2019



Source: FAO (2021a).

Production by State

Detailed production and farmed area for broadacre crop values for states can be found below in Table 2.13 and Table 2.14

Western Australia is the largest producer of Wheat in Australia producing 40.3% of the national production total. Western Australia produced 5.8 million tonnes of Wheat in 2019-20 on 4.1 million hectares. Victoria was the next largest producing wheat state in Australia contributing 25.7% to the national production total followed by South Australia contributing 18.6%.

Queensland is the primary producer of Sorghum in Australia producing 313,6206 tonnes in 2019-20 on 159,035 hectares contributing 78.8% to the national production total. New South Wales was the next largest producer of Sorghum producing 78,880 tonnes on 44,360 hectares contributing 19.8% to the national production total.

Queensland produced 162,082 tonnes of Chickpeas in 2019-20 on 170,785 hectares contributing 68.9% to the national production total. This was followed by Victoria contributing 10.9% to the national production total and New South Wales contributing 10.4% to the national production total.

Table 2.13. Broadacre Production (tonnes) by State (2019-20)

State	Wheat	Sorghum	Chickpea
QLD	418,475	313,206	162,082
NSW	1,772,365	78,880	24,367
VIC	3,714,313	3,644	25,543
WA	5,842,187	1,756	5,116
SA	2,689,074	-	18,057
TAS	43,805	-	-
Total	14,480,217	397,485	235,165

Note: States/Territories that are not included do not have any values attributed to the crop.
Source: ABS (2021).

Table 2.14. Broadacre farmed area (ha) by State (2019-20)

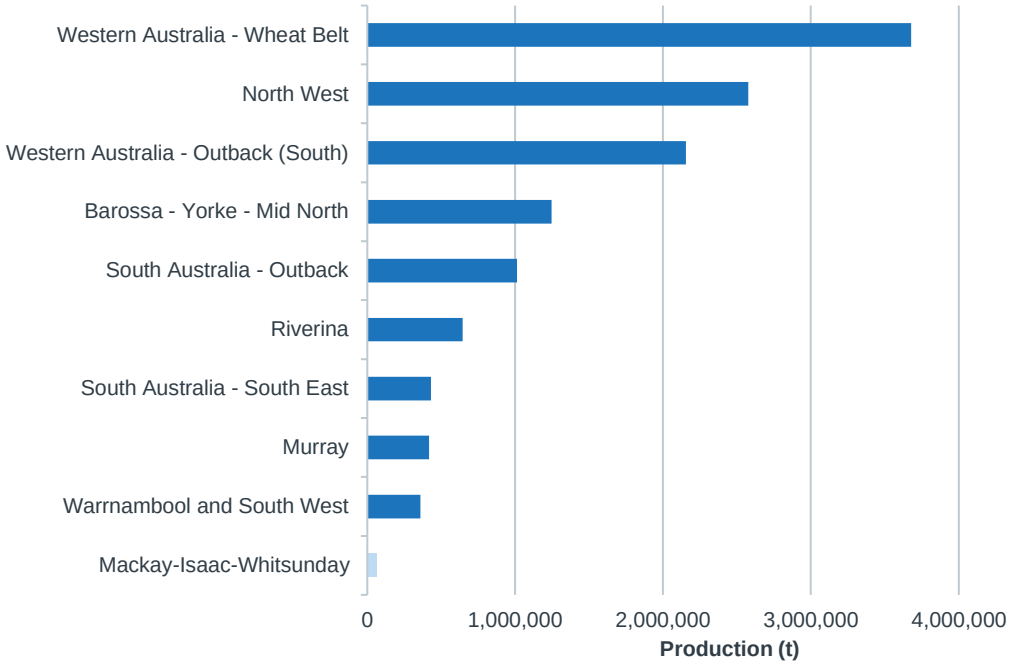
State	Wheat	Sorghum	Chickpea
QLD	441,477	159,035	170,785
NSW	2,132,016	44,360	66,355
VIC	1,428,857	369	37,823
WA	4,132,709	348	12,817
SA	1,720,943	-	21,370
TAS	7,182	-	-
Total	9,863,184	204,112	309,151

Note: States/Territories that are not included do not have any values attributed to the crop.
Source: ABS (2021).

Production by Region

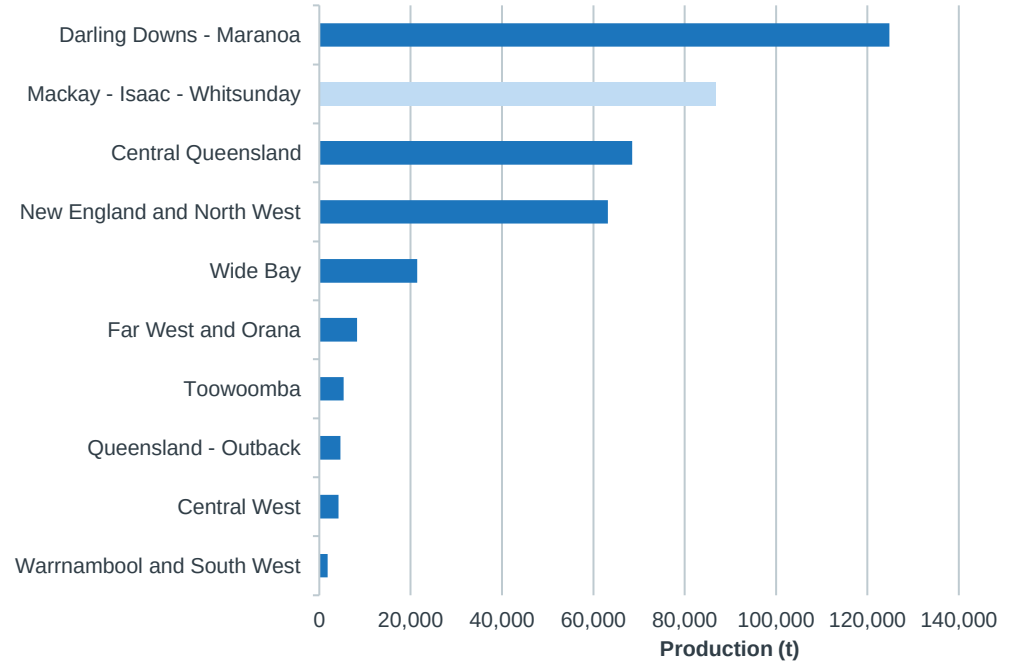
Figure 2.40, Figure 2.41 and Figure 2.42 below show the relative strength of the MIW Region to other major producing regions and the local distribution of broadacre cropping.

Figure 2.40. Primary Wheat Producing Regions (SA4) in Australia 2019-20



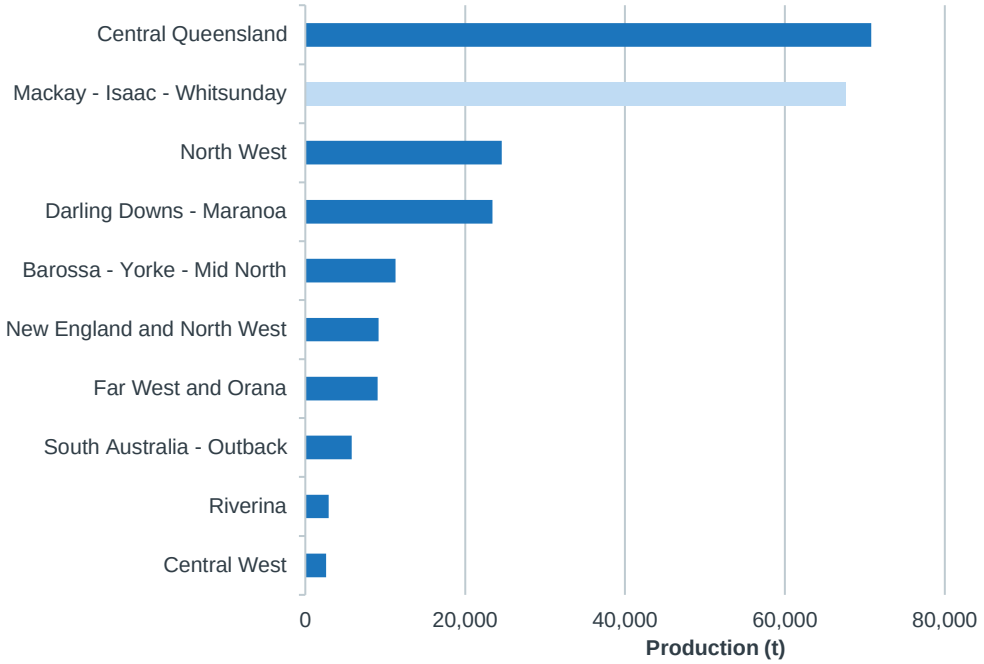
Source: ABS (2021)

Figure 2.41. Primary Sorghum Producing Regions (SA4) in Australia 2019-20



Source: ABS (2021)

Figure 2.42. Primary Chickpea Producing Regions (SA4) in Australia 2019-20



Source: ABS (2021)

Seasonality

The Mackay-Isaac-Whitsunday region is in the Northern region of Australia for Broadacre cropping. The wheat production timeline begins in April where the first sowing takes place through to June. The product is then ready for harvest which begins in October and ends in November.

Table 2.15. Wheat production timeline of regions in Australia

Region	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Northern Region												
Southern Region												
Western Region												
Cycle	Harvest		Sowing									

Source: GrainGrowers (2021)

In the Northern Region, Sorghum is sown in September and October along with December and January. Harvesting takes place between February and May.

Table 2.16. Sorghum production timeline of regions in Australia

Region	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Northern Region												
Cycle	Harvest		Sowing									

Source: GrainGrowers (2021)

Chickpea production begins in April for the Northern Region where sowing is done through to June. The harvest of the crop is done between the months of October and November.

Table 2.17. Chickpea production timeline of regions in Australia

Region	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Northern Region												
Southern Region												
Western Region												
Cycle	Harvest		Sowing									

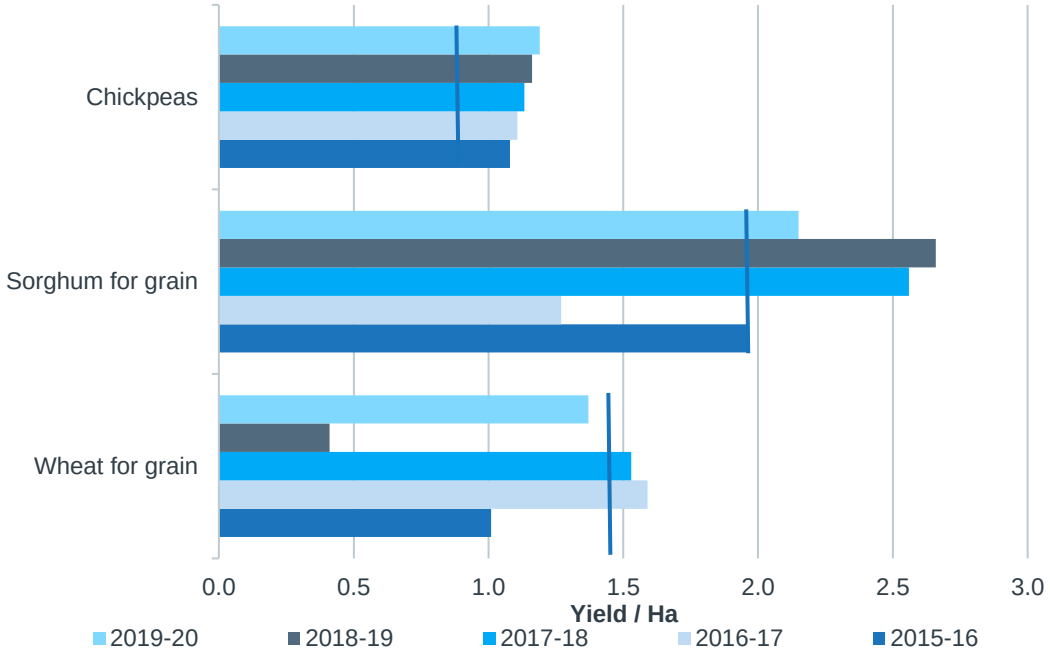
Source: GrainGrowers (2021)

2.5.2 Productivity

Crop Yields

In the MIW region sorghum provides the best broadacre crop productivity with the 2019/20 season productivity a yield of 2.15t/ha which is above the national yield in the same period of 1.95t/ha having a five year high in 2018-19 with a yield of 2.66t/ha. 2016-17 saw a large decrease in productivity to sorghum due to warmer conditions through summer in Queensland seeing sorghum production decrease 49% (ABS, 2018). Wheat for grain provided a productivity of 1.37t/ha in the 2019-20 season, below the national yield of 1.47t/ha, with a five-year yield high of 1.53t/ha in 2017-18 but fell dramatically in the following season to 0.41t/ha due to drought within wheat growing regions (ABS, 2020). Chickpeas provided a yield of 1.08t/ha in 2016-16 and grew to 1.19t/ha in 2019-20 which is above the national yield of 0.8t/ha.

Figure 2.43. Farm Productivity, Broadacre Yield (t/ha)



Note:
- Growth rate used for Chickpea data between 2016-17 and 2018-19.
- Lines indicate National Yield Figures for 2019-20

Source: ABS (2020).

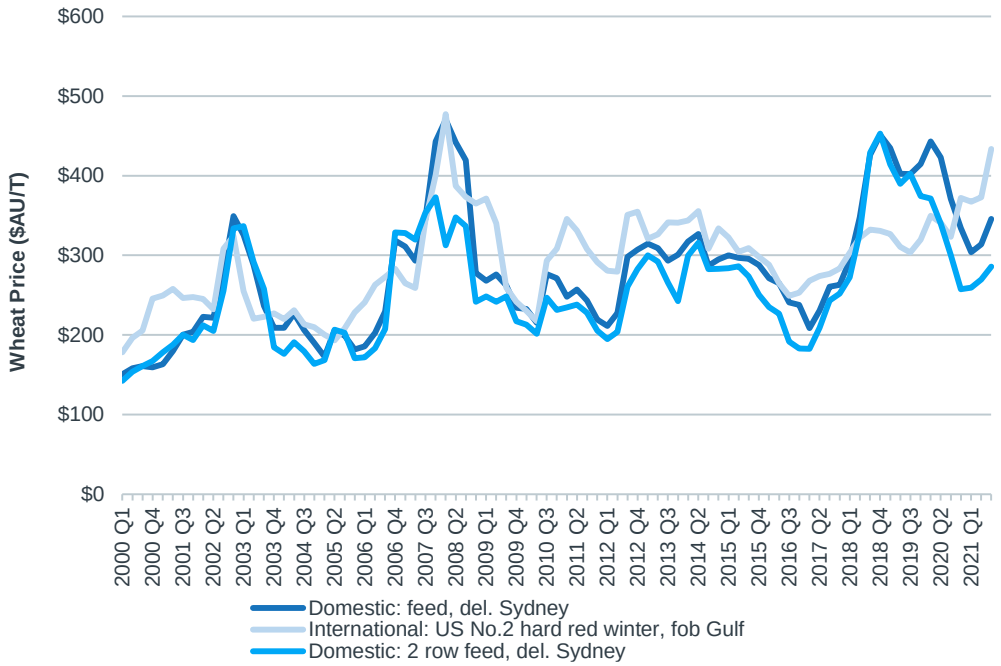
2.5.3 Commodity Prices

Wheat

In the third quarter of 2021 domestic feed wheat prices were estimated to total $346 per tonne, decreasing from a peak of $443 per tonne in the first quarter of 2020.

Australian prices for wheat are being sold lower than global prices, with US prices at $434 per tonne in the third quarter of 2021. Two big export markets for Australian wheat are Indonesia and China, and prices for Australian wheat in the international market is competitive. The cost of wheat into both Indonesia and China are low compared to other competing origins such as the Ukraine and Russia (Thomas Elder Markets, 2021).

Figure 2.44. Average Wheat Prices, 2000 to 2021

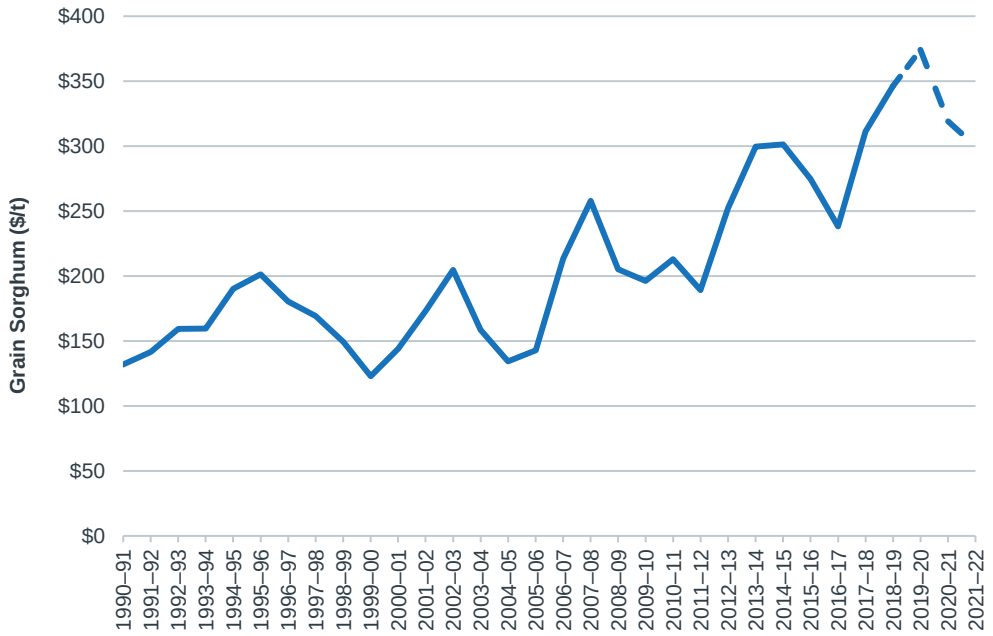


Notes: The international pricing is an average of daily offer prices made in US dollars and converted to Australian dollars using quarterly average of daily exchange rates.
Source: ABARES (2021 f).

Sorghum

Australian grain sorghum prices are expected to peak in 2019-20 at approximately $374 per tonne, decreasing by an average annual rate of 10% to reach $300 per tonne in 2021-22 (ABARES, 2021 a). The decrease in price is largely due to 'the return to average seasonal production from drought-induced lows, and a fall in demand for animal feed due to increased pasture and fodder availability' (ABARES, 2021 a).

Figure 2.45. Grain Sorghum (Australian Agricultural Prices), 1990-91 to 2021-22



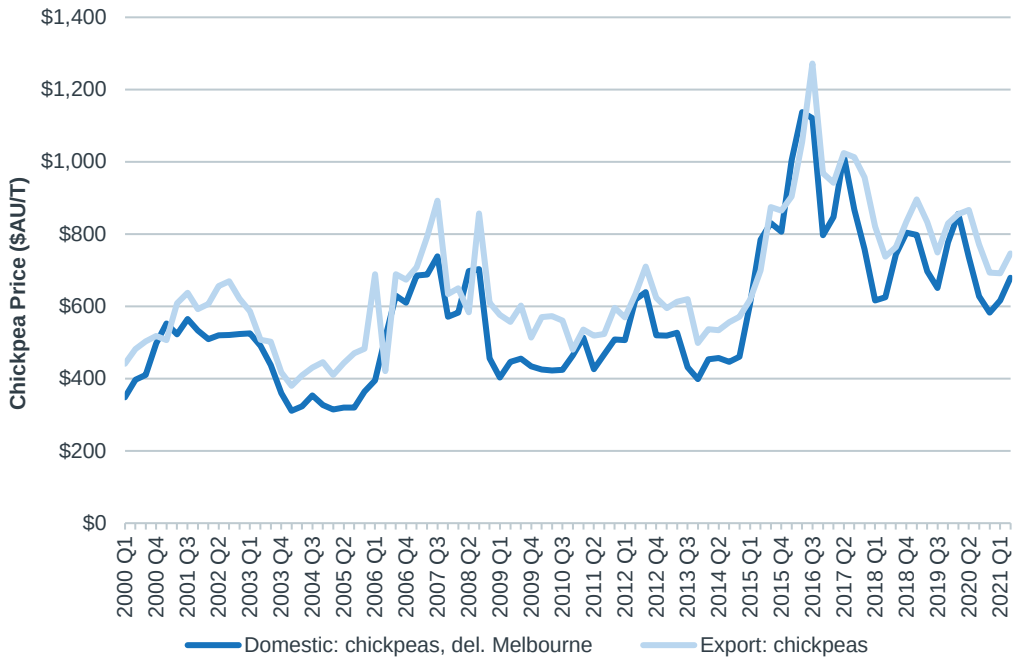
Source: ABARES (2021a).

Chickpeas

In the second quarter of 2021, Australian prices for chickpeas totalled approximately $679 per tonne. Export volumes for chickpeas were slightly higher at $747 per tonne.

Chickpea prices experienced a peak in the begging to middle of 2016, reaching $1,138 per tonne for domestic chickpeas and $1,272 per tonne for export chickpeas.

Figure 2.46. Average Australian Chickpea Prices ($/t)



Source: ABARES (2021b).

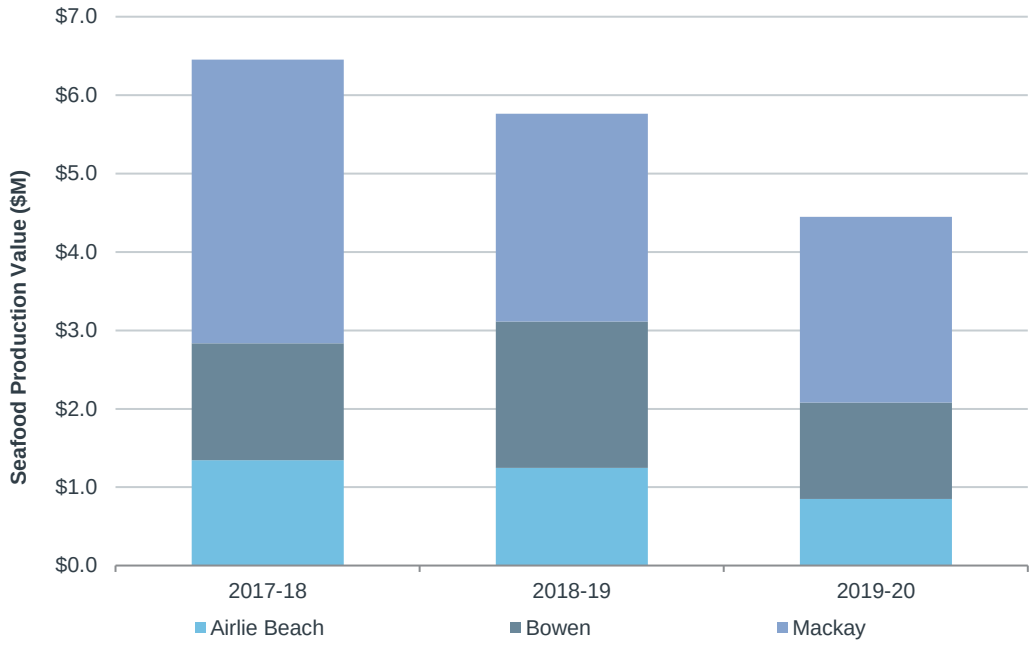
2.6 SEAFOOD

2.6.1 Production

Wild Caught Seafood Production Value

Wild caught seafood has been decreasing over the past three years falling from $6.5 million in 2017-18 to $4.4 million in 2019-20. There are three ports for seafood production in the MIW region including Airlie Beach and Bowen in the Whitsunday LGA and the Mackay port in Mackay. The Mackay port is the largest production port in the region contributing $2.4 million to the region total of 53.2% in the 2019-20 year.

Figure 2.47. Wild Caught Seafood Production Value by Port ($M), 2017-18 to 2019-20



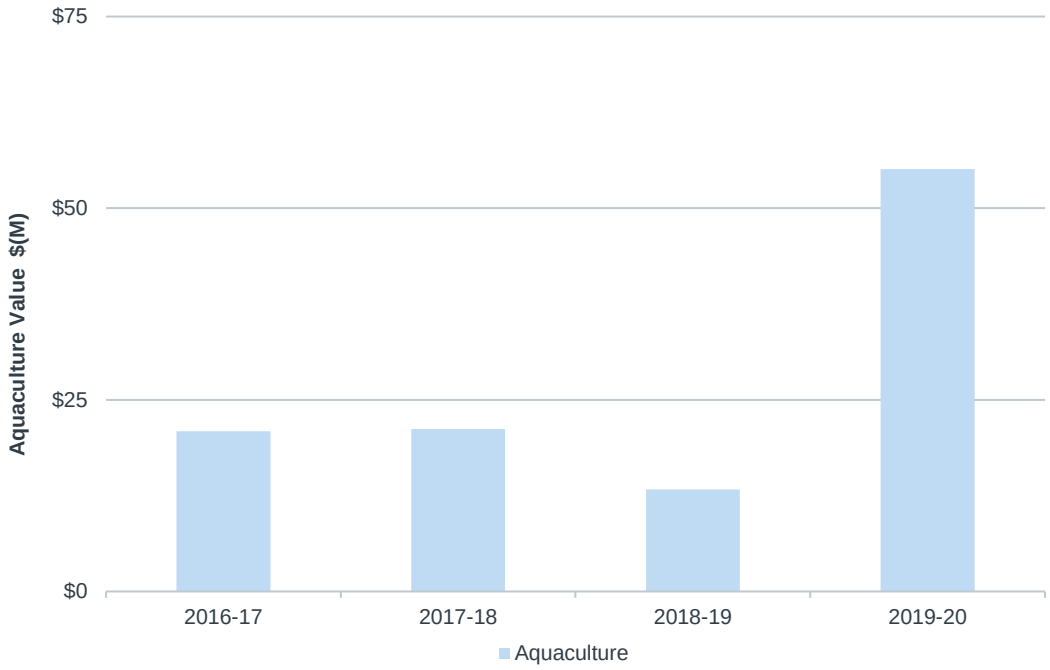
Source: BDO (2019), DAF (2021 b)

Aquaculture Production Value

Aquaculture is an up-and-coming industry within the MIW region and sees good potential into the future. Because of the current size of the industry, there is a lack of public information due to commercial sensitives regarding some regions having very low number of aquaculture businesses.

Aquaculture production in the MIW region in 2019-20 was valued at $55.1 million, an increase of 314% from the year previous. Prawns and barramundi are the main aquaculture species produced in the MIW region.

Figure 2.48. Aquaculture Production Value ($M)



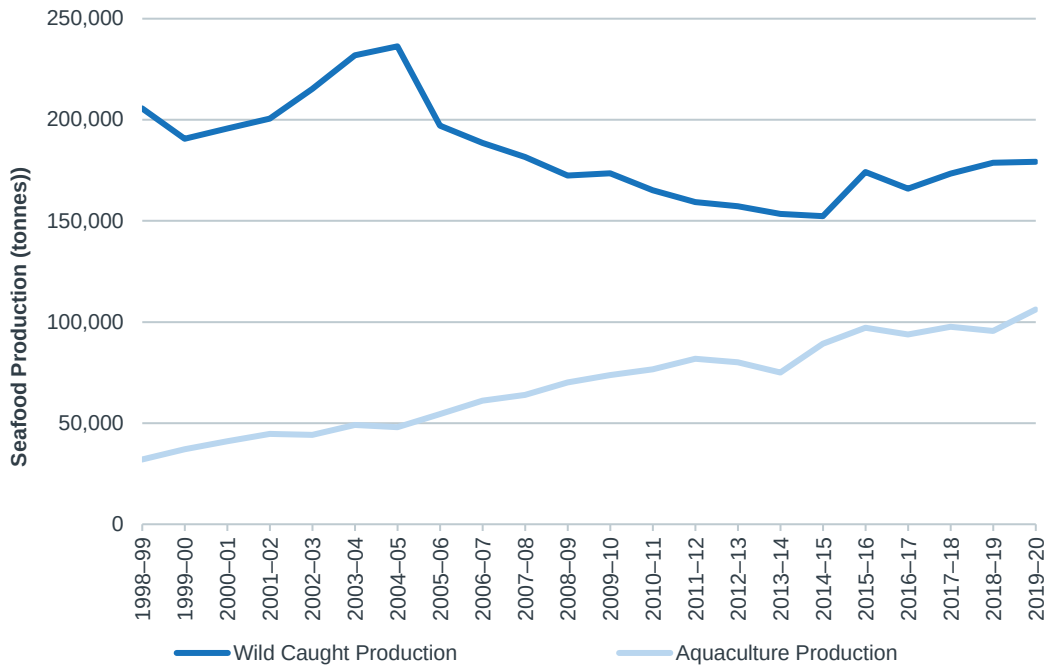
Source: DAF (2020)

Australian Production

Australian production of wild caught seafood peaked in 2004-05 where approximately 236,300 tonnes were caught. The industry saw a decrease between the years of 2005-06 and 2014-15, however has seen an average annual increase of 3.3% per annum between the 2014-15 and 2019-20 years. Overall, the wild caught seafood industry has been seeing a decrease in production since 1998-99 declining at an annual average rate of 0.7% per annum. The 2019-20 179,261 tonnes of wild caught seafood contributed 62.8% of total seafood production in Australia.

Aquaculture has seen the opposite growth compared to wild caught seafood and has seen steady growth since 1998-99 growing at an average annual rate of 5.9% per annum. 2019-20 was the most productive year for Australian aquaculture production with a total of 106,139 tonnes harvested contributing 37.2% to the national seafood production

Figure 2.49. Australian Production (Wild Caught Seafood & Aquaculture), 1998-99 to 2019-20



Source: ABARES (2020c).

Production by State

The information listed in the table below highlights the fisheries and aquaculture production throughout Australia by state/territory. It must be noted that the information provided by ABARES by state and territory does not line up the total estimates provided by ABARES. It is estimated that in 2019-20, Queensland was the third largest producer of aquacultural products producing 9,753 tonnes (9.2% of aquaculture in Australia). Tasmania was the largest producer of aquacultural products in Australia producing 69,519 tonnes (65.4% of aquaculture in Australia) followed by South Australia that produced 17,472 tonnes (16.4% of aquaculture in Australia).

Queensland was the third largest producer of wild caught seafood in Australia catching 16,927 tonnes (14.3% of wild caught in Australia). South Australia was the largest producer of wild caught seafood in Australia catching 48,422 tonnes (40.8% of wild caught in Australia). Followed by Western Australia that caught 20,031 tonnes (16.9% of wild caught in Australia).

Table 2.18. Seafood Production (t) by State, 2019-20

State	Aquaculture	Wild Caught
QLD	9,753	16,927
NSW	4,827	11,642
VIC	3,016	2,928
WA	1,732	20,031
SA	17,472	48,422
TAS	69,519	12,803
NT	-	5,857
Total	**106,319**	**118,610**

Notes: Preliminary estimates.
Source: ABARES (2020d).

Production by Fishing Region Queensland – Wild Caught

Table 2.19 displays the wild caught seafood catch for regions in Queensland. Coral Trout is the most caught seafood commodity within the Mackay region and is the second largest catcher of the species in the state catching 175.7 tonnes in 2020-21. King Prawns are the next biggest caught species in Mackay with 133.9 tonnes followed by Mud Crabs with 61.7 tonnes and Grey Mackerel with 59.6 tonnes.

Table 2.19. Wild Caught Seafood Catch (t), Queensland, 2020-21

	Mackay	Cairns	Capricorn Bunker	Far Northern	Gulf of Carpentaria	Sub Tropical	The Swains	Townsville
Coral Trout	175.7	125.6	11.9	67.1	0.3	0.7	166.9	299.8
King Prawns	153.9	14.7	547.0	1.4	0.0	1,656.0	162.3	226.9
Mud Crab	61.7	55.9	174.2	0.0	71.4	125.9	0.0	188.0
Grey Mackerel	58.6	13.0	0.0	0.0	643.3	14.6	0.0	60.8
Banana Prawns	44.8	0.7	15.3	0.0	0.0	188.7	0.0	66.5
Red Throat Emperor	36.7	0.0	6.5	0.0	0.0	0.3	69.7	63.3
Barramundi	36.4	3.5	8.7	0.0	632.8	5.6	0.0	60.5
Tiger Prawns	29.4	404.0	1.7	45.8	0.0	176.2	0.0	557.1
Spanish Mackerel	28.2	30.8	20.9	24.4	188.1	23.1	6.5	163.7
Other	192.3	482.8	548.9	222.5	483.7	4,009.0	158.1	835.3
Total	817.7	1,131.1	1,334.9	361.3	2,019.6	6,200.3	563.5	2,521.8
% of Total	**5%**	**8%**	**9%**	**2%**	**14%**	**41%**	**4%**	**17%**

Source: DAF (2022 b)

Production by Region – Aquaculture

The MIW region was the most valuable aquaculture region in the state producing $55.1 million of goods in 2019-20 (33.4% of the state value). Although being the most valuable, the region was the second largest in terms of production producing 2,973.5 tonnes (31.2% of the state production) on 262.8 hectares of ponded area. The region employs approximately 188.3 FTEs in aquacultural industries. Cairns was the largest producer of aquacultural products producing 3,475.6 tonnes (36.4% of the state production) and the second most valuable with production value at $50.6 million (30.7% of the state value). Overall, the state produced 9,535.8 tonnes of aquaculture products at a production value of $164.9 million.

Table 2.20. Regional Aquaculture Production, 2019-20

SA4 Region	Production (tonnes)	Yield (t/ha)	Ponded area (hectares)	Employment (FTE)	Total Production Value ($M)
Brisbane - East	-	-	-	17.2	$0.4

SA4 Region	Production (tonnes)	Yield (t/ha)	Ponded area (hectares)	Employment (FTE)	Total Production Value ($M)
Cairns	3,475.6	9.4	368.0	218.1	$50.6
Central Queensland	355.2	11.6	30.7	19.4	$7.2
Gold Coast	722.7	7.0	103.3	61.4	$15.3
Mackay-Isaac-Whitsunday	2,973.4	11.3	262.8	188.3	$55.1
Queensland - Outback	-	-	7.4	15.3	$1.5
Sunshine Coast	-	-	3.0	10.5	$0.1
Townsville	1,361.9	10.0	135.9	103.0	$24.0
Wide Bay -Burnett	431.7	3.7	118.0	65.1	$8.8
Total	**9,535.8**	**9.1**	**1,045.4**	**713.7**	**$164.9**

Note: Sum of all regions may not equal state data.
Source: DAF (2020).

Seasonality

Despite wild Barramundi typically spawning between March and September, seasonality for aquaculture Barramundi production is often observed year-round for both hatchery and harvesting

Aquaculture Prawns have peak harvesting seasons between December and January, and March and April. Hatchery in prawns is generally observed between June and September.

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Prawns												
Cycle	Harvest		Breeding									

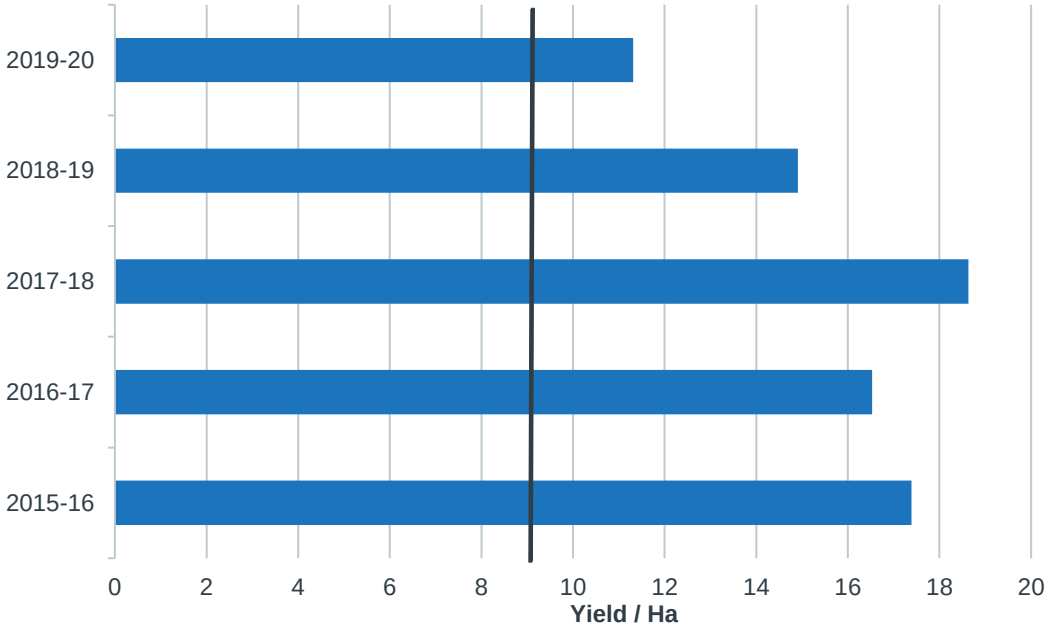
Source: AEC (unpublished).

2.6.2 Productivity

Aquaculture Yields

Aquaculture yields in the MIW region are consistently above the state average of 9.1 t/ha. During the 2019-20 year, yields in the MIW region were 11.3t/ha, lower than 2017-18 year yields which were at a record high of 18.6t/ha.

Figure 2.50 Aquaculture Yields in MIW Region



Note: the bar at 9.1 t/ha represents the state aquaculture yield in 2019-20.
Source: DAF (2020)

Wild Catch Quota

Table 2.21 displays the wild catch quotas for the listed species along with the total east coast catch for the season and the amount of the quota utilised.

Table 2.21. Wild Catch Quota East Coast (QLD), 2020-21

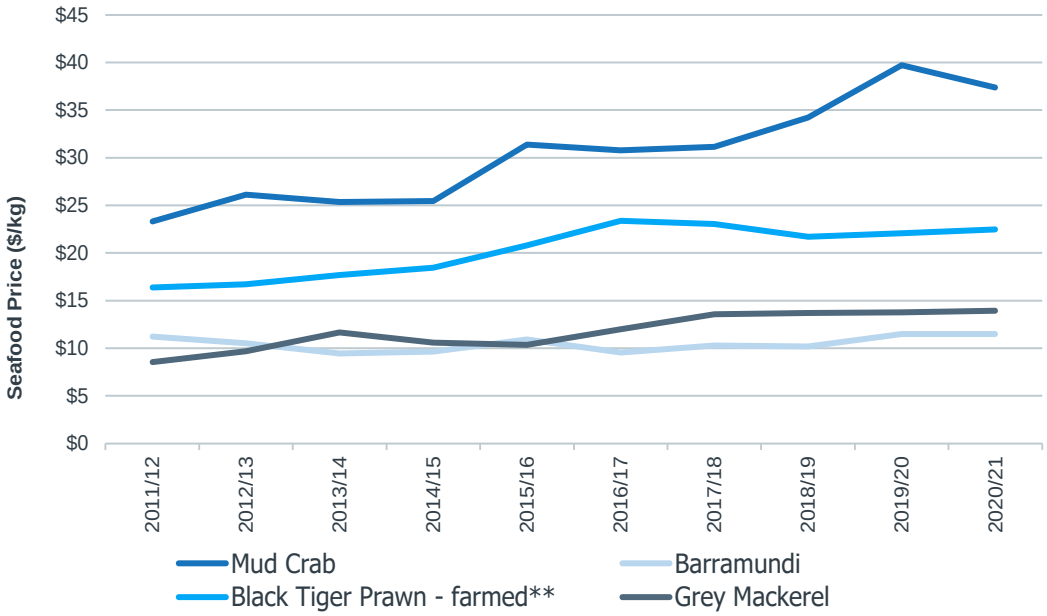
Species	Quota (t)	Catch (t)	Quota Utilised
Barramundi	244.0	114.7	47.0%
King Threadfin	72.1	56.0	77.6%
Spanish Mackerel	578.0	297.5	51.5%
Red Throat Emperor	607.8	176.7	29.1%
Coral Trout	1,287.2	848.0	65.9%
Tropical Rock Lobster	195.0	145.4	74.6%

Source: DAF (2021 a), DAF (2021 b)

2.6.3 Commodity Prices

Table 2.22 shows the prices received for the primary seafood varieties produced in the MIW region and sold in the Sydney markets. Prices for fish species have been generally static over time, whereas crustacean prices have been slowly increasing.

Figure 2.51. Seafood Prices (Sydney Markets)



Source: AEC

3. FARM MARGIN ANALYSIS

Farm margin analysis was prepared to explore the relative profitability of different agricultural commodities. The purpose of exploring farm margins is to identify opportunities for higher value output from the MIW region.

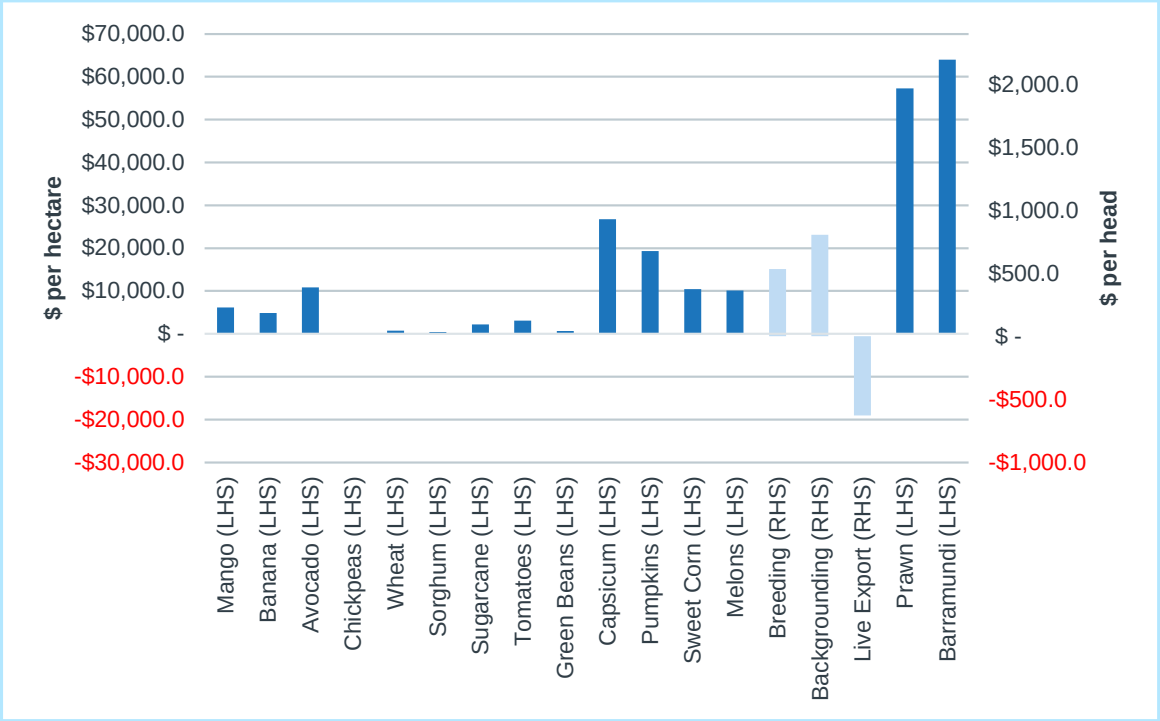
KEY TAKEAWAYS

Figure 3.1 below shows the relative gross margin for the range of commodities produced in the MIW region.

The gross margin shows aquaculture (prawn and barramundi) as having very strong gross margins on a per hectare basis.

Similarly, row crops such as capsicum, and pumpkins are favourable commodities.

Figure 3.1. Summary of Farm Margin Analysis



Source: AEC

The outcomes of the analysis for all commodities in the study area is reflected in Table 11.1 below. The data used in this section was collated from publicly available third-party sources (including the ABS and Queensland Department of Agriculture). Where possible, data was checked and amended in consultation with key industry participants to achieve information that is realistically representative of what can be achieved and reflective of the MIW region.

Table 3.1. Margin Analysis Summary

	Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue (AUD/unit)	Production Operating Cost (AUD/unit)	Gross Margin (AUD/ unit)
Orchard						
Mango	30 hectares	$13/ Tray*	8 trays/ tree	$14,118/ hectare	$7,932/ hectare	$6,186/ hectare
Banana	265 hectares	$26/ Carton	233 cartons/ hectare	$72,800/ hectare	$65,981/ hectare	$4,837/ hectare
Avocado	15 hectares	$35/ Tray	27.5 kg/ tree	$24,000/ hectare	$13,621/ hectare	$10,879/ hectare
Broadacre						
Chickpeas	760 hectares	$583/ tonne	1.2tonnes/ hectare	$710/ hectare	$510/ hectare	$192/ hectare
Wheat	760 hectares	$400/ tonne	1.6tonnes/ hectare	$1,248/ hectare	$488/ hectare	$760/ hectare
Sorghum	1,500 hectares	$230/ tonne	2.1tonnes/ hectares	$483/ hectare	$93/ hectare	$390/ hectare
Sugarcane	150 hectares	$527.50/ tonnes	11.7 tonnes/ hectare	$6,172/ hectare	$3,967/ hectare	$2,205/ hectare
Row Crops						
Tomatoes	53 hectares	$1,113/ tonne*	55 tonnes/ hectare	$61,215/ hectare	$58,094/ hectare	$3,121/ hectare
Green Beans	53 hectares	$1,743/ tonne	5.3tonne /hectare	$9,238/ hectare	$8,609/ hectare	$629/ hectare
Capsicum	53 hectares	$17.40/ carton	24 tonnes/ hectare	$52,200/ hectare	$25,477/ hectare	$26,723/ hectare
Pumpkins	11 hectares	$463/ tonne	26 tonnes/ hectare	$26,751/ hectare	$8,330/ hectare	$19,342/ hectare
Sweet Corn	486 hectares	$20.51/ carton*	12 tonnes/ hectare	$24,614/ hectare	$14,217/ hectare	$10,397/ hectare
Melons	28 hectares	$1,079/ tonne	25 tonne/ hectare	$26,968/ hectare	$16,832/ hectare	$10,136/ hectare
Livestock						
Cattle – Breeding	1,000 head / 1,813 AE	$1,022/ head*	na	$1,022/ head*	$487/ head	$535/ head
Cattle – Backgrounding	800 head / 1,813 AE	$2,779/ head*	na	$2,779/ head*	$1,971/ head	$807/ head
Cattle – Live Export	800 head / 1,813 AE	$1,259/ head*	na	$1,259/ head*	$1,888/ head	-$628/ head*
Aquaculture						
Prawn	16 hectares	$21.27/ kg*	7.8 tonnes/ hectare	$161,640/ hectare	$103,139/ hectare	$57,254/ hectare
Barramundi	15 hectares	10.41/kg	26.3 tonnes/ hectare	$273,117/ hectare	$209,126/ hectare	$63,991/ hectare

Note:

- Costs marked with an asterisk are a weighted average
- Beef production has been segmented into its individual production segments. To calculate a traditional multisegmented operational margin, each relevant segment should be added together. This approaches the potential impact of supplying one market over another where such choice exists. For example, an integrated breeding and backgrounding operation that sold 350kg animals to finishing or feedlot operators would have a margin of $$1,342 per head. If the same animal was sold as a Live Ex animal, the margin would only be $714 per head reflecting the higher domestic pricing as demand for cattle to replenish domestic herds continues to put pressure on the Live Ex supply chain.

3.1 APPROACH TO GROSS MARGIN DEVELOPMENT

In undertaking the crop margin analysis, commodities were assessed on the following basis:

3 **Crop Suitability**: Land and climate suitability has been assumed to enable the target crops identified for review to be grown within the study area. Where crops (e.g. Avocadoes) may struggle to survive in the region based on climatic conditions, a note to that effect has been included in its relevant section. No other suitability analysis has been undertaken in this analysis.

4 **Greenfield Development**: In order to ensure comparability of analysis, the margin analysis is based on a mature operation, not greenfield developments. This approach precludes the calculation of any investment returns arising from any greenfield development or the sunk capital incurred in reaching maturity.

5 **Average Data Reliance**: Where regional data has been unavailable for use in undertaking the margin analysis, State or National average performance data has been used. Use of average data may skew margin performance to potentially more suitable growing regions for some crops where the disease, pests, climate and other variables may be more beneficial than the study area.

6 **Supporting Infrastructure Capacity & Inputs**: Supply chain infrastructure and capacity has been assumed to be in place in order to enable producers to access end markets and obtain all necessary production inputs. All require resources, natural or otherwise are available to run a commercially scaled farm. This includes water, labour, trees, and supporting infrastructure. It is assumed there are no inhibiting factors to access sufficient water. Similarly, it is assumed the region has sufficient access to certified seedlings for planting and that there are enough skilled labour and supporting infrastructure to produce more of each commodity. No adjustment for supply chain impediments has been made in the margin analysis.

7 **Production Systems are Segmented**: Production chain segmentation has been used to compartmentalise and isolate the margins for each stage of production. For example, in the beef sector, this is reflected in the segmentation of breeding, backgrounding, finishing (i.e. sale to domestic processors) and sale to live trade market. In order to calculate an aggregate business that spans multiple segments, each margin would need to be added together. For a live trade market supplier who bred their own cattle, they would breed, background to target weight and then sell to the live export market. This type of segmentation highlights potential value accretion or loss along the value chain.

8 **Annualised Cost Basis**: Time taken to maturity and associated fluctuations/ movements are not reflected in the analysis of margins, which are generally presented as an annualised cost based on the year of sale. Care should be taken in interpreting the margins for those industries (e.g. cattle) that may hold their inventory/stock for more than 12 months prior to sale. Stated margins would need to be adjusted to reflect the holding cost associated with the inventory turnover period associated with those commodities on an individual business operational basis.

9 **Pricing**: Pricing is based on current market data available and has not been adjusted for any future trends in market demand or supply. Nor has the information been adjusted to reflect any potential shocks to the market arising from any geopolitical or environmental issues.

10 **Yield**: Yield information has been tailored to specific varieties disclosed in the margin analysis explanatory material. There may discrepancies with the seasonal yields disclosed in the market analysis due to the use of rolling average production data or yields achieved by industry respondents with direct experience in the production and supply of the commodities in question. The use of rolling average data is designed to eliminate short term seasonal influences on the margin analysis.

3.2 ORCHARD CROPS

Orchard crops have a long establishment phase with commercial production taking up to seven years for some crops such as Macadamias and Citrus. In addition, varietal choice has a significant impact on end market access, seasonal timing and profitability.

The data presented in this section presents an average production assessment based on selected varieties where information has been accessible, or, where unavailable, sector averages. Each specific crop assumption is detailed in its respective section.

In modelling the farm gross margin, it's assumed the typical farm in MIW would be a traditional orchard (not trellis based) and is a medium-density farm due to the higher-than-average growth expected due to the area's climatic conditions. A traditional farm typically has lower capital and density assumptions which reflect the goal of balancing sufficient yield with minimising pruning costs due to the high growth environment associated with the MIW region.

Given tree crops are a bearer asset, the cost of planting is capitalised, not an operational cost, the cost of planting is not considered in the gross margin analysis.

3.2.1 Mango

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
30 hectares	$13/ Tray*	8 trays/ tree	$14,118/ hectare	$7,932/ hectare	$6,186/ hectare

Note: Costs marked with an asterisk are a weighted average
Source: Ausmarket Consultants (unpublished), CRCNA (2021), DAF (1999), Hort Innovation (2021a), Ngo and Owens (2004). Consultation with the Australian Mango Industry Association.

The majority of mangoes produced in Australia is Kensington Pride (46%), the gross margin estimated is based on the prices and yields of a Kensington Pride orchard. Kensington Pride are not suited for the majority of export markets due to their fragility. Other varieties such as Kiett, Honey Gold, Calypso and R2E2 may be more suitable for export but have a lower average price and margin if sold domestically.

The gross margin is estimated for the mature Kensington Pride mango orchard, where trees are approximately 10 years old. The modelled average farm is assumed to have moderated density (approximately 185 trees/ hectare). These trees will yield approximately 56 kilograms each when at maturity, this is equivalent to 8 trays per tree. High producing mango trees can yield about 12 trays per tree.

The weighted average price used in estimating the gross margin is $13 per tray. Grade One Kensington Pride will sell for an approximate $22 per tray at the Brisbane Market (this is based on the average price per tray for the past five years). Grade One Kensington Pride mangoes are approximately 45% of the total yield, on average.

The productivity of an average mature mango farm is shown in Table 3.2.

Table 3.2. Kensington Pride Production at Maturity

	Total Trees
Total Trees per Ha	185
Total Kilograms Produced per Ha	10,360
Average Trays Produced per Tree	8

Source: Consultation with Queensland industry growers

Mango farm operating costs are approximately $7,932 per hectare. The primary components contributing to production costs are fertilisers and insecticides at a combined cost of $13.92 per tree.

3.2.2 Banana

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
265 hectares	$26/ Carton	233 cartons/ hectare	$72,800/ hectare	$65,981/ hectare	$4,837/ hectare

Source: DAF (1998), Consultation with Queensland growers

The banana gross margin is estimated to be $5,828 when the average sale price is $26/ carton. On anecdotal advice, a productive banana farm will yield 233 cartons per hectare, however, DAF (1998) report carton yields can range with an upper estimate of 2,500 cartons per hectare.

Total domestic production is approximately 402,982 tonnes across 14,000 hectares (Hort Innovation, 2021a), which translates to about 16kg of bananas consumed per capita. Australian banana production is almost entirely self-sufficient, with Australia effectively importing and exporting no bananas, essentially all domestic production is for domestic consumption. Queensland is the biggest producer in the country, producing about 94% of all bananas, of which Tropical North Queensland is the biggest producer.

Production is concentrated in tropical areas given their natural aptitude for growing higher yields and consistently quality fruit (DAF, 1998). Subtropical production, although has typically lower yields and lower quality, is less susceptible to natural disasters.

Given the concentration of Australia's banana production, any natural disasters in Tropical North Queensland have a significant and stark impact on banana prices. An assumed $26/ carton has been used in estimating the gross margin for a sample banana farm in the MIW region.

Market analysis for the domestic market has not been undertaken. It's unclear how much appetite Australian's have for increasing banana consumption. Additionally, the export market is currently an underdeveloped avenue for the banana producers in Australia, and as such, does not have a developed supply chain with support infrastructure, nor are the banana varieties suitable for export markets understood.

The most popular variety is cavendish – accounting for 97% of all produced. The other 3% are lady finger bananas Hort Innovation (2021a). On a global scale, Australia cannot compete in any export markets with the cavendish banana variety, as our cost of production prior to transport costs is higher than the equivalent price points in countries such as the Philippines and Ecuador (Hort Innovation, no date).

The production cost per hectare is estimated to be $65,981 in the MIW region. The key operating costs contributing to this are labour and selling costs. Selling costs include things such as freight (35% of selling costs) and packing materials (28% of selling costs).

3.2.3 Avocado

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
15 hectares	$35/ Tray	27.5kg/ tree	$24,000/ hectare	$13,621/ hectare	$10,879/ hectare

Source: NSW Agriculture (2003) and consultation with Queensland growers.

Avocadoes are a popular fruit as domestic consumption is approximately 3.8 kilograms per capita. Avocadoes are a largely domestically produced and consumed commodity. Only 4% of total avocado production is exported, with 89% of domestically produced and 100% of imports purchased as fresh supply. Australia is a net importer, with a balance of nearly 25 thousand tonnes net, imported in 2021.

The total wholesale value of consumed avocadoes in FY2021 was $717.3 million. There are five key production areas in Australia: Atherton Tablelands, Bundaberg/ Childers, Southeast Queensland and Northern NSW, Sunraysia in Victoria, and Pemberton Manjimup in Western Australia. The MIW region is not a large producer of avocadoes, with only $5,506 worth produced in 2016 (ABS, 2017b) and less than half a tonne produced in 2020 (ABS, 2021).

For avocado trees to flower the tree requires at least four weeks of relatively cold temperatures to flower. The trees then require at least three days of temperatures above 10 degrees for fruitset to occur. Typically, coastal areas north of Yeppoon, Queensland will not meet these temperature requirements (DAF, 2016b; RDA, no date). Given the potential variability in production yields and quality that would likely arise from this short window, prices attained can be expected to be lower than the industry average.

The gross margin has been estimated based on a mature avocado farm where the average production is 27.5 kilograms per tree – the equivalent of 5 trays. With the relatively low avocado tree population of 140 trees/ hectare the total production per hectare is 248 tonnes. The tree density has been assumed based on the north Queensland

average tree density in the Australian Avocado Benchmarking Program Development report (Horticulture Innovation Australian, 2013)[2].

The average farm size of 15 hectares has been used in this analysis. This reflects both the average farm size of a North Queensland farm and the upper bound of where the majority of avocado growers fall (Whiley, 1999). It should be noted than larger Avocado farms can be up to 100 hectares in size.

Consultation with growers suggests that the average farmgate price for avocado is $35 per tray (this price was consistent with data published by Hort Innovation (2021)). It should be noted, this price does not take into account seasonality or supply driven pricing variability, nor does it account for varietal or grade variations.

There are only two key avocado varieties produced in Australia, Hass and Shepherd. These varieties have differing harvesting timeframes, shown in the table below. The average operating cost of $13,621 per hectare does not take into account varietal differences.

Table 3.3. Avocado Seasonality by Variety

Variety	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Hass												
Shepheard												
Availability	High			Medium			Low					

Source: Hort Innovation (2021a).

Despite the strong average gross margin experienced in the industry, avocadoes are unlikely to be a suitable crop for the MIW region due to their climatic needs.

3.3 BROADACRE

Due to lack of clarity on water availability and data capture issues between dryland and irrigated cropping at a farm level in the MIW region, all broadacre crops are assumed to be irrigated, unless otherwise stated, with no water supply limitations.

3.3.1 Chickpeas

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
760 hectares	$583/ tonne	1.2tonnes/ hectare	$710/ hectare	$510/ hectare	$192/ hectare

Source: ABS (2021), DAF (2013), McKellar, et al. (2013).

The estimated gross margin for chickpea production in the MIW region is $192 per hectare, based on a yield of 1.2 tonnes per hectare and an average price of $583 per tonne. There are two key chickpea varieties grown on a commercial level in Australia, in assessing the gross margin, no differential has been made on varietal type.

At an assumed $583 per tonne price, and yield of 1.2 tonnes per hectare the average revenue for a MIW region chickpea farm is $701 dollars per hectare.

As an annual crop, planting is a key operating activity and expense. Planting chickpeas are assumed to cost approximately $73 per hectare and can be undertaken in a rather short window, particularly for tropical regions and dryland farming.

Chickpea planting requires sufficiently moist soil prior to planting for optimal plant growth. Without the right climatic conditions, (that is, sufficiently wet soil) chickpea plants can be relatively unproductive due to low nutrient uptake (GRDC, 2016a). This was a significant issue in the 2017-2019 period when substantial land farming chickpeas was in drought (BOM, 2020) and forms a key risk in chickpea production. Subsequently, the primary variable operating cost associated with chickpea production is chemical applications (including fertiliser, fungicide, insecticide, and herbicide) which cost an approximate $248 per hectare and represents about half of all variable operating costs.

[2] Horticulture Innovation Australia is now known as Hort Innovation.

3.3.2 Wheat

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
760 hectares	$400/ tonne	1.6tonnes/ hectare	$1,248/ hectare	$488/ hectare	$760/ hectare

Source: ABS (2021), McKellar, et al. (2013).

The gross margin for wheat is estimated to be $760 per hectare. This margin is reflective of an average annual yield of 1.56 tonnes per hectare and an average price of $400 per tonne. The estimated gross margin is based on mature farm operations and assumes wheat production and commodity outlook will be consistent in the forward years. The production and commodity outlook of wheat determines its supply and demand and therefore determines prices. The assumption of consistency in these variables leads to a consistent projection of prices.

The current study has not used external factors, including geopolitics, to understand gross margin estimates. The current geopolitical climate may impact the gross margin of wheat due to various supply and supply chain issues.

Soil quality is imperative to the successful establishment of wheat crops. Soil naturally loses fertility over time and fertiliser plays a key role in preventing this and ensuring long-term sustainability of production (GRDC, 2016b). Fertiliser represents the 26% of non-labour operational cost to growers at approximately $310 per hectare and constitutes the largest share. As for most of the surrounding region, MIW predominantly operates with cracking clay soils, or vertisol (GRDC, 2016b). This soil is well suited to wheat production if there is sufficient rainfall or irrigation available (Eswaran and Reich, 2005) and appropriate nutrient management practices are followed (GRDC, 2016b).

MIW is at the peak of Australia's northern grain producing region (GRDC, undated). Wheat production in the region has increased relative to the state in recent years. In the 2016 financial year MIW supplied 1.0% of Queensland's wheat production (ABS, 2017) and by the 2020 financial year supplied 15.9% of the state's production (ABS, 2021).

3.3.3 Sorghum

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
1,500 hectares	$230/ tonne	2.1tonnes/ hectares	$483/ hectare	$93/ hectare	$390/ hectare

Source: McKellar, et al. (2013), RDA (no date), DAF (no date), NSW Department of Primary Industries [DPI] (2005).

The estimated gross margin for a sorghum farm in the MIW region is $390 per hectare. This margin is reflective of an average yield of 2.1 tonnes per hectare and an average price of $230 per tonne (McKellar, et al., 2013). The gross margin estimated is based on mature farm operations and assumes sorghum production and commodity outlook will be consistent in the forward years.

The sorghum is assumed be a dryland crop which increases the variability of farm performance and net margin in any given season as reliance on seasonal rainfall drives on farm performance. Exceptional yield for a sorghum crop requires both adequate water and appropriate soil. Sorghum grows best in clay-based soils which can hold water through the warmer seasons. Irrigation of sorghum can increase the expected yield per hectare, increasing the reliability of the land's productivity, as the planting density can be increased (DPI, 2005). Irrigated sorghum can produce a yield of up to 8tonnes/ hectare in Queensland (DAF, no date a). Given the dryland nature of sorghum in the region, the average annual yield is significantly lower at 2.1 tonnes per hectare.

Sorghum prices have been relatively volatile over the past five years. North Queensland sorghum prices in 2021 ranges from $270 to $300/ tonne (Heard, 2021). A conservatively assumed $230/ tonne has been used on evaluating the gross margin for sorghum in the MIW region to account for a balance between strong and below average seasons. At a conservatively assumed price of $230 per tonne price, and yield of 2.1 tonnes per hectare the average revenue for a MIW region sorghum farm is $483 dollars per hectare.

The total estimate variable operating costs for farmed sorghum in the MIW is $93 per hectare. The biggest operating costs related to sorghum production are soil and crop nutrition and crop protection DAF (no date). As with a lot of broadacre crops, soil health has a direct impact on the quality of the commodity produced and the quantity of yield produced.

3.3.4 Sugarcane

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
150 hectares	$527.50/ tonnes	11.7 tonnes/ hectare	$6,172/ hectare	$3,967/ hectare	$2,205/ hectare

Source: FEAT (2022).

Financial estimates for sugar cane were developed using the QDAF Farm Economic Analysis Tool (FEAT) online model for the Mackay sugarcane production area. Prices were based on the 2022 grower floor price published on the Queensland Sugar market snapshot on 18 March 2022.

Fuel prices were adjusted to reflect current bowser prices after the diesel fuel rebate in order to better reflect current market conditions with the remaining assumptions based on the region's historic average performance and farm structures as set out in the QDAF data set.

The gross margin was estimated on an average farm size of 150 hectares, with the planted area of 125 hectares. The estimated gross margin for sugar cane is $2,205 per hectare with a net operating margin after fixed costs of just under $1,145 per hectare based on a cane yield 84.8 tonnes per hectare. Average planting and growing costs have been estimated at $2,113/ hectare with a total farm income of $3,965/ hectare.

The breakeven income for a farm in the region is estimated at $2,820/ hectare or a price equivalent of $241/tonne of sugar produced.

3.4 ROW CROPS

3.4.1 Tomatoes

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
53 hectares	$1,113/ tonne*	55 tonnes/ hectare	$61,215/ hectare	$58,094/ hectare	$3,121/ hectare

Note: Costs marked with an asterisk are a weighted average
Source: ABARES (2018), Ausvege (no date), DAF (2006c & 2007c), Hort Innovation (2020b).

Queensland produces approximately 40% of Australia's tomatoes for fresh consumption, with the key growing areas currently Bowen and Bundaberg.

Tomato production, operating costs, and prices vary greatly by tomato variety, with cherry and grape tomatoes typically requiring greater operating costs and higher market prices. Ergashev (2020) assesses the operating cost difference between cherry tomatoes and gourmet tomatoes can be as much as $7,107 per hectare, with planting and irrigation costs contributing the largest variance. For the purpose of analysis, the gross margin estimated is based on a gourmet or round tomato.

The average weighted price per tonne is $1,113. This price assumes approximately 60% of total yield is Grade One ($12.88/ carton) and the remaining 40% is Grade Two ($8.50/ carton) (Ausvege, no date; DAF, 2006c). It should be noted that there is assumed to be no spoilage in this analysis, and as such, the achievable gross margin may be lower than estimated.

The assumed yield is 55.0 tonnes per hectare (DAF, 2007c). At a carton size of 10kilograms, this translates to 291,500 cartons produced annually for the average 53-hectare farm, all of which are assumed to be transported to Brisbane, from the MIW region, for processing and distribution (at an assumed cost of $1.79 per carton).

The total variable operating cost for a mature single variety tomato farm in the MIW region is estimated to be $58,094, consisting of:

- Fertilisers, herbicides, pesticides (including insecticide and fungicide) – approximately $3,994/ hectare
- Packing costs including materials and labour – approximately $6.34/ carton
- Other harvesting costs including machinery– approximately $455/ hectare.

3.4.2 Green Beans

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
53 hectares	$1,743/ tonne	5.3tonne /hectare	$9,238/ hectare	$8,609/ hectare	$629/ hectare

Source: ABARES (2018), Ausvege (no date)

In line with the ABARES estimates, the gross margin estimate for bean production in MIW region is $629 per hectare. This gross margin assumes average price of $1,743 per tonne and 5.3 tonnes per hectare.

Queensland produces approximately 53% of Australian beans (including green bean, French bean, and runner beans) (Hort Innovation, 2021b). Key areas of production in Queensland are Innisfail and Bundaberg, relatively coastal and tropical environments. The MIW regions produced, in production value terms, 15.5% of Queensland's beans in 2016 (ABS, 2017).

Approximately 96% of all produced beans in Australia were consumed domestically. Additionally, Australia is a net exporter of beans (Hort Innovation, 2021b), and of those exported, 96% were sent to New Zealand. A successful increase in bean production is likely to be in response to a growing export market, as it is unlikely the domestic appetite will accommodate more beans.

It should be noted, however, that this may not be consistent across bean varieties, nor is it consistent with processed beans. Australia imports approximately 7,000 tonnes of frozen beans, while exporting only 20 tonnes of frozen beans.

3.4.3 Capsicum

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
53 hectares	$17.40/ carton	24 tonnes/ hectare	$52,200/ hectare	$25,477/ hectare	$26,723/ hectare

Source: ABARES (2018), DAF (2007a), DPI (2013), DPI (2013), Growcom (no date a).

Reported capsicum prices can vary significantly, from $2 to $70 per kilogram (DAF, 1999a). Currently prices are, on average, $2.41 per kilogram, or $19.28 per carton. For the purpose of analysis, a relatively conservative assumption of $17.40 per carton has been used, where cartons are typically 8 kilograms (DAF, 2007a)

The capsicum is a perennial plant which typically likes to grow in warm to hot conditions. Queensland produces approximately 66% of Australia's capsicums and they can be produced year-round. Optimum temperatures for fruit set are between 16°C and 21°C (Department of Primary Industries and Regional Development [DPIRD], 2016). In Queensland, the key growing areas are currently Bowen and Bundaberg (Hort Innovation, 2021b). The MIW region produced 53% of Queensland capsicums in 2016 (by production value) (ABS, 2017).

Table 3.4. Capsicum Seasonality in Queensland

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Queensland												
Availability	High			Medium			Low					

Source: Hort Innovation (2021b).

Time on plant often relates to the colour of the capsicum, green capsicums are harvested sooner than red capsicums. Green capsicums can be harvested 30-35 days after fruitset and red capsicums can be harvested 50-60 days after fruit set. The red capsicum often has a higher price, however, there is a trade-off between holding the fruit for longer and harvesting for a commercial return earlier.

Capsicums can be farmed under a protected harvest, that is, either with a shade cloth or in a greenhouse to protect the fruit from sun and wind damage (DPRID, 2016), however, this method of farming does require a greater capital investment.

It is assumed in this gross margin analysis, all fruit sorting and storage will be undertaken at a centralised packhouse and then sold by a distributor, the cost associated with holding and sorting the capsicum will not be attributable to the farmer.

3.4.4 Pumpkin

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
11 hectares	$463/ tonne	26 tonnes/ hectare	$26,751/ hectare	$8,330/ hectare	$19,342/ hectare

Source: ABARES (2018), ABS (2021), Ausvege (no date), DAF (2007a), DPI (2009a).

The gross margin has been calculated based on the kent pumpkin variety's operational costs and revenues. However, the average yield assumed is the MIW region's pumpkin yield in the FY2019-20 season which does not distinguish the total yield by variety of pumpkin. The MIW region is highly productive when it comes to producing pumpkins, they produced approximately 30% more pumpkins (in tonnes) per hectare than the Queensland state average in the FY2019-20 (ABS, 2021). It is unclear how much this productivity is driven by climatic conditions, farm operations and management, or variety of pumpkin grown. For the purpose of analysis, it has been assumed that the productivity levels for all pumpkins in the MIW region is applicable to kent pumpkins.

The average farm size for pumpkins in the MIW region is 11 hectares, and this is largely in line with the average pumpkin farm size in Queensland. The total variable operating costs assumed to be incurred by the average farm is approximately $91,625 per annum, or $8,330 per hectare per annum (DAF, 2006b). The largest variable operating costs associated with pumpkin farming are the harvesting expenses which are approximately $1,954 per hectare, per month and include harvesting labour and harvesting equipment and materials.

Pumpkins require full sun and moderate water in order to grow effectively (DAF, 2016a). The cost assumptions used assume the pumpkin farm will require irrigated water, however, it is noted the cost assumptions are built on the basis of a Southern Queensland farm. According to DAF (no date b), pumpkin production in Southern Queensland (specifically the Balonne- Condamine region) use between two and four megalitres of irrigated water per hectare per annum with an average annual rainfall of 550mm (Queensland Reconstruction Authority [QRA] (no date). This is a stark difference from the MIW region which records average annual rainfall of 1585mm per year (BOM, no date). This high level of rainfall depending on timing could increase or disease risk for the pumpkin crop whilst also reducing the overall irrigation demand for the crop.

3.4.5 Sweet Corn

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
486 hectares	$20.51/ carton*	12 tonnes/ hectare	$24,614/ hectare	$14,217/ hectare	$10,397/ hectare

Notes: costs marked with an asterisk are a weighted average
Source: ABS (2021), Ausmarket Consultants (unpublished), DAF (2007b), DPI (2007).

The estimated gross margin for sweet corn is $10,397 per hectare. This is based on an assumed farm size of 486 hectares, yielding 12 tonnes per hectare and selling at the farm gate for a weighted average price of $20.51 per carton.

The average farm size is assumed based on the number of businesses counted by the ABS (2021) and the total area of production for sweet corn in the MIW region (ABS, 2021). This is significantly higher than the Queensland average farm size of 108 hectare. It has been assumed, for the purpose of producing a gross margin, that corn planting happens in a staged process across the planting period.

Queensland produces about 70% of Australia's sweet corn, with production concentrated in Burdekin and Bundaberg regions (Hort Innovation, 2021b), both regions which hare relatively coastal and tropical. However, according to the ABS (2021) MIW region produced approximately 32% of Queensland's sweet corn in the 2019-20 season, with yields of about 12 tonnes per hectare. This is above the Queensland average of 11.3 tonnes per hectare.

Operating cost information is based on sweet corn for fresh supply, rather than processing (DAF 2007b), where over half (54%) of all produced sweet corn is grown for processing (Hort Innovation, 2021b). It's assumed there is cost differential and quality differential between production, and that the corn grown in the MIW region will be sold for fresh supply.

Operating costs are estimated to be, on average. $14,217 per hectare for a mature sweet corn farm. One of the dominant operating costs is the planting expense which is approximately $750 per hectare. Other key operating expenses include fertiliser, herbicide and insecticide ($1,005 per hectare), as well as harvesting and packing costs ($7.67 per carton) (DAF, 2007b).

3.4.6 Watermelons

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
28 hectares	$1,079/ tonne	25 tonne/ hectare	$26,968/ hectare	$16,832/ hectare	$10,136/ hectare

Source: ABARES (2018), Agri Farming (2019), Gardennate (no date), Growcom (no date b), DPI (2009b), Rural Industries Research and Development Corporation [RIRDC] (no date).

The gross margin analysis was undertaken for watermelons. The gross margin for watermelon is estimated to be $10,136 per hectare. This margin is reflective of an average annual yield of 25 tonnes per hectare and an average price of $1,079 per tonne. The estimated gross margin is based on mature farm operations and assumes production and the commodity outlook will be consistent in forward years, and as such, assumes no economic shocks will influence price or production movements.

Queensland produces approximately 32% of watermelons in Australia, with approximately 87% destined for fresh supply domestically. Key areas of production in Queensland are Bowen and Bundaberg, both of which are relatively coastal and tropical environments, and Chinchilla which is located in Southern Queensland (Hort Innovation, 2021b).

Irrigation is imperative to the successful establishment of watermelon crops. Watermelons have a water requirement of at least 3 ML per hectare per annum, representing the largest share of non-labour operational costs at an assumed $1,450 per hectare. Given watermelon is an annual crop, seedlings and fertiliser are also important production costs.

For the purposes of assessment no rotational crop has been considered, and as such the gross margin presented is reflective of a single crop farm. Depending on the soil and land suitability, it may be imperative for a crop rotation in the MIW region when growing watermelons.

3.5 LIVESTOCK

3.5.1 Cattle

	Average Farm Size	Average Price (AUD/ unit)	Revenue	Variable Operating Costs	Gross Margin (AUD/ Ha)
Breeding	1,000 head / 1,813 AE	$1,022/ head*	$1,022/ head*	$487/ head	$535/ head
Backgrounding	800 head / 1,813 AE	$2,779/ head*	$2,779/ head*	$1,971/ head	$807/ head
Live Export	800 head / 1,813 AE	$1,259/ head*	$1,259/ head*	$1,888/ head	-$628/ head*

Notes:
- Costs with an asterisk are weighted averages
- AE means Adult Equivalent and refers to the quantified standard unit for comparison of cattle on a like-for-like basis.

Source: Meat and Livestock Australia [MLA] (2022), Regional Livestock Exchanges [RLX] (2022).

In the MIW Region, the livestock industry is dominated by beef cattle production and accounts for 9.7% of Queensland's industry value.

The gross margin for cattle has been estimated at three points along the value chain; breeding, backgrounding, and for live export. The gross margins presented above have been estimated at each segment in order to identify the transfer price at each stage of production.

In estimating all three gross margins, a number of overarching assumptions have been applied:

- Prices are not adjusted for holding time
- Cost of herd replacement has been included for both heifers and steers

- Calves are not held as replacement herd.

If cows are held as replacement herd the gross margin at each stage will increase, with the greatest impact on breeding as the farm operations will not include expenditure for stock replacement.

Table 3.5. Gross Margin with Calves Heald for Replacement

	Gross Margin (AUD/ Ha)
Breeding	$843/ head
Backgrounding	$809/head
Live Export	-$626/ head

Backgrounding gross margin is calculated based on the following assumptions:

- The average annual calves produced is 640
- The herd size is 800 head with a calf carry capacity of 120 head
- The total farmland is estimated to be 16,819 hectares
- The target weight for steers is 450 kilograms and 550 kilograms for heifers and the assumed herd is 50-50 steers to heifers
- The price of a steer is assumed to be $2,714/ head and the price of a heifer is $2,8434/ head.

Live export when coupled with breeding and early backgrounding will deliver a positive margin of $1,026 per head, which is $626 lower than the equivalent margin for domestic processor and feedlot supply. This negative margin for the live export sale stage reflects the current domestic feeder and restocker prices. Given the current stocking densities; the live export market is not as attractive as the domestic market opportunities, which are currently delivering higher prices for the same target weight. This scenario may change when the industry moves out of its current herd rebuilding phase and into a more normalised supply and demand profile.

Table 3.6. Price per Head, Live Export and Stock Repurchases

	Live Export Price	Stock Repurchases
Steers	$1,300/ head	$1,568/ head
Heifers	$1,219/ head	$1,636/ head

Source: MLA (2022).

Cattle can be an economically viable avenue which relies on a balance between economies of scale and operating efficiency, and sustainable practices to ensure longevity in the farmed land (McLean et al., 2020). However, cattle farming has very high barriers to entry, and the cost of establishing a cattle property in MIW region is not included in estimating the gross margin.

3.6 AQUACULTURE

3.6.1 Prawn

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
16 hectares	$21.27/ kg*	7.8 tonnes/ hectare	$161,640/ hectare	$103,139/ hectare	$57,254/ hectare

Source: Consultation with Industry

Prawns are estimated to return a gross margin of $57,254/ hectare of farmed prawn at an established (10-year-old) intensive farm. The price used in estimating this gross margin is a weighted average of $21.27/ kg. This price includes jumbo, extra-large, large, and medium prawns.

Intensive farming can yield between 2,500-10,000 kilograms per hectare. Across the four prawn sizes (DAF, 2006a), an estimated yield of about 7,758 kilograms per hectare is being achieved in the sample farm modelled. The break-down of yield by size is show in the table below.

Table 3.7. Yield by Prawn Size, Per Hectare

	Yield per Hectare
Jumbo	1,019kg
Extra-Large	3,199kg
Large	2,748kg
Medium	791kg

The operating costs associated with running a prawn farm include the larvae and feed purchases, these account for 31.1% of total operating costs. Prawn feed has been a historically imported good which relies on the natural wild fish stock. Producing quality prawns is next to impossible without an element of fish meal or fish oil in the feed. As global fish stocks are pressured, there is increased risk in securing reliable and affordable prawn feed (CSIRO, 2021).

Wages and other staff related costs account for 24.9% of the total operating expense. In managing and operating a prawn farm, all operating expenses are assumed to be variable to the level of production except administrative costs, including licenses and subscriptions.

Establishing a prawn farm can be capital intensive, in part due to the technology required, and in part due to the favourable environments for prawn farming. Prawn farming is typically a coastal venture and as such as to compete with other interested parties and sectors wanting real estate along the coast. Additionally, prawn farming needs to be situated relatively close to a hatchery to ensure secure and risk mitigated transport of larvae. Mackay is noted a superior location for prawn farming, for the purposes of analysis, it is assumed that sufficient land is available for expanding prawn farming in the region.

It has been assumed in estimating the prawn farm gross margin that there are no limitations to the availability of seed stock, and that at the time of maturity the farm will be operating in an economic environment which is aligned to the current day structure.

3.6.2 Barramundi

Average Farm Size	Average Price (AUD/ unit)	Yield	Revenue	Production Operating Costs	Gross Margin (AUD/ Ha)
15 hectares	10.41/kg	26.3 tonnes/ hectare	$273,117/ hectare	$209,126/ hectare	$63,991/ hectare

Source: Consultation with Industry

Barramundi Farms (Pond Based) are estimated to return a gross margin of $63,991/ hectare of farmed fish at an established (10-year-old) intensive farm. The price used in estimating this gross margin is a weighted average of $10.41/ kg. This price assumes a target weight of approximately 2kg per fish.

Traditional farming will yield around 10 tonnes per pond or around 393 tonnes for a 15 hectare farm with 5 hectares of ponds. Based in industry production and cost data for the Townsville region, the gross margin is expected to be around 23% or around $2.44 per kilogram of production.

Margins can be improved through more efficient grow out programs using higher tech production systems and/or through integration with high performance hatcheries and fingerling production systems. Fingerling purchase make up approximately 8% of total income ($0.15 per mm based on 100mm fingerling size) if purchased from an external supplier.

The operating costs associated with running a barramundi farm reflect the high labour input for grading, cleaning and processing the fish. Total operating costs is approximately $7.09 per kg excluding fingerling acquisitions.

Wages and other staff related costs account for 20.6% of the operating expense. In managing and operating a barramundi farm, all operating expenses are assumed to be variable to the level of production except administrative and maintenance costs.

It has been assumed in estimating the barramundi farm gross margin that there are no limitations to the availability of fingerlings, and that at the time of maturity the farm will be operating in an economic environment which is aligned to the current structure of the farm data obtained from industry respondents.

4. MARKET ANALYSIS

This section provides an overview of price and consumption and export trends for key agricultural commodities.

4.1 KEY TAKEAWAYS

Beef (incl Live Cattle)

- Despite lower global per-capita consumption of beef, continued population growth is growing the market for beef. Beef consumption in China is quickly increasing following an outbreak of African Swine Fever (ASF) in its pig heard (pork is traditionally the most widely eaten meat in China)
- Argentina, Australia, Brazil, China, and USA are the largest producers of beef.
- Brazil, Australia, the USA, the Netherlands and New Zealand are the largest exporters of beef.
- China, Japan, Netherlands, Russia and USA the largest importers of beef.
- Australia is a major supplier of beef to Japan, Indonesia and the Republic of Korea, supplying over 50% of their beef imports.
- Australia is a large exporter of live cattle and Indonesia and Vietnam are the major export destinations.

Sugar

- Despite lower global per-capita consumption of sugar, continued population growth is growing the market for sugar.
- Brazil, India, the European Union, China and Thailand are the world's largest producers of sugar.
- Australia, Brazil, Guatemala, Mexico, and Thailand are the largest exporters of raw sugar with China, Indonesia, Korea, Malaysia, and USA the largest importers of raw sugar.
- Brazil, France, Germany, India, and Thailand are the largest exporters of refined (white) sugar with Belgium, Germany, Italy, Spain, and USA the largest importers of refined (white) sugar.
- Australia continues to be a major exporter of raw sugar to Japan, Korea and Indonesia.

Mangoes, mangosteens & guavas

- Global production of mangoes has increased considerably, principally due to increased production in India, who now accounts for over 40% of global production. Thailand, China, Indonesia and Pakistan are the other major mango producing countries.
- Brazil, India, Mexico, Peru, and Thailand are the largest exporters of mangoes with Germany, Netherlands, Saudi Arabia, United Kingdom, and USA the largest importers of mangoes.
- Australia's main export markets include China (Hong Kong), Singapore, New Zealand and the UAE. However, in all non-New Zealand markets, Australia's exports make up less than 15% of country imports.
- Australia's consumption of mangoes (1.7kg per capita) is substantially below global averages (7kg).

Tomatoes

- China is the world's largest producer of tomatoes (producing over 30% of all tomatoes). India, the USA, Turkey and Egypt are the other large producers of tomatoes.
- Mexico, Morocco, Netherlands, Spain, and Turkey are the largest exporters of tomatoes with France, Germany, Russia, United Kingdom, and USA the largest importers of tomatoes.
- Despite exporting over 6 million kilograms of tomatoes during the 1990s, Australia is now imports and exports similar quantities of tomatoes.
- The primary market destinations for Australian tomatoes are New Zealand, Singapore, Indonesia and pacific nations such as Papua New Guinea, Fiji and New Caledonia.
- Australia consumes approximately half the volumes of tomatoes per capita than global averages (15kg, compared to 30kg), with Australian consumption trending downwards.

Capsicums (incl chilies)

- China is the world's largest producer of capsicums (producing over 50% of all capsicums). India, the Mexico, Turkey, Indonesia and Spain are the other large producers of capsicums.
- Mexico, Spain, the Netherlands, Canada and the USA are the largest exporters of capsicums with the USA, Germany, the United Kingdom, France and Russa the largest importers
- Since the year 2000, Australia has become a net importer of capsicums, predominantly from New Zealand, who is also a supplier of capsicums to Japan (accounting for approximately 10% of Japanese imports)
- Australia also exports capsicums to New Zealand, as well as pacific island nations of Papua New Guinea, Fiji, New Caledonia, Nauru and Vanuatu
- Australia consumes less than half the volumes of capsicums and chillies per capita than global averages (2kg, compared to 8kg), with Australian consumption trending downwards and global consumption experiencing strong growth

Green Beans

- China is the world's largest producer of green beans (producing over 80% of all green beans). Indonesia, India, Turkey and Thailand are the other large producers of green beans.
- Morocco, France, Mexico, the Netherlands and the USA are the major exporters of beans, with Spain, Belgium, the USA, the Netherlands and France being the largest importers.
- Australia is a net exporter of green beans, principally to New Zealand
- Australia consumes less than one quarter the volumes of green beans per capita than global averages (1.5kg, compared to 6kg), with Australian consumption trending downwards and global consumption experiencing strong growth

Melons

- China is the world's largest producer of melons (producing over 60% of all melons). Turkey, Iran, Brazil and India are the other large producers of melons.
- Mexico, Spain, Iran, the USA and are the largest exporters of melons with the USA, Germany, China, Canada and France the largest importers of melons.
- Australia is a net exporter of melons, with exports considerably increasing since 2011. New Zealand and the UAE are Australia's largest export markets. Australia's supply accounts for nearly all melons imported into New Zealand, but less than 2% of melons imported into the UAE.
- Forecast demand is expected to continue to grow, both within Australia and in key export markets

Pumpkins

- China and India are the world's largest producers of pumpkins (accounting for approximately 30% and 20% respectively). Russia, Ukraine and the USA are the other large producers of pumpkins.
- Mexico, Spain, New Zealand, Turkey and the USA are the major exporters of pumpkins (with Spain and Mexico accounting for 50% of global exports), with the USA, France, Japan, Germany and the UK as the largest importers.
- Australia has only recently started to export pumpkins (since 2011), with over 70% of exports landing in Singapore. While an important export market to Australian exporters, Singapore's imports of Australian pumpkins account for less than 5% of total imports.
- Australia consumes similar volumes of pumpkin per capita to global averages, yet domestic consumption per capita is decreasing, while global consumption per capita is steadily increasing.

Wheat

- China, India and Russia are the world's largest producers of wheat (producing 17%, 13% and 9% respectively). The USA, Canada and France are the other large producers of wheat.
- Russia, the USA, France, Canada and Ukraine at the world's largest exporters, while Indonesia, Turkey, Egypt, Italy and Algeria are the world's largest importers
- Australia is a considerably net exporter of wheat, with key export destinations being Indonesia, Vietnam, South Korea and China. Trade with Australia accounts for over 50% of wheat imports in Malaysia, 40% in Indonesia and approximately 30% in China, South Korea and Yemen.

- Australia is a large consumer of wheat, with per capita consumption nearly three times higher than global averages (300 kg per capita in Australia v 110 kg per capita globally). Global demand for wheat is expected to remain steady, with Australian demand continues to grow.

Sorghum

- The USA, Nigeria, Mexico, India and Ethiopia are the world's largest producers of sorghum.
- The USA dominates global sorghum exports, dwarfing all other major exporters, which include Argentina, Australia, Ukraine and France. China, Japan, Mexico, Spain and Chile are the world's largest importers of sorghum.
- Australia is a net exporter of sorghum and supply nearly 100% of New Zealand's sorghum imports, over 50% for the Philippines and approximately 30% for both Indonesia and South Africa.

Chickpea

- India is the world's largest producer of chickpeas, accounting for 67.5% of global production. Australia is the world's second largest producer, accounting for only 6% of global production.
- Australia is the world's largest exporter of chickpeas, with Russia, India, Mexico and Canada, while India, Bangladesh, Pakistan the UAE and Algeria are the world's largest importers.
- Australia is a net exporter of chickpeas, with Australian exports accounting for over 85% of Bangladeshi imports, 80% of Nepalese imports and 70% of Indian imports.
- Per capita consumption of chickpeas is expected to continue to steadily grow over time. Australian chickpea consumption is very low by international standards.

Prawns

- China is the world's largest producer of prawns (producing over 40% of all prawns). Indonesia, Vietnam, India and Thailand are the other large producers of prawns.
- India and Ecuador are the world's largest exporters of prawns (these countries are experiencing strong export growth), followed by Vietnam, Thailand and China. The USA, China, Japan, Spain and France are the world's largest prawn importers. Chinese prawn imports have increased seven-fold over the past three years, as demand for non-pork protein grows, following the ASF outbreak.
- Australia is a net importer of prawns, with most prawns coming from Vietnam, Thailand, China and Malaysia
- Australia does export some prawns, principally to China (accounting for 35% of all imports) and Japan 9accounting for less than 20% of all imports)
- Consumption of prawns per capita in Australia is approximately three times higher than global averages and demand in Australia and globally is expected to experience strong growth into the future

Fish

- Iran, China, Chile, Turkey and Norway are the world's largest producers of fish, with Iran and China experiencing strong production growth over the past decade
- Chile, Norway, Denmark, Turkey and Sweden are the world's largest fish exporters, with Japan, Russia, Germany, Poland and the USA the largest importers
- Australia has historically been a net exporter of fish, but is now a net importer
- Global consumption per capital for fish has tripled in the past 30 years and is expected to continue strong growth into the future

4.2 APPROACH

This section provides an overview of production, the international trade market, Australia's largest export markets and domestic and global consumption. This information has been largely based on statistics provided by the Food and Agricultural Organisation of the United States (FAO) and the Australia Bureau of Agricultural and Resource Economics and Sciences (ABARES).

Future Demand estimates have been developed based primarily on consumption rates per capita, population projections and historical trends for export and impacts activities

For each commodity, initial estimates of consumption per capita has been developed based on:

- Linear trend line applied to the historical period and projected forward (Linear Trend)
- Historical long-run average held constant into the future (Long-Run Average)
- Application of the historical average annual change in consumption per capita to the latest rate of consumption per capita (Historical Trends)Application of half the rate of annual change in consumption per capita to the latest rate of consumption per capita (Adjusted Historical Trends)

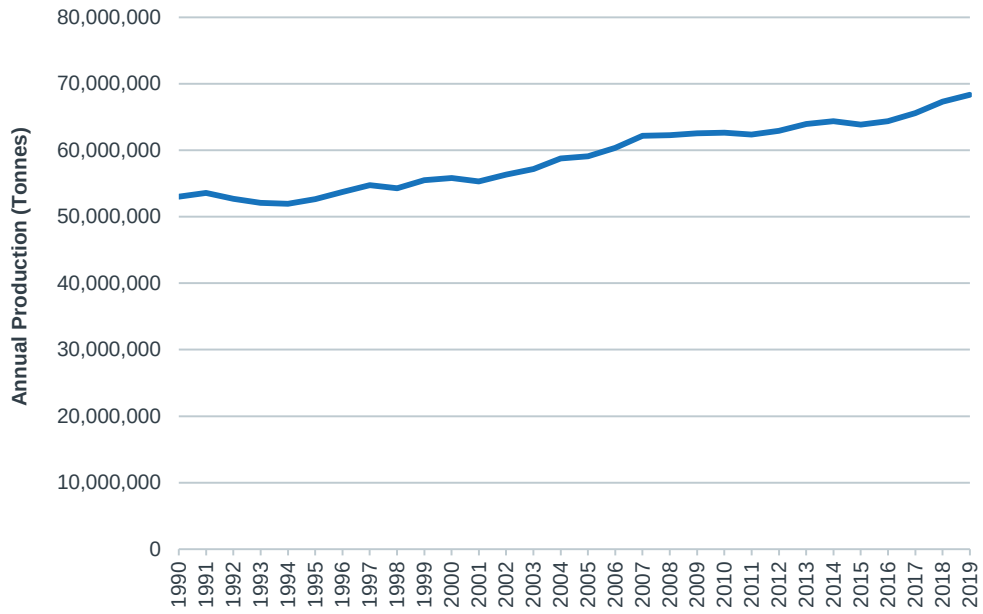
4.3 BEEF

4.3.1 Global Overview

Global Production

Global cattle meat production has been growing by an average annual rate of 0.9% per annum to reach a total of 68.3 million tonnes in 2019. Cattle meat production is primarily driven by the US and Brazil as seen in Figure 4.2 below.

Figure 4.1. Global Cattle Meat Production, 1990 to 2019



Note: This data only includes 'cattle, meat' as defined by FAO.
Source: FAO (2021a).

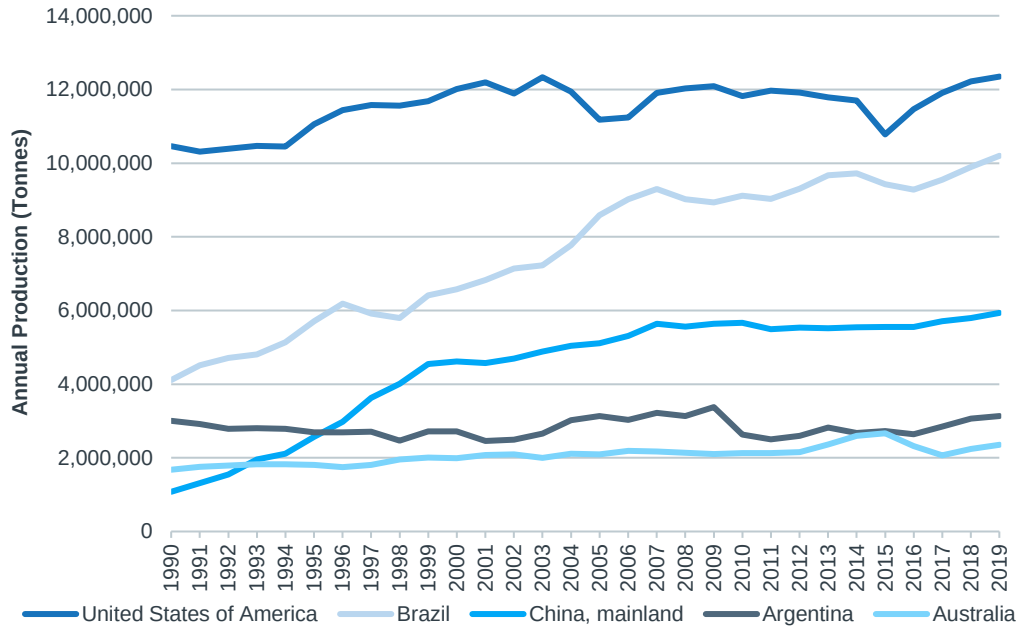
Major Producers

In 2019, the USA was the largest producer of cattle meat with production totalling 12.3 million tonnes. From 1990 to 2019, production in the US has experienced an average annual growth rate of 0.6%.

Brazil was the second most prominent producer of cattle meat, with an estimated 10.2 million tonnes produced in 2019. Brazil has been experiencing faster growth in cattle meat production than the US, growing by an average annual rate of 3.2% since 1990.

China is the third largest producer in cattle meat, producing 5.9 million tonnes in 2019. China experienced a relatively steep growth in production over the 1990's, with production growing by 6.1% per annum from 1990 to 2019.

Figure 4.2. Top Five Global Producers of Cattle Meat, 1990 to 2019



Note:

- This data includes 'meat, cattle and meat, cattle, boneless (beef & veal)' as defined by FAO.
- Top five largest producers on average from 2010 to 2019.

Source: FAO (2021a).

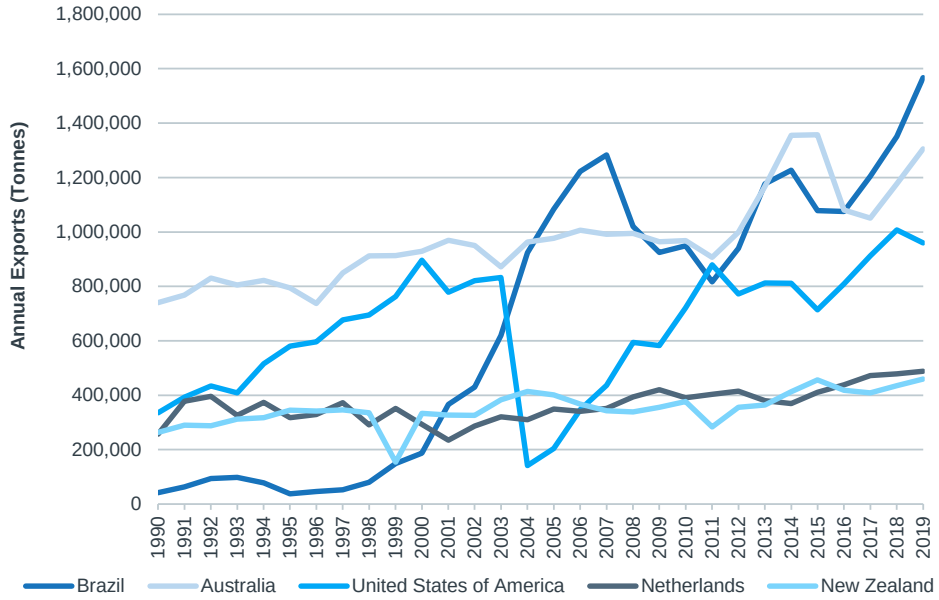
Major Exporters

Since 1990, global export of cattle meat has experienced a 3.6% increase on average per annum. In 2019, global exports were estimated to total approximately 9.4 million tonnes.

In 2019 it was estimated that Brazil was the largest exporter of cattle meat, totalling 1.6 million tonnes. Brazil's beef exports experienced significant growth throughout the early 2000s, growing by an average annual rate of 31.7% from 2000 to 2007.

Of important note, Australia was listed as the second largest cattle meat exporter on the global scale, exporting approximately 1.3 million tonnes in 2019. Before the significant growth in Brazil's exports in the early 2000s, Australia was historically the largest exporter of cattle meat.

Figure 4.3. Top Five Global Exporters of Cattle Meat, 1990 to 2019



Note:
- This data includes 'meat, cattle and meat, cattle, boneless (beef & veal)' as defined by FAO.
- Top five largest exports on average from 2010 to 2019.

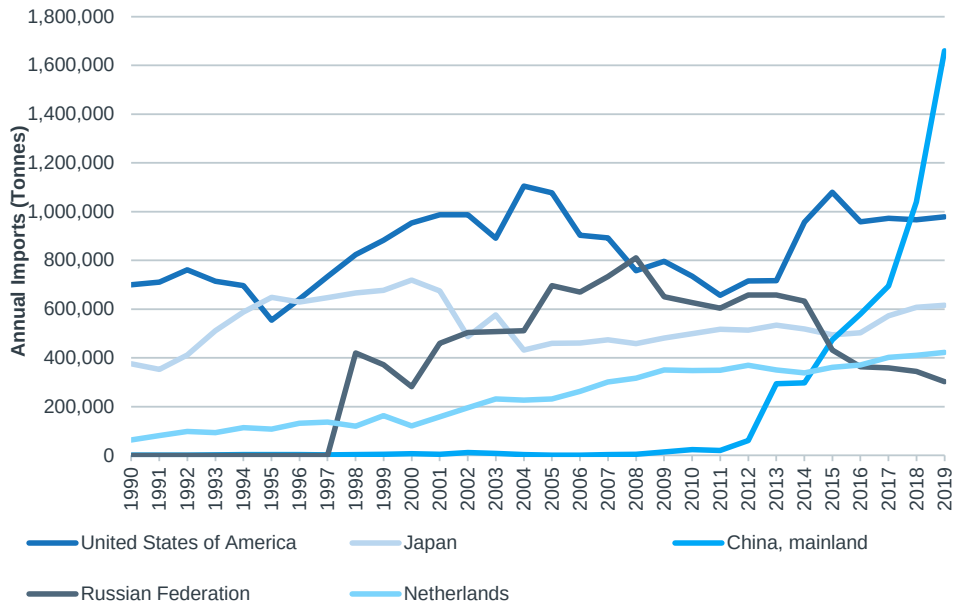
Source: FAO (2021a).

Major Importers

China was the largest importer of cattle meat in 2019, totalling 1.7 million tonnes. China has experienced significant growth in cattle meat imports in recent years, with an average growth rate of 60.4% per annum from 2010 to 2019, due to the impact of African Swine Fever (ASF) on the country's pork industry, causing demand for alternative protein sources.

Prior to 2018 the US was the largest importer of beef. In The US, the growth of beef imports has remained relatively steady compared to China, increasing by an average annual rate of 12% from 1990 to 2019.

Figure 4.4. Top Five Global Importers of Cattle Meat, 1990 to 2019



Note:
- This data includes 'meat, cattle and meat, cattle, boneless (beef & veal) 'as defined by FAO.
- Top five largest importers on average from 2010 to 2019.

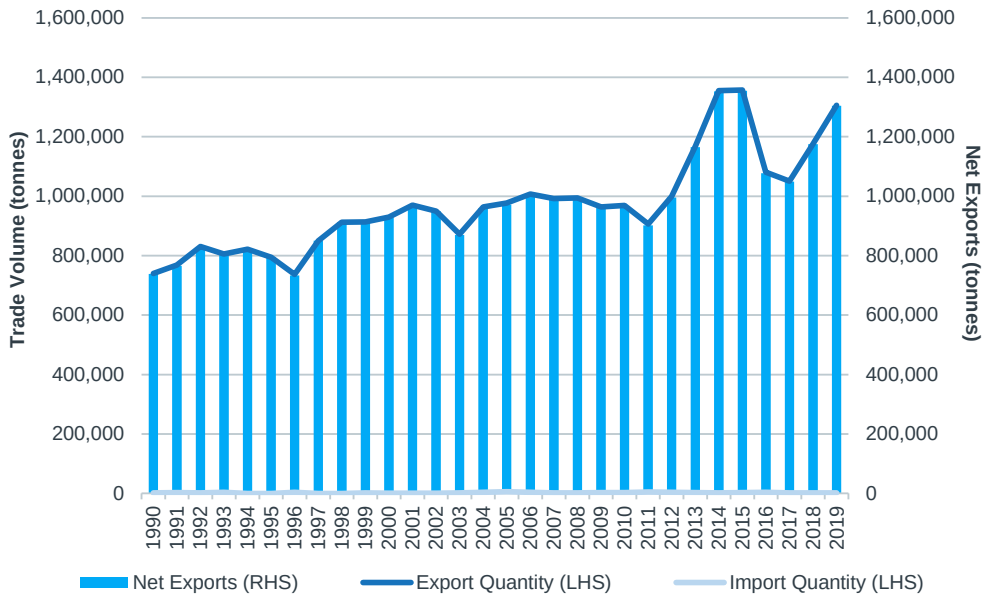
Source: FAO (2021a).

4.3.2 Export Markets

Australian Trade Balance

Australian imports minimal cattle meat products into the country as domestic production is more than sufficient to meet domestic demand. In 2019, net exports totalled 1.3 million tonnes.

Figure 4.5. Trade Balance Australia (Cattle Meat), 1990 to 2019

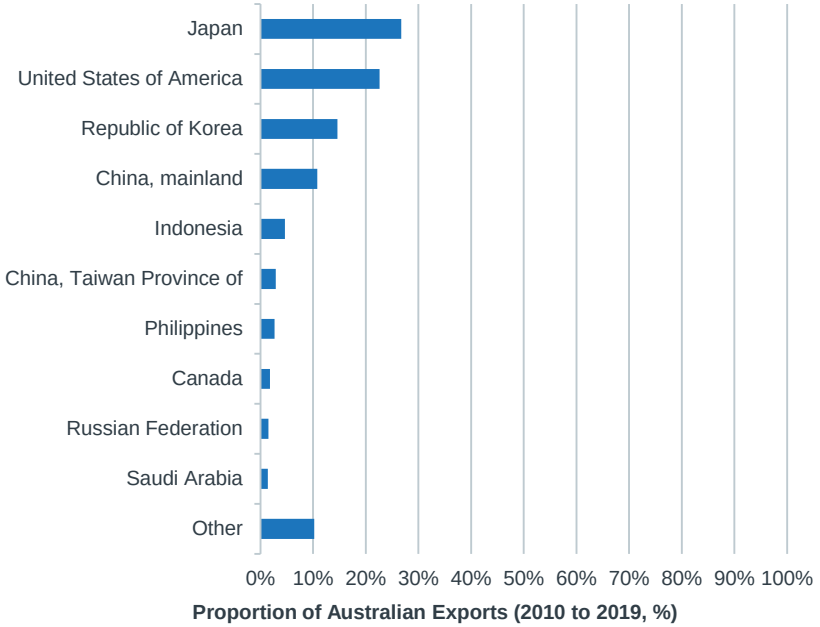


Note: This data includes 'meat, cattle and 'meat, cattle, boneless (beef & veal) as defined by FAO.
Source: FAO (2021a).

Key Export Markets

From 2010 to 2019, Japan was Australia's largest export market for cattle meat, accounting for an average of 26.7% of Australia's total cattle meat exports. The US is Australia's second largest export market for cattle meat, accounting for an average of 22.7% of exports from 2010 to 2019.

Figure 4.6. Key Exports Markets for Australia (Top 10) (Cattle Meat)



Note: This data includes 'meat, cattle and 'meat, cattle, boneless (beef & veal) as defined by FAO.
Source: FAO (2021a).

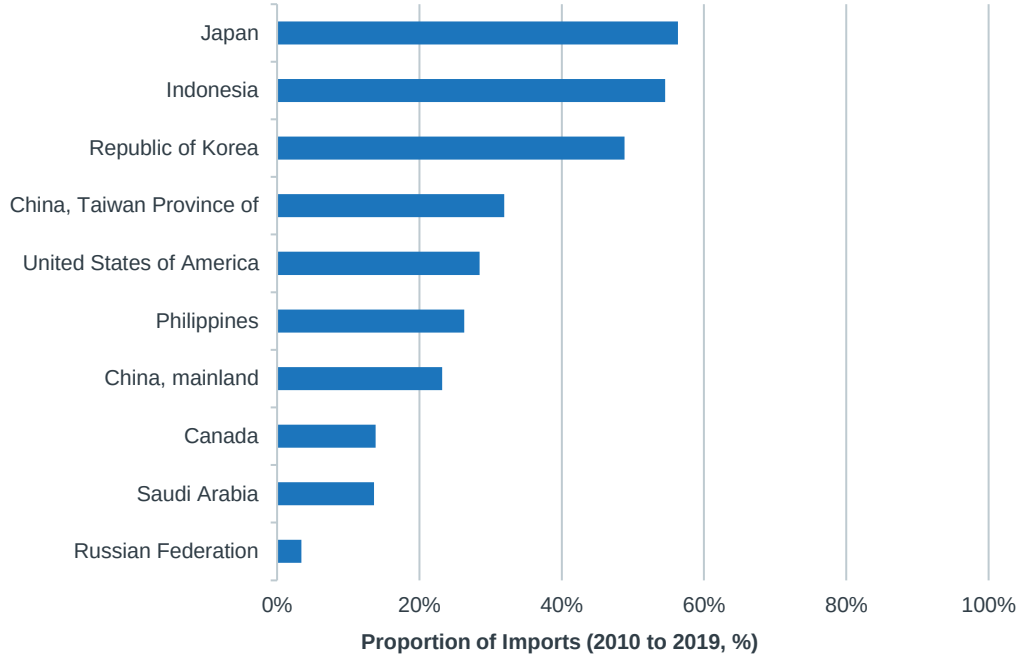
Export Market Share

The figure below highlights how much of Australia's cattle meat exports make up of each key market's imports from 2010 to 2019. Japan was Australia's largest export market for cattle meat. Of the country's total cattle meat imports, it is estimated that it sourced approximately 56.3% of its cattle meat from Australia on average over 2010 to 2019.

Although Indonesia was Australia's fifth largest export market for cattle meat, the country is largely reliant on Australian imports to meet demand. Of Indonesia's total cattle meat imports, it is estimated that it sourced 54.5% of its total imports from Australia on average from 2010 to 2019.

Although the US is Australia's second largest export market, the country is less reliant on cattle meat imports from Australia to satisfy domestic demand. Of total cattle meat imports to the US, it is estimated that the country sourced 28.5% from Australia on average between 2010 to 2019.

Figure 4.7. Proportion of Australia's Exports make up of Total Key Imports (Cattle Meat) (Australia's Top 10 Export Markets)



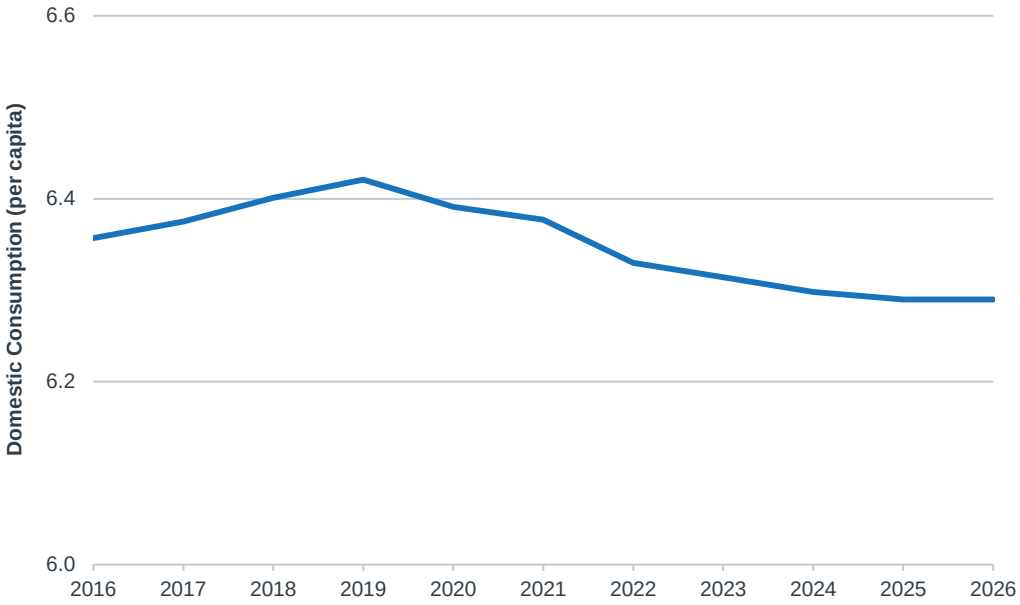
Note: This data includes 'meat, cattle and 'meat, cattle, boneless (beef & veal) as defined by FAO.
Source: FAO (2021a).

4.3.3 Consumption

Global Consumption

OECD (2021) have estimated that consumption of beef and veal on the global scale will experience a slight decrease over the coming years. In 2026, it is estimated that consumption of beef and veal could total 6.3 kilograms per capita.

Figure 4.8. Domestic Consumption for Global Market, 2016 to 2026 Forecast (Kilograms) (Cattle Meat)

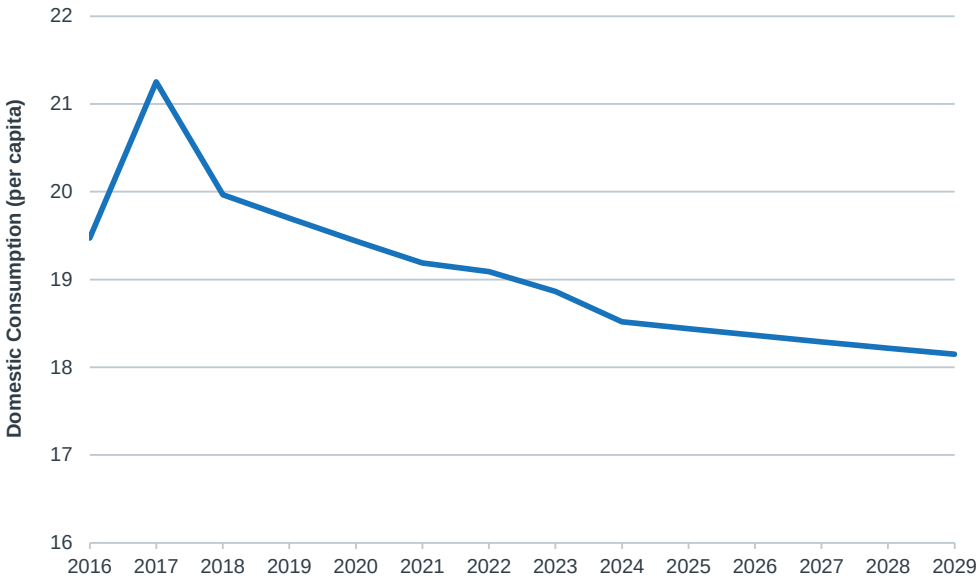


Note: Per person consumption data are expressed on an edible weight basis, estimated using OECD conversion factors of 0.7 for beef and veal.
Source: OECD (2021), AEC.

Domestic Consumption

OECD (2021) have estimated that consumption of beef and veal in Australia will experience a slight downturn over the coming years. In 2029, it is estimated that consumption of beef and veal could total 18.1 kilograms per capita.

Figure 4.9. Domestic Consumption Per Capita, 2016 to 2029 Forecast (kilograms) (Cattle Meat)

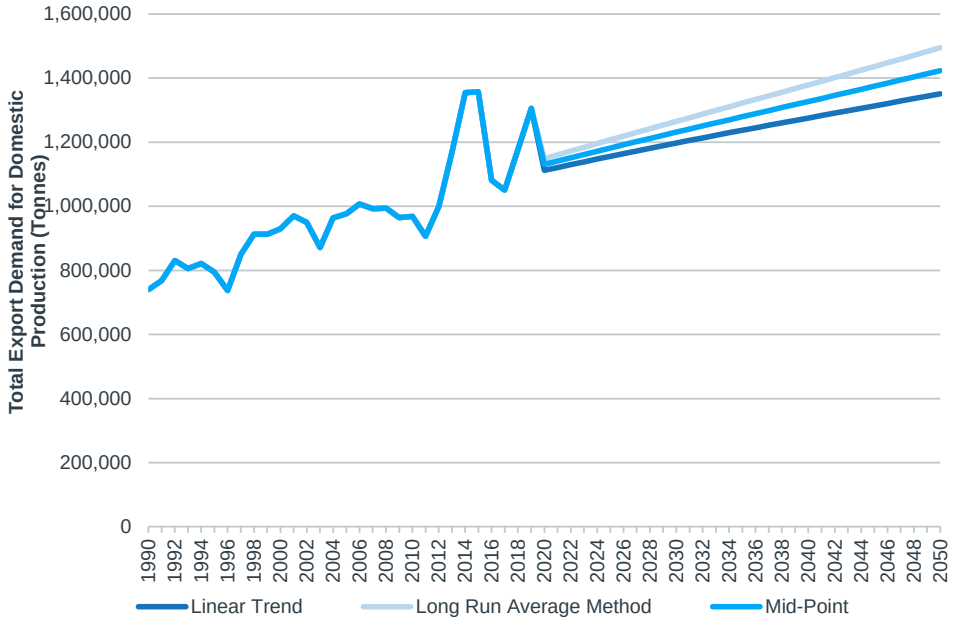


Note: Per person consumption data are expressed on an edible weight basis, estimated using OECD conversion factors of 0.7 for beef and veal.

Forecast Consumption in Export Markets

Export demand for Australian cattle meat has increased significantly over the 2000s to reach a total of 1.2 million tonnes in 2018. Future export demand for domestic production could reach between the linear trend scenario at 1.4 million tonnes in 2050 or the long-run average volumes in 2050 at 1.5 million tonnes.

Figure 4.10. Total Export Demand for Domestic Production (Cattle Meat), 1990 to 2050



Source: FAO (2021a), AEC.

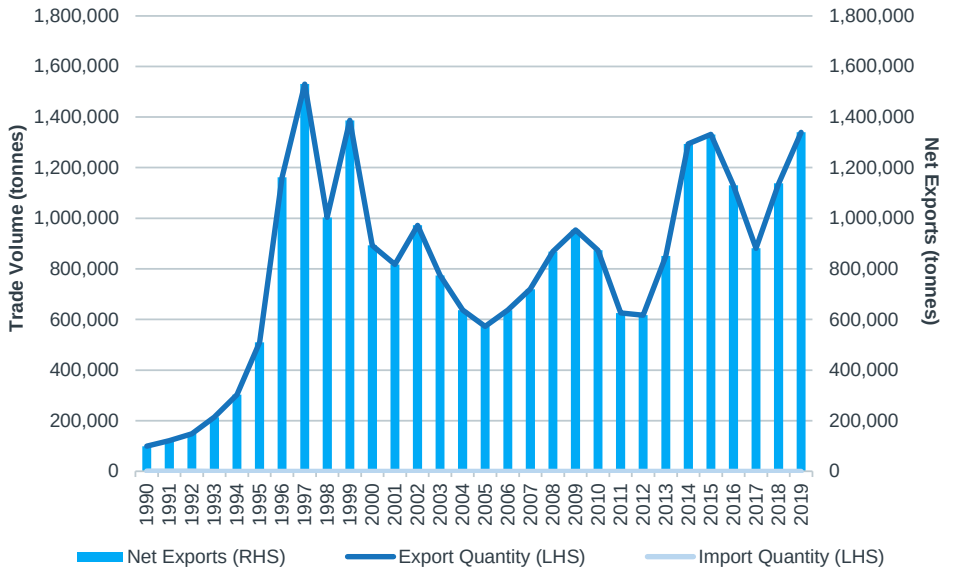
4.4 LIVE CATTLE (EXPORT MARKETS ONLY)

4.4.1 Export Markets

Australian Trade Balance

Of the total cattle herd in Australia in 2019, approximately 5.4% was exported to global markets (or approximately 1.3 million head of cattle). Australia does not import live cattle, with the domestic herd being sufficient to meet demand. Australian exports have been increasing by an average of 9.4% per annum from 1990 to 2019. This strong growth is largely driven by the low export volumes achieved in the early 1990s.

Figure 4.11. Trade Balance Australia of Live Cattle, 1990 to 2019

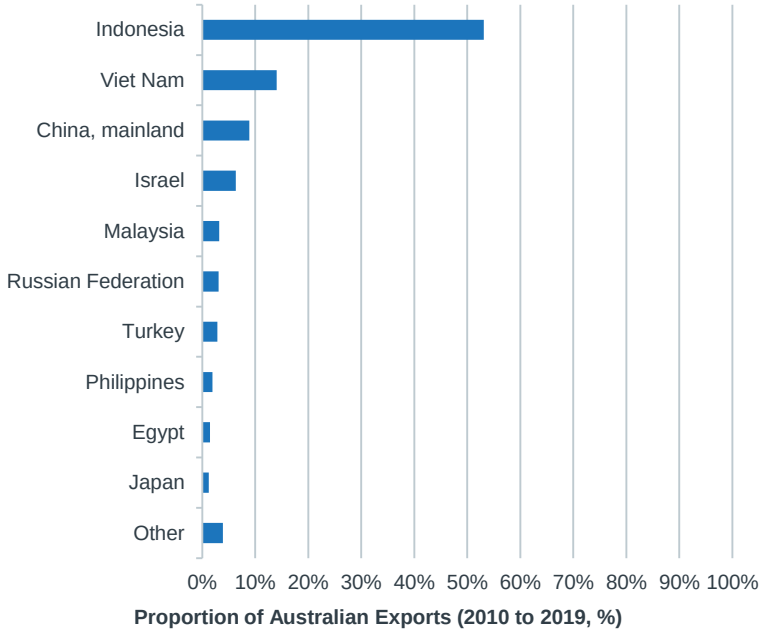


Source: FAO (2021a).

Key Export Markets

From 2010 to 2019, Indonesia was Australia's largest live cattle export market, accounting for an average of 53.1% of total exports. Vietnam was Australia's second largest export market for live cattle, accounting for an average of 14.0% of exports from 2010 to 2019.

Figure 4.12. Key Exports Markets for Australia (Top 10) (Live Cattle)



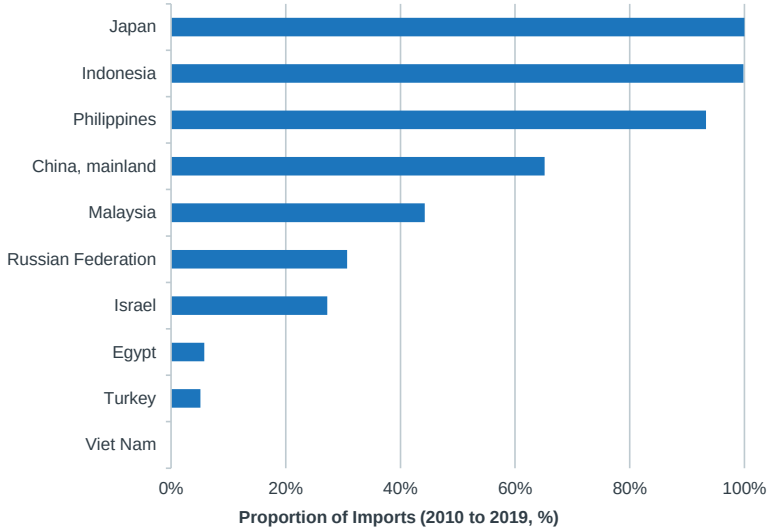
Source: FAO (2021a).

Export Market Share

The figure below highlights how much of Australia's live cattle exports make up of each key market's imports on average from 2010 to 2019. Japan was Australia's 10th largest export market, however out of the top 10 Australian export markets, Japan is the most reliant on Australian live cattle imports.

Indonesia is Australia's largest export market for live cattle and they are also significantly reliant on Australian cattle to satisfy demand. Of Indonesia's total live cattle imports, it is estimated that it sourced 99.8% of its total imports from Australia on average from 2010 to 2019.

Figure 4.13. Proportion of Australia's Exports make up of Total Key Imports (Live Cattle) (Australia's Top 10 Export Markets)



Note: Detailed import source for live cattle from Australia to Vietnam are not available on the FAO statistics database. However it must be noted that Vietnam is Australia's second largest export market.
Source: FAO (2021a).

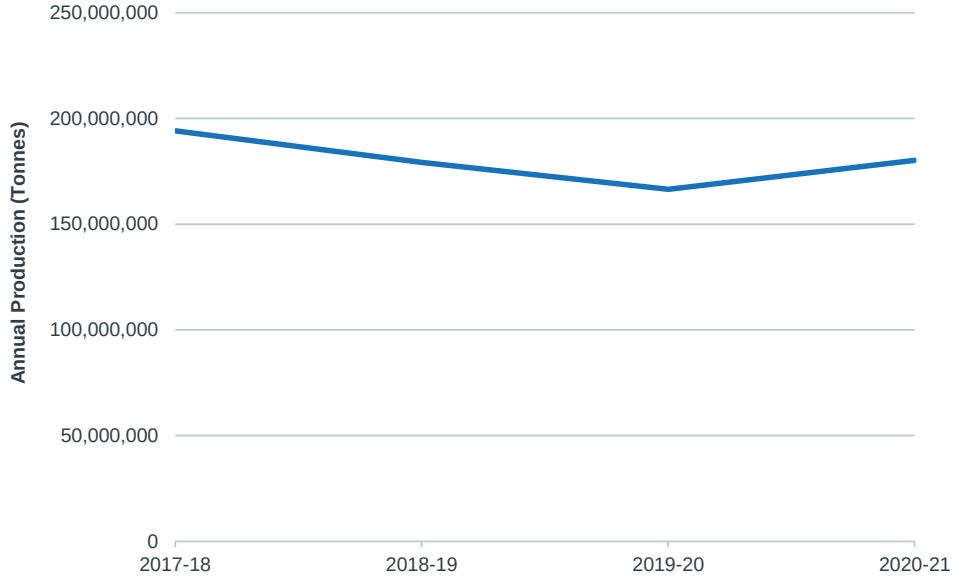
4.5 SUGAR

4.5.1 Global Overview

Global Production (Raw Sugar)

In 2020-21, global raw sugar production totalled approximately 180.1 million tonnes. From 2017-18 to 2020-21 raw sugar production experienced a 2.5% average annual decline.

Figure 4.14. Global Raw Sugar Production, 2017-18 to 2020-21

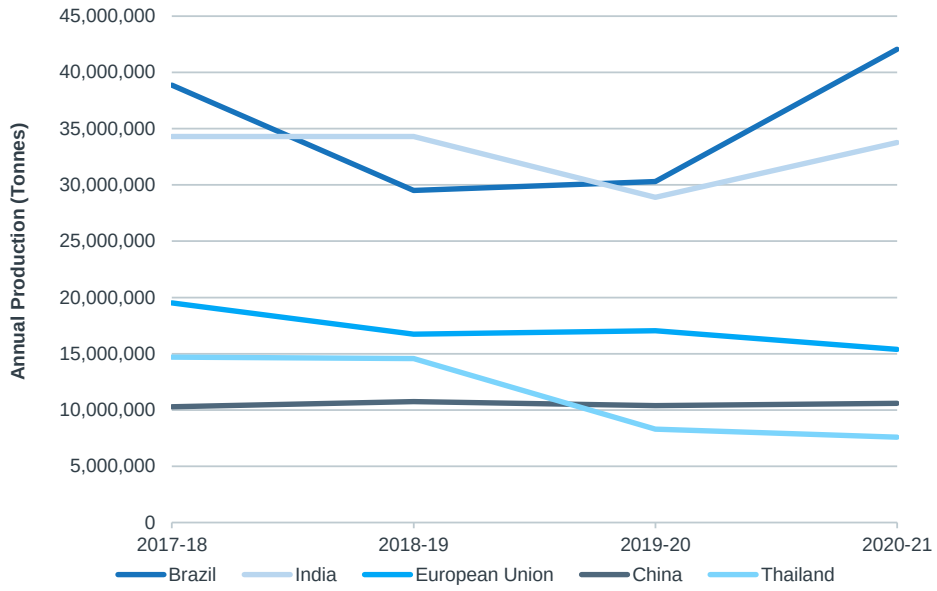


Source: USDA (2021b).

Major Producers (Raw Sugar)

Brazil is the most prominent producer of raw sugar, accounting for 23% of total global production in 2020-21. In 2020-21, Brazil produced approximately 42.1 million tonnes of raw sugar, with production growing at an average rate of 2.7% per annum from 2017-18 to 2020-21. India was the second largest producer of raw sugar in 2020-21, producing approximately 33.8 million tonnes in 2020-21.

Figure 4.15. Top Five Major Global Producers (Raw Sugar), 2017-18 to 2020-21



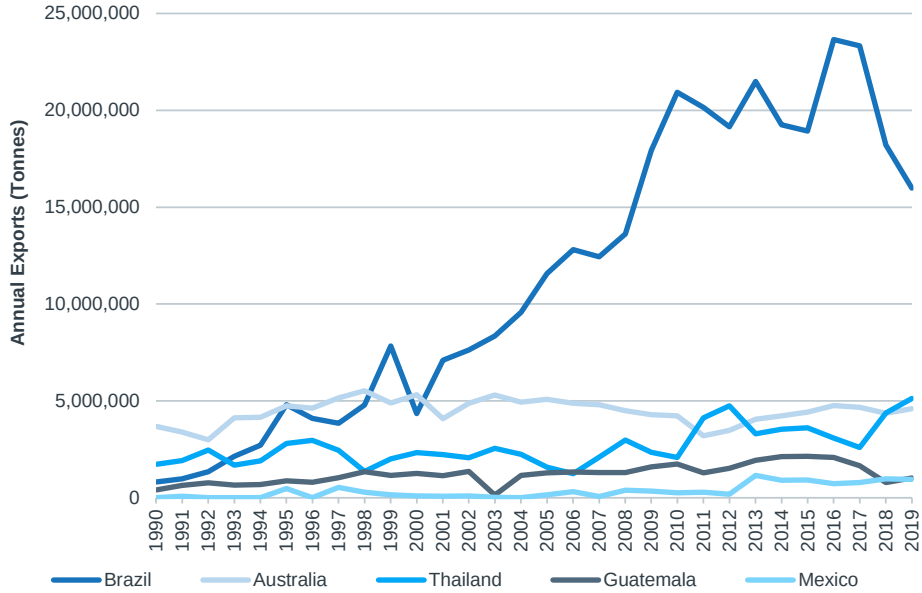
Source: USDA (2021b).

Major Exporters (Raw Sugar)

Brazil has also historically been the largest exporter of raw sugar, with exports in 2019 totalling an estimated 16.0 million tonnes. Similar to trends in refined sugar, Brazil's raw sugar exports experienced a declining trend from 2016 onwards.

Thailand was the second most prominent exporter of raw sugar on the global scale, exporting a total of 5.1 million tonnes in 2019. The third most prominent exporter of raw sugar was Australia, exporting an estimated 4.6 million tonnes.

Figure 4.16. Top Five Major Exporters (Raw Sugar), 1990 to 2019



Notes:

- Australia export numbers reflect the total sugar export estimate from ABARES. It must be noted that ABARES only reports total sugar exports, as a result, AEC have calculated raw sugar exports based on ABARES total sugar exports and FAOs refined sugar export estimates.
- Top five largest exporters on average from 2010 to 2019.

Source: FAO (2021a), ABARES (2021b).

Major Exporters (White Sugar)

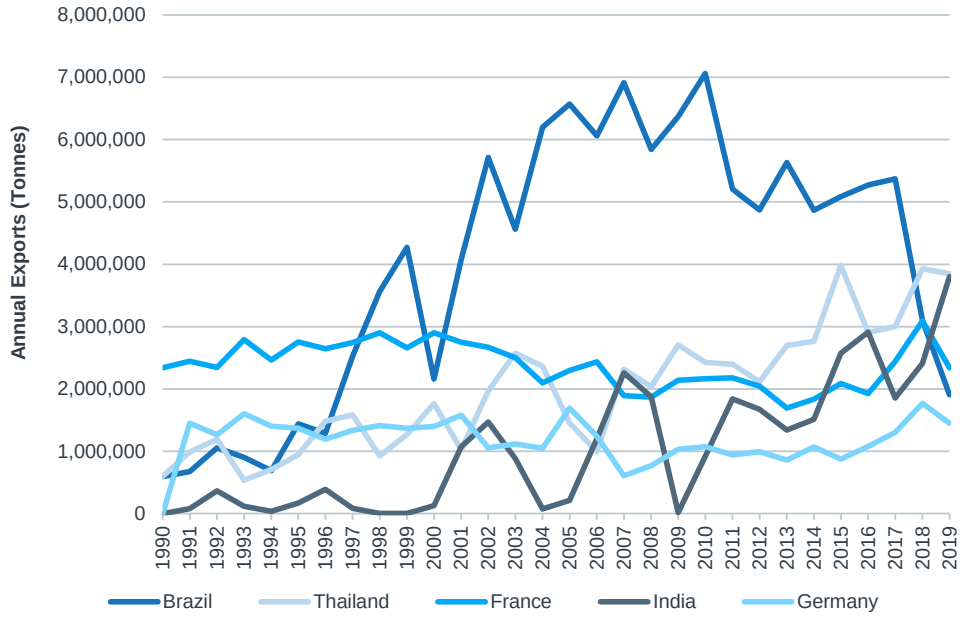
Global exports refined sugar have experienced an average annual increase of 3.9% since 1990, totalling approximately 25 million tonnes in 2019.

Historically, the most prominent export country of refined sugar has been Brazil which has historically comprised approximately 20.8% of global exports between 1990 and 2019. From 2017 to 2019, Brazil experienced a significant drop in sugar exports, reaching a total of 1.9 million tonnes in 2019. The export volume for Brazil in 2019 is estimated to be the lowest that has been experienced since 1996.

In 2019, it was estimated that the largest exporter of refined sugar was Thailand, exporting a total of 3.8 million tonnes.

India was the second largest exporter of refined sugar, with exports reaching little under 3.8 million tonnes. In 2017-18, the Indian Government implemented an Indian sugar export subsidy which supported Indian mills. This was driving domestic prices high, while simultaneously reducing the price for sugar on the global market.

Figure 4.17. Top Five Major Exporters (Refined Sugar), 1990 to 2019



Note: Top five largest exporters on average from 2010 to 2019.
Source: FAO (2021a).

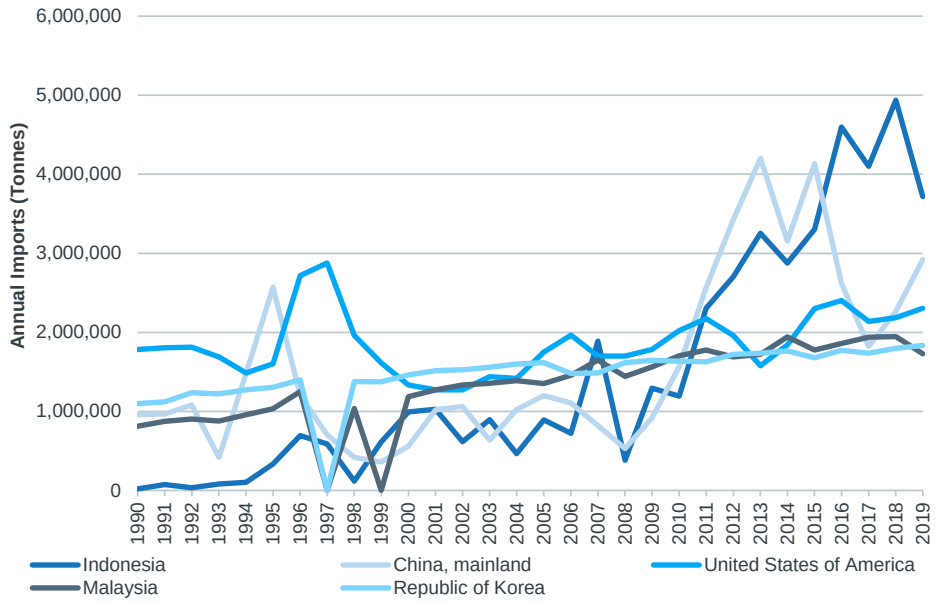
Major Importers (Raw Sugar)

In 2019, global raw sugar imports were estimated to total 32.4 million tonnes. From 1990 to 2019, raw sugar imports have experienced an average annual growth rate of 3.6%.

Indonesia was the largest importer of raw sugar in 2019, with imports totalling 3.7 million tonnes. Growth in Indonesia raw sugar imports is significant, with imports growing by an average annual rate of 20.1% from 1990 to 2019.

China was the second largest importer of raw sugar, with imports totalling an estimated 2.9 million tonnes in 2019. China experienced a steep decline in imports from 2015 to 2017, decreasing by a total of 2.3 million tonnes.

Figure 4.18. Top Five Major Importers (Raw Sugar), 1990 to 2019



Source: FAO (2021a).

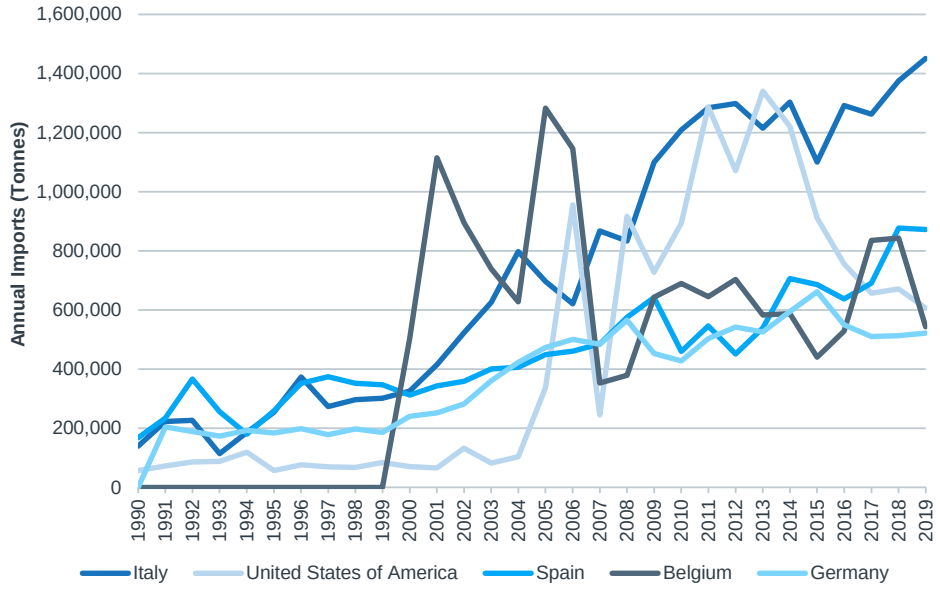
Major Importers (White Sugar)

In 2019, total imports of refined sugar estimated approximately 18.8 million tonnes. Refined sugar exports have experienced a 4.0% growth on average per annum from 1990 to 2019. In 2019, the major importer of refined sugar was Italy, with imports totalling an estimated 1.5 million tonnes. Italy's refined sugar imports have been experiencing a growth rate of 8.4% on average per annum from 1990 to 2019.

The second most prominent importer of refined sugar in 2019 was Spain, importing a total of 0.9 million tonnes.

Of important note, imports of refined sugar to the US have experienced significant fluctuation over the years. In 2013 and 2011, the US was the largest importer of refined sugar, only to decrease to the third largest importer in 2019. Imports to the US have been decreasing year on year from 2013, experiencing an average annual decrease of 12.4% per annum.

Figure 4.19. Top Five Major Importers (Refined Sugar), 1990 to 2019



Note:

- From 1990 to 1999 no information is provided for Belgium
- Top five largest importers on average from 2010 to 2019.

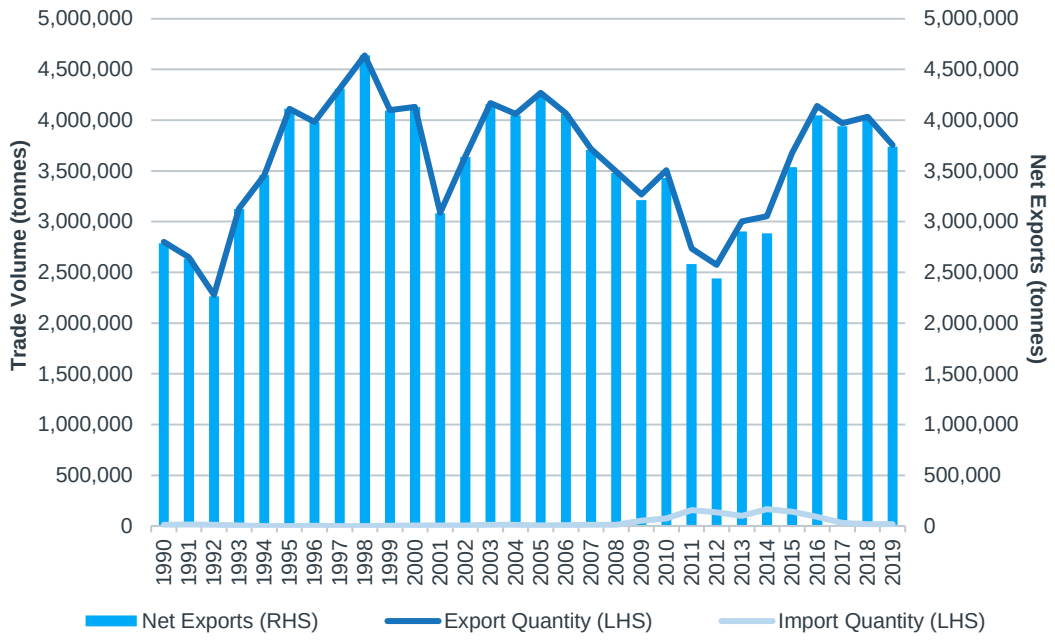
Source: FAO (2021a).

4.5.2 Export Markets

Australian Trade Balance

Australia is significant producer and exporter of sugar globally. Australia imports little volumes of sugar, highlighting that domestic production is rather sufficient to meet demand.

Figure 4.20. Trade Balance Australia for Sugar, 1990 to 2019

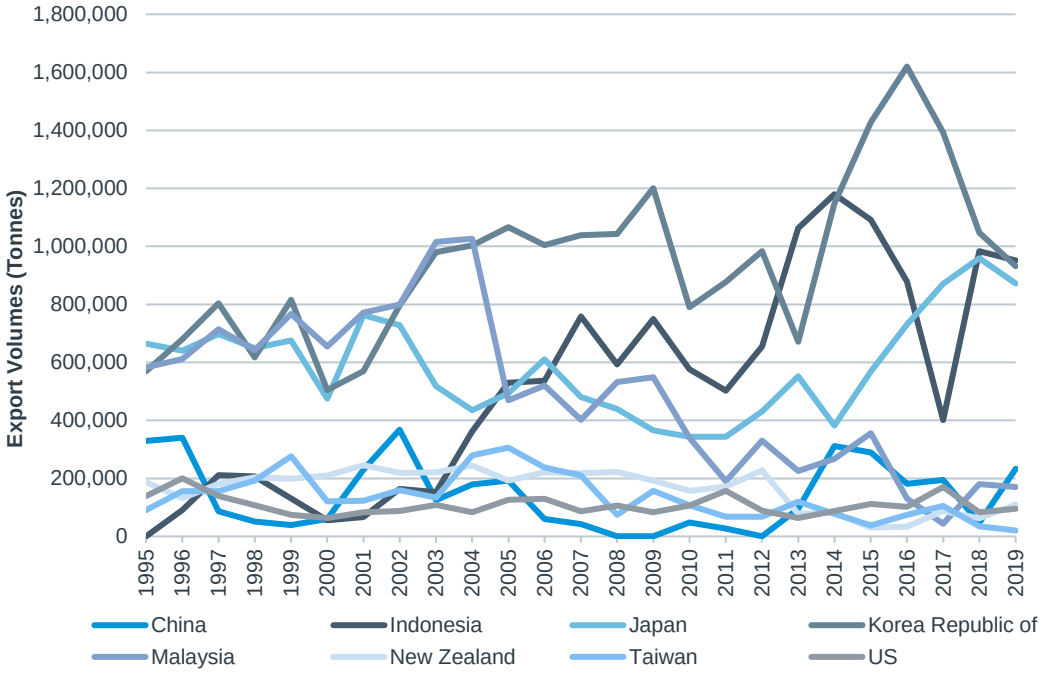


Source: ABARES (2021 b).

Key Export Markets (Raw Sugar)

In 2019, Indonesia was Australia's largest export market for raw sugar with exports totalling over 951,000 tonnes. This was closely followed by South Korea with exports estimated to total 931,000 tonnes in 2019.

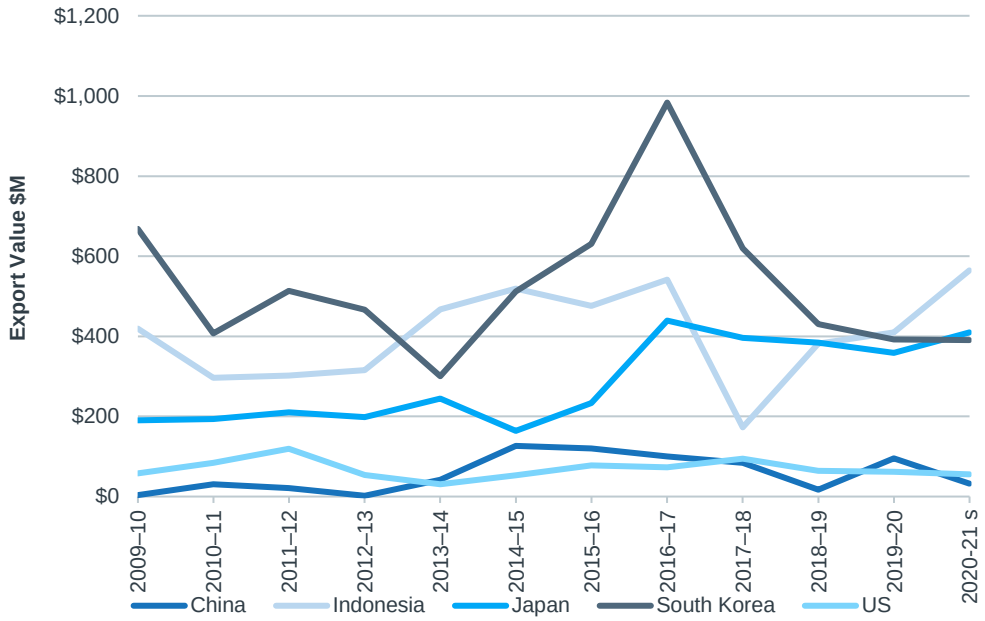
Figure 4.21. Australia's Raw Sugar Exports to Key Markets (Tonnes), 1995 to 2019



Source: ABARES (2022).

More recent figures at the time of report highlight that in 2020-21, Australia was estimated to export approximately $565 million worth of sugar to Indonesia. Both Japan and South Korea are also large markets for Australian sugar, with Australia's exports totaling $410 million to Japan and $390 million to South Korea in 2020-21.

Figure 4.22. Australia's Sugar Exports to Key Markets ($M)

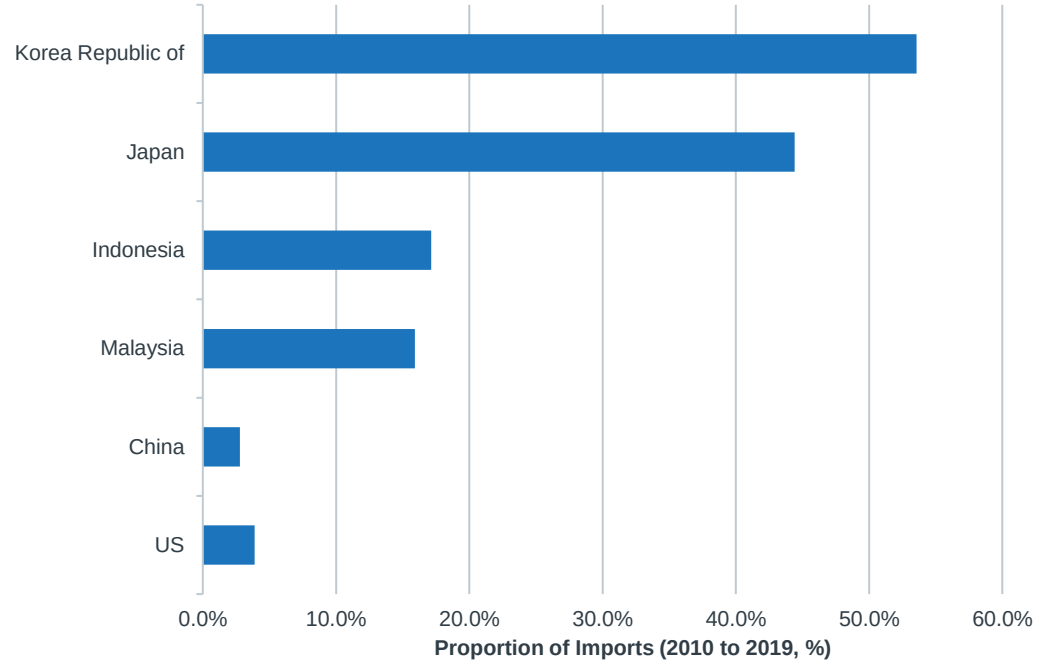


Note: ABARES estimated value.
Source: ABARES (2021 b).

Export Market Share

From 2010 to 2019, Australian raw sugar accounted for approximately 53.6% of Korea's total raw sugar imports on average. This was followed by Japan, with Australian raw sugar accounting for 44.4% of total imports to Japan on average from 2010 to 2019.

Figure 4.23. Proportion of Australia's Exports make up of Total Key Imports, Raw Sugar



Note: ABARES does not report raw sugar imports individually for New Zealand or Taiwan.
Source: ABARES (2022).

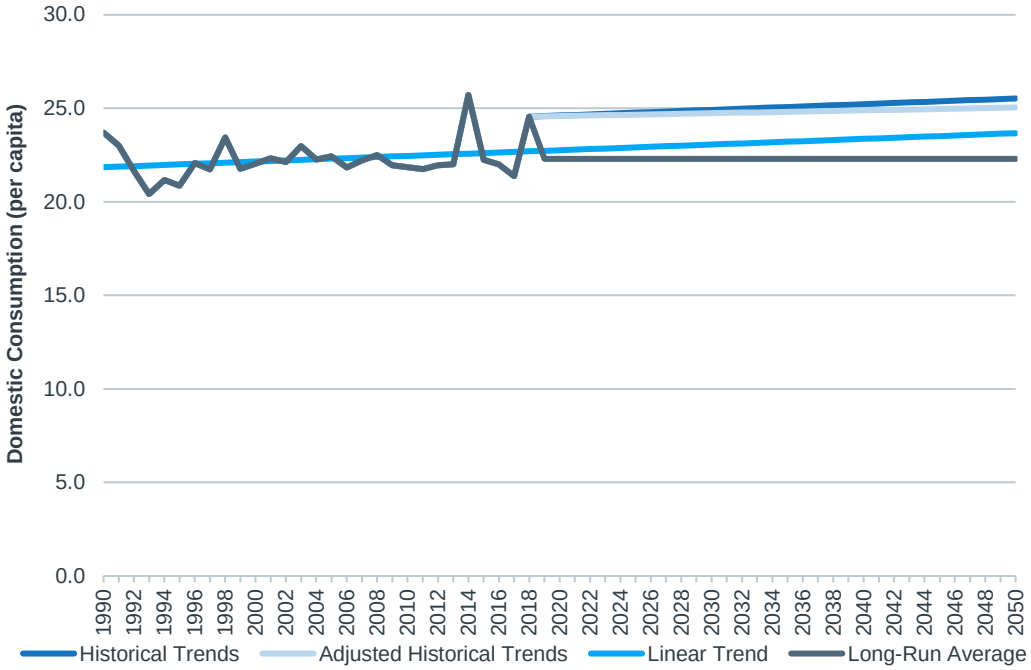
4.5.3 Consumption

Global Consumption

Historically, sugar consumption on the global scale has been growing at a steadier rate than the consumption in Australia. Based on the historic consumption trends on a global scale, there is more potential for future domestic consumption to reach linear volumes in 2050.

Based on the linear trend volumes, consumption could total 23.7 kilograms per capita in 2050.

Figure 4.24. Domestic Consumption for Global Market (Sugar) excluding Australia, 1990 to 2050

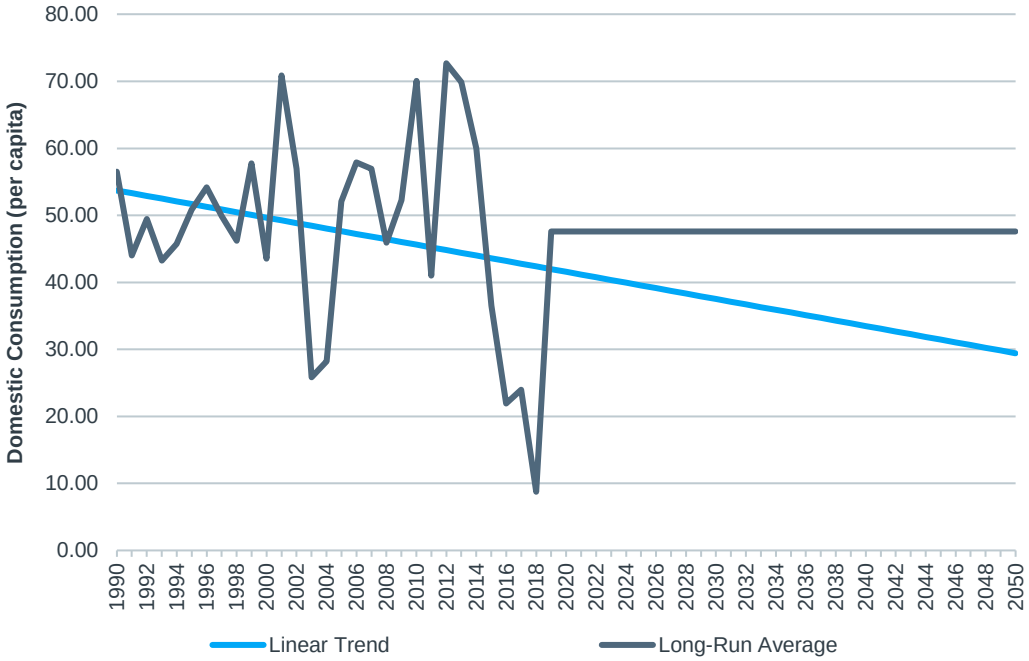


Source: FAO (2021a), AEC.

Domestic Consumption

Based on the historical domestic consumption trends for sugar in recent years, there is potential for domestic consumption to decline. However, based on long-run average trend volumes, consumption could total approximately 47.6 kilograms per capita in 2050.

Figure 4.25. Domestic Consumption Per Capita (Sugar), 1990 to 2050 (kilograms)

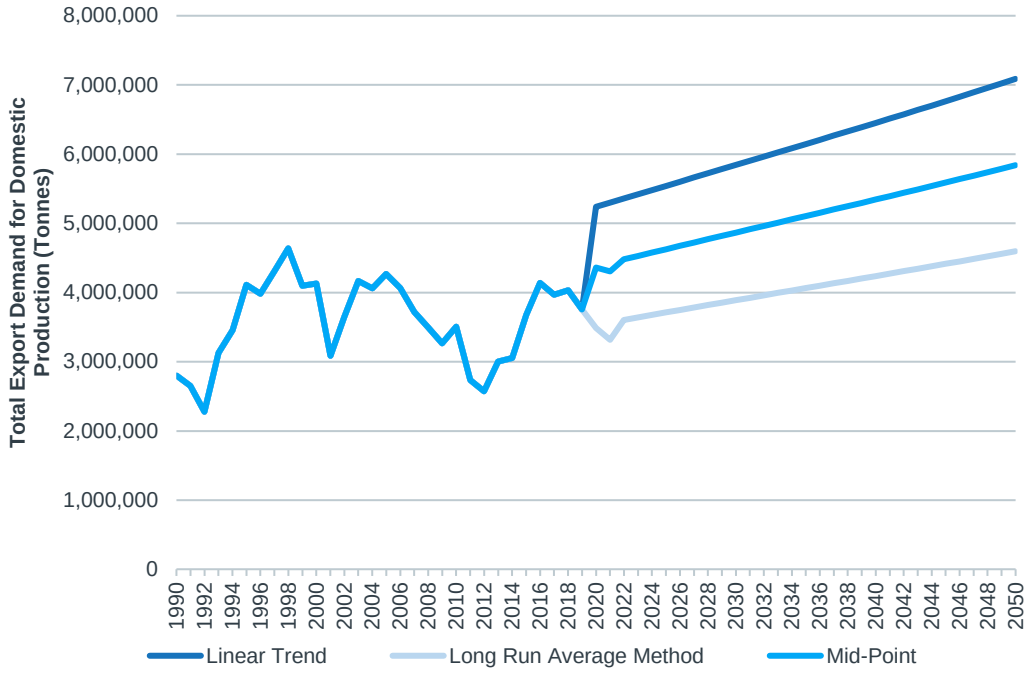


Note: Consumption for sugar has historically been on the decline, this decline impacts future projections based on historical trends and adjusted historical trends. As a result, these projections have been excluded from the graph above.
Source: FAO (2021a), ABARES (2020b), AEC.

Forecast Consumption in Export Markets

Export demand for Australian raw sugar has increased by an average annual rate of 1.3% from 1990 to 2018. Future export demand for domestic production could reach between the long-run average scenario at 4.6 million tonnes in 2050 or linear trend volumes in 2050 at 7.1 million tonnes.

Figure 4.26. Total Export Demand for Domestic Production (Sugar), 1990 to 2050



Source: FAO (2021a), AEC, ABARES (2021f).

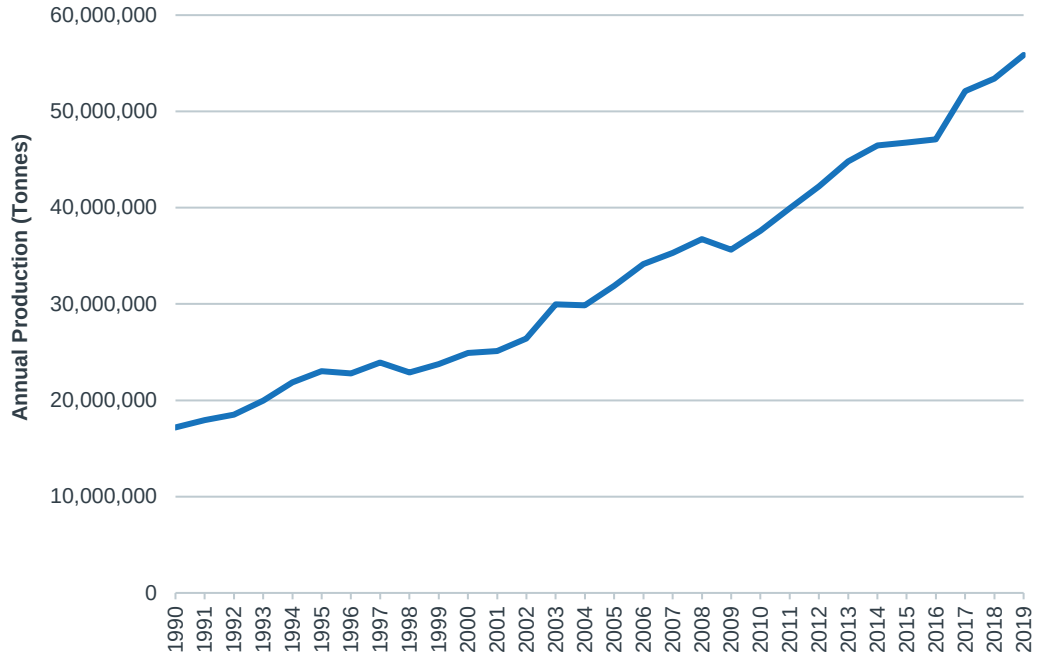
4.6 MANGO

4.6.1 Global Overview

Global Production

In 2019 global mango, mangosteens and guava production totalled approximately 55.9 million tonnes. Since 1990, global production has been growing by 4.2% on average per annum. The production of mango, mangosteens and guava is largely driven by India.

Figure 4.27. Global Mango, Mangosteens & Guava Production, 1990 to 2019



Source: FAO (2021a).

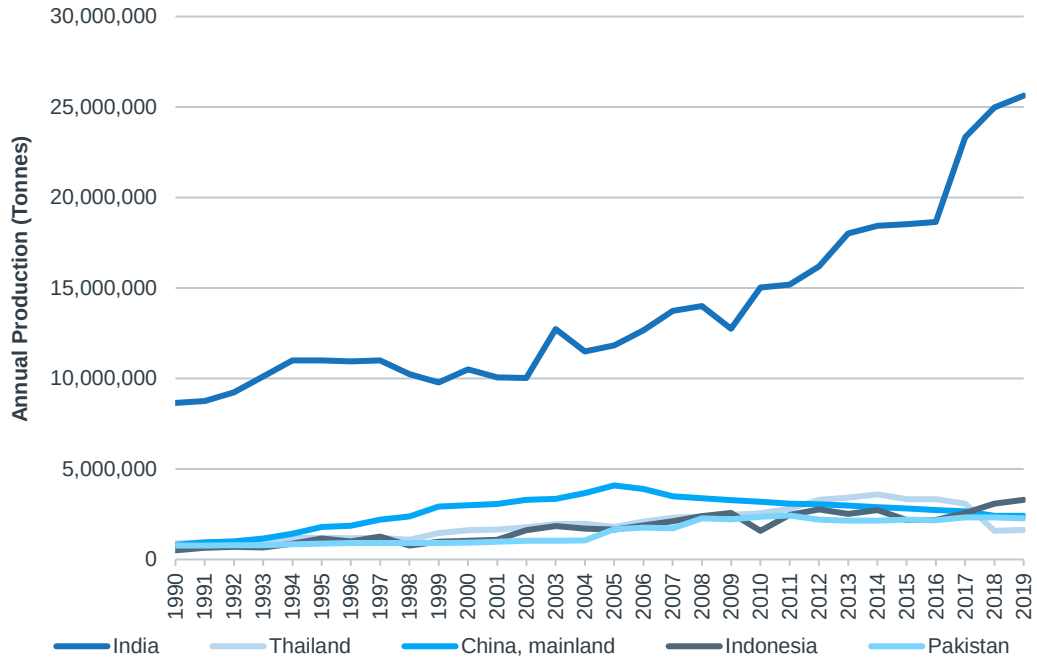
Major Producers

India is the most prominent producer of mangoes, mangosteens and guavas, accounting for an average of 42% of total global production from 1990. In 2019, India produced approximately 25.6 million tonnes of mangoes, mangosteen and guavas, with production growing by an average annual growth rate of 3.8% since 1990.

The second most prominent producer of mangoes, mangosteens and guavas globally is Indonesia, producing 3.3 million tonnes in 2019. From 2010 to 2017, Thailand was the second largest producer of mangoes, mangosteens and guavas. However, over the two most recent years, production has declined by nearly 50% on production levels achieved in 2017.

As of 2019, China was recorded as be the third largest producer of mangoes, mangosteens and guavas, producing approximately 2.4 million tonnes. Production in China has been on the decline since 2005, decreasing by an average annual rate of 3.7% per annum.

Figure 4.28. Top Five Global Producers (Mangoes, Mangosteens & Guava), 1990 to 2019



Note: Top five largest producers on average from 2010 to 2019.
Source: FAO (2021a).

Although India holds the largest share of production in the global market, its share has remained relatively steady over the past 10 years. Smaller producing countries have experienced an increase in market share from 1990.

Australia's share of the global market has remained steady and relatively small.

Table 4.1. Top 10 Global Producers (Mangoes, Mangosteens & Guava) (+ Australia)

	Average % of Total Production		
Country	**From 1990**	**From 2000**	**From 2010**
India	41.9%	40.4%	41.6%
Thailand	6.1%	6.3%	6.1%
China, mainland	8.0%	8.1%	6.1%
Indonesia	5.2%	5.6%	5.4%
Pakistan	4.6%	4.8%	4.8%
Mexico	5.0%	4.7%	4.3%
Brazil	3.1%	3.3%	3.4%
Bangladesh	1.8%	2.1%	2.5%
Egypt	1.7%	1.9%	2.2%
Malawi	1.1%	1.4%	2.2%
Australia	0.1%	0.1%	0.1%
Other	21.3%	21.4%	21.3%
Total	**100.0%**	**100.0%**	**100.0%**

Source: FAO (2021a).

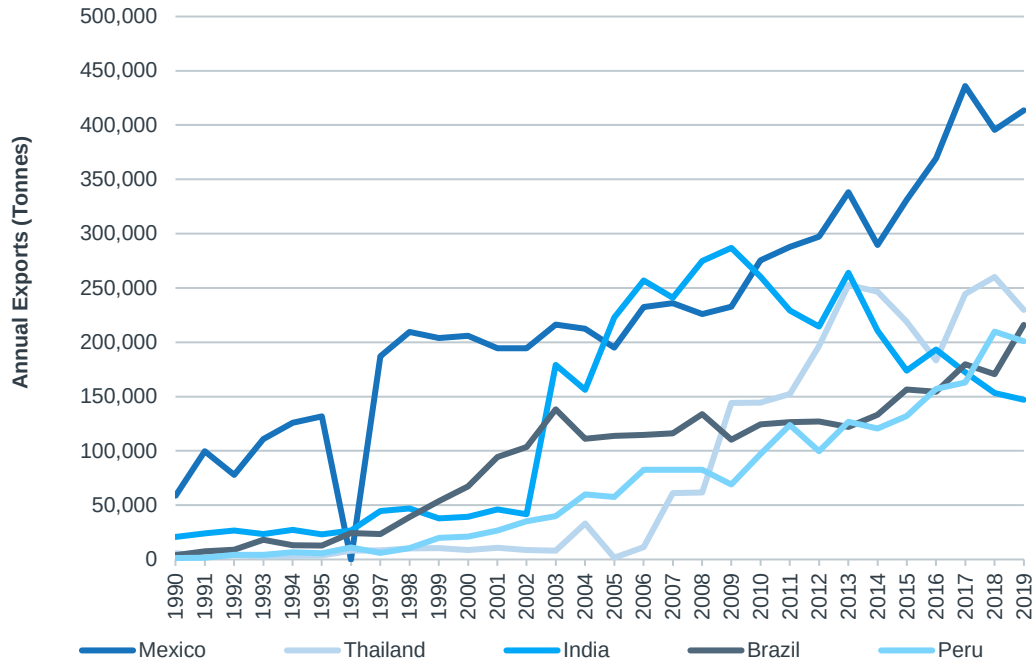
Major Exporters

Global exports have experienced an average annual increase of 9.9% since 1990, totalling 1.9 million tonnes in 2019. The majority of mango, mangosteen and guava production is consumed by locals, with 3.4% of global production being exported.

Historically, the most prominent export country has been Mexico which has historically comprised approximately 23.8% of global exports between 1990 and 2019. However, from 2005 to 2009 India became the most prominent exporting nation, experiencing a staggering average growth of 74.9% per annum from 2002 to 2009.

The second largest exporter of mangoes, mangosteens and guavas in 2019 was Thailand, followed by Brazil.

Figure 4.29. Top Five Major Exporters (Mangoes, Mangosteens & Guava), 1990 to 2019



Note:
- No production data is available for Mexico in 1996.
- Top five largest exporters on average from 2010 to 2019.

Source: FAO (2021a).

Major Importers

The US is the largest global importer of mangoes, mangosteens and guavas, importing approximately 493,000 tonnes in 2019. Since 1990, the average annual growth rate of imports in the US has totalled 7.6% per annum. In the US, the production of mangoes, mangosteens and guavas have declined by an average annual rate of 6.8% from 1990 to reach 1,141 tonnes in 2019. The country significantly relies on imports of the fruits to support the demand for consumption.

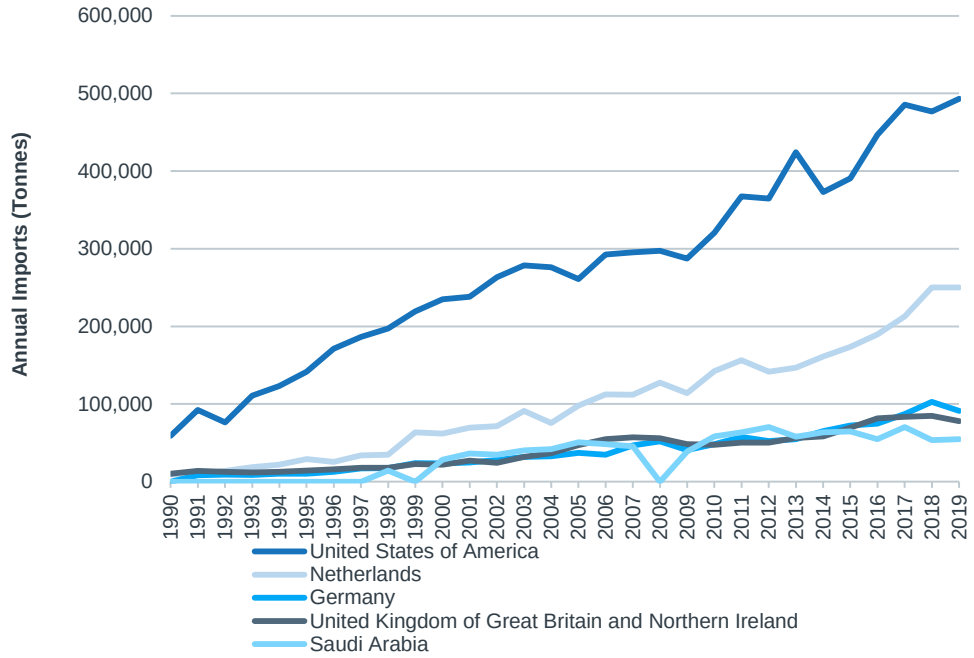
Mangoes are tropical fruits and require a tropical climate to grow, that's why a significant portion of mangoes, mangosteens and guavas are grown near the equator (Mexico, Ecuador, Peru, Brazil, etc). Approximately 86% of the mangoes[3] imported to the US are supplied by Mexico (WIFSS, 2016).

The Netherlands is the second largest importer of mangoes, mangosteens and guavas, importing approximately 250,250 tonnes in 2019.

Together, the US and the Netherlands accounted for approximately 46% of total global imports in 2019.

[3] Not including mangosteens or guavas.

Figure 4.30. Top Five Major Importers (Mangoes, Mangosteens & Guava), 1990 to 2019



Note: Top five largest importers on average from 2010 to 2019.
Source: FAO (2021a).

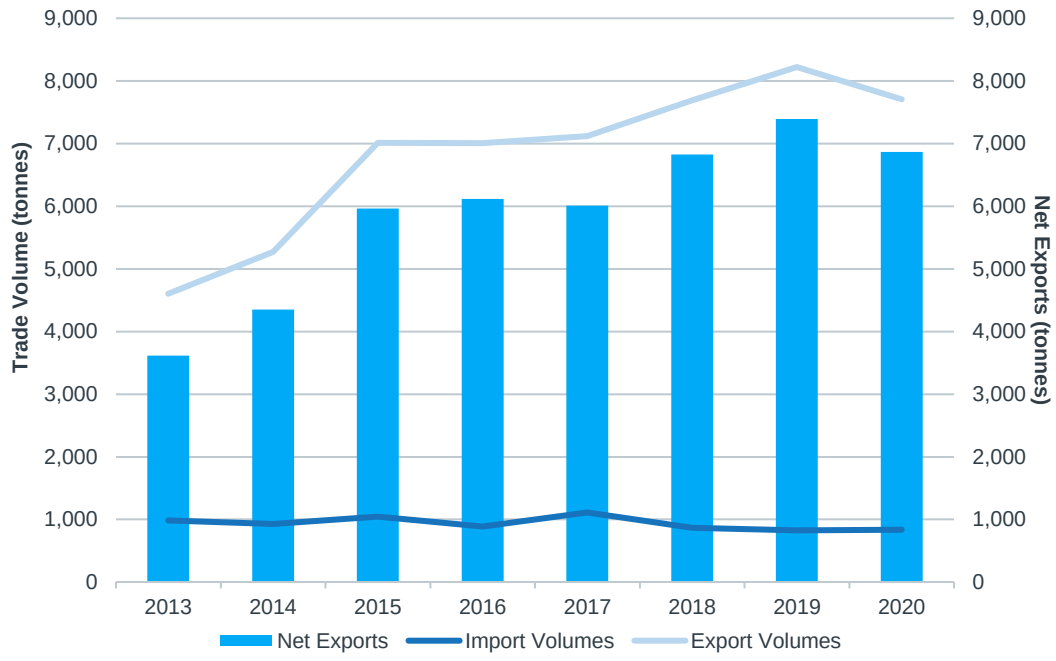
4.6.2 Export Markets

Australian Trade Balance

Of the total mango production in Australia in 2020, approximately 16% was exported to global markets (or approximately 7,707 tonnes). In 2020, Australia imported approximately 838 tonnes of mangoes, leaving net exports at 6,869 tonnes.

From the range examined below, Australia has historically been a net exporter of Mangoes. This combined with the small volumes of imports highlights that domestic demand is being met by domestic production.

Figure 4.31. Trade Balance Australia (Mangoes)

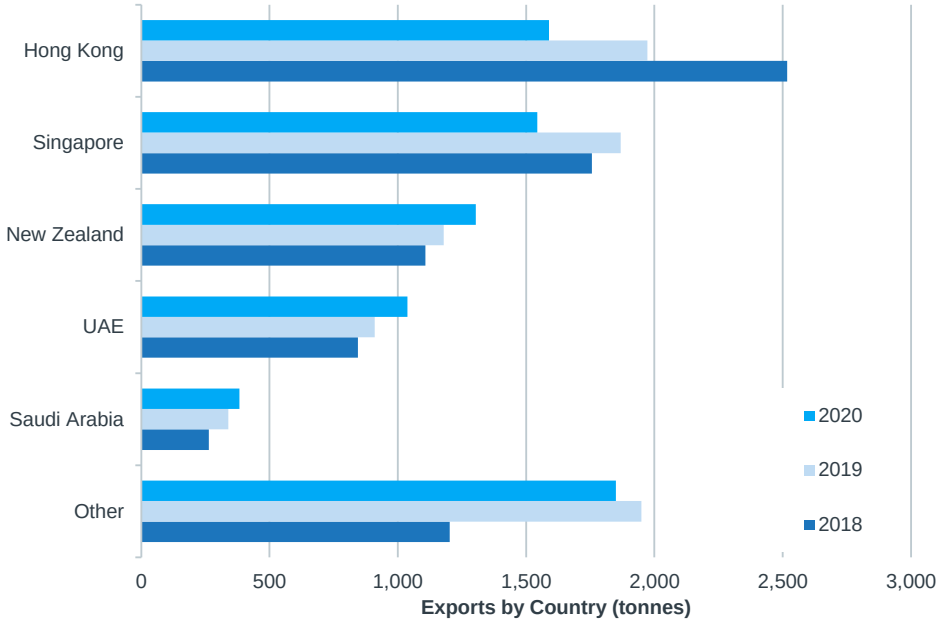


Source: Hort Innovation (2020a, 2019, 2018, 2017, 2016, 2015, 2014, 2013)

Key Export Markets

According to Hort Innovation (2020a), Hong Kong was Australia's key export market accounting for approximately 1,589 tonnes of mangoes. However, mango exports to Hong Kong have declined by -20.6% from 2018 to 2020.

Figure 4.32. Key Export Markets for Australian Mangoes



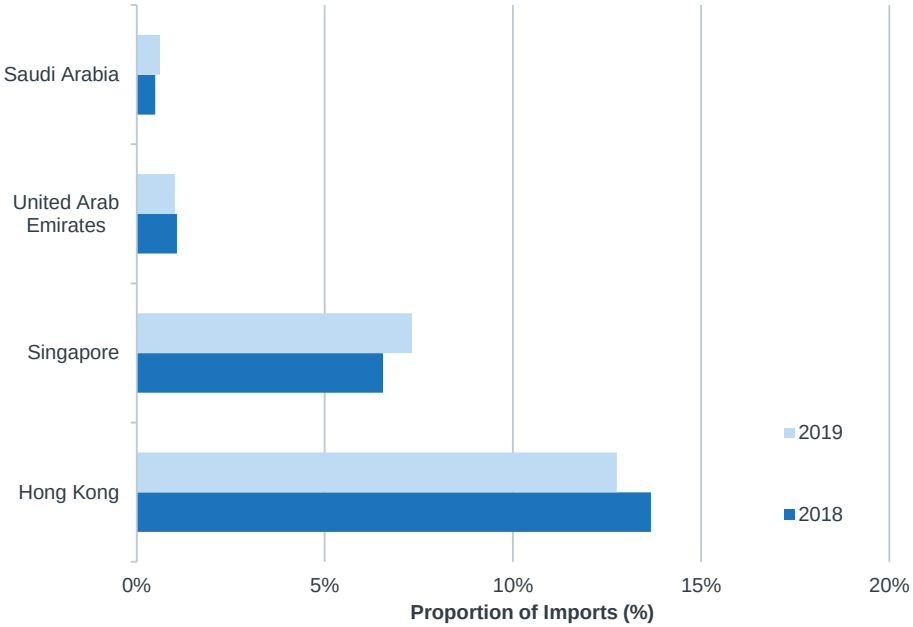
Source: Hort Innovation (2020a).

Export Market Share

The figure below highlights how much of Australia's mango exports make up of each key market's imports of mangoes, mangosteens and guavas in 2018 and 2019. In 2019, Australian mango exports to Hong Kong accounted for approximately 12.8% of their total mango, mangosteen and guava imports for the year.

In 2019, it was also estimated that approximately 7.3% of imports to Singapore were from Australia.

Figure 4.33. Australia's Import Market Share, 2018 and 2019



Note: FAO does not provide import information for New Zealand, one of Australia's top export markets.
Source: FAO (2021 a), Hort Innovation (2020a).

Seasonality

The tables below highlight Australia's top mango export markets and their import seasonality for their largest mango imports (i.e. Hong Kong is Australia's largest market for mango exports and they also source from the Philippines, Thailand and Indonesia).

Table 4.2. Hong Kong Mango Import Seasonality

Country	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Australia												
Philippines												
Thailand												
Indonesia												
Availability	High	Medium	Low									

Source: Valavi (undated), Philippine Department of Agriculture (2018).

Table 4.3. Singapore Mango Import Seasonality

Country	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Australia												
Thailand												
Malaysia												
India												
Availability	High	Medium	Low									

Source: Philippine Department of Agriculture (2018).

Table 4.4. New Zealand Mango Import Seasonality

Country	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Australia												
Mexico												
Ecuador												
Peru												
Availability	High	Medium	Low									

Source: Philippine Department of Agriculture (2018), Mango.org (2021).

Table 4.5. United Arab Emirates Mango Import Seasonality

Country	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Australia												
India												
Pakistan												
Kenya												
Availability	High	Medium	Low									

Source: Valavi (undated), Philippine Department of Agriculture (2018), Griesbach (undated).

The table below provides a breakdown of the mango seasonality in Australia by state. Australian mangoes are not produced in the month of April to June, however, they are prominent in the month of October to January.

Table 4.6. Mango Seasonality by State

State	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
NSW												
QLD												
WA												
NT												
Availability	High	Medium	Low									

Source: Hort Innovation (2020a).

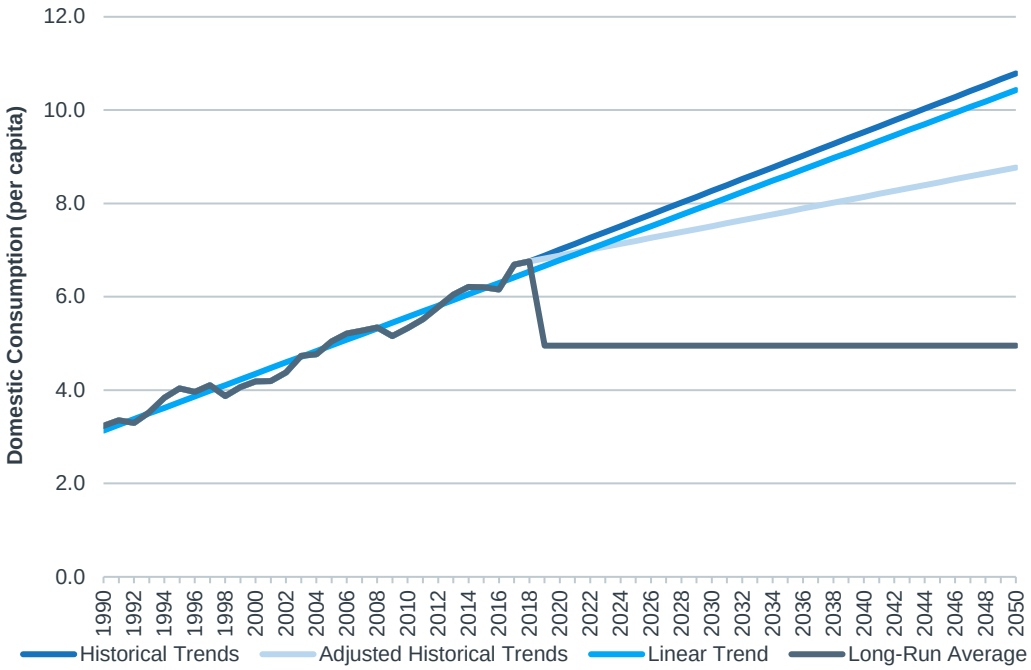
4.6.3 Consumption

Global Consumption

Domestic consumption per person in the global market is significantly higher than the domestic consumption in Australia. Domestic consumption of mangoes, mangosteens and guavas in the global market has been growing by an average annual rate of 2.7% from 1990 to 2018. Based on the historical trends in domestic consumption in the global market, there is potential for future demand to fall in line with the linear trend volumes.

In 2050, domestic consumption in the global market could reach 10.4 kilograms per capita based on linear trends.

Figure 4.34. Domestic Consumption for Global Market (Mangoes, Mangosteens & Guava), excluding Australia, 1990 to 2050 (kilograms)

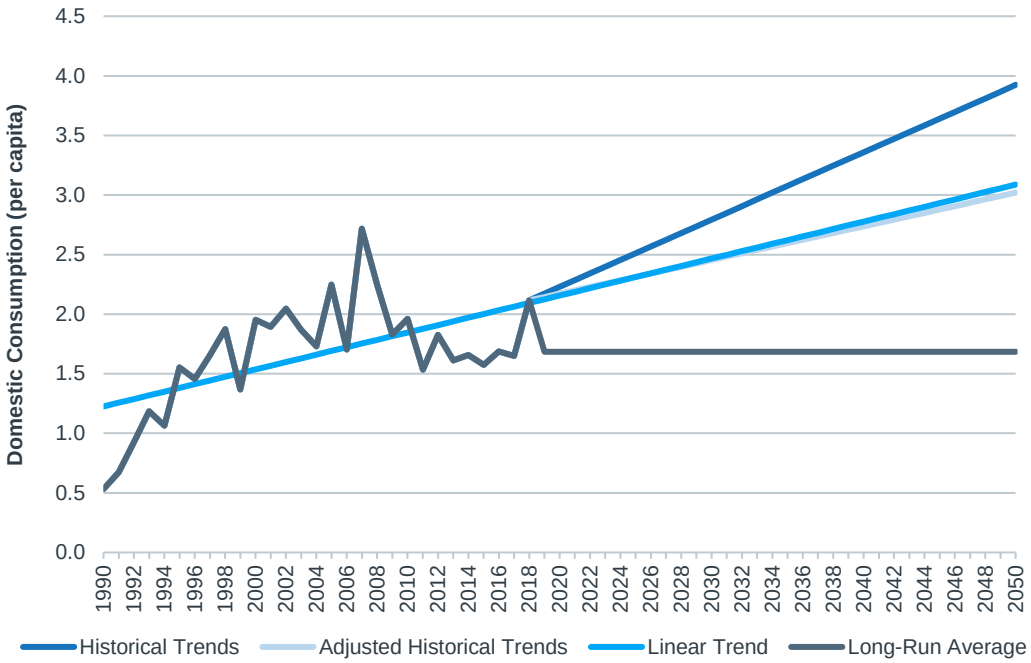


Source: FAO (2021a), AEC.

Domestic Consumption

Based on the historical domestic consumption trends for mangoes, mangosteens and guavas in recent years, there is more potential for future domestic consumption to reach between the long-run average (1.7 kilograms) and the linear trend volumes (3.1 kilograms) in 2050.

Figure 4.35. Domestic Consumption Per Capita (Mangoes, Mangosteens & Guava), 1990 to 2050 (kilograms)



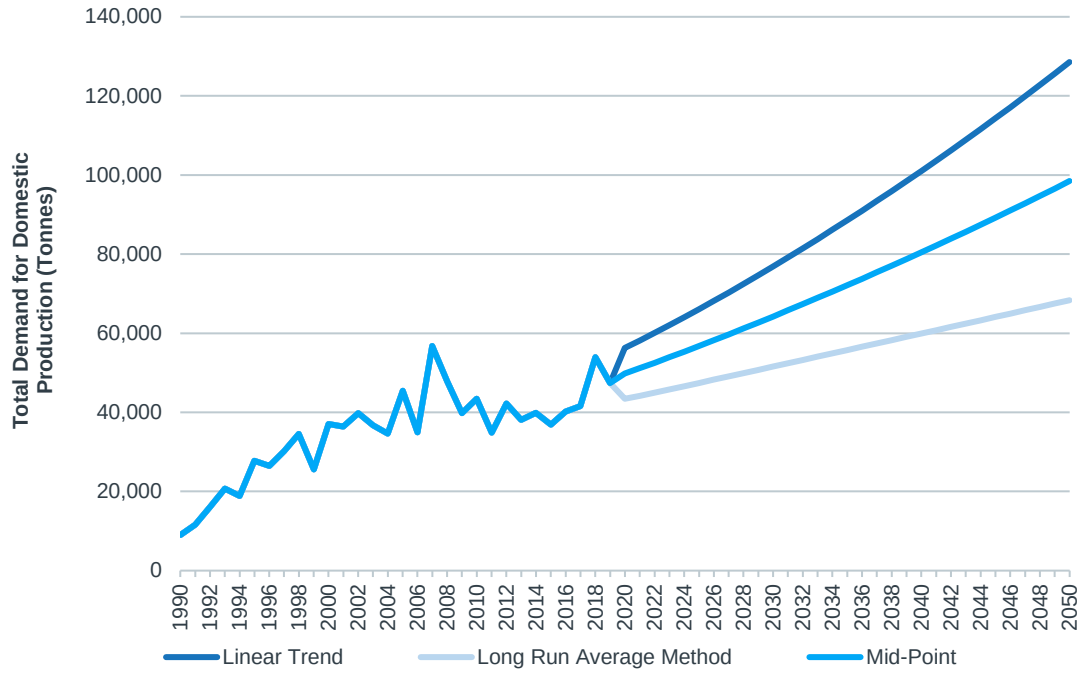
Source: FAO (2021a), AEC.

Forecast Consumption in Domestic Markets

Historically, domestic demand for domestic production has grown by an average annual rate of 5.9% since 1990 to reach 53,931 tonnes in 2018.

Based on historical trends, future domestic demand for domestic production is likely to reach between the long-run average (66,361 tonnes in 2050) or the mid-point scenario (98,469 tonnes in 2050).

Figure 4.36. Total Domestic Demand for Domestic Production (Mangoes, Mangosteens & Guava), 1990 to 2050

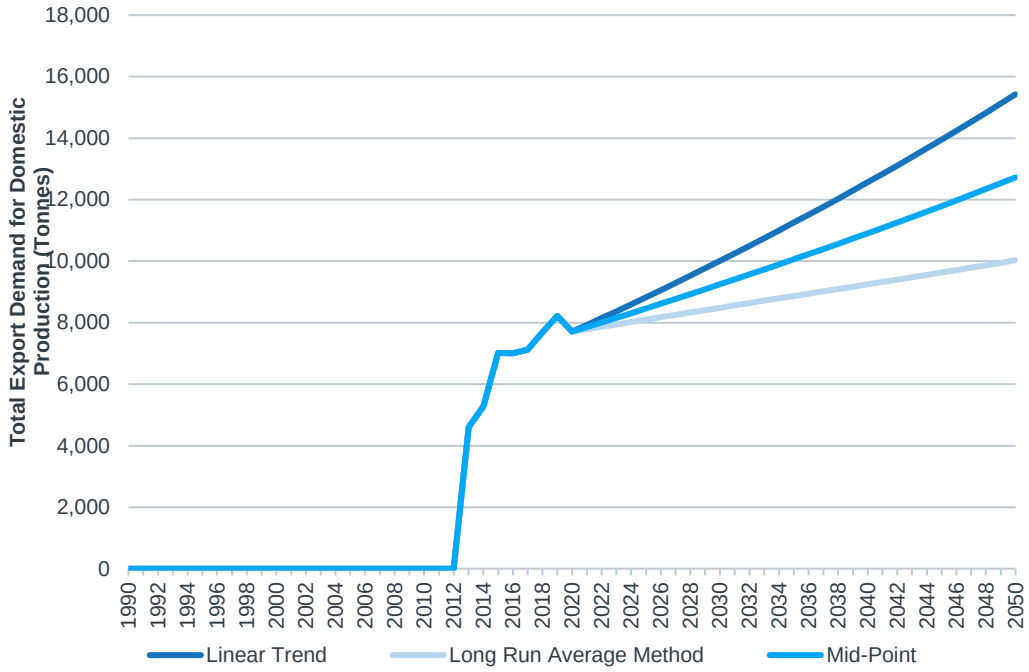


Source: FAO (2021a), AEC.

Forecast Consumption in Export Markets

From 2013 (the first-year information on mangoes, mangosteens and guava exports that was available) to 2018, exports demand for domestic production grew from approximately 4,600 tonnes to 7,707 tonnes in 2020.

Figure 4.37. Total Export Demand for Domestic Production (Mangoes, Mangosteens & Guava), 1990 to 2050



Note: Mango, mangosteens and guava export information was not available in the FAO database. This information from 2013 was supplied from the Hort Innovation Handbook.
Source: Hort Innovation, AEC.

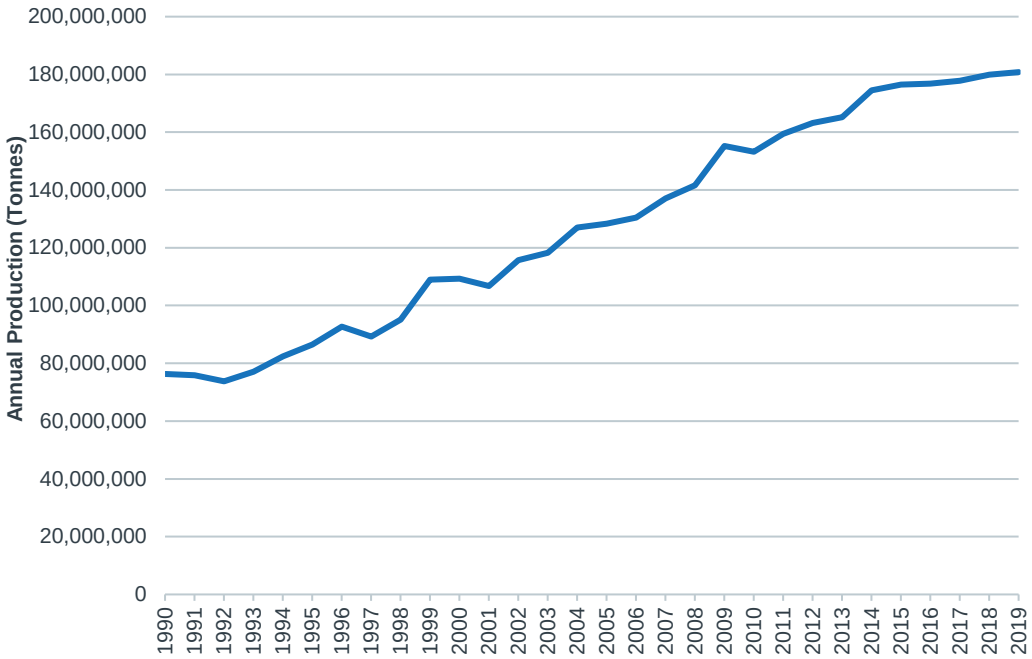
4.7 TOMATO

4.7.1 Global Overview

Global Production

From 1990 to 2019, global tomato production experienced an increase of 3.0% per annum. In 2019, it was estimated that global tomato production totalled 180.8 million tonnes.

Figure 4.38. Global Production of Tomatoes, 1990 to 2019



Source: FAO (2021a).

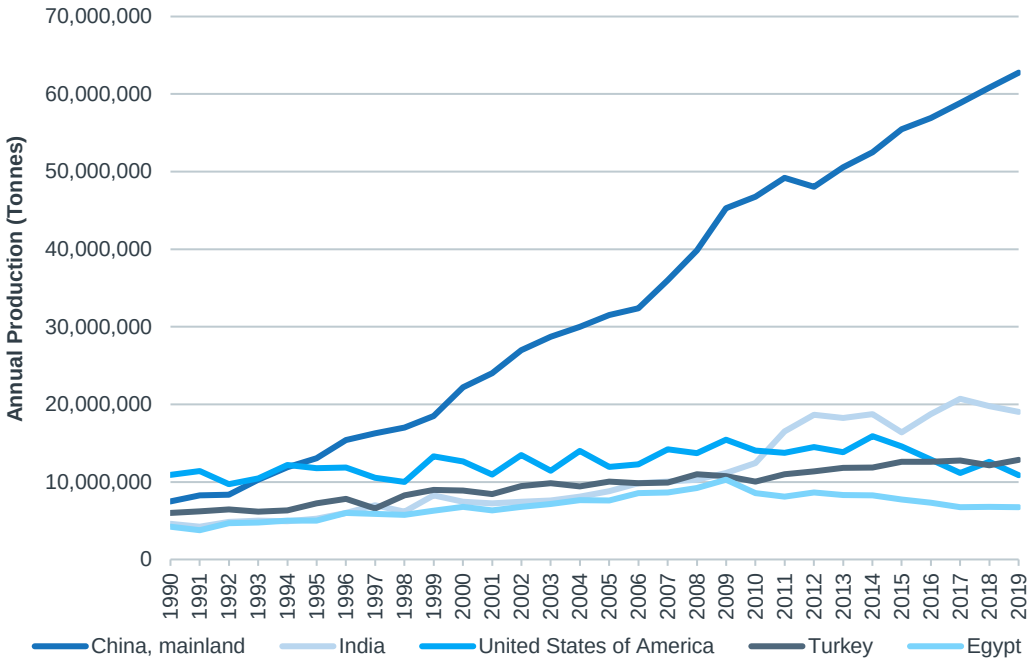
Major Producers

China is the most prominent producer of tomatoes, accounting for an average of 25.7% of total global production from 1990 to 2019. In 2019, China produced approximately 62.8 million tonnes of tomatoes, with production growing at an average annual growth of 7.6% from 1990 to 2019.

The second most prominent cultivator of tomatoes globally is India, producing little over 19 million tonnes in 2019. Prior to 2010, the US was the second largest producer of tomatoes on the global scale, however, over the last decade India experienced stronger growth.

Australia is currently a small producer in the global tomato market, accounting for an average of 0.3% of global production since 1990.

Figure 4.39. Top Five Global Producers of Tomatoes, 1990 to 2019



Note: Top five largest producers on average from 2010 to 2019.
Source: FAO (2021a).

China has increased its share of global production by 6 percentage points from 1990, reflecting the country's rapid ramp up in production over the years. Over the same period of time, India and Iran have experienced an increase in their share of global tomato production, but to a lesser extent than China. Australia's share of the global market has experienced a 0.1 percentage point decline from 1990.

Table 4.7. Top 10 Global Producers of Tomatoes (+ Australia)

	Average % of Total Production		
Country	**From 1990**	**From 2000**	**From 2010**
China, mainland	25.7%	28.8%	31.7%
India	8.4%	9.0%	10.5%
United States of America	9.8%	8.9%	7.9%
Turkey	7.5%	7.3%	7.0%
Egypt	5.4%	5.2%	4.5%
Italy	4.8%	4.2%	3.4%
Iran (Islamic Republic of)	3.3%	3.4%	3.3%
Spain	3.1%	2.9%	2.7%
Brazil	2.7%	2.6%	2.4%
Mexico	2.3%	2.2%	2.1%
Australia	0.3%	0.3%	0.2%
Other	26.8%	25.2%	24.3%
Total	**100.0%**	**100.0%**	**100.0%**

Source: FAO (2021a).

Major Exporters

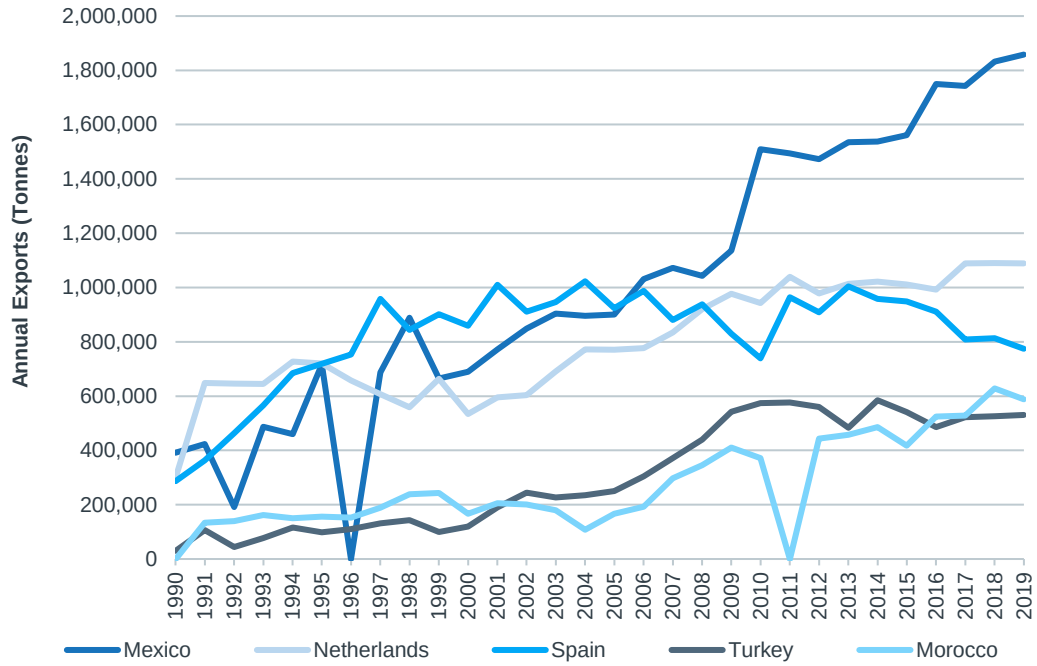
In 2006, Mexico emerged as the largest global exporter of tomatoes worldwide. Tomato exports from Mexico experienced a sharp increase from 2009 to 2010, increasing by 32.9% over the year (or approximately 373,000 tonnes).

The demand for Mexican tomatoes is largely from the US, which accounts for nearly 99.7% of total Mexican exports (USDA, 2021a). "Sinaloa is the largest tomato producing state in Mexico, with fall/winter production. Sinaloa tomatoes are harvested and supply the US market during the winter months" (USDA p. 4, 2021).

The Netherlands was the second largest exporter of tomatoes in the global market, exporting 1.1 million tonnes in 2019. From 2010, tomato exports for the country have experienced a slowing of growth, reaching an average annual rate of 1.6% per annum from 2010 to 2019.

Spain is the third largest exporter of tomatoes, totalling over 773,000 tonnes in 2019. Spanish tomato exports have been experiencing a steady decline since 2013 due to decreasing imports of Spanish tomatoes within Europe (Hort Daily, 2021). This is largely driven by competing exports from Morocco, and more recently Turkey in 2019 (Hort Daily, 2021).

Figure 4.40. Top 5 Major Exporters of Tomatoes, 1990 to 2019



Notes:
- No data was available for Mexico in 1996 and Morocco in 2011.
- Top five largest exporters on average from 2010 to 2019.

Source: FAO (2021a).

Out of the top 10 global export countries listed below, Mexico, Turkey, Morocco, France, Belgium and Iran have increased their global tomato exports since 1990.

Table 4.8. Top 10 Major Exporters of Tomatoes (+ Australia)

	Average % of Total Global Exports		
Country	**From 1990**	**From 2000**	**From 2010**
Mexico	19.6%	20.2%	21.7%
Netherlands	15.4%	14.0%	13.6%
Spain	15.9%	14.3%	11.7%
Turkey	6.0%	6.6%	7.2%
Morocco	5.3%	5.3%	5.9%
Jordan	5.2%	5.3%	5.2%
France	2.7%	2.8%	3.0%
Belgium	2.7%	3.3%	2.9%
United States of America	3.7%	3.3%	2.8%
Iran (Islamic Republic of)	1.6%	1.9%	2.6%
Australia	0.1%	0.0%	0.0%
Other	21.8%	23.1%	23.3%
Total	**100.0%**	**100.0%**	**100.0%**

Source: FAO (2021a).

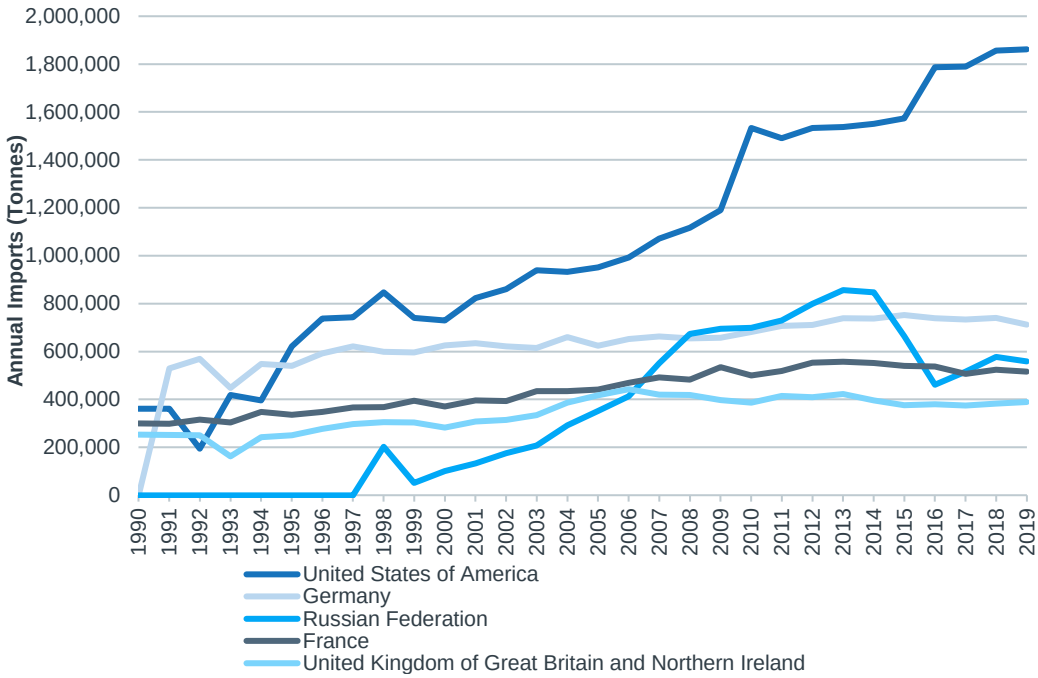
Major Importers

The US is the largest importer of tomatoes and also one of the top five largest tomato producing countries. This highlights significant demand for domestic consumption of tomatoes. In 2019, the US imported approximately 1.9 million tomatoes and domestically produced an estimated 10.9 million tonnes.

In the US, Florida and California are the largest producers of tomatoes, with Florida producing tomatoes from October to June and California producing year-round except winter (Guan, Z., Biswas, T., & Wu, F., 2018 b). The gap in production times are filled by the country's most prominent global exporters, Mexico and Canada (Guan, Z., Biswas, T., & Wu, F., 2018 b).

Of important note, Russia was the second largest importer of tomatoes from 2008 to 2012. However, Russia experienced a significant decline in tomato imports from 2014 to 2016. A portion of this decline can be attributed to the ban on Turkish tomato imports in 2015, following "Turkey's downing of a Russian fighter jet on the border with Syria" (Meyer, H, 2020). The bilateral political relations significantly impact Russian imports from Turkey, banning most food imports from the country (Heigermoser, M, 2021). This ban was lifted in 2017, however quotas for Turkish tomato imports were put into place. These quotas have increased to allow for the import of more Turkish tomatoes.

Figure 4.41. Top Five Importers of Tomatoes, 1990 to 2019



Note: Top five largest importers on average from 2010 to 2019.
Source: FAO (2021a).

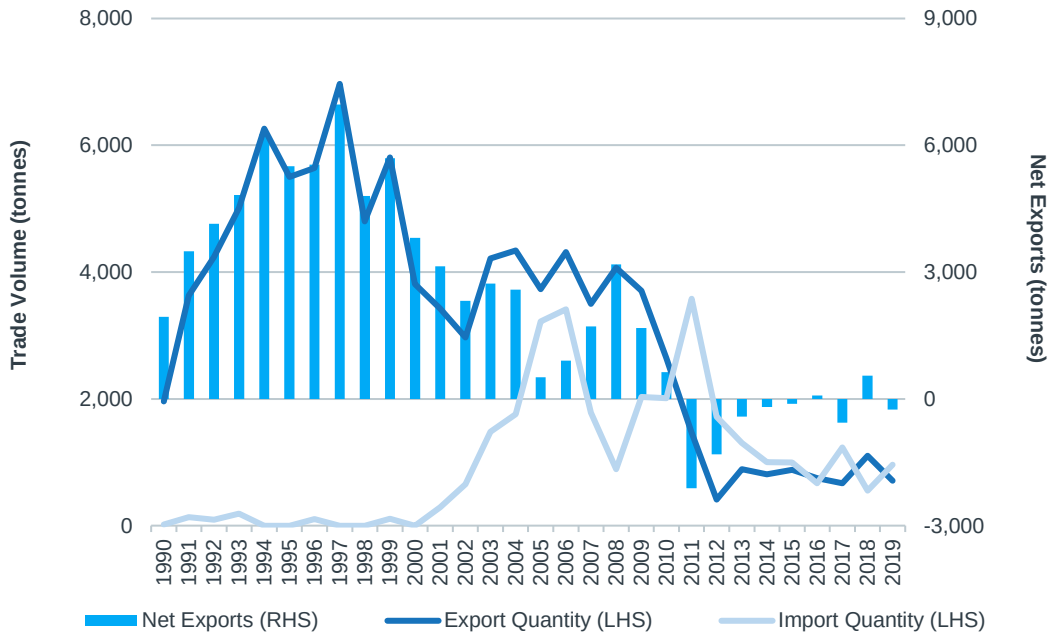
4.7.2 Export Markets

Australian Trade Balance

Of the total tomato production in Australia in 2019, approximately 0.2% was exported to global markets (or approximately 711 tonnes). In 2019, Australia imported approximately 962 tonnes of tomatoes leaving net exports at approximately -250 tonnes.

Historically, Australia's trade balance for tomatoes has been positive, with exports being significantly higher than imports. However, since 2011, Australia has largely experienced a negative trade balance with an increase in imports and a decrease in exports.

Figure 4.42. Trade Balance Australia for Tomatoes, 1990 to 2019

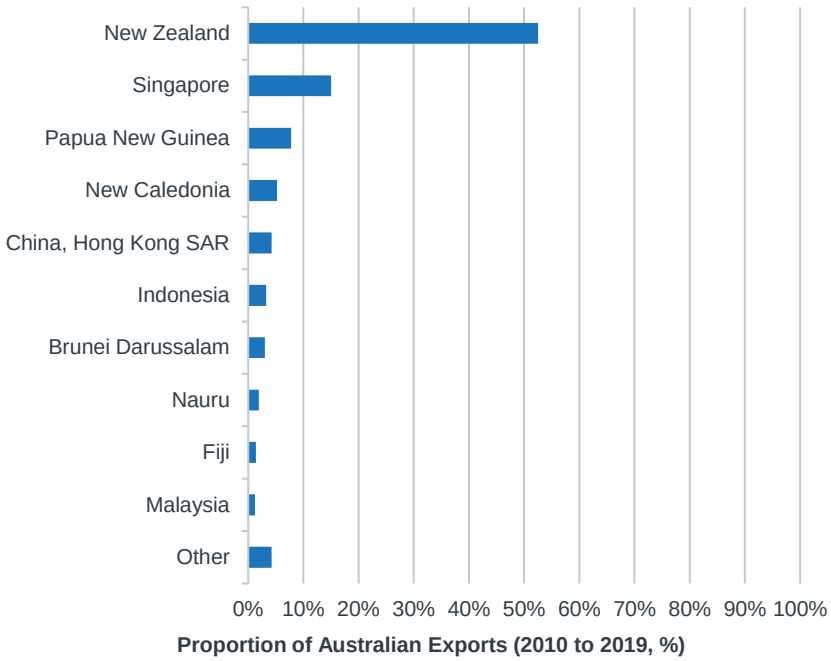


Source: FAO (2021a).

Key Export Markets

From 2010 to 2019, New Zealand accounted for 52.6% of Australia's tomato exports. Singapore was Australia's second largest export market for tomatoes, accounting for an average of 15.0% of exports from 2010 to 2019.

Figure 4.43. Key Exports Markets for Australia (Top 10) (Tomatoes)



Source: FAO (2021a).

The tables below highlight Australia's top tomato export markets and their import seasonality for their largest tomato imports (i.e. Singapore is Australia's second largest market for tomato exports, however they also source from Malaysia, etc.).

Table 4.9. Singapore Tomato Import Seasonality

Country	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Australia												
Malaysia												
Netherlands												
Thailand												
Availability	High											

Source: Bergwerff (undated), Radam (undated), Sasidhaan (2021).

Table 4.10. New Caledonia Tomato Import Seasonality

Country	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Australia												
New Zealand												
Availability	High											

Source: The Produce Company, NZ (undated).

Australian tomatoes are produced all year round, with only Tasmania experiencing low availability throughout the year. Tomatoes are largely in season from July to September and April to June. It must be noted that Queensland has the highest availability of fresh tomatoes throughout the year.

Table 4.11. Fresh Tomatoes Seasonality by State

State	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
NSW												
VIC												
QLD												
WA												
SA												
TAS												
Availability	High	Medium	Low									

Source: AUSVEG (as cited in Hort Innovation 2020a).

The field tomato is the most produced variety of tomato, accounting for 40% of fresh production in 2019-20 (Hort Innovation, 2020a). This was followed by large truss tomatoes (30%) and cherry/grape tomatoes (24%) (Hort Innovation, 2020a).

Cherry/grape and large truss tomatoes have high availability year round as they can be grown outdoors and in greenhouses.

Table 4.12. Fresh Tomatoes Seasonality by Type

State	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Field												
Large Truss												
Cherry/Grape												
Roma												
Processing												
Availability	High	Medium	Low									

Source: AUSVEG (as cited in Hort Innovation 2020a).

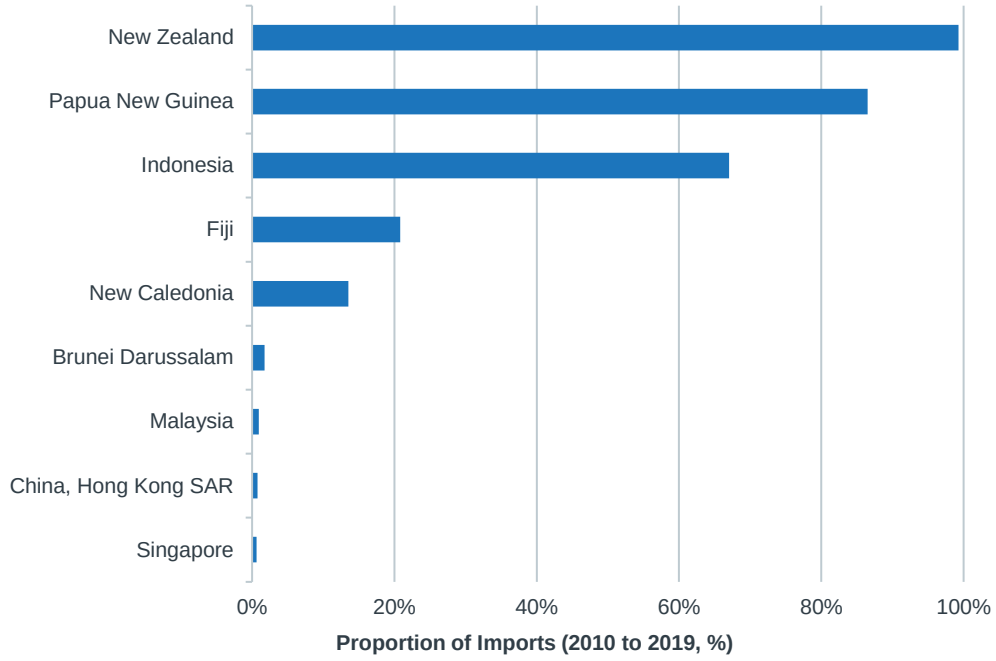
Export Market Share

The figure below highlights how much of Australia's tomato exports make up of each key market's imports on average from 2010 to 2019. New Zealand was Australia's largest export market for tomatoes. Of New Zealand's total tomato imports, it is estimated that is sourced 99.3% of its tomatoes from Australia on average between 2010 and 2019.

Papua New Guinea was Australia's third largest export market for tomatoes. Of Papua New Guinea's total tomato imports, it is estimated that 86.5% of its tomatoes were sourced from Australia on average between 2010 and 2019.

Although Singapore is Australia's second largest export market, it is estimated that Singapore only sourced 0.6% of tomatoes from Australia.

Figure 4.44. Proportion of Australia's Exports make up of Total Key Imports (Tomatoes) (Australia's Top Export Markets)



Source: FAO (2021a).

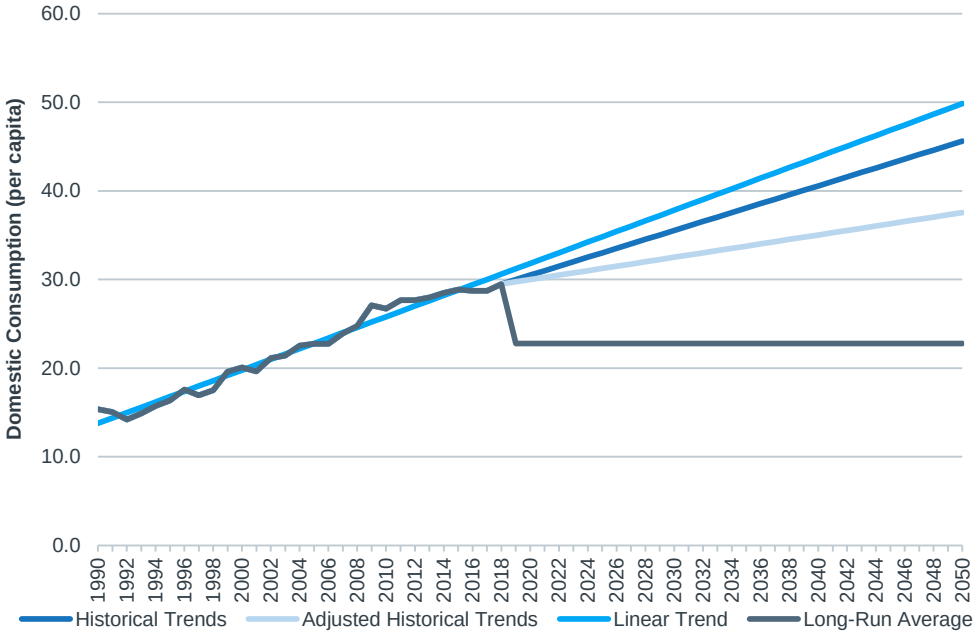
4.7.3 Consumption

Global Consumption

Historically, tomato consumption on the global scale has been growing at a steadier rate than consumption in Australia. Based on the historic consumption trends on a global scale, there is more potential for future domestic consumption to reach linear volumes in 2050.

Based on the linear trend volumes, consumption could total approximately 49.9 kilograms per capita in 2050.

Figure 4.45. Domestic Consumption for Global Market (Tomatoes), excluding Australia, 1990 to 2050

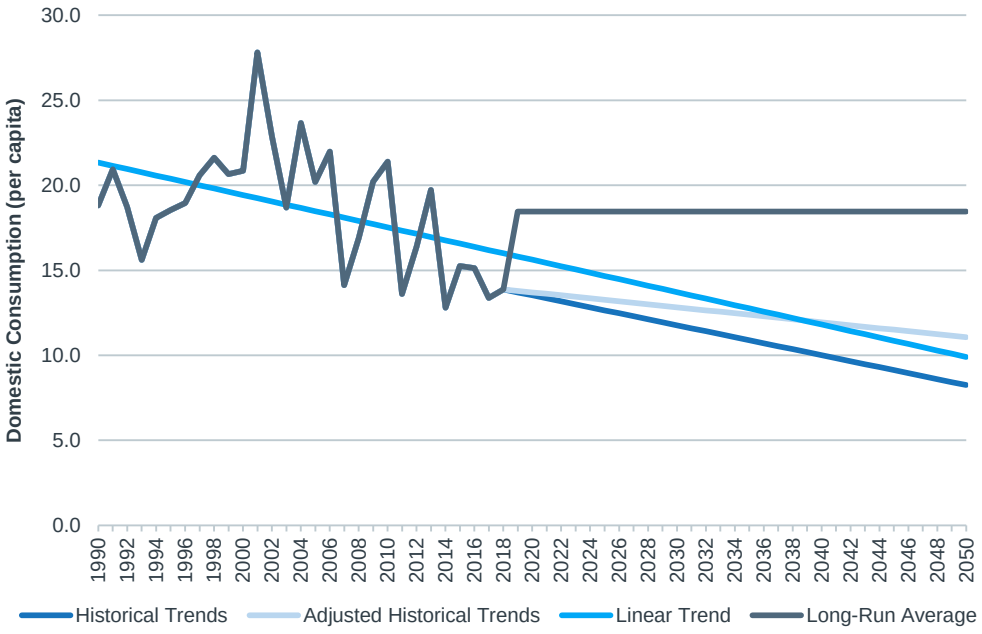


Source: FAO (2021a), AEC.

Domestic Consumption

Based on the long-run average volumes, consumption could total approximately 18.5 kilograms per capita in 2050.

Figure 4.46. Domestic Consumption Per Capita of Tomatoes, 1990 to 2050 (kilograms)



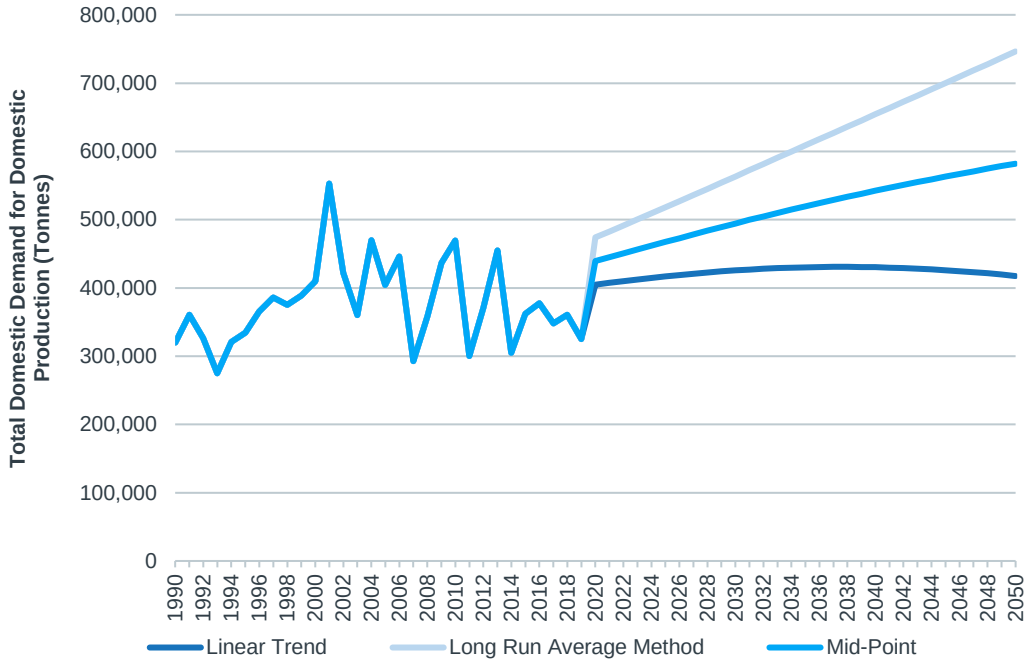
Source: FAO (2021a), AEC.

Forecast Consumption in Domestic Markets

Historically, the domestic demand for domestic production has grown by an average annual rate of 0.4% from 1990 to 2018, to reach 360,685 tonnes in 2018.

Future domestic demand for domestic production could reach between the linear trend scenario at 417,590 tonnes in 2050 or the long-run average volumes in 2050 at 746,567 tonnes. Based on historical trends, there is more potential for the future domestic demand for domestic production of tomatoes to fall in line with the mid-point scenario.

Figure 4.47. Total Domestic Demand for Domestic Tomato Production, 1990 to 2050



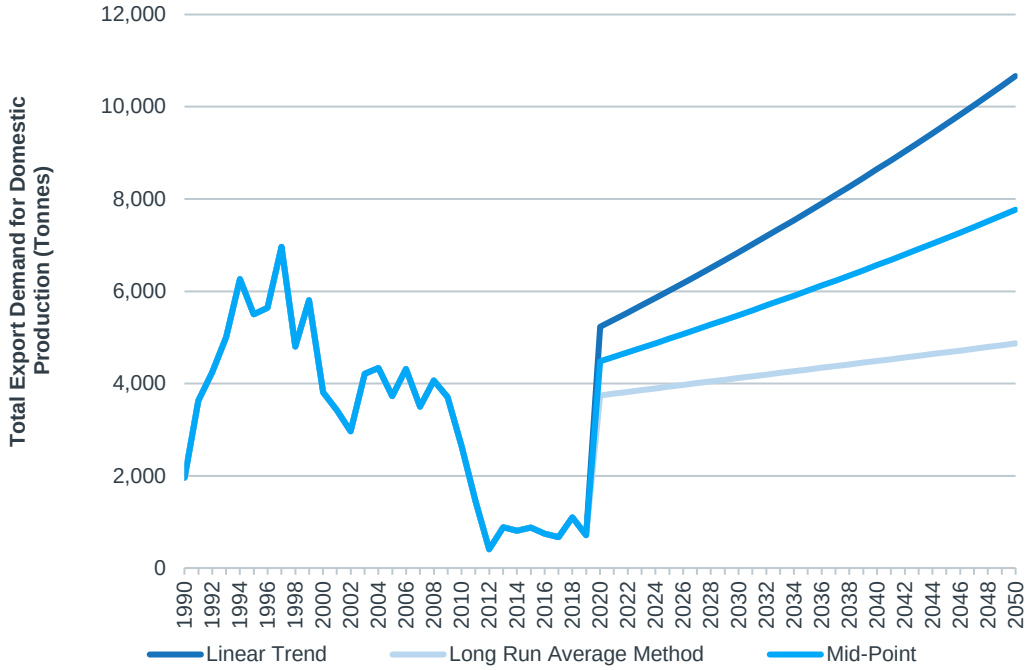
Source: FAO (2021a), AEC.

Forecast Consumption in Export Markets

Export demand for Australian tomatoes has experienced a declining trend since 1990. From 2008 to 2012, export demand for Australia production experienced a significant decline. This decrease may partiality be attributed to the temporary ban New Zealand placed on Australian tomato imports in 2008 (The Sydney Morning Herald, 2008).

Future export demand for domestic production could reach between the long-run average scenario at 4,870 tonnes in 2050 or linear trend volumes in 2050 at 10,662 tonnes.

Figure 4.48. Total Export Demand for Domestic Production (Tomatoes), 1990 to 2050



Source: FAO (2021a), AEC.

4.8 CAPSICUM

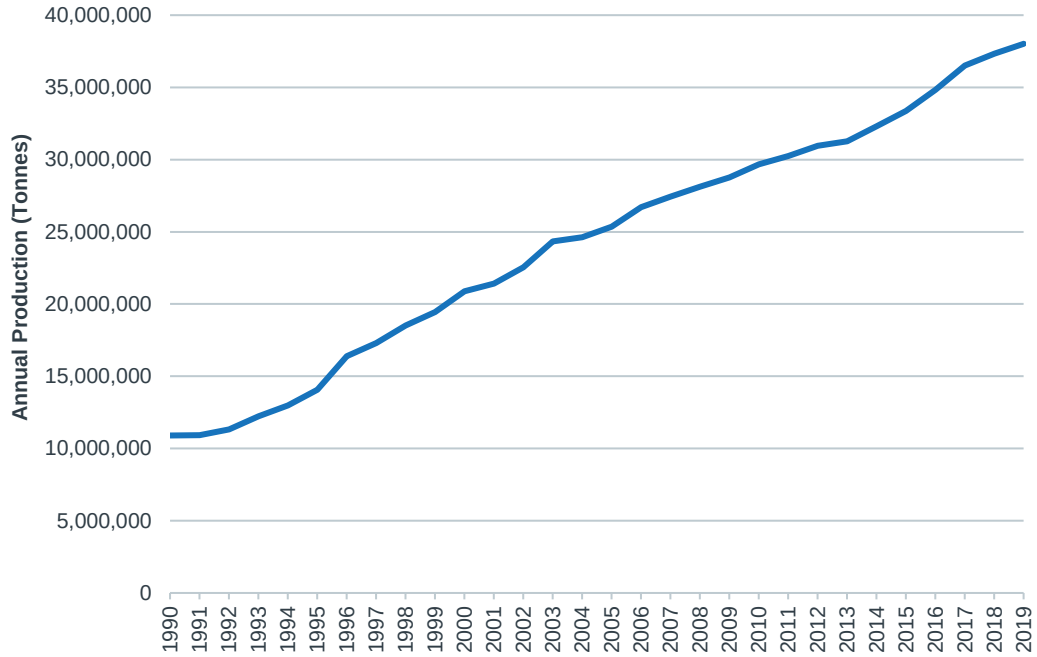
4.8.1 Global Overview

Global Production

In 2019, global production of chillies and peppers totalled approximately 38.0 million tonnes. Since 1990, global production has been growing by 4.4% on average per annum. The production of chillies and peppers is primarily driven by China.

On the global scale, Australia is a small producer of chillies and peppers, only accounting for 0.1% of total global production.

Figure 4.49. Global Chillies and Peppers (Green), 1990 to 2019



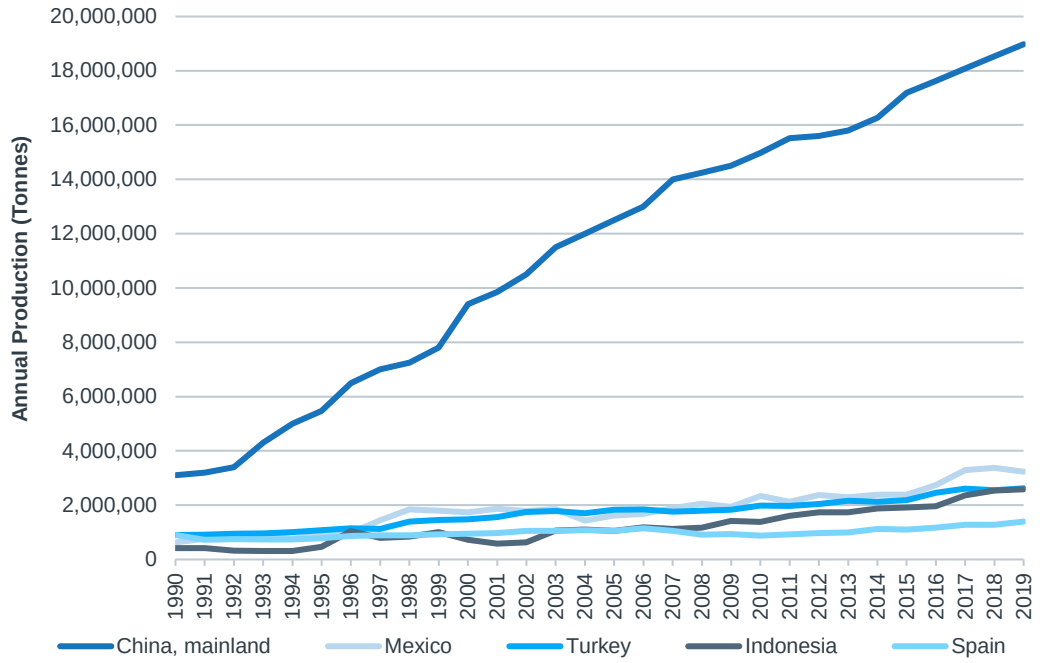
Source: FAO (2021a).

Major Producers

China is the most prominent producer of chillies and peppers, accounting for an average of 47.1% of total global production from 1990 to 2019. In 2019, China produced approximately 19.0 million tonnes of chillies and peppers, with production growing by an average annual growth rate of 6.4% from 1990 to 2019. In 2019, China produced nearly 50% of the total global production.

The second most prominent producer of chillies and peppers globally is Mexico, producing 3.2 million tonnes in 2019. This is closely followed by Turkey and Indonesia, each producing approximately 2.6 million tonnes in 2019 respectively.

Figure 4.50. Top Five Global Producers of Chilies and Peppers (Green), 1990 to 2019



Note: Top five largest producers on average from 2010 to 2019.
Source: FAO (2021a).

China's global share of total production has increased by over two percentage points from 1990, reflecting significant growth relative to other top producers. Of important note, Indonesia also experienced an increase in their share of chilli and pepper production, increasing by one percentage point from 1990. Tunisia and Algeria also experienced a slight increase in their global production share.

On the other hand, Australia's share of the global market has experienced a slight decline from 1990.

Table 4.13. Top 10 Global Producers of Chilies and Peppers (Green) (+ Australia)

Country	Average % of Total Production		
	From 1990	From 2000	From 2010
China, mainland	47.1%	49.6%	50.4%
Mexico	7.6%	7.6%	7.9%
Turkey	7.0%	6.9%	6.8%
Indonesia	4.9%	5.1%	5.9%
Spain	4.1%	3.7%	3.3%
United States of America	3.3%	3.0%	2.5%
Nigeria	2.9%	2.5%	2.2%
Egypt	2.0%	2.0%	2.0%
Algeria	1.3%	1.3%	1.6%
Tunisia	1.1%	1.1%	1.2%
Australia	0.2%	0.2%	0.1%
Other	18.5%	17.1%	16.1%
Total	**100.0%**	**100.0%**	**100.0%**

Source: FAO (2021a).

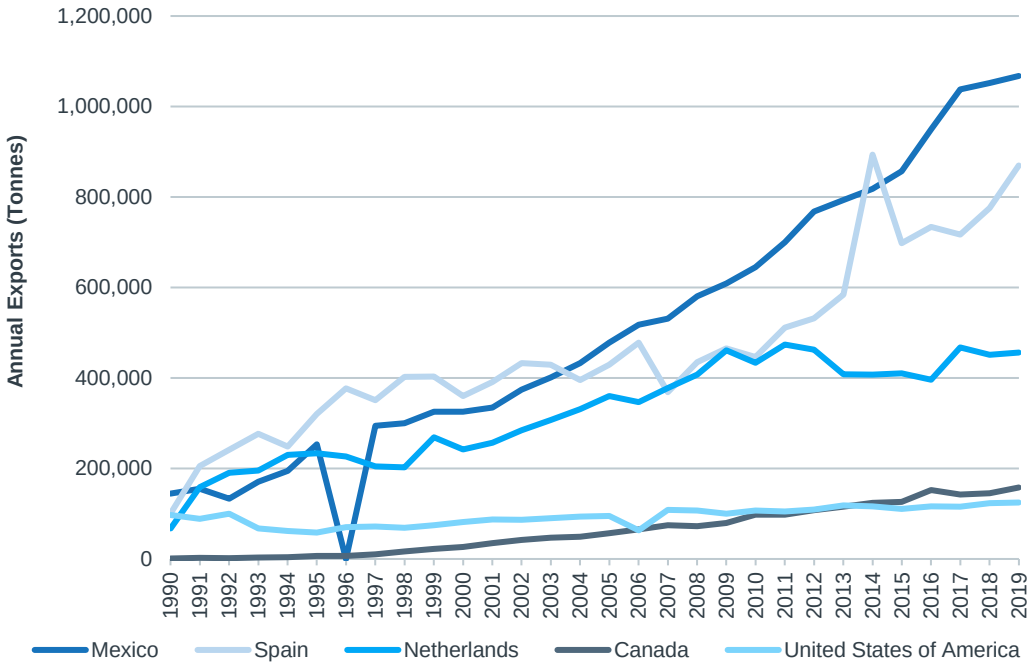
Major Exporters

Global exports have experienced an average annual increase of 7.4% since 1990, totalling 3.6 million tonnes in 2019. These export figures only represent 9.6% of global production being exported in 2019.

Historically, the most prominent export country has been Mexico. Mexico accounted for 29.3% of total global exports in 2019, totalling 1.1 million tonnes. In recent years, growth in exports from Mexico has softened compared to the country's historical growth. The main export destinations for Mexican chillies are the US, Canada and Guatemala (Mexico Now, 2019). The largest export market for Mexico's bell peppers (capsicums) is the US, with Mexican imports accounting for over 70% of their total imports (Guan, Z., Biswas, T., & Wu, F., 2018 a).

Spain is the second largest of exporters of chillies and peppers, totalling 869,591 tonnes in 2019.

Figure 4.51. Top Five Major Exporters of Chilies and Peppers (Green), 1990 to 2019



Note:
- For some years, there is no information available.
- Top five largest exporters on average from 2010 to 2019.

Source: FAO (2021a).

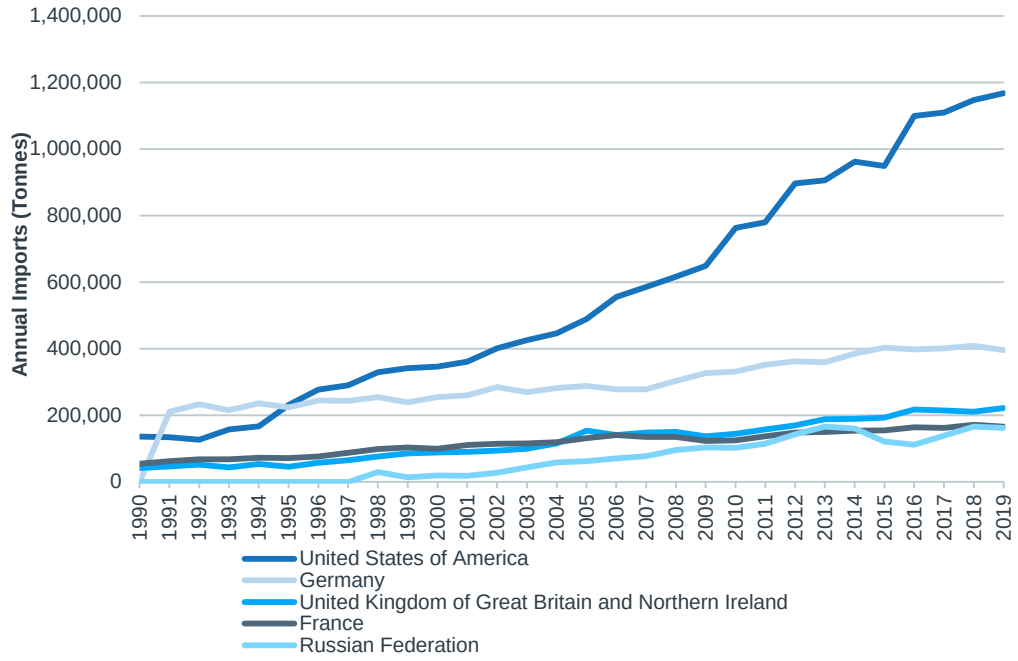
Major Importers

The US is the largest global importer of chillies and peppers, importing approximately 1.2 million tonnes in 2019. From 1990 to 2019, the average annual growth rate of imports in the US has totalled 7.7% per annum.

The US is the 6th largest producer of chillies and peppers globally, however, since 2014 production has experienced year on year decline. Increased market competition from Mexico, including lower labour costs and government support has seen the US favouring Mexican exports (Guan, Z., Biswas, T., & Wu, F., 2018 a).

Germany is the second largest importer of chillies and peppers, importing approximately 395,532 tonnes in 2019.

Figure 4.52. Top Five Major Importers of Chilies and Peppers (Green), 1990 to 2019



Note:

- For some years, there is no information available.
- Top five largest importers on average from 2010 to 2019.

Source: FAO (2021a).

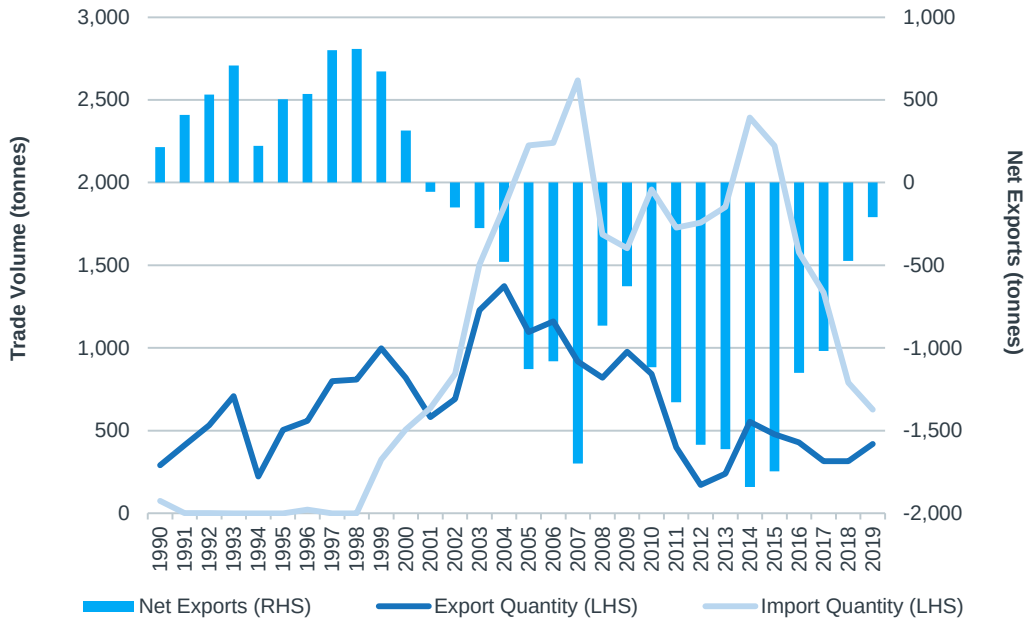
4.8.2 Export Markets

Australian Trade Balance

Of the total chilli and pepper production in Australia in 2019, approximately 0.9% was exported to global markets (or approximately 420 tonnes). In 2019, Australia imported approximately 628 tonnes of chillies and peppers leaving net exports at approximately -210 tonnes.

Australian imports for chillies and peppers experienced a peak in 2007 of 2,618 tonnes.

Figure 4.53. Trade Balance Australia for Chilies and Peppers (Green), 1990 to 2019

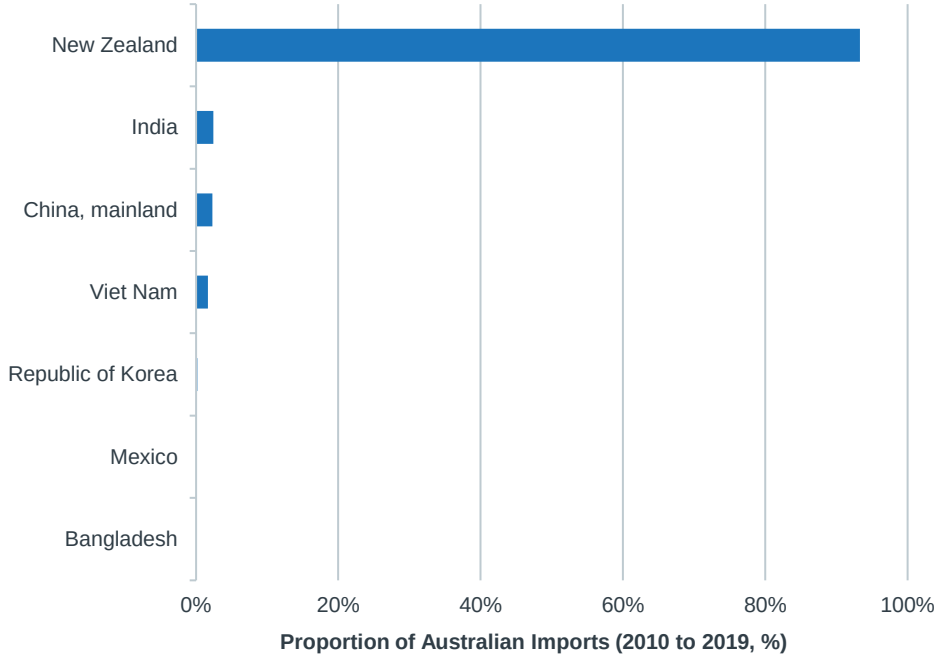


Source: FAO (2021a).

Import Origins

On average from 2010 to 2019, Australia sourced majority of its chillies and peppers from New Zealand. The remaining markets Australia sourced the produce from was India, China and Vietnam.

Figure 4.54. Key Import Markets for Australia (Chilies and Peppers (Green))

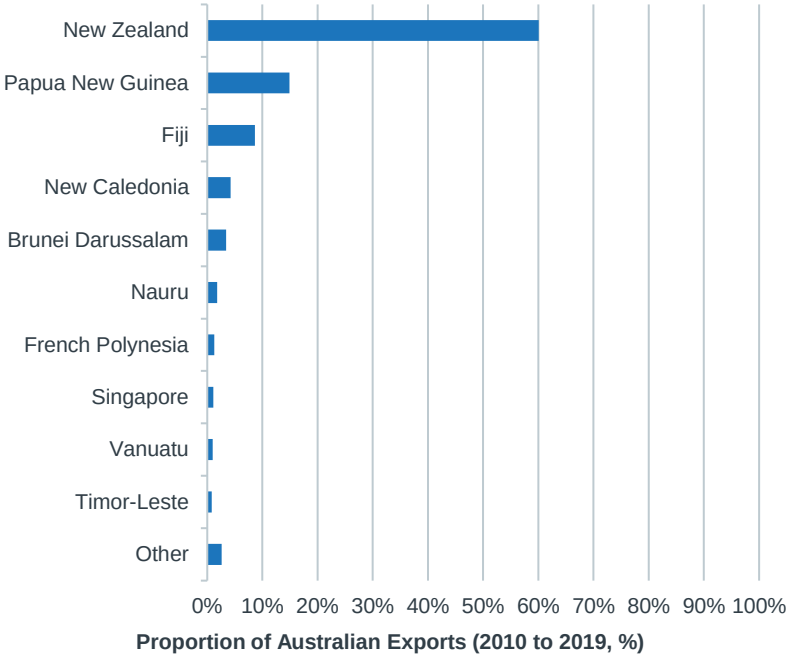


Source: FAO (2021a).

Australia's Key Export Markets

From 2010 to 2019, New Zealand accounted for 60.1% of Australia's chilli and pepper exports on average. Papua New Guinea was Australia's second largest export market for chillies and peppers, accounting for an average of 14.9% of exports from 2010 to 2019.

Figure 4.55. Key Exports Markets for Australia (Top 10) (Chilies and Peppers (Green))



Source: FAO (2021a).

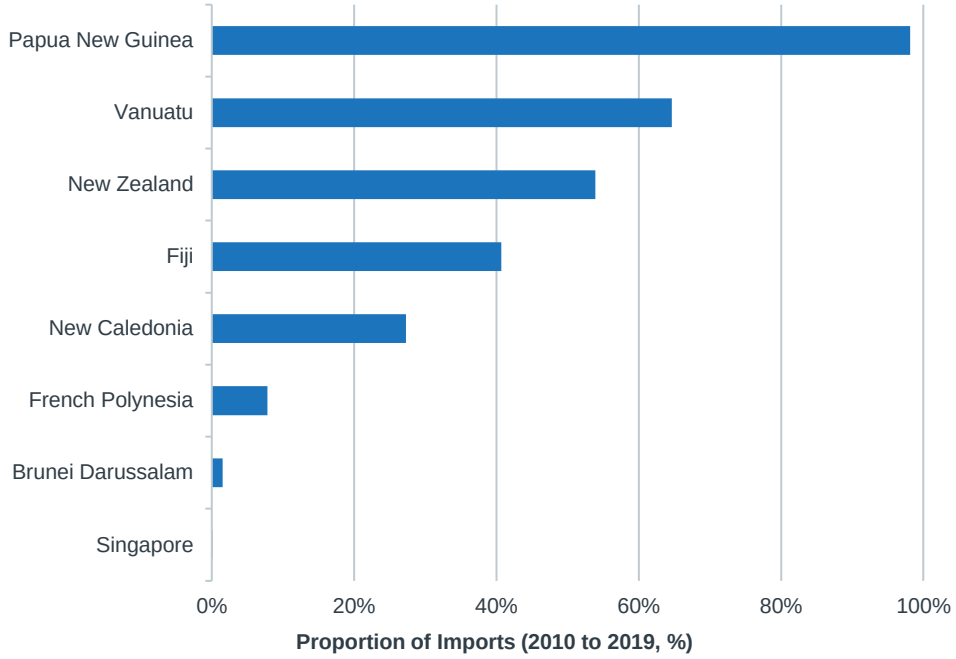
Australian Export Market Share

The figure below highlights how much of Australia's chilli and pepper exports make up of each key market's imports on average from 2010 to 2019.

Papua New Guinea was Australia's second largest export market for chillies and peppers, however, out of the top 10 largest export markets for Australia, Papua New Guinea is the most reliant on imports from Australia. Of Papua New Guinea's total chilli and pepper imports, it is estimated that it sourced 98.1% of the commodity from Australia.

It is estimated that Singapore only sourced 0.1% of their total chilli and pepper imports from Australia.

Figure 4.56. Proportion of Australia's Exports make up of Total Key Imports (Chilies and Peppers (Green)) (Australia's Top Export Markets)

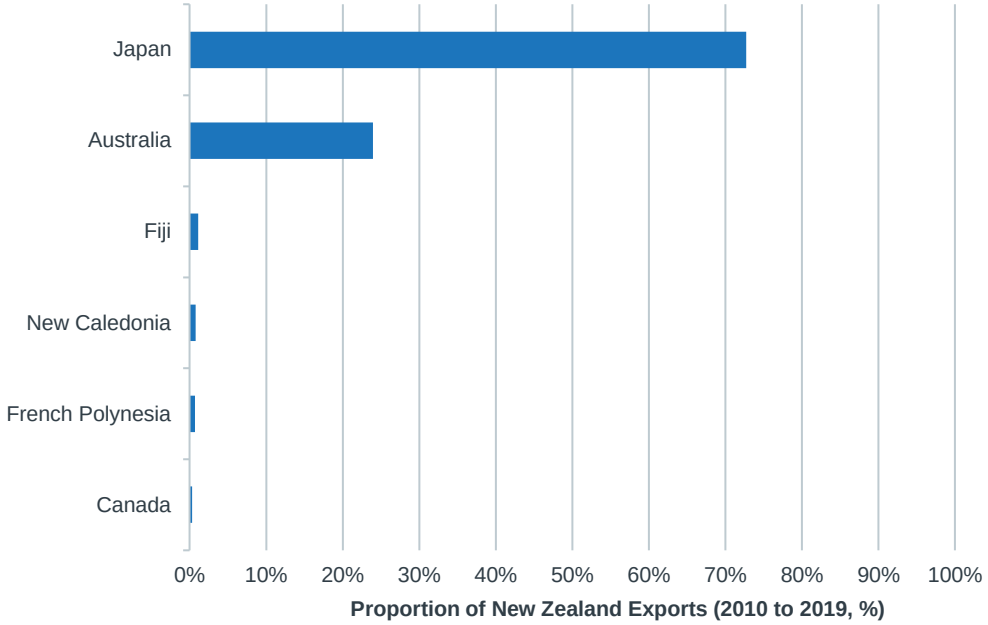


Source: FAO (2021a).

New Zealand Exports

From 2010 to 2019, Japan accounted for 72.7% of New Zealand's chilli and pepper exports on average. Australia was New Zealand's second largest export market for chillies and peppers, accounting for an average of 23.9% of exports from 2010 to 2019.

Figure 4.57. New Zealand's Top Export Markets



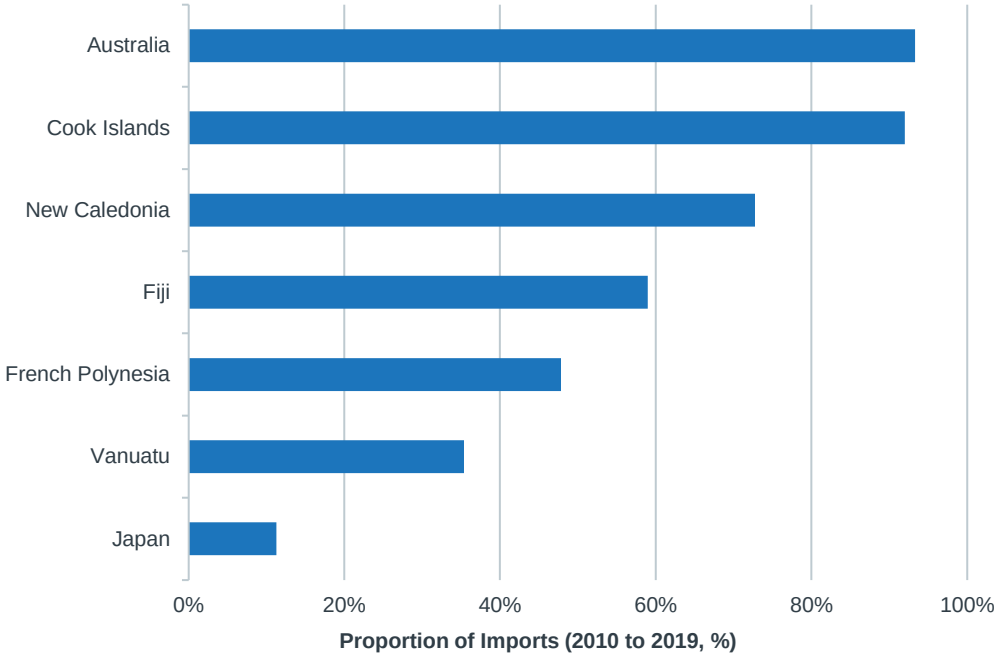
Source: FAO (2021a).

New Zealand Export Market Share

The figure below highlights how much of New Zealand's chilli and pepper exports make up of each key market's imports on average from 2010 to 2019.

Both Australia and the Cook Islands are largely reliant on imports of chillies and peppers from New Zealand. Chillies and peppers from New Zealand accounted for 93% of Australia's total imports and 92% of the Cook Island's imports.

Figure 4.58. Proportion of New Zealand's Exports make up of Total Key Imports (New Zealand's Top Export Markets)



Source: FAO (2021a).

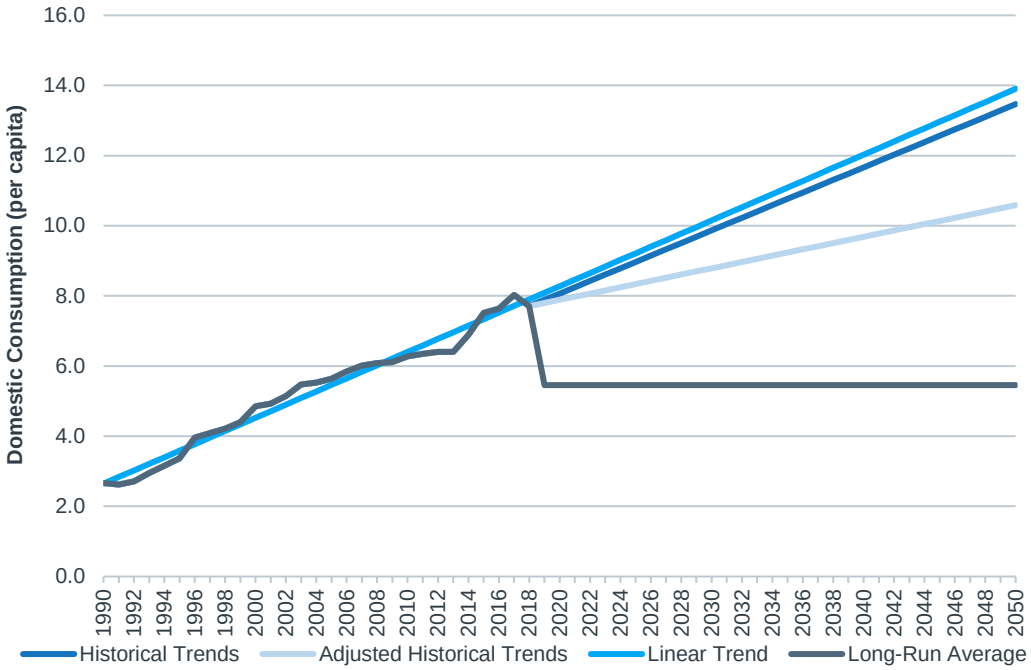
4.8.3 Consumption

Global Consumption

Historically, chilli and pepper consumption on the global scale has been growing at a steadier rate than the consumption in Australia. Based on the historic consumption trends on a global scale, there is more potential for future domestic consumption to reach linear trend volumes in 2050.

Based on the linear trend volumes, consumption could total approximately 13.9 kilograms per capita in 2050.

Figure 4.59. Domestic Consumption for Global Market of Chilies and Peppers (Green), excluding Australia, 1990 to 2050

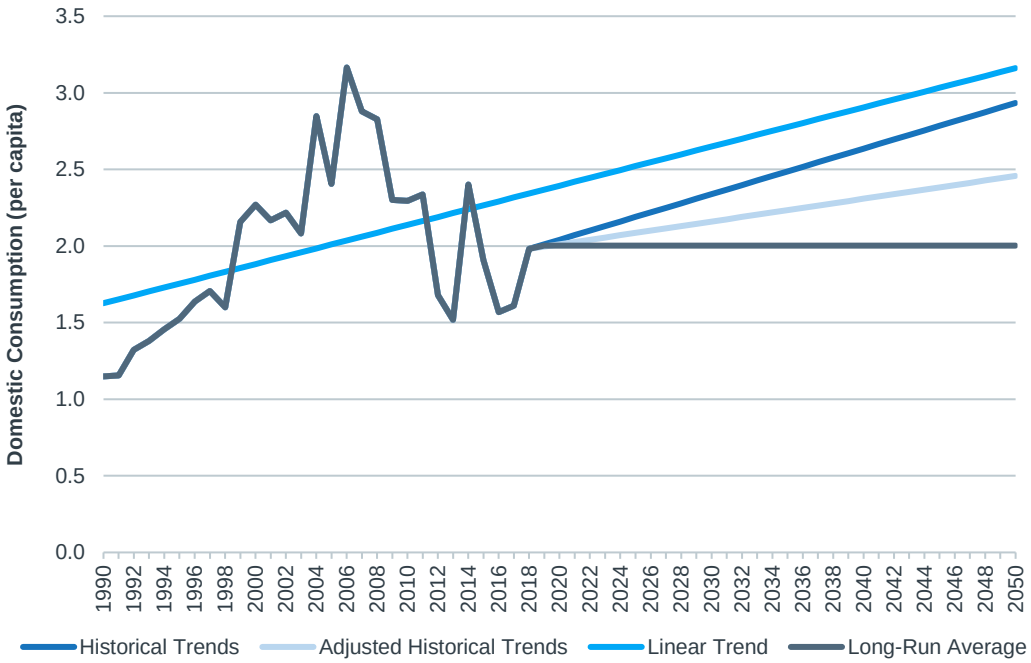


Source: FAO (2021a), AEC.

Domestic Consumption

Based on the adjusted historical trend volumes, consumption could total approximately 2.5 kilograms per capita in 2050.

Figure 4.60. Domestic Consumption Per Capita of Chilies and Peppers (Green), 1990 to 2050 (kilograms)



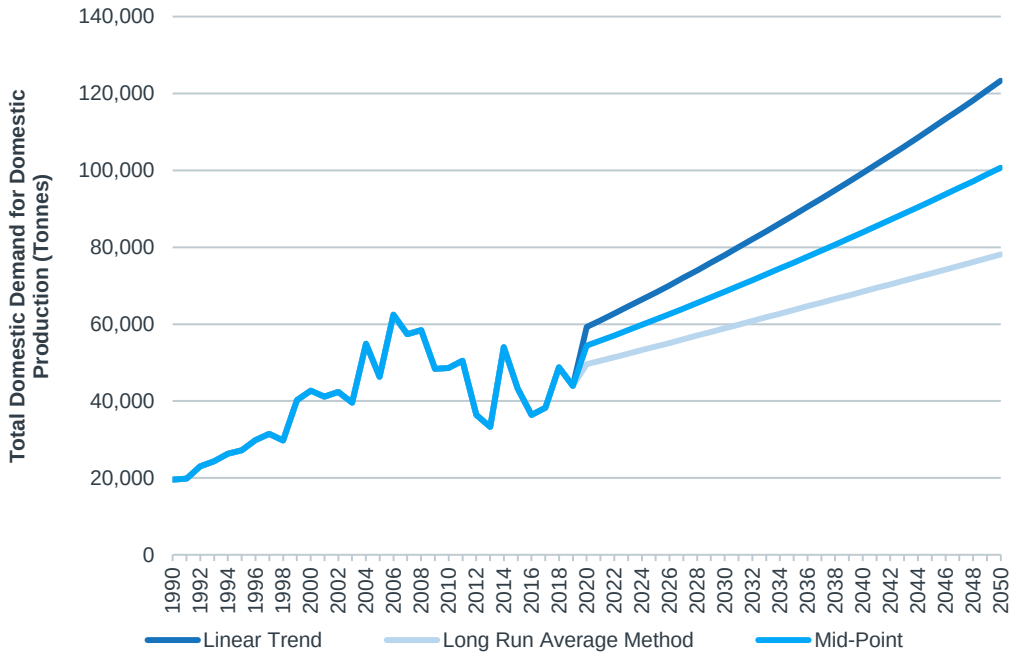
Source: FAO (2021a), AEC.

Forecast Consumption in Domestic Markets

Historically, domestic demand for domestic production has grown by an average annual rate of 3.3% from 1990 to 2018, to reach 48,723 tonnes in 2018.

Future domestic demand for domestic production could reach between the long-run average trend scenario at 78,089 tonnes in 2050 or the linear trend volumes in 2050 at 123,292 tonnes. Based on historical trends, there is more potential for the future domestic demand for domestic production of chillies and peppers to fall in line with the mid-point scenario.

Figure 4.61. Total Domestic Demand for Domestic Chilli and Pepper Production, 1990 to 2050

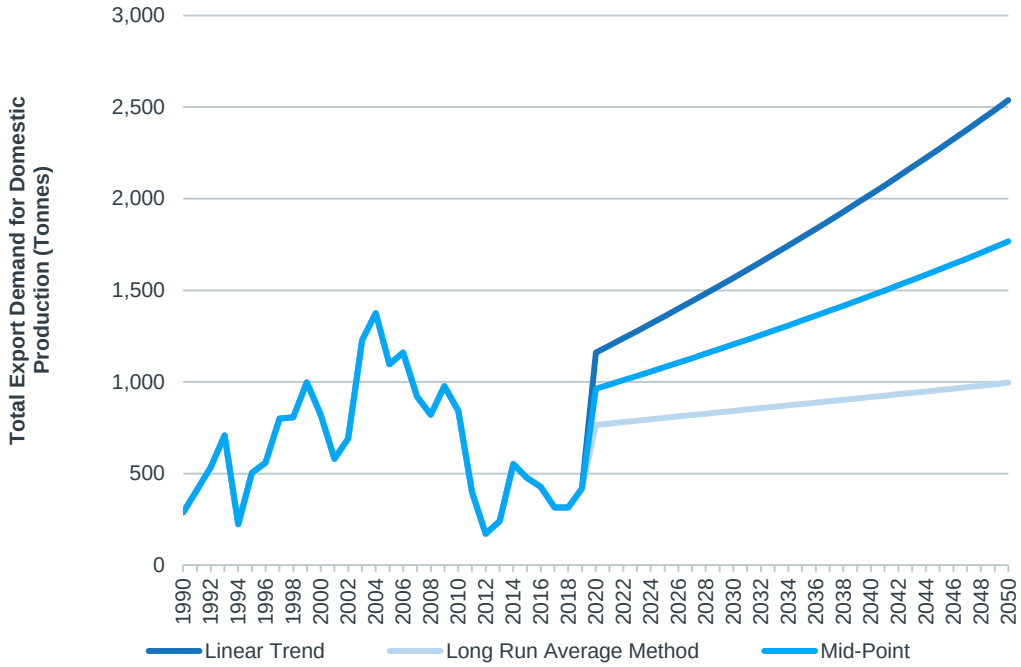


Source: FAO (2021a), AEC.

Forecast Consumption in Export Markets

Export demand for Australian chillies and peppers has increased by an average annual rate of 0.3% from 1990 to 2018. Future export demand for domestic production could reach between the long-run average scenario at 995 tonnes in 2050 or linear trend volumes in 2050 at 2,537 tonnes.

Figure 4.62. Total Export Demand for Domestic Production (Chilies and Peppers (Green)), 1990 to 2050



Source: FAO (2021a), AEC.

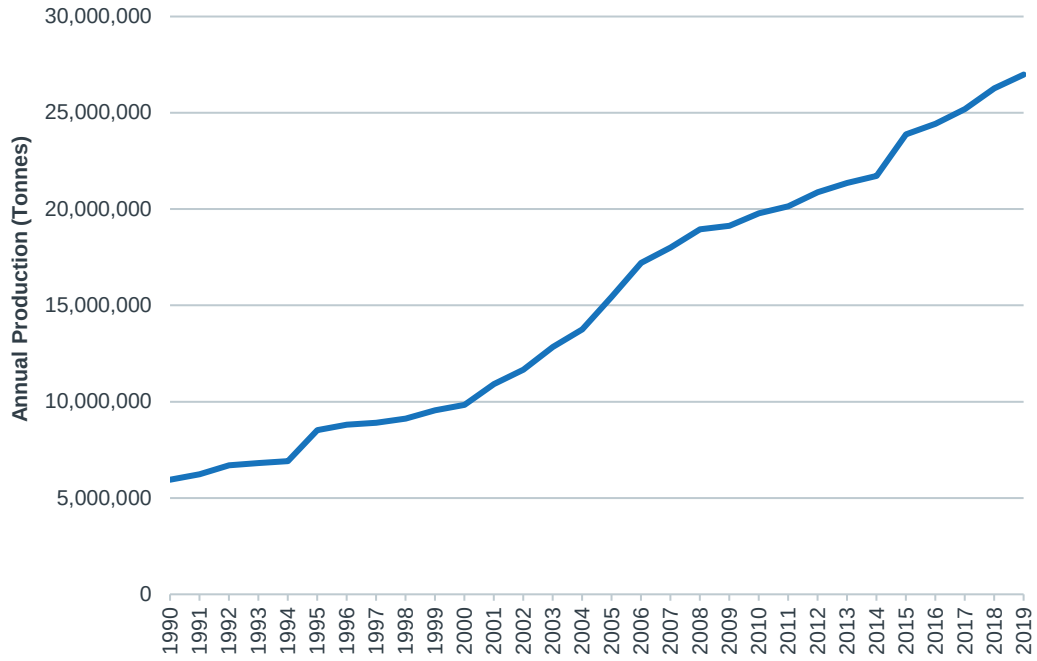
4.9 GREEN BEAN

4.9.1 Global Overview

Global Production

Global bean production has increased considerably since 1990, rising from 5.9 million tonnes to reach 27.0 million tonnes in 2019. This rapid growth equates to an average annual growth rate of 7.1% from 1990 to 2019. Bean production growth was significant in the 2000 to 2010 period, largely driven by significant expansion of China's production over this timeframe. In recent years, bean production has experienced a slower growth rate, growing by an average of 3.5% per annum from 2010 to 2019.

Figure 4.63. Global Production of Beans, 1990 to 2019



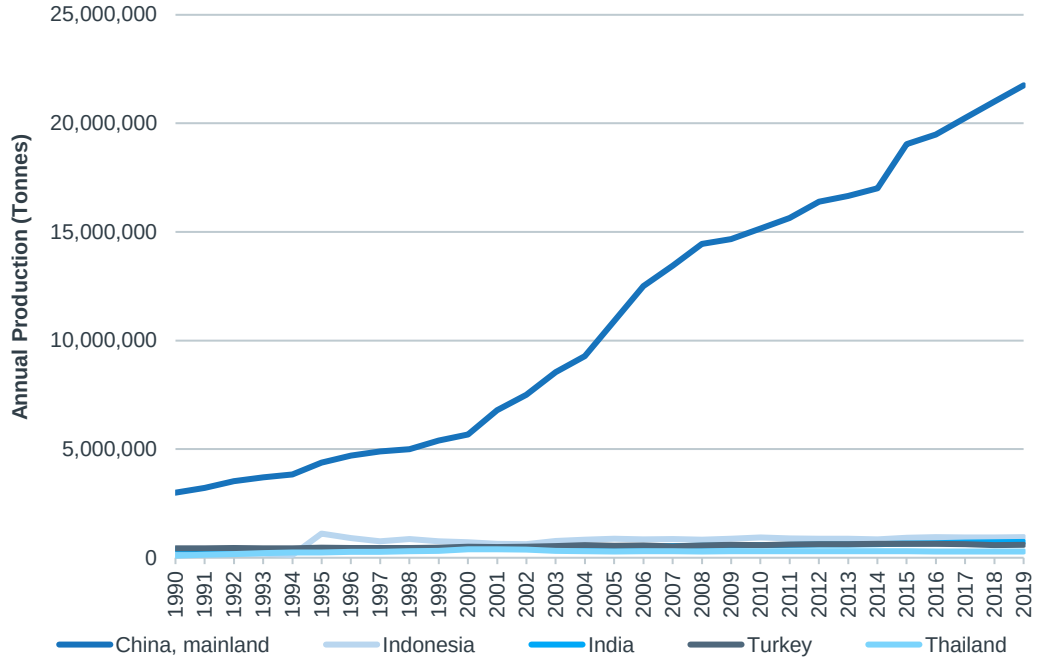
Source: FAO (2021a).

Major Producers

China is by far the most prominent global producer of beans. In 2019, China produced approximately 21.7 million tonnes of beans which accounted for more than 80% of total global production. China's production is primarily for local consumption, only exporting little over 4,000 tonnes in 2019.

Indonesia, India, Turkey and Thailand are also key global producers of beans; however, their levels of production are dwarfed by that of China.

Figure 4.64. Top Five Global Producers of Beans, 1990 to 2019



Note: Top five largest producers on average from 2010 to 2019.
Source: FAO (2021a).

China has increased its share of global production by over seven percentage points from 1990, reflecting the country's rapid ramp up in production over the years.

Of important note, all other countries experienced a decrease in their share of global bean production.

Table 4.14. Top 10 Global Producers of Beans (+ Australia)

Country	Average % of Total Production		
	From 1990	From 2000	From 2010
China, mainland	71.9%	75.6%	79.1%
Indonesia	4.9%	4.5%	4.0%
India	3.4%	3.0%	2.8%
Turkey	3.5%	3.1%	2.7%
Thailand	1.9%	1.7%	1.3%
Egypt	1.5%	1.4%	1.2%
Morocco	0.7%	0.8%	0.8%
Spain	1.5%	1.1%	0.7%
Italy	1.3%	0.9%	0.7%
Bangladesh	0.5%	0.5%	0.5%
Australia	0.2%	0.2%	0.2%
Other	8.8%	7.3%	6.2%
Total	**100.0%**	**100.0%**	**100.0%**

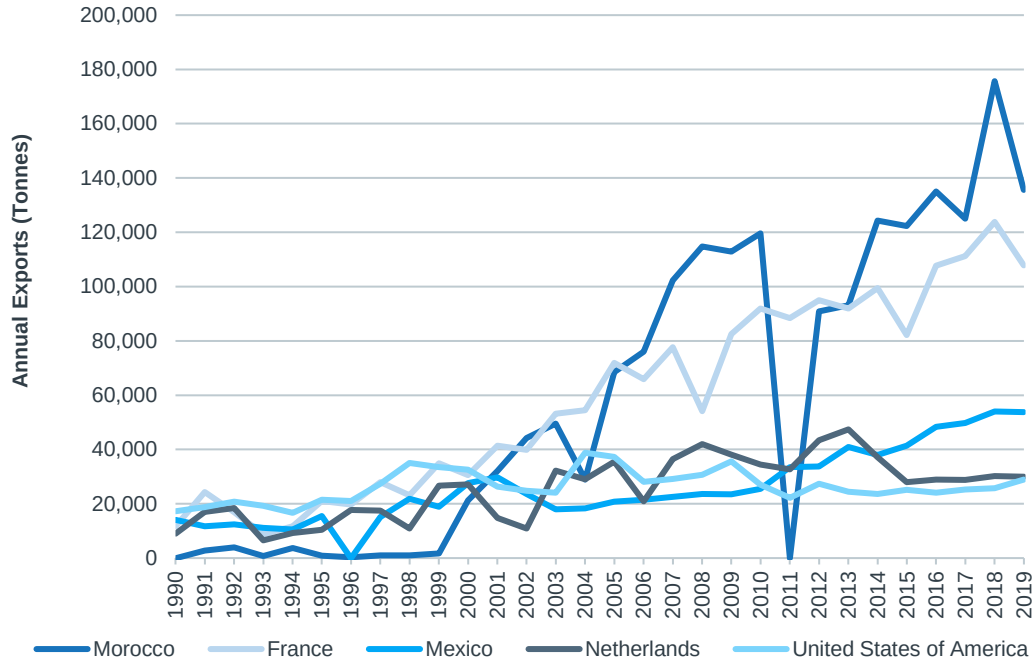
Source: FAO (2021a).

Major Exporters

Global exports have experienced an average annual increase of 4.9% since 1990, totalling approximately 556,781 tonnes in 2019. The majority of bean production is consumed by domestic markets, with only 2.1% of global production being exported.

Since 2006, the most prominent export country has been Morocco which has historically comprised approximately 21.9% of global exports on average between 2010 and 2019.The second largest exporter of beans is France, exporting 107,855 tonnes in 2019.

Figure 4.65. Top Five Major Exporters of Beans, 1990 to 2019



Note:

- In some years, information for Morocco is not available.
- Top five largest exporters on average from 2010 to 2019.

Source: FAO (2021a).

Out of the top 10 global exports listed in the table below, Morocco, France, Mexico, Guatemala, Egypt and Germany have all increased their share of global bean exports since 1990.

Table 4.15. Top 10 Major Exporters of Beans (+ Australia)

Country	Average % of Total Global Exports		
	From 1990	From 2000	From 2010
Morocco	17.3%	20.4%	21.9%
France	17.1%	18.1%	19.5%
Mexico	7.5%	7.5%	8.2%
Netherlands	7.5%	7.2%	6.7%
United States of America	7.7%	6.5%	4.9%
Guatemala	2.5%	3.0%	4.4%
Egypt	3.5%	3.6%	4.0%
Kenya	5.3%	4.7%	3.9%
Spain	6.5%	4.9%	3.7%
Germany	2.5%	2.6%	3.3%
Australia	0.3%	0.3%	0.3%
Other	22.6%	21.5%	19.5%
Total	**100.0%**	**100.0%**	**100.0%**

Source: FAO (2021a).

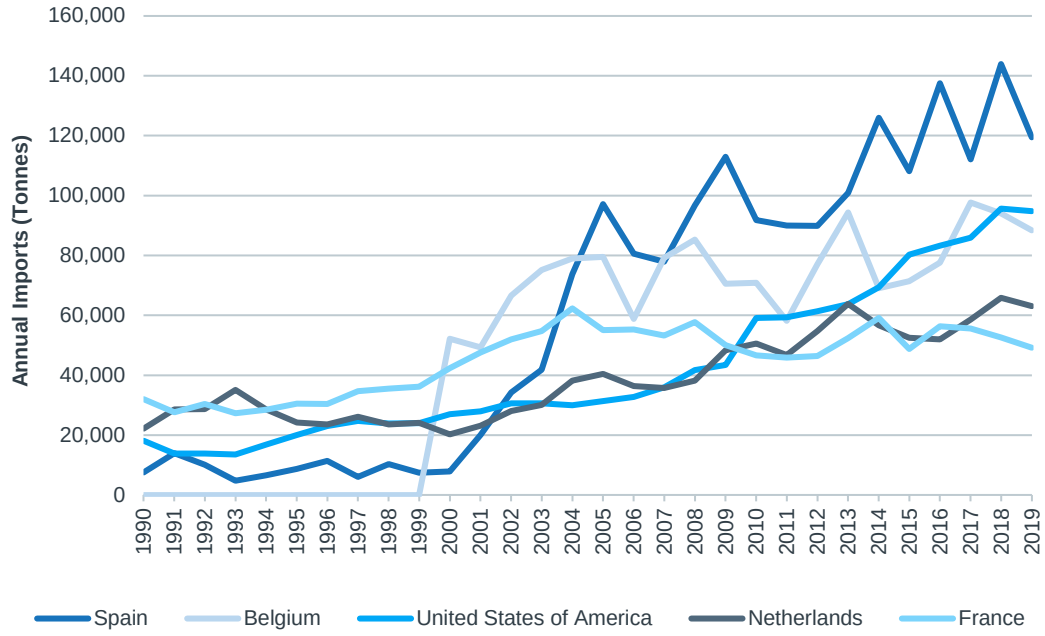
Major Importers

Since 2005, Spain has been the largest importer of beans, with imports growing by 1.5% per annum from 2005 to 2019. In 2019, Spain imported approximately 119,400 tonnes of beans, accounting for 19% of total global imports for the year.

Spain is the eighth largest producer of beans globally, however since 1990, production has been experiencing a 2.2% decline (see Figure 4.67 below). The growing imports and the declining production of beans in Spain suggests that the country is becoming more reliant on imports to meet domestic demand requirements.

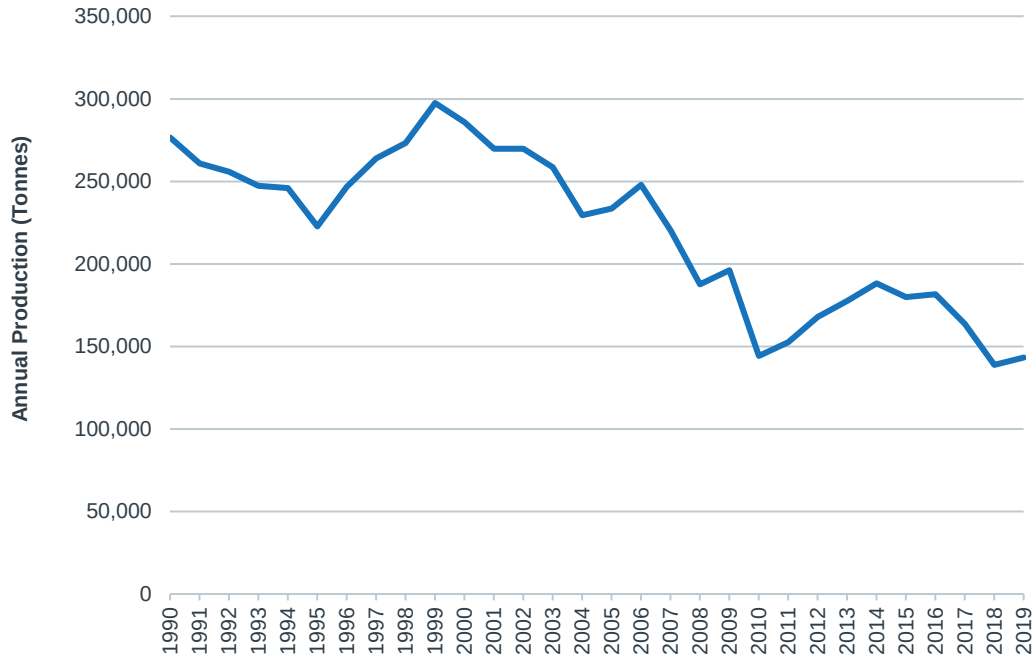
The second most prominent global importer of bean in 2019 was the US, importing a total of 94,764 tonnes. This was closely followed by Belgium, importing 88,380 tonnes of beans in 2019.

Figure 4.66. Top Five Importers of Beans, 1990 to 2019



Note: Top five largest importers on average from 2010 to 2019.
Source: FAO (2021a).

Figure 4.67. Production of Beans (Spain), 1990 to 2019



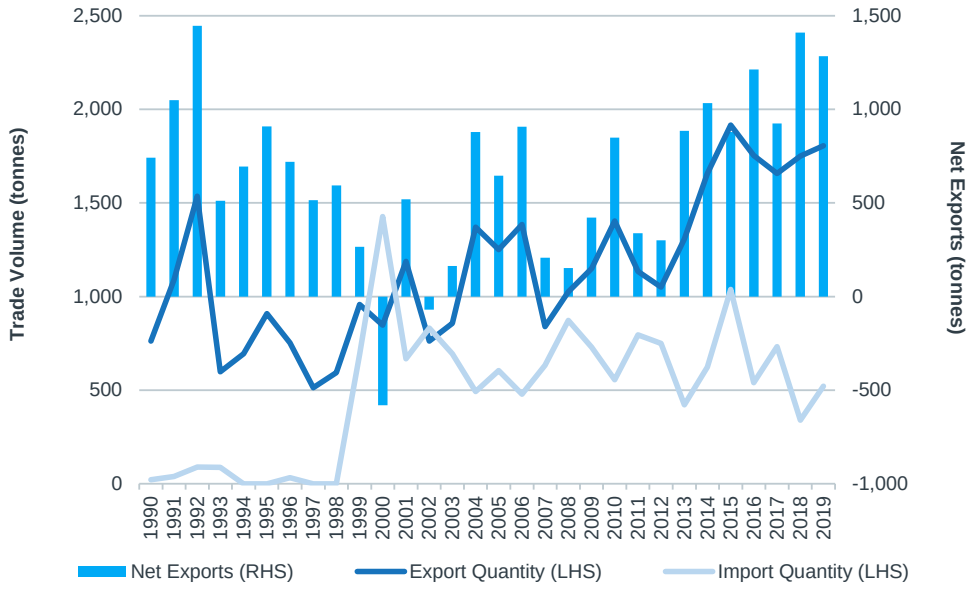
Source: FAO (2021a).

4.9.2 Export Markets

Australian Trade Balance

Of total bean production in Australia in 2019, approximately 4% was exported to global markets (or approximately 1,805 tonnes). In 2019, Australia imported approximately 521 tonnes of the vegetable leaving net exports at approximately 1,284 tonnes. This suggests that Australia's production of beans is sufficient to support the demand for domestic consumption. Australian exports for bean have increased by an average annual rate of 3.0% since 1990.

Figure 4.68. Trade Balance Australia for Beans, 1990 to 2019

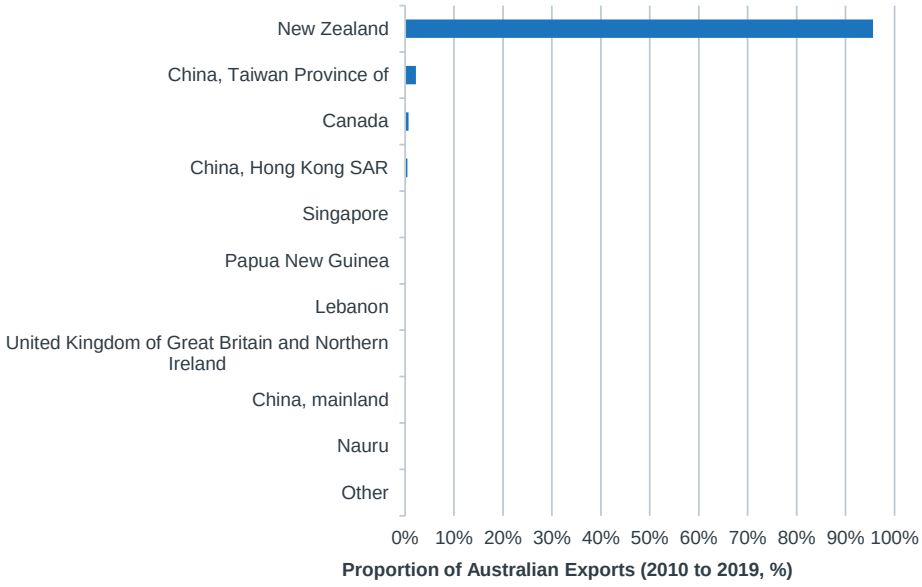


Source: FAO (2021a).

Key Export Markets

From 2010 to 2019, New Zealand accounted for 95.6% of Australia's green bean exports. Taiwan is Australia's second largest export market for beans, accounting for an average of 2.2% of exports from 2010 to 2019.

Figure 4.69. Key Exports Markets for Australia (Top 10) (Beans)



Source: FAO (2021a).

The tables below highlight Australia's top bean export markets and their import seasonality for their largest bean import markets (i.e., New Zealand is Australia's largest market for bean exports, however they also source from Fiji, etc.).

Table 4.16. New Zealand Bean Import Seasonality

Country	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Australia												
Fiji												
United States												
China, Mainland												
Availability	High											

Source: Li (undated), United States Department of Agriculture (1997), Fiji Ministry of Agriculture (2014).

Table 4.6. China, Mainland Bean Import Seasonality

Country	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Australia												
Laos												
Myanmar												
Italy												
Availability	High											

Source: Wijensinha-Bettoni (undated), Australian Centre for International Agricultural Research (2017).

Table 4.7. Canada Bean Import Seasonality

Country	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Australia												
United States of America												
Mexico												
Guatemala												
Availability	High											

Source: United States Department of Agriculture (1997), Buckley (undated).

Table 4.8. Hong Kong Bean Import Seasonality

Country	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Australia												
China, Mainland												
Kenya												
Mexico												
Availability	High											

Source: Li (undated), Buckley (undated), Cropnuts (undated).

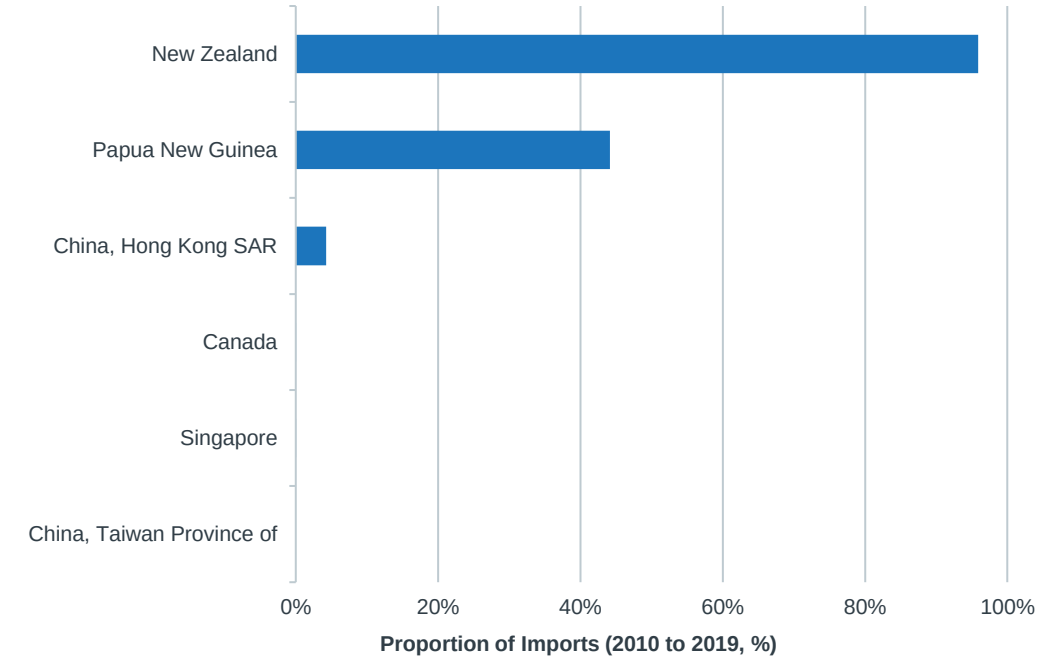
Export Market Share

The figure below highlights how much of Australia's bean exports make up of each key market's imports on average from 2010 to 2019. New Zealand was Australia's largest export market for beans. Of the country's total bean imports, it is estimated that it sourced approximately 95.9% of its beans from Australia on average over 2010 to 2019.

Papua New Guinea was Australia's second largest export market for beans. Of Papua New Guinea's total bean imports, it is estimated that it sourced 44.1% of its beans from Australia on average over 2010 to 2019.

Canada and Singapore's imports from Australia only accounted for 0.04% and 0.03% of their total imports.

Figure 4.70. Proportion of Australia's Exports make up of Total Key Imports (Beans) (Australia's Top Export Markets)



Source: FAO (2021a).

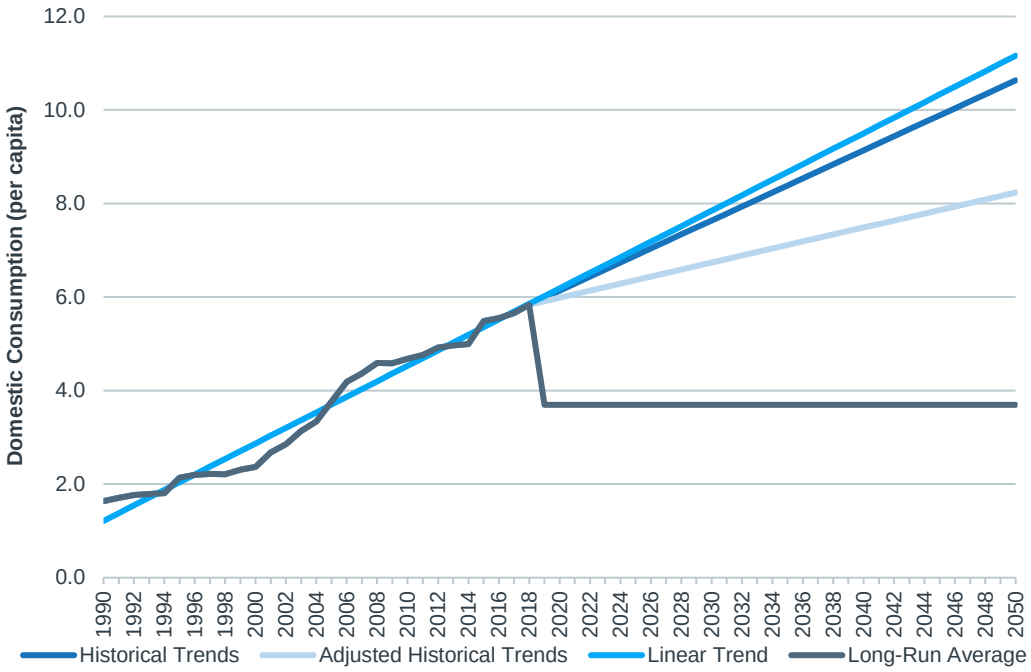
4.9.3 Consumption

Global Consumption

Historically, bean consumption in on the global scale has been growing at a steadier rate than the consumption in Australia. Based on the historic consumption trends on a global scale, there is more potential for future domestic consumption to reach historical trend volumes in 2050.

Based on the historical trend volumes, consumption could total approximately 10.6 kilograms per capita in 2050.

Figure 4.71. Domestic Consumption for Global Market (Beans), excluding Australia, 1990 to 2050

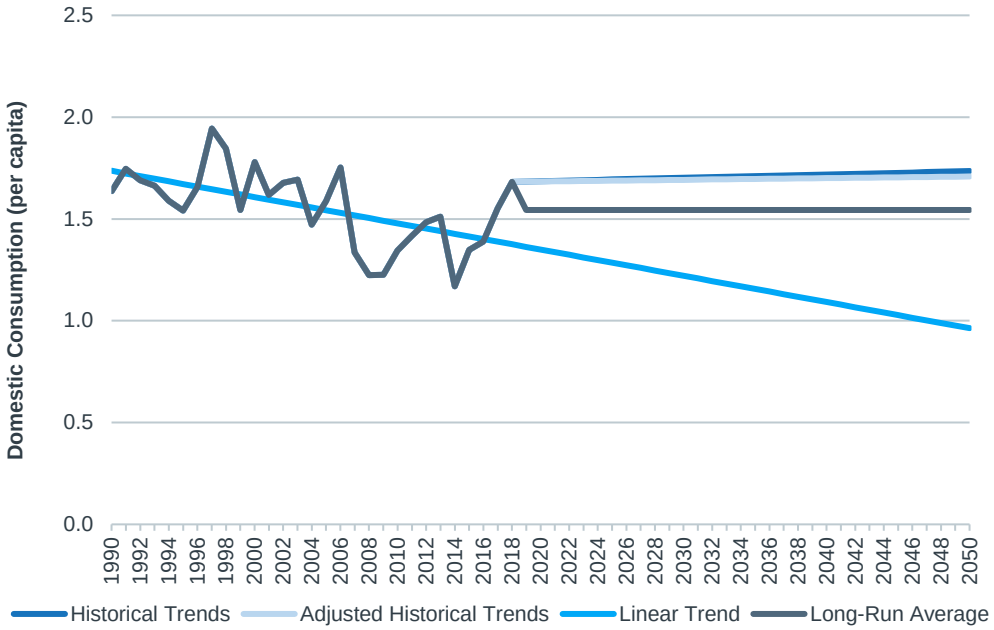


Source: FAO (2021a), AEC.

Domestic Consumption

Based on the long-run average volumes, consumption could total approximately 1.5 kilograms per capita in 2050.

Figure 4.72. Domestic Consumption Per Capita of Beans, 1990 to 2050 (kilograms)



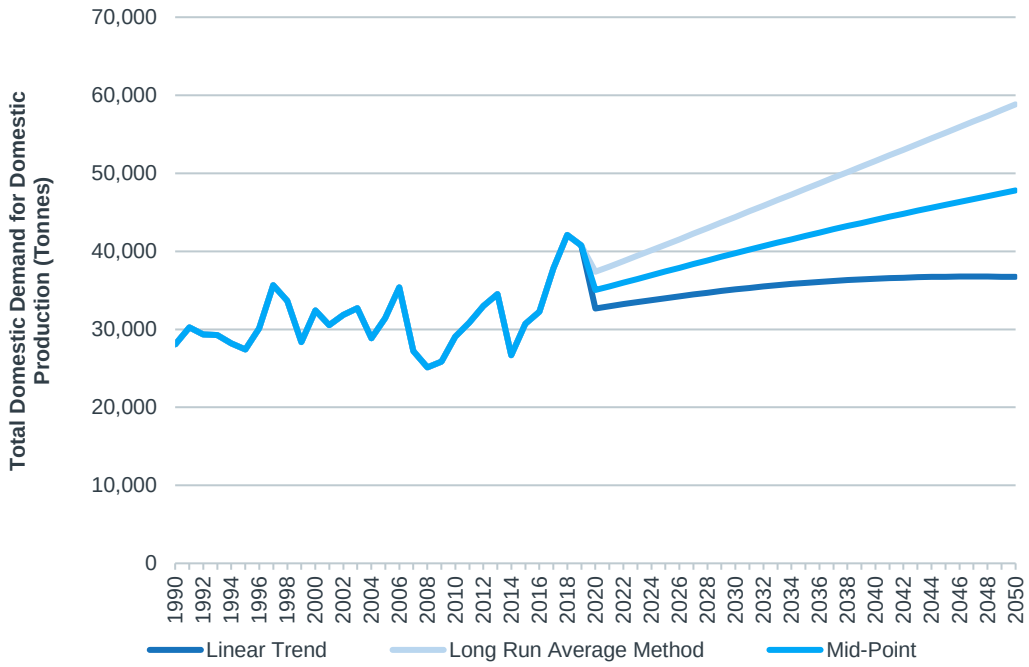
Source: FAO (2021a), AEC.

Forecast Consumption in Domestic Markets

Historically, the domestic demand for domestic production has grown by an average annual rate of 1.5% from 1990 to 2018, to reach 42,111 tonnes in 2018.

Future domestic demand for domestic production could reach between the linear trend scenario at 36,715 tonnes in 2050 or long-run average volumes in 2050 at 58,847 tonnes. Based on historical trends, there is more potential for the future domestic demand for domestic production of beans to fall in line with the mid-point scenario.

Figure 4.73. Total Domestic Demand for Domestic Bean Production, 1990 to 2050

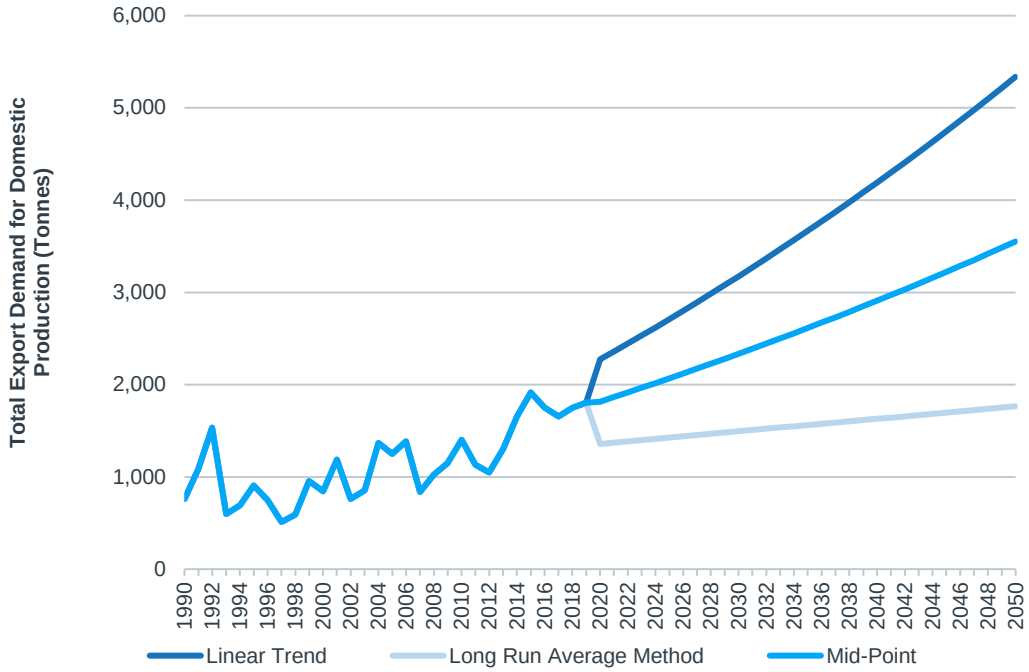


Source: FAO (2021a), AEC.

Forecast Consumption in Export Markets

Export demand for Australian beans has increased by an average annual rate of 3.0% from 1990 to 2018. Future export demand for domestic production could reach between the long-run average scenario at 1,768 tonnes in 2050 or linear trend volumes in 2050 at 5,337 tonnes.

Figure 4.74. Total Export Demand for Domestic Production (Beans), 1990 to 2050



Source: FAO (2021a), AEC.

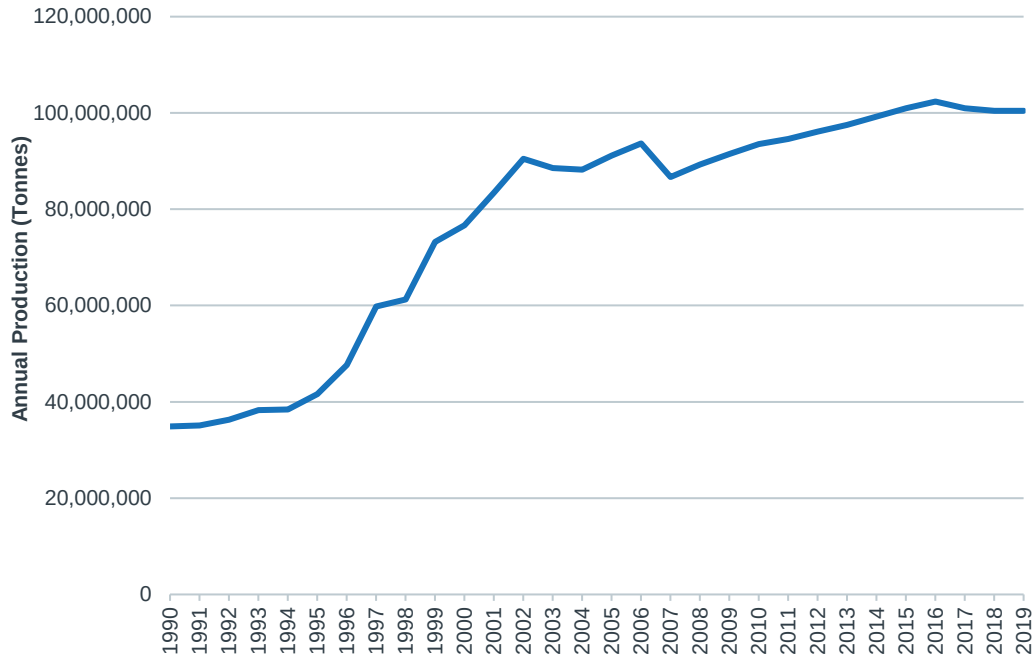
4.10 MELONS

4.10.1 Global Overview

Global Production

Global watermelon production has increased considerably since 1990, from approximately 34.9 million tonnes to approximately 100 million tonnes in 2019. This rapid growth equates to an average annual growth rate of 3.7% over this time frame. Watermelon production growth was significant in the 1994 to 2002 period, where the average annual growth rate was recorded at 11.3%, driven by significant expansion of China's production over this timeframe. In recent years, watermelon production has experienced a slower growth rate, growing by an average of 0.8% per annum from 2010 to 2019.

Figure 4.75. Global Production of Watermelon, 1990 to 2019

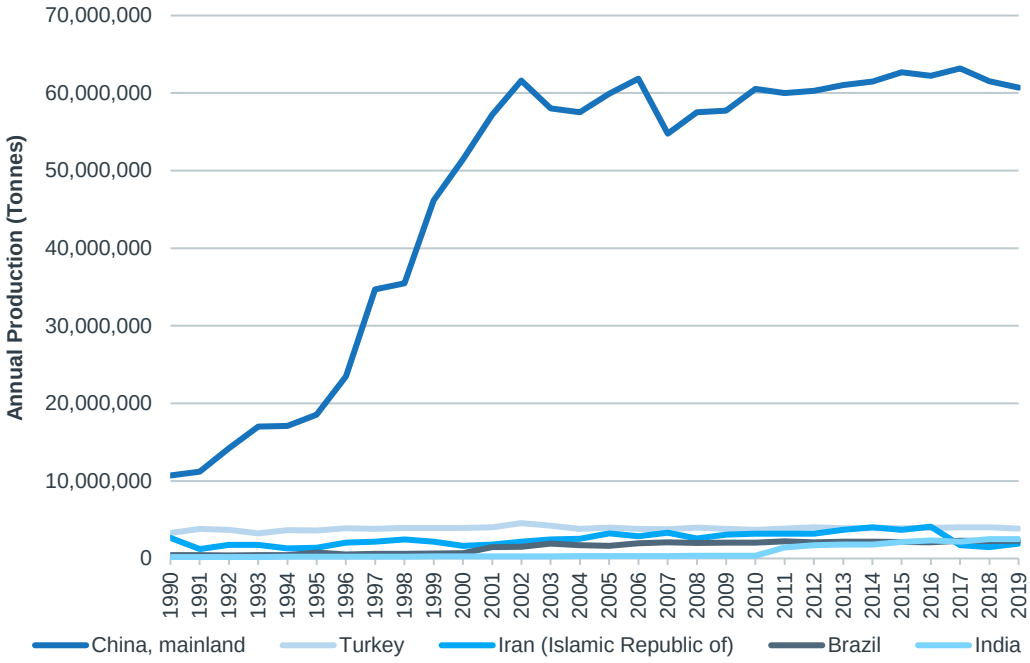


Source: FAO (2021a).

Major Producers

China is the most prominent global producer of watermelons. In 2019, China produced approximately 60.7 million tonnes of watermelons and accounted for more than 60% of total global production. China's watermelon production expanded rapidly in the 1990 to 2000 period and has been relatively flat since 2010. China's production is primarily for local consumption, where the fruit's low cost supports demand in the summer months. It is estimated the Chinese population is consuming, on average, 50 kilograms of watermelon per annum (People's Daily Online, 2019). Turkey, Iran, Brazil and India are also key global producers of watermelons; however, their levels of production are dwarfed by that of China.

Figure 4.76. Top 5 Global Producers of Watermelon, 1990 to 2019



Note: Top five largest producers on average from 2010 to 2019.
Source: FAO (2021a).

Table 4.17. Top 10 Global Producers of Watermelon (+ Australia)

Country	Average % of Total Production		
	From 1990	From 2000	From 2010
China, mainland	60.9%	63.8%	62.2%
Turkey	5.0%	4.2%	4.0%
Iran (Islamic Republic of)	3.2%	3.0%	3.1%
Brazil	1.9%	2.1%	2.2%
India	1.0%	1.2%	1.9%
United States of America	2.2%	1.9%	1.7%
Algeria	1.2%	1.3%	1.7%
Uzbekistan	1.2%	1.2%	1.6%
Russian Federation	1.3%	1.4%	1.6%
Egypt	1.9%	1.8%	1.6%
Australia	0.2%	0.2%	0.2%
Other	20.1%	18.0%	18.1%
Total	**100.0%**	**100.0%**	**100.0%**

Source: FAO (2021a).

Major Exporters

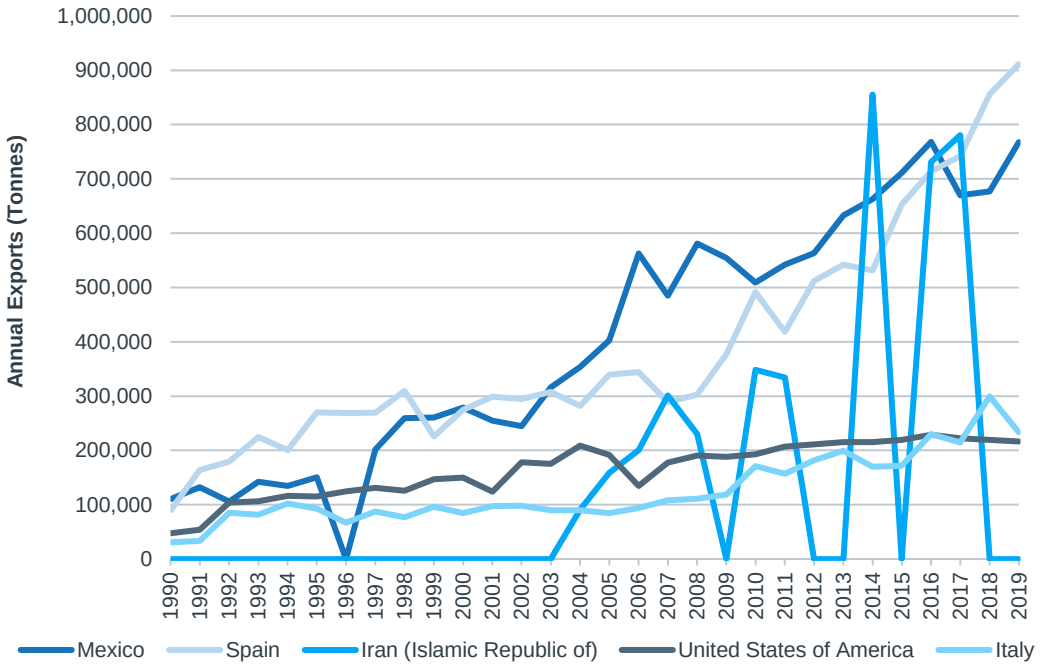
Global exports have experienced an average annual increase of 7.0% since 1990, totalling 3.6 million tonnes in 2019. The majority of watermelon production is consumed by locals, with 3.6% of global production being exported in 2019.

Historically, the most prominent export country has been Mexico, which has historically comprised approximately 19.5% of global exports between 1990 and 2019. Mexico's key trading partners include the United States, Japan and Canada. In 2017, driven by disruption to Mexican export volumes and significant increase in Spanish exports, Spain became the most prominent exporting nation. Spain has recorded significant growth in export volumes over recent decades, recording an average annual growth rate of 8.3% per annum since 1990.

The decrease in Mexico's exports over 2017 and 2018 are reflective of the decrease in US imports. Mexico's exports to US declined, as production in the US increased throughout 2016 and 2017.

Although China is by far the largest producer of watermelons on the global scale, their exports only totalled 0.08% of total production in 2019. This highlights that majority of China's watermelon production is consumed domestically.

Figure 4.77. Top Five Major Exporters of Watermelon, 1990 to 2019



Note:

- There may be some discrepancies in the FAO data, with Iran recording sporadic export volumes.
- Note: Top five largest exports on average from 2010 to 2019.

Source: FAO (2021a).

Out of the top 10 global exports listed in the table below, Mexico, Spain, Iran, Italy, Guatemala, Netherlands and Morocco have all increased their share of global watermelon exports since 1990.

Table 4.18. Top 10 Major Exporters of Watermelon (+ Australia)

Country	Average % of Total Global Exports		
	From 1990	From 2000	From 2010
Mexico	19.5%	20.6%	20.6%
Spain	18.9%	18.6%	20.2%
Iran (Islamic Republic of)	6.5%	7.9%	9.7%
United States of America	8.0%	7.6%	6.8%
Italy	6.1%	5.9%	6.4%
Greece	6.9%	5.5%	5.4%
Guatemala	2.2%	2.2%	2.7%
Netherlands	2.3%	2.5%	2.6%
Morocco	1.2%	1.4%	2.2%
Hungary	3.6%	3.5%	2.1%
Australia	0.1%	0.1%	0.1%
Other	24.7%	24.4%	21.4%
Total	**100.0%**	**100.0%**	**100.0%**

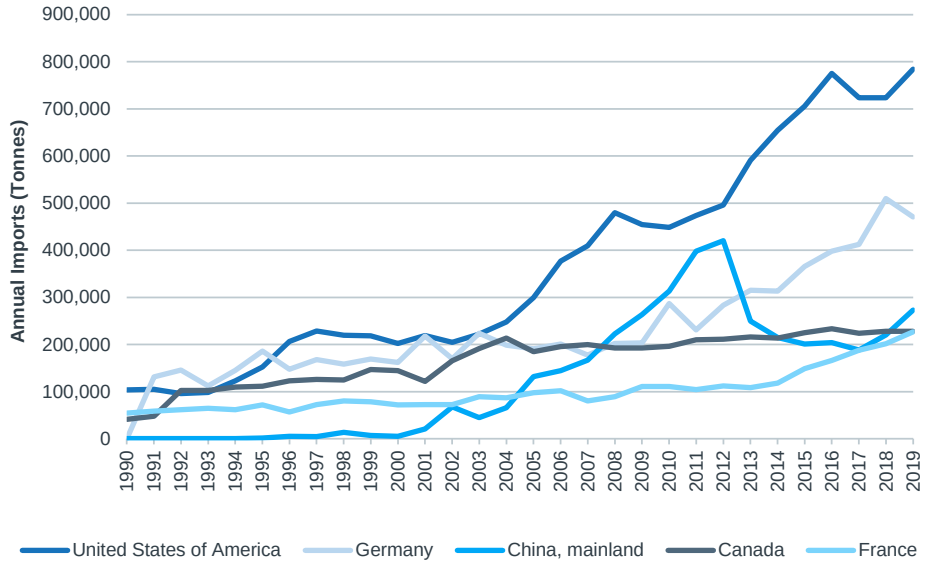
Source: FAO (2021a).

Major Importers

Historically, the US has been the largest importer of watermelons, with imports growing by 7.2% on average per annum since 1990. In 2019, the US imported little over 780,000 tonnes of watermelons, accounting for 20% of total global imports. While watermelon produced within the US remains the main source of consumption in the world, domestic production has remained relatively steady over the years, increasing by 1.3% per annum between 1990 and 2019 (see Figure 4.79 below). This suggests that with an increasing population, the US is looking to supply domestic demand with imports from other countries as domestic production has not experienced large growth, while imports have.

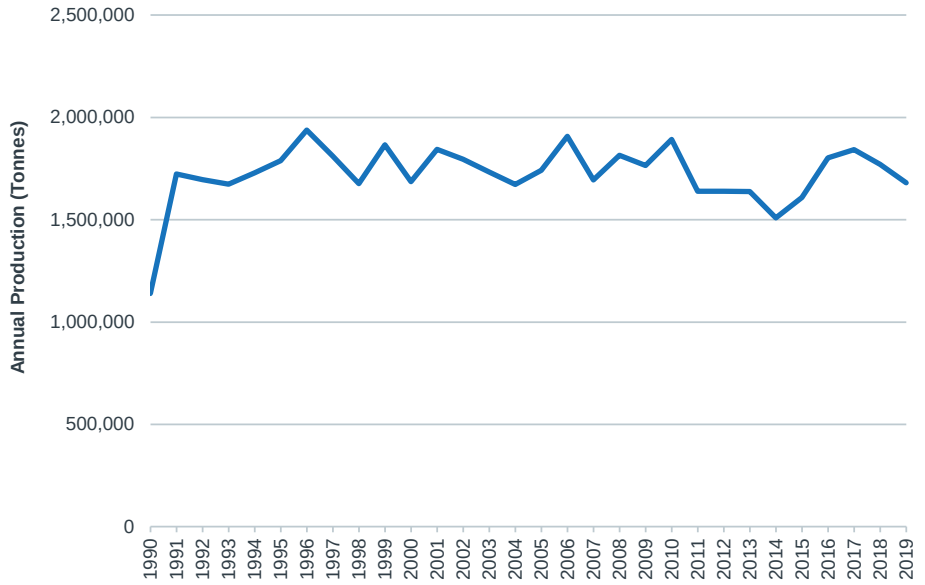
Despite being the most prominent production region, China is also amongst the largest importing regions for watermelons, reflecting strong local consumption demand. In 2019, China's imports of watermelons have comprised approximately 7.1% of global imports. China does not import watermelons from Australia.

Figure 4.78. Top Five Importers of Watermelon, 1999 to 2019



Note: Top five largest importers on average from 2010 to 2019.
Source: FAO (2021a).

Figure 4.79. US Production of Watermelon, 1990 to 2019



Source: FAO (2021a).

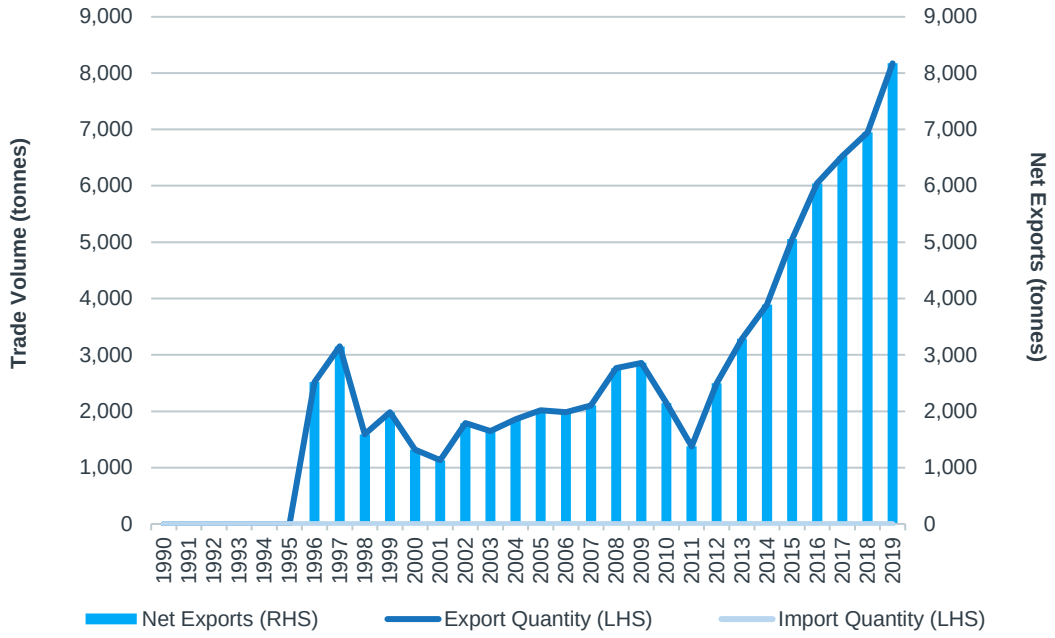
4.10.2 Export Markets

Australian Trade Balance

The FAO (2021a) data presented in the figure below indicated that Australia does not import any watermelons from other countries. However, information from Hort Innovation (2020a) suggest that in 2019-2020, Australia imported approximately 155 tonnes of watermelon. This import value is relatively low, suggesting that Australia's domestic production is sufficient to cover domestic demand.

Exports of Australian watermelons experienced a significant increase from 2011 to 2019, growing by an average annual rate of 24.9%. In 2019, net exports of watermelons from Australia totalled over 8,000 tonnes.

Figure 4.80. Trade Balance Australia of Watermelon



Source: FAO (2021a).

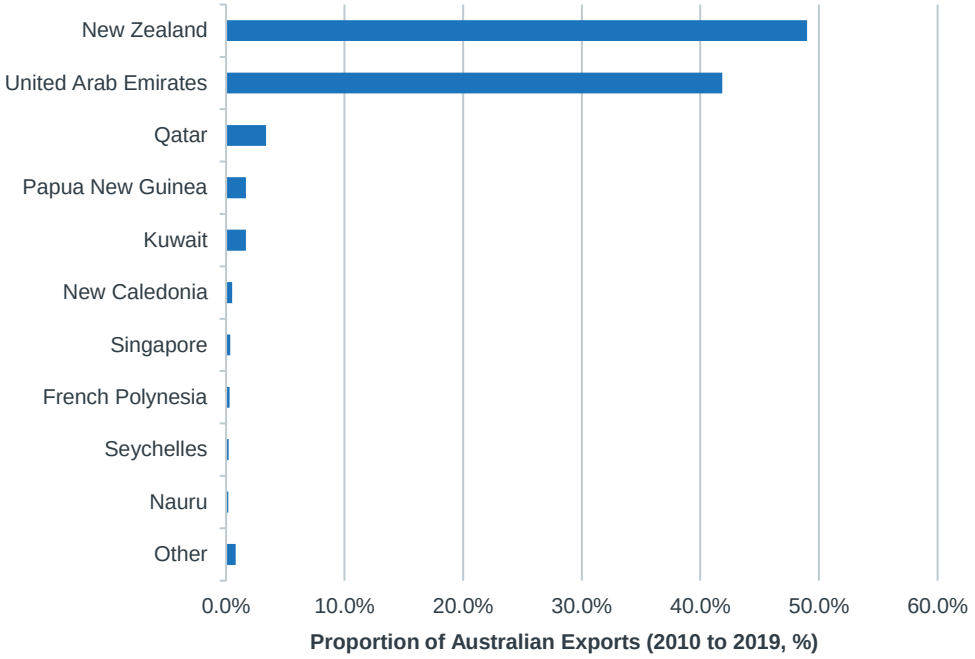
Key Export Markets

From 2010 to 2019, New Zealand was the largest importer of Australian watermelons, accounting for nearly 50% of Australia's total watermelon exports. The second largest importer of Australian watermelons is the United Arab Emirates (UAE), accounting for approximately 42% of Australia's exports on average between 2010 to 2019.

At the end of 2019, New Zealand suspended cucurbit (melon, pumpkin, squash and cucumber) trade from Queensland with the detection of cucumber green mottle mosaic virus on melons (Australian Government, 2021). New Zealand lifted the suspension mid-March 2021, however the impact of the industry in not yet known (Australian Government, 2021).

It must be noted that from 2016 to 2019, the UAE has been the largest market for Australian watermelons.

Figure 4.81. Key Export Markets for Watermelon



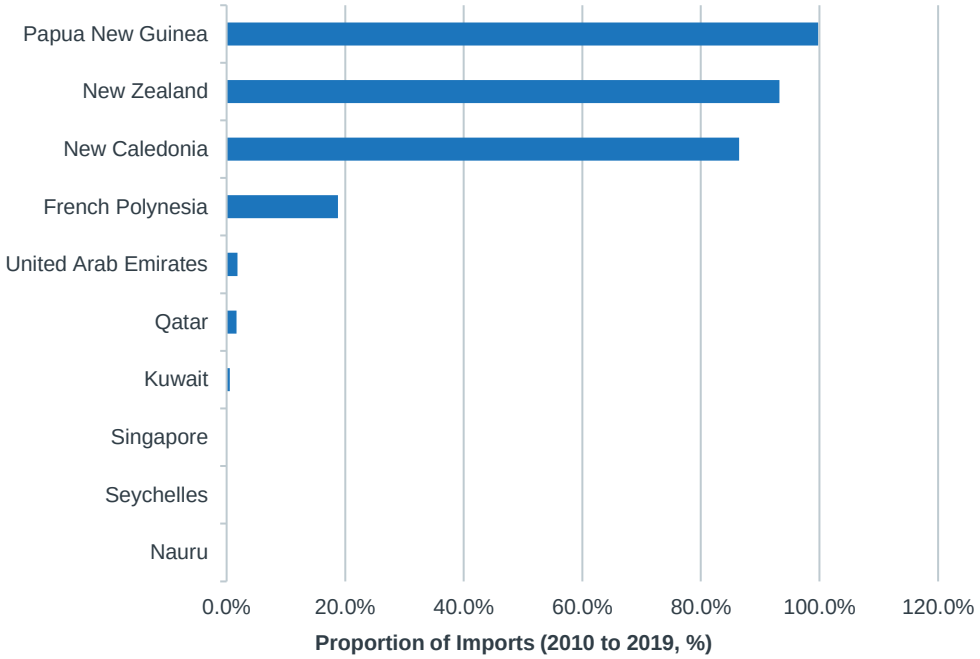
Source: FAO (2021a).

Export Market Share

The figure below highlights how much of Australia's watermelon exports make up of each key market's imports from 2010 to 2019. It was estimated that nearly 100% of watermelon imports from Papua New Guinea were sourced from Australia.

In 2019, it was also estimated that approximately 93.2% of watermelons imported to New Zealand were from Australia.

Figure 4.82. Proportion of Australia's Exports make up of Total Key Imports of Watermelons (Australia's Top 10 Export Markets)



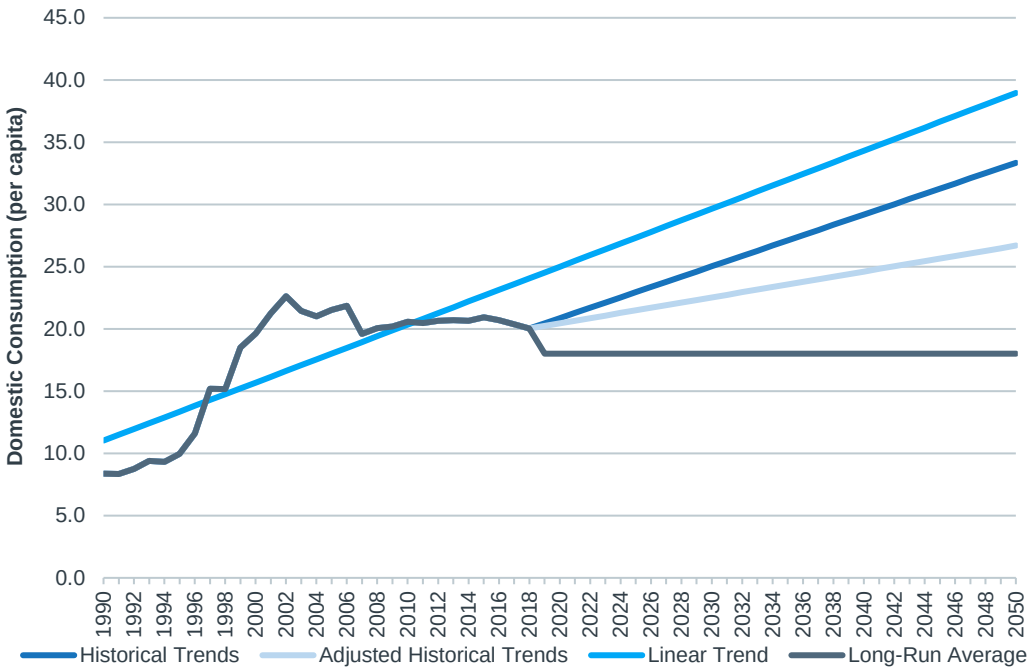
Source: FAO (2021a).

4.10.3 Consumption

Global Consumption

Domestic consumption per capita in the global market is significantly higher than the domestic consumption per capita in Australia. Between 2006 and 2018, the global consumption of watermelons has remained relatively steady over time. As a result, the future growth of global watermelon consumption could remain relatively flat. Based on the long-run average, consumption per person in the global market is estimated to total 18.0 kilograms per person in 2050.

Figure 4.83. Domestic Consumption for Global Market (Watermelon), excluding Australia, 1990 to 2050 (kilograms)

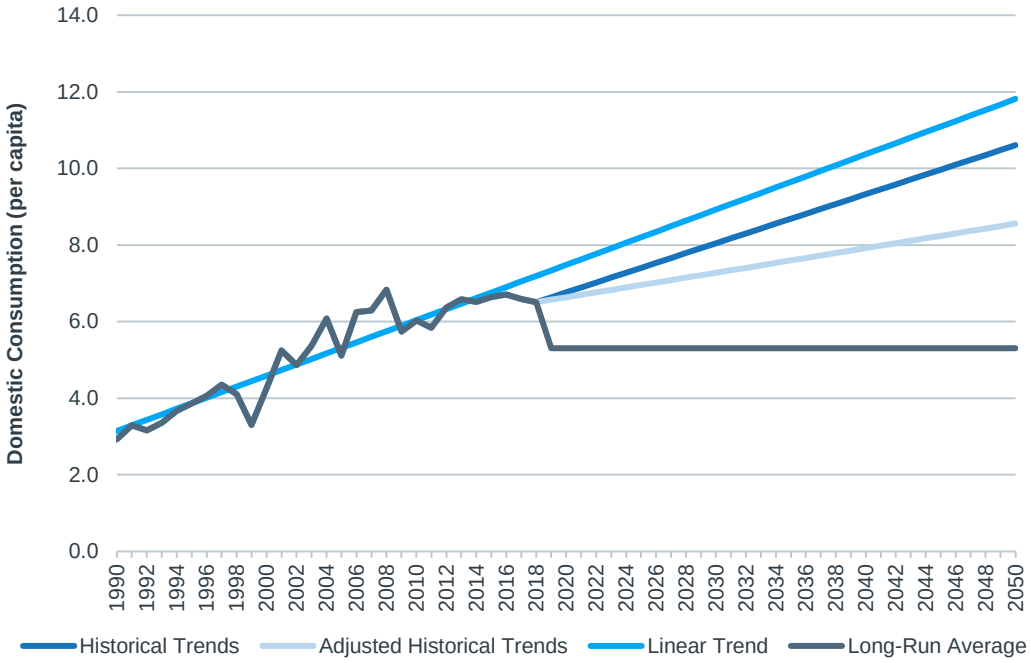


Source: FAO (2021a), AEC.

Domestic Consumption

Based on the historical trend volumes, consumption could total approximately 10.6 kilograms per capita in 2050.

Figure 4.84. Domestic Consumption Per Capita, 1990 to 2050 (kilograms)



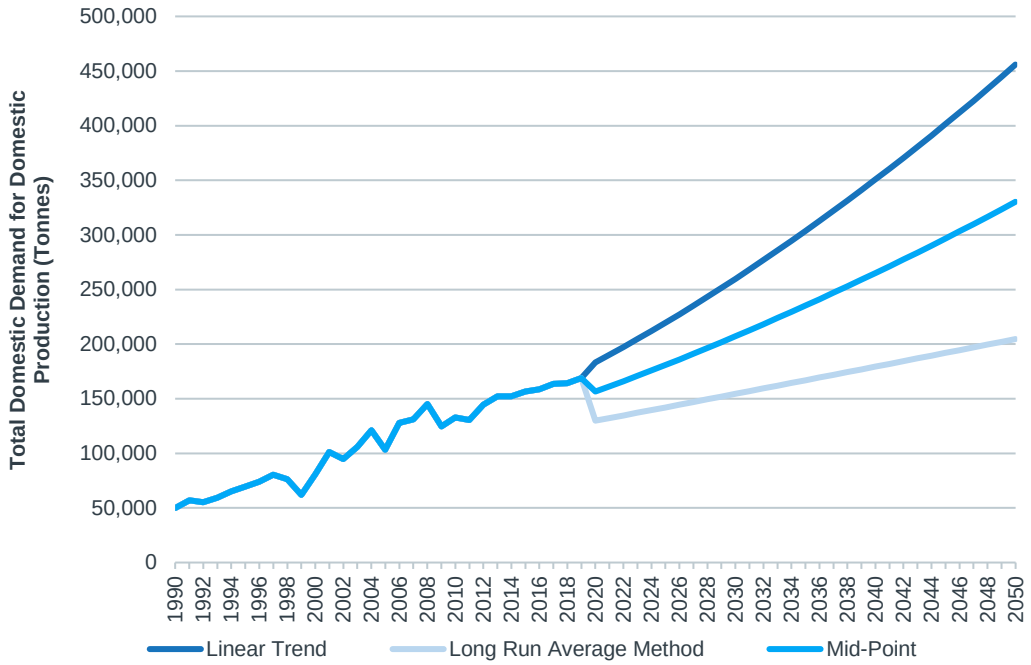
Source: FAO (2021a), AEC.

Forecast Consumption in Domestic Markets

Historically, the domestic demand for domestic production has grown by an average annual rate of 4.3% since 1990 to reach 164,194 tonnes in 2018.

Future domestic demand for domestic production could reach between the long-run average scenario at 204,665 tonnes in 2050 or linear trend volumes in 2050 at 455,870 tonnes. Based on historical trends, there is more potential for the future domestic demand for domestic production of watermelons to fall in line with the mid-point scenario.

Figure 4.85. Total Domestic Demand for Domestic Watermelon Production, 1990 to 2050

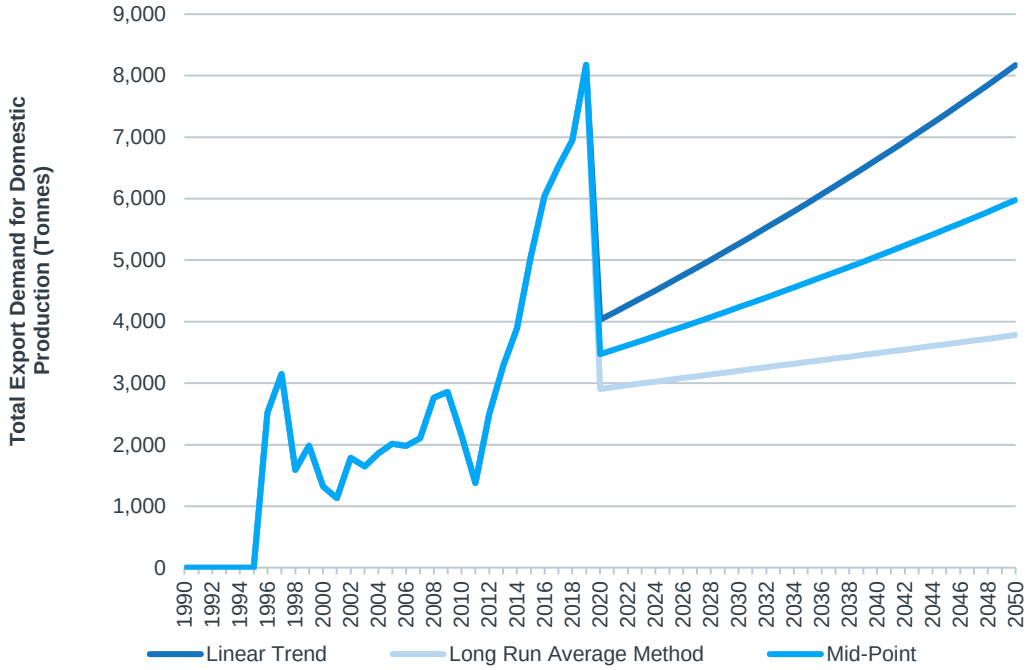


Source: FAO (2021a), AEC.

Forecast Consumption in Export Markets

Export demand for Australian produce has grown significant over the years, increasing by an average annual rate of 4.7% from 1996 to 2018. Export demand for Australian watermelons could reach a peak of 8,175 tonnes in 2019, decreasing significantly in 2020. Future export demand for domestic production could reach between the long-run average scenario at 3,783 tonnes in 2050 or linear trend volumes in 2050 at 8,171 tonnes.

Figure 4.86. Total Export Demand for Domestic Production (Watermelon), 1990 to 2050



Source: FAO (2021a), AEC.

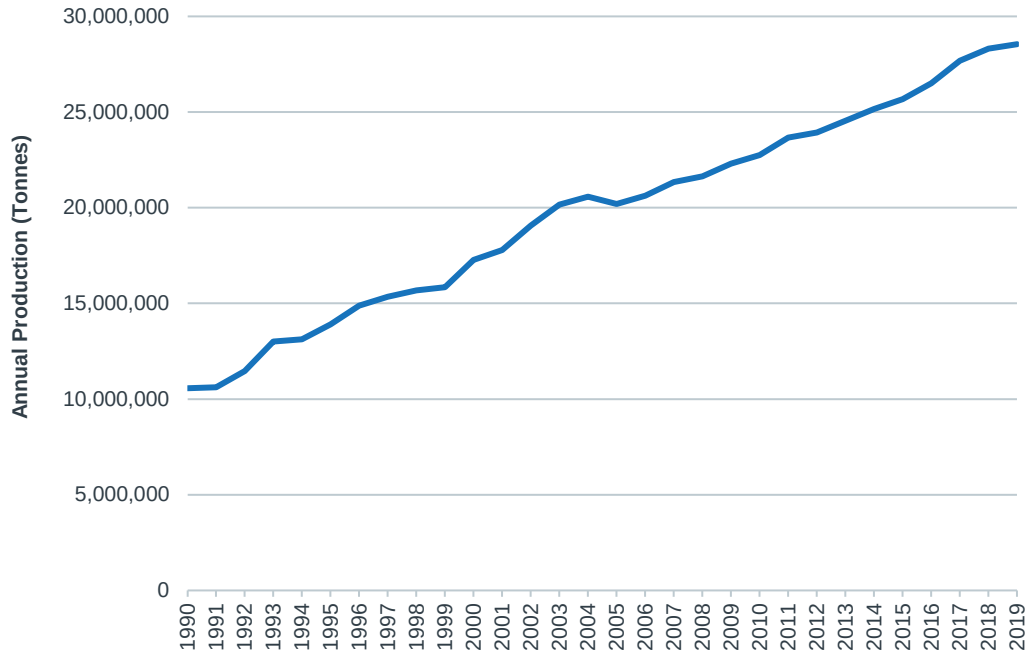
4.11 PUMPKINS

4.11.1 Global Overview

Global Production

Global pumpkin, squash and gourds production has increased considerably since 1990, rising from 10.6 million tonnes to reach 28.6 million tonnes in 2019. This steady growth equates to an average annual growth rate of 3.5% from 1990 to 2019. Pumpkin, squash and gourds production is largely driven by both China and India.

Figure 4.87. Global Production of Pumpkin, Squash and Gourds, 1990 to 2019



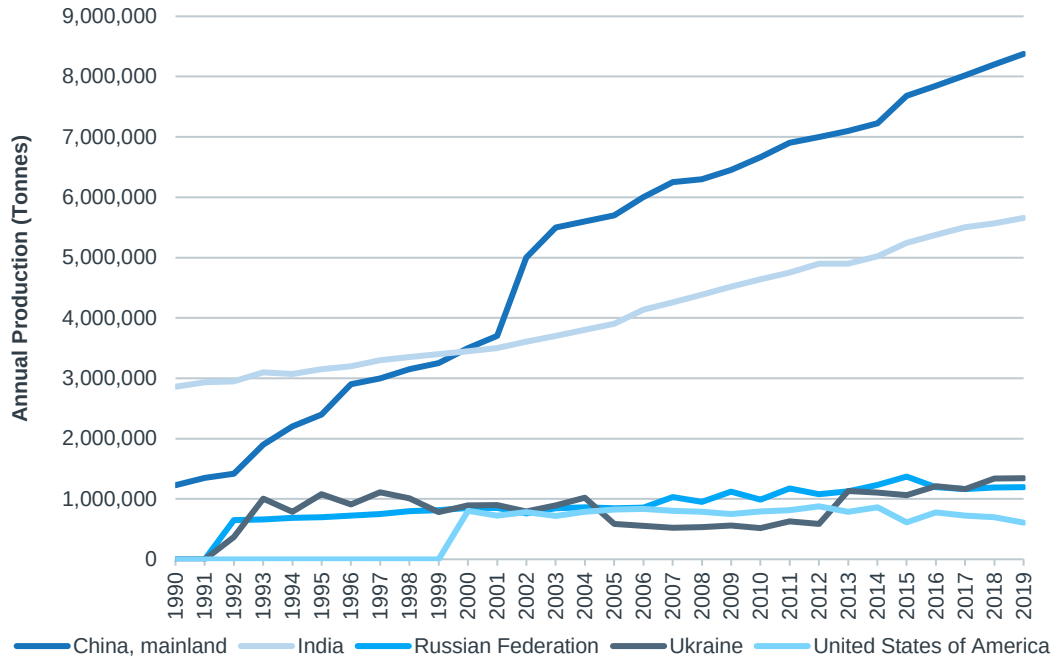
Source: FAO (2021a), NationMaster (2021).

Major Producers

From the 2000s, China has been the largest producer of pumpkins, squash and gourds, producing a total of 8.4 million tonnes in 2019. Of total global production, China accounted for approximately 29.3% in 2019. From 2001 to 2002, China experienced a 1.3 million tonne increase in the production of pumpkin, squash and gourds.

In 2019, India was the second most prominent producer of the pumpkins, squash and gourds, with production totalling 5.7 million tonnes. Production in India has remained relatively steady over the years, increasing by an average annual growth rate of 2.4% from 1990 to 2019.

Figure 4.88. Top Five Global Producers of Pumpkin, Squash and Gourds, 1990 to 2019



Note:

- Production data for the US is unavailable from 1990 to 1999.
- Top five largest producers on average from 2010 to 2019.

Source: FAO (2021a), NationMaster (2021).

China has increased its share of global production by 3.6 percentage points from 1990, reflecting the country's ramp up in production over the years.

Australia's share of global production has decreased since 1990.

Table 4.19. Top 10 Global Producers of Pumpkin, Squash and Gourds (+ Australia)

Country	Average % of Total Production		
	From 1990	From 2000	From 2010
China, mainland	25.6%	28.2%	29.2%
India	20.6%	19.8%	20.1%
Russian Federation	4.5%	4.5%	4.6%
Ukraine	4.1%	3.8%	3.9%
United States of America	2.6%	3.4%	2.9%
Mexico	2.6%	2.5%	2.4%
Spain	2.0%	2.0%	2.2%
Italy	2.4%	2.3%	2.2%
Egypt	2.8%	2.6%	1.9%
Turkey	2.0%	1.9%	1.9%
Australia	0.5%	0.5%	0.4%
Other	30.2%	28.6%	28.3%
Total	**100.0%**	**100.0%**	**100.0%**

Source: FAO (2021a), NationMaster (2021).

Major Exporters

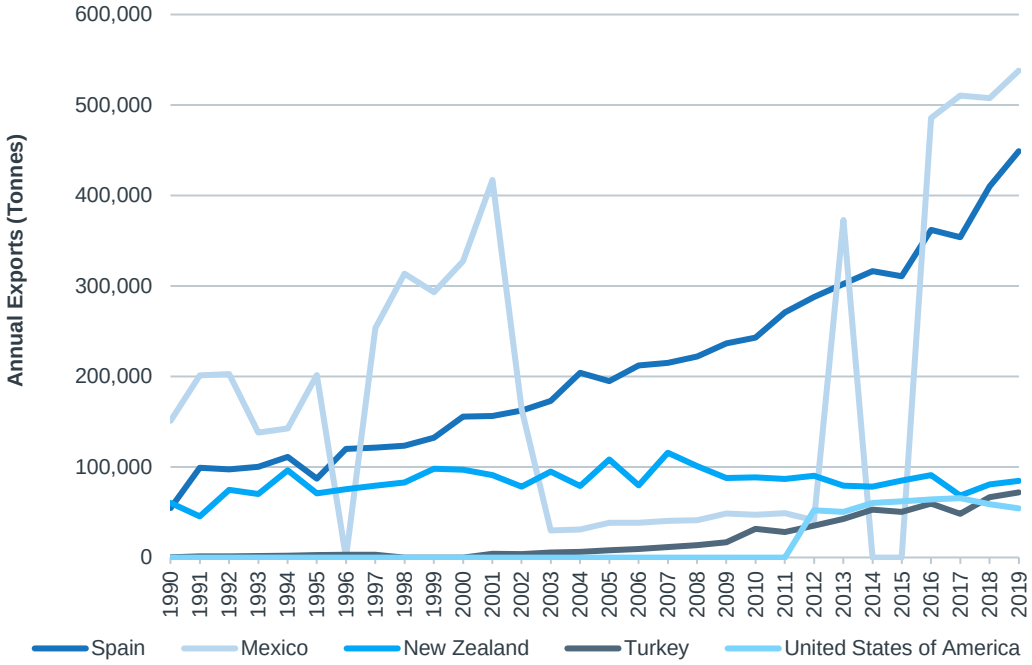
Global exports have experienced an average annual increase of 6.0% since 1990, totalling approximately 1.7 million tonnes in 2019. In 2019, it was estimated that global exports of pumpkin, squash and gourds totalled 1.7 million tonnes.

In 2019 Mexico was the largest exporter of pumpkin, squash and gourds, with exports totalling 538,039 tonnes. The data provided by FAO for Mexico is rather variable, however, on average between 1990 and 2019 Mexico experienced a 4.5% growth rate per annum.

In 2019, Spain was the second largest exporter of pumpkin, squash and gourds totalling 449,048 tonnes. Spain has experienced relatively strong growth in exports, increasing by an average annual rate of 7.5% per annum from 1990 to 2019.

Of important note, New Zealand is the world's third largest exporter of pumpkins, squash and gourds. In 2019, New Zealand exported approximately 65% of the country's total production.

Figure 4.89. Top Five Major Exporters of Pumpkin, Squash and Gourds, 1990 to 2019



Note: Top five largest exporters on average from 2010 to 2019.
Source: FAO (2021a), NationMaster (2021).

Out of the top 10 global exports listed in the table below, Turkey, the US, Morocco, Netherlands, and Portugal have all increased their share of global pumpkin, squash and gourds exports since 1990.

Table 4.20. Top 10 Major Exporters of Pumpkin, Squash and Gourds (+ Australia)

Country	Average % of Total Global Exports		
	From 1990	From 2000	From 2010
Spain	30.8%	32.3%	30.2%
Mexico	27.6%	23.0%	23.3%
New Zealand	12.4%	10.9%	7.6%
Turkey	2.9%	3.5%	4.5%
United States of America	2.3%	2.9%	4.3%
Morocco	3.2%	3.9%	3.6%
Netherlands	3.3%	3.5%	3.5%
Italy	2.9%	2.8%	2.8%
France	3.2%	3.2%	2.6%
Portugal	1.5%	1.9%	2.6%
Australia	0.1%	0.1%	0.1%
Other	10.0%	12.0%	15.1%
Total	**100.0%**	**100.0%**	**100.0%**

Source: FAO (2021a), NationMaster (2021).

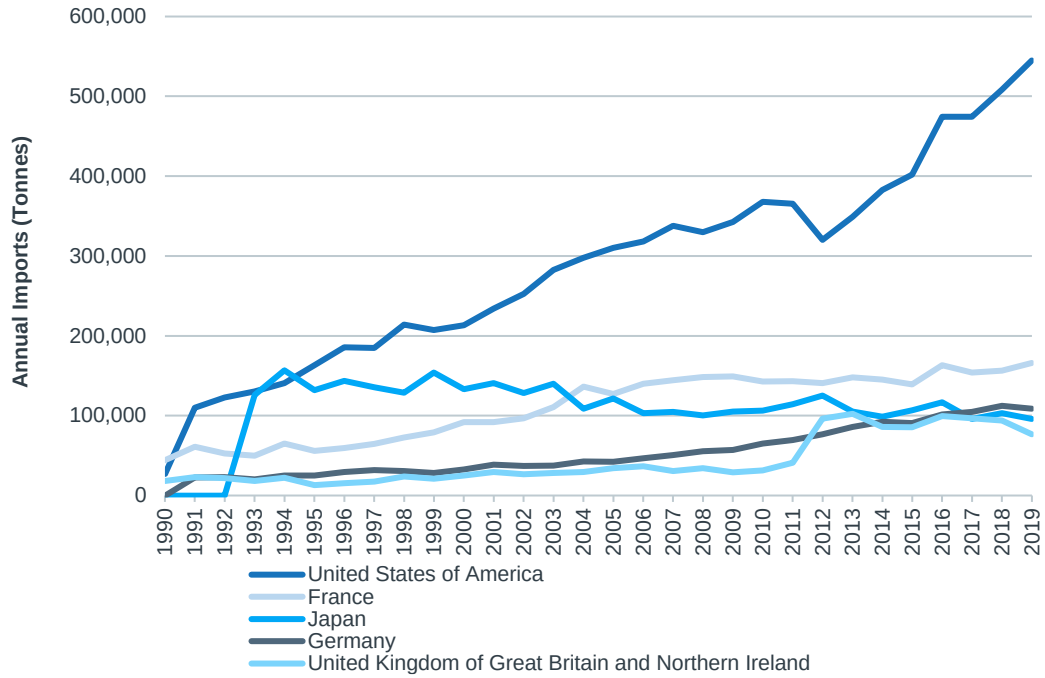
Major Importers

In 2019, global imports of pumpkin, squash and gourds was estimated to total 1.6 million tonnes. From 1990 to 2019, pumpkin, squash and gourds experienced an average annual growth rate of 9.2%.

The US was the single largest importer on the global scale, importing a total of 544,993 tonnes and representing 34% of total imports. Pumpkin, squash and gourd imports to the US have been increasing by an average annual rate of 10.9% per annum from 1990 to 2019.

France was the second most prominent importer of pumpkin, squash and gourds, importing 166,130 tonnes.

Figure 4.90. Top Five Importers of Pumpkin, Squash and Gourds, 1990 to 2019



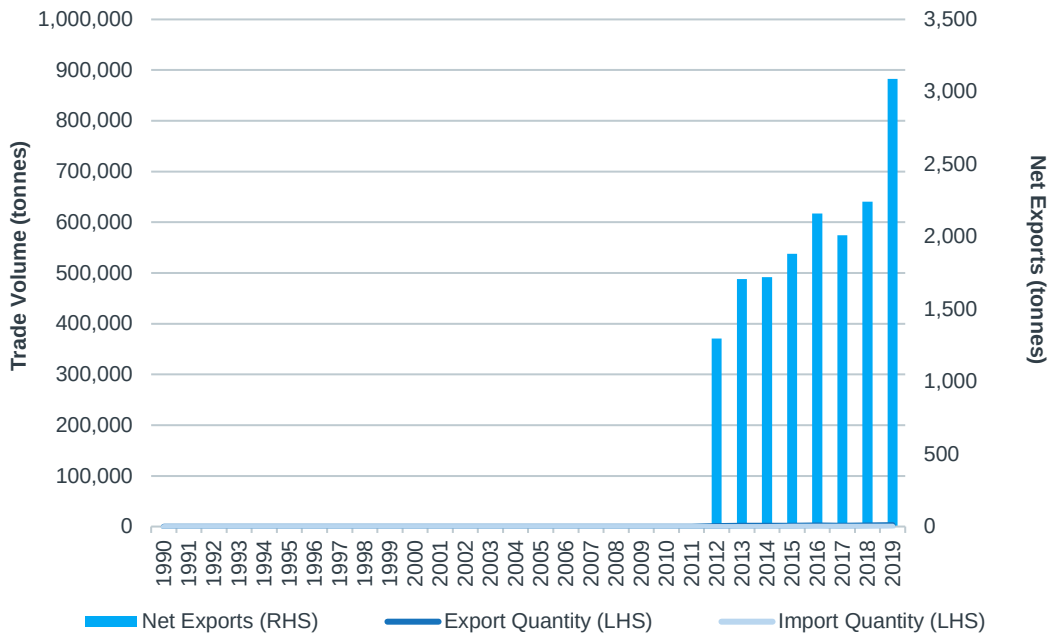
Note: Top five largest importers on average from 2010 to 2019.
Source: FAO (2021a), NationMaster (2021).

4.11.2 Export Markets

Australian Trade Balance

It must be noted that the FAO do not have export volumes for Australia until 2012, and imports recorded until 2015. Australia imports little volumes of pumpkin, squash and gourds and is largely a net exporter of the commodity.

Figure 4.91. Trade Balance Australia for Pumpkin, Squash and Gourds, 1990 to 2019

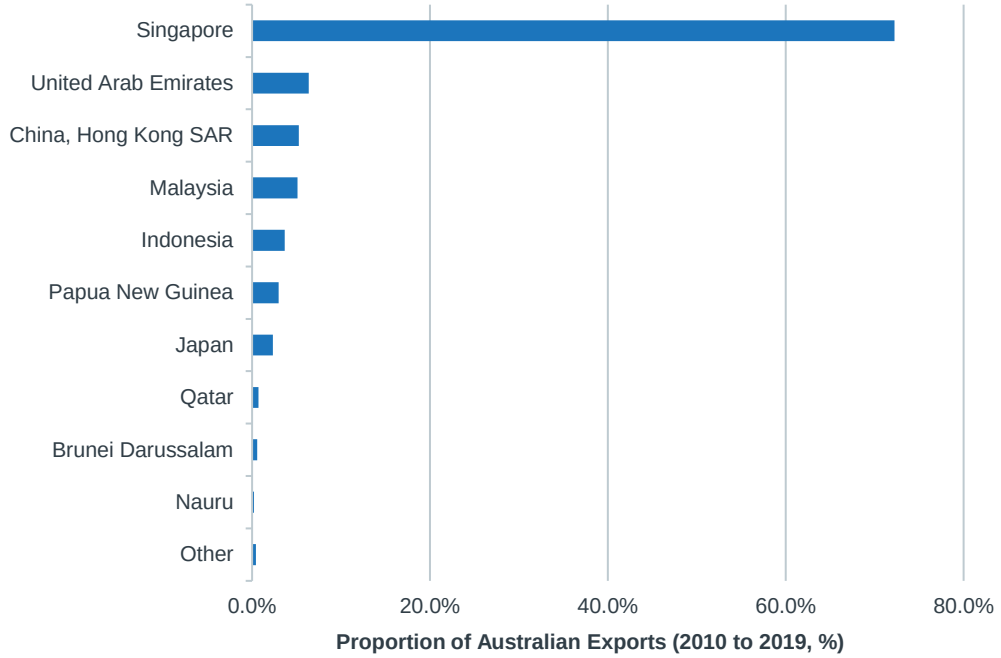


Source: FAO (2021a).

Key Export Markets

From 2010 to 2019, Singapore accounted for approximately 72% of Australia's pumpkin, squash and gourds exports. The UAE (United Arab Emirates) was Australia's second largest export market for pumpkin, squash and gourds, accounting for an average of 6.4% of total exports from 2010 to 2019.

Figure 4.92. Key Exports Markets for Australia (Top 10) (Pumpkin, Squash and Gourds)



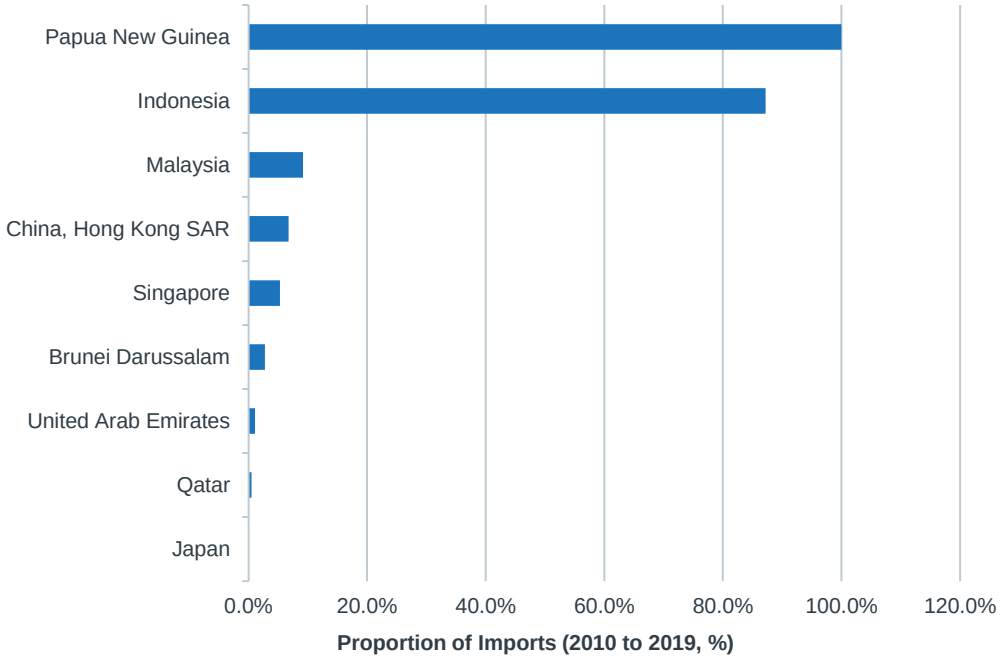
Source: FAO (2021a).

Export Market Share

The figure below highlights how much of Australia's pumpkin, squash and gourds exports make up of each key market's imports on average from 2010 to 2019. Of Papua New Guineas total imports of pumpkin, squash and gourds, Australia accounted for an average of 100% of their imports from 2010 to 2019.

Indonesia is also largely reliant on imports of pumpkin, squash and gourds from Australia, with imports from Australia accounting for an average of 87% of total imports from 2010 to 2019.

Figure 4.93. Proportion of Australia's Exports make up of Total Key Imports (Pumpkin, Squash and Gourds) (Australia's Top Export Markets)



Source: FAO (2021a).

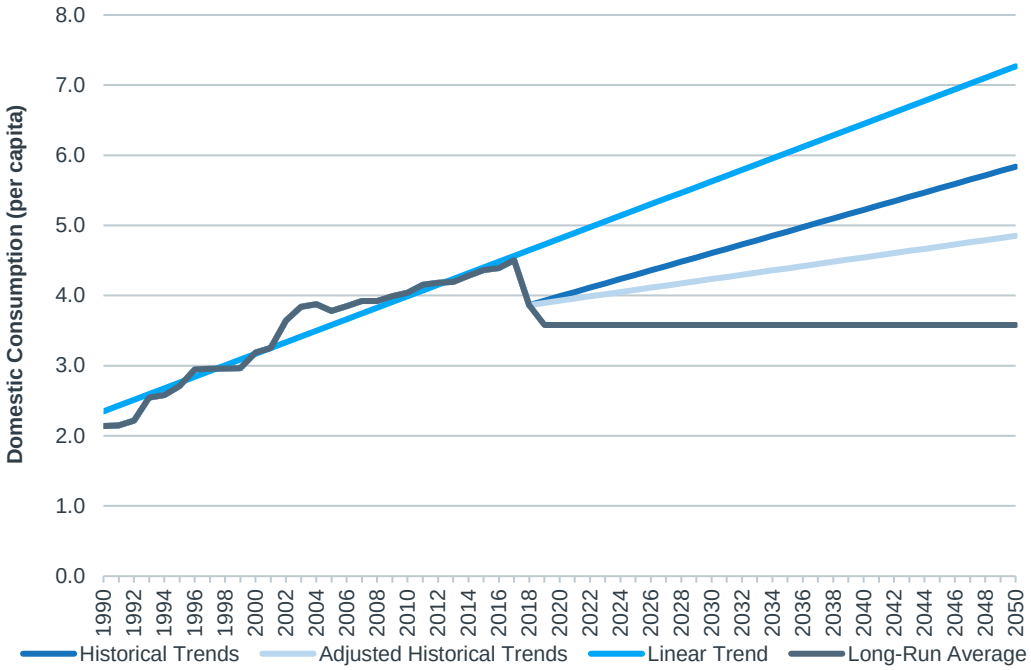
4.11.3 Consumption

Global Consumption

Historically, pumpkin, squash and gourd consumption in on the global scale has been growing at a steadier rate than the consumption in Australia. Based on the historic consumption trends on a global scale, there is more potential for future domestic consumption to reach linear trend volumes in 2050.

Based on the linear trend volumes, consumption could total approximately 7.3 kilograms per capita in 2050.

Figure 4.94. Domestic Consumption for Global Market (Pumpkin, Squash and Gourds), excluding Australia, 1990 to 2050

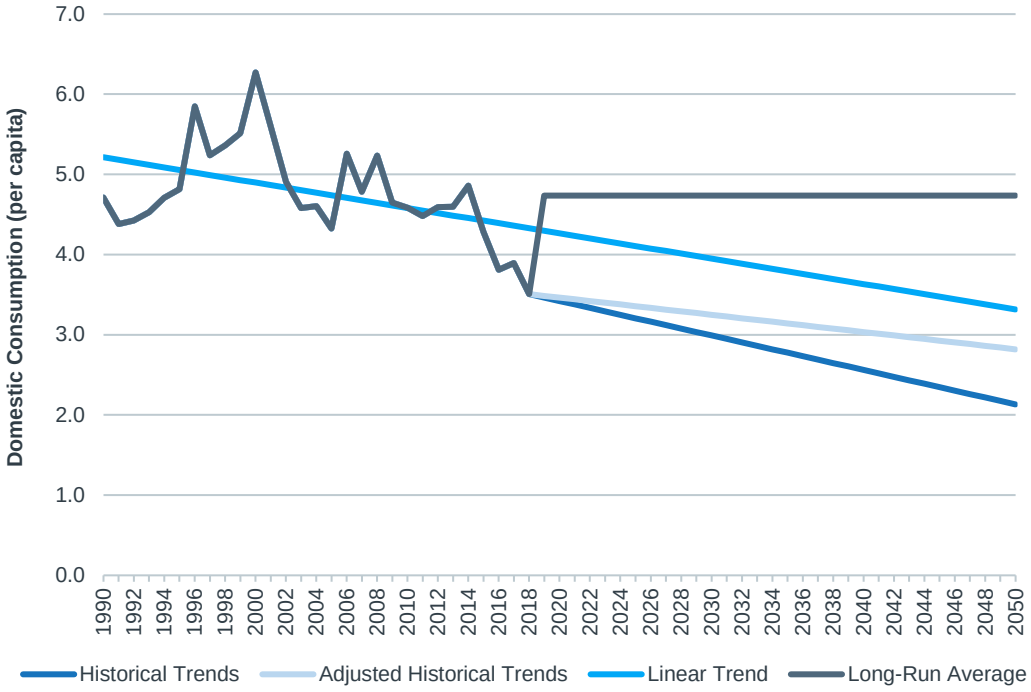


Source: FAO (2021a), AEC.

Domestic Consumption

Based on the linear trend, consumption could reach between approximately 3.3 kilograms and 4.7 per capita in 2050.

Figure 4.95. Domestic Consumption Per Capita (Pumpkin, Squash and Gourds), 1990 to 2050 (kilograms)



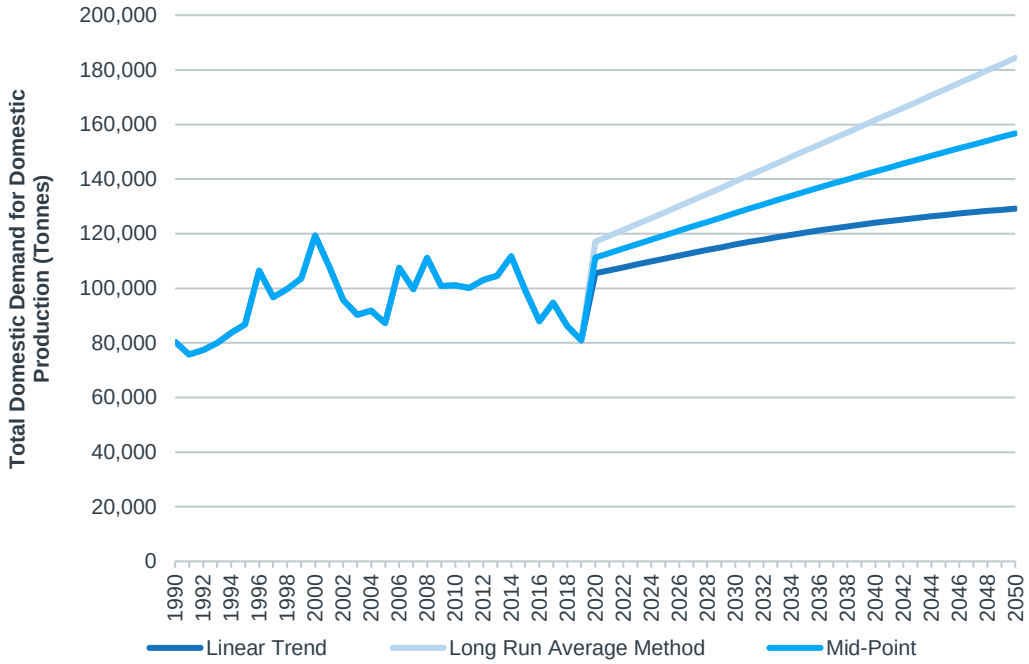
Source: FAO (2021a), AEC.

Forecast Consumption in Domestic Markets

Historically, domestic demand for domestic production has grown by an average annual rate of 0.3% from 1990 to 2018, to reach 86,207 tonnes in 2018.

Future domestic demand for domestic production could reach between the linear trend scenario at 129,147 tonnes in 2050 or long-run average volumes in 2050 at 184,369 tonnes. Based on historical trends, there is more potential for the future domestic demand for domestic production of pumpkin, squash and gourds to fall in line with the linear trend scenario.

Figure 4.96. Total Domestic Demand for Domestic Pumpkin, Squash and Gourds Production, 1990 to 2050

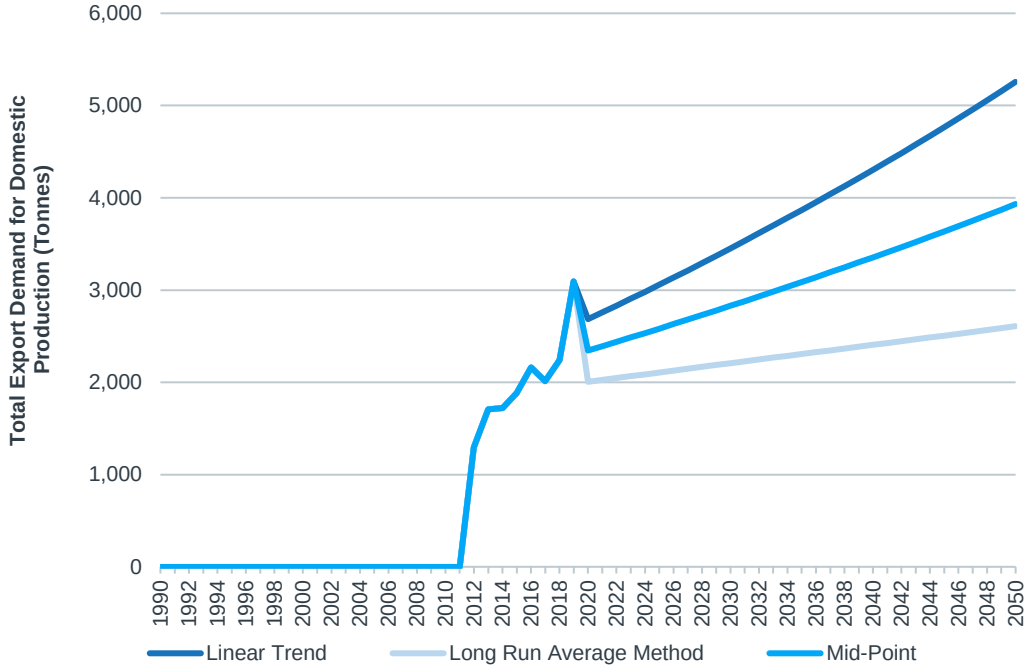


Source: FAO (2021a), AEC.

Forecast Consumption in Export Markets

The Food and Agricultural Organisation only reports Australia's pumpkin, squash and gourds production from 2012 onwards. From 2012 to 2018, Australia's exports experienced a 10% average annual increase year on year to reach a total of 2,243 tonnes. Export demand for Australia pumpkin, squash and gourds has the potential to reach between the long-run average scenario at 2,610 tonnes in 2050 or the linear trend volumes in 2050 at 5,255 tonnes.

Figure 4.97. Total Export Demand for Domestic Pumpkin, Squash and Gourds Production, 1990 to 2050



Source: FAO (2021a), AEC.

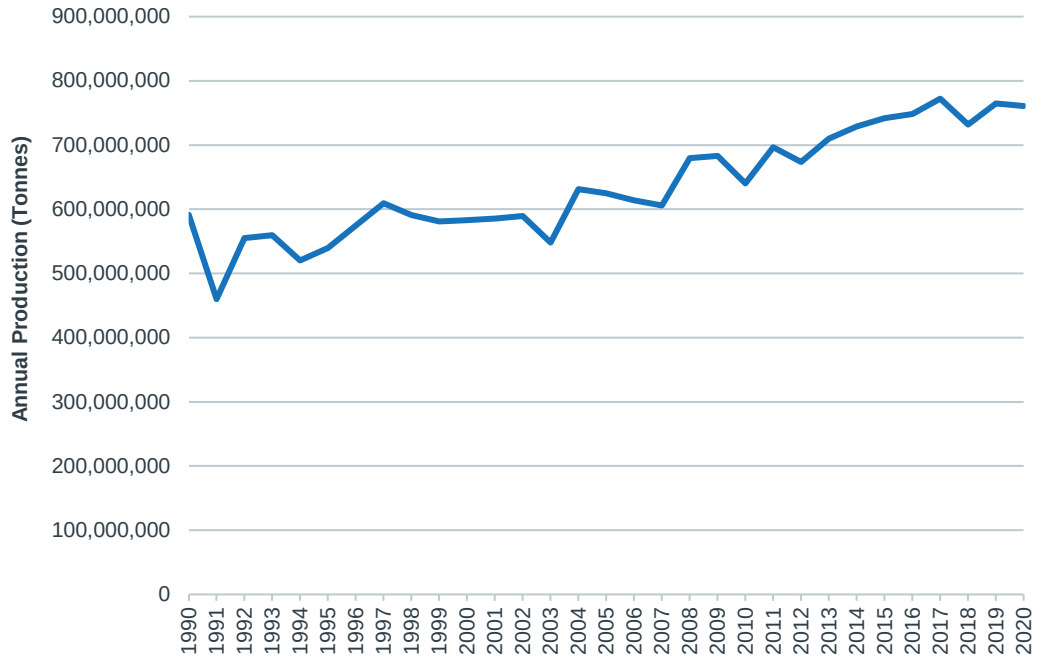
4.12 WHEAT

4.12.1 Global Overview

Global Production

In 2020, global wheat production totalled approximately 760.9 million tonnes, having increased by an average annual rate of 0.8% per annum since 1990.

Figure 4.98. Global Production of Wheat, 1990 to 2020



Source: FAO (2022).

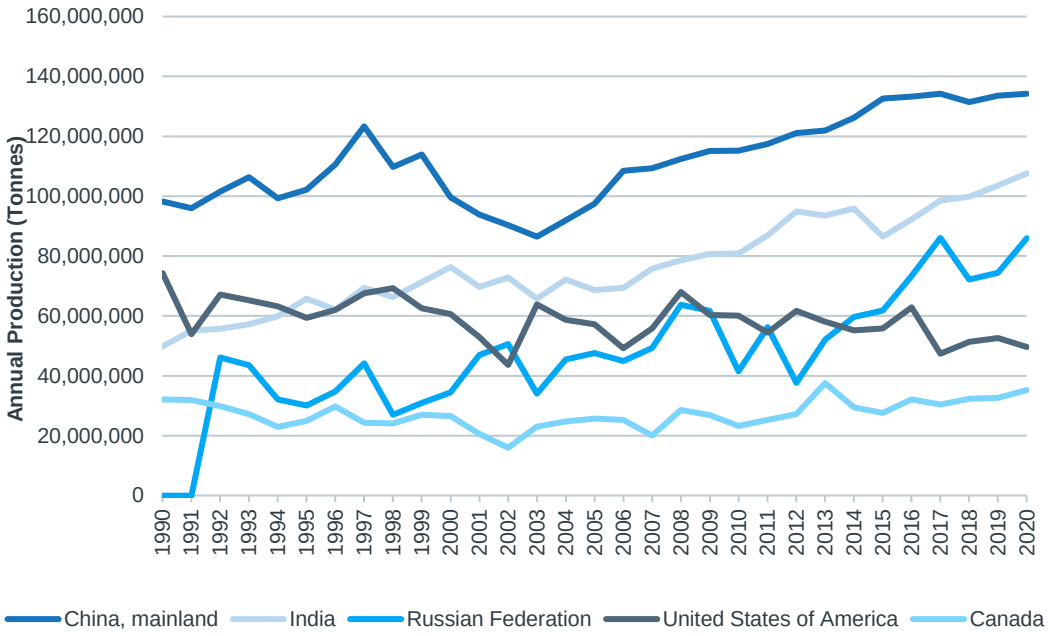
Major Producers

In 2019, the largest producer of wheat in the global market was China with production totalling approximately 134.3 million tonnes. Wheat production in China accounted for approximately 17.6% of the total global production in 2020. Since 2003 wheat production in China has experienced a relatively stable increase, rising by an average of 2.6% per annum. The commodity is key in China and is being used to create food such as noodles, buns, dumplings and other pastries (Sapiens, 2019).

The second most prominent producer of wheat in 2020 was India, producing 107.6 million tonnes of the commodity. From 1990 to 2020, wheat production in India has experienced an average annual growth of 2.6%. This was followed by Russia as the third largest producer, producing 85.9 million tonnes of wheat in 2020. In the early 2000s Russia made a decision to strive for self-sufficiency in meat production, and in order to supply the increasing livestock industry and increasing demand from a growing population, wheat production saw an increase (World Grain, 2021 b).

Together, the top three largest wheat producing countries accounted for 43% of total global production in 2020.

Figure 4.99. Top 5 Global Producers of Wheat, 1990 to 2020



Note: The FAO does not have production data for Russia in 1990 or 1991.
Source: FAO (2022).

China's share of the global market for wheat production has remained steady from 1990. Both India and Russia have increased their share of global production over the years.

Australia's share of the global market has remained steady.

Table 4.21. Top 10 Global Producers of Wheat (+ Australia)

Country	Average % of Total Production		
	From 1990	From 2000	From 2010
China, mainland	17.6%	17.0%	17.6%
India	12.1%	12.5%	13.1%
Russian Federation	7.5%	8.4%	8.8%
United States of America	9.3%	8.4%	7.6%
France	5.6%	5.4%	5.1%
Canada	4.3%	4.0%	4.2%
Pakistan	3.3%	3.4%	3.4%
Germany	3.4%	3.5%	3.3%
Australia	3.2%	3.2%	3.2%
Ukraine	2.9%	3.1%	3.2%
Australia	3.2%	3.2%	3.2%
Other	27.8%	27.8%	27.2%
Total	**100.0%**	**100.0%**	**100.0%**

Source: FAO (2022).

Major Exporters

Global exports of wheat have experienced an average annual increase of 2.7% since 1990, totalling 198.1 million tonnes in 2020.

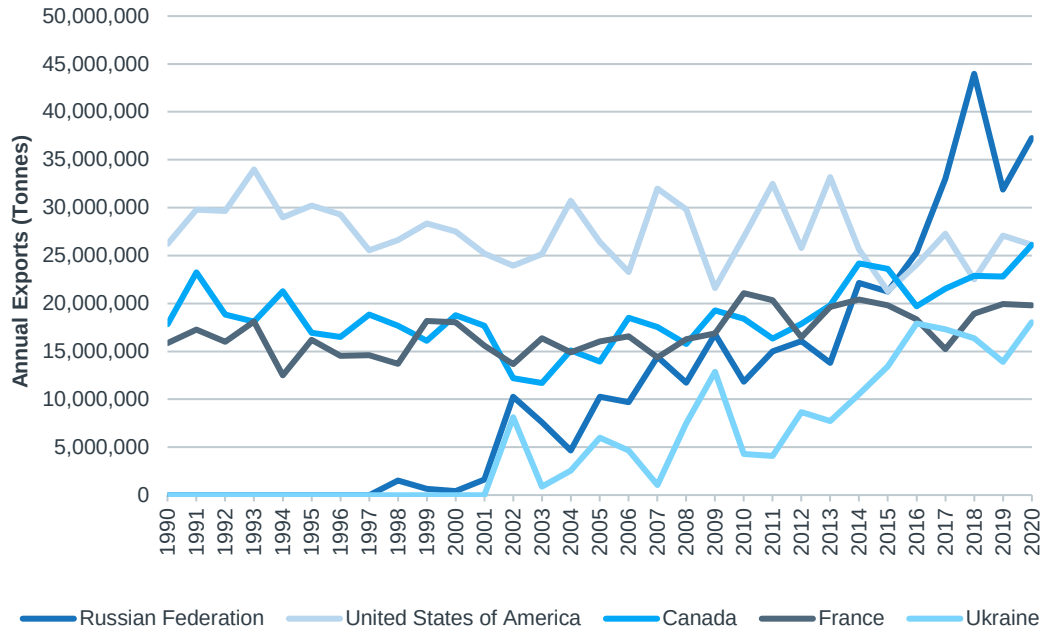
Historically, the US has been the largest exporter of wheat up until 2016 when Russia took precedence. Russia was the largest exporter of wheat in 2020, exporting approximately 37.3 million tonnes (totalling approximately 43% of Russia's total production).

Russia's reliance on imports have decreased over the years as production began to rise and the country shifted to being a significant global exporter. There are a number of reasons for the increase in exports including, privatisation of the economy, investment in port infrastructure and large-scale farming operations (World Grain b, 2021).

In 2021, Russia implemented a permanent floating-rate tax on wheat exports which is '70% of the different between the base price of wheat per tonne and $200/mt' (Gro Intelligence, 2021 a). The permanent tax was implemented to control domestic prices (Gro Intelligence, 2021). Additionally, from February 2022 to June 2022, Russia plan to cut wheat exports to a quota of 8 million tonnes (Gro Intelligence, 2021 b). This tax and quota has the potential for the remaining four largest exporters to fill supply shortfalls in the international market.

The second largest exporter of wheat on the global scale is the US, exporting 26.1 million tonnes in 2020. Exports of wheat from the US have been experiencing decline in recent years, decreasing by an average annual rate of 0.3% from 2010 to 2020. This decline in production is stemming largely from an increase in global competition, with return declining relative to other cropping option (USDA, undated).

Figure 4.100. Top 5 Global Exporters of Wheat, 1990 to 2020



Notes: The FAO does not have export data for Russia from 1990 to 1997.
Source: FAO (2022).

Major Importers

Global imports of wheat have experienced an average annual increase of 3.7% since 1990, totalling 174.8 million tonnes in 2020.

In 2020, Indonesia imported the largest volumes of wheat, taking precedence over Egypt which was the largest importer from the early 2010s. In 2020, Indonesia imported an estimated 10.3 million tonnes of wheat, with imports growing by 6.2% per annum from 1990 to 2020. The country is reliant of wheat imports to meet the demand for consumption with both population and livestock.

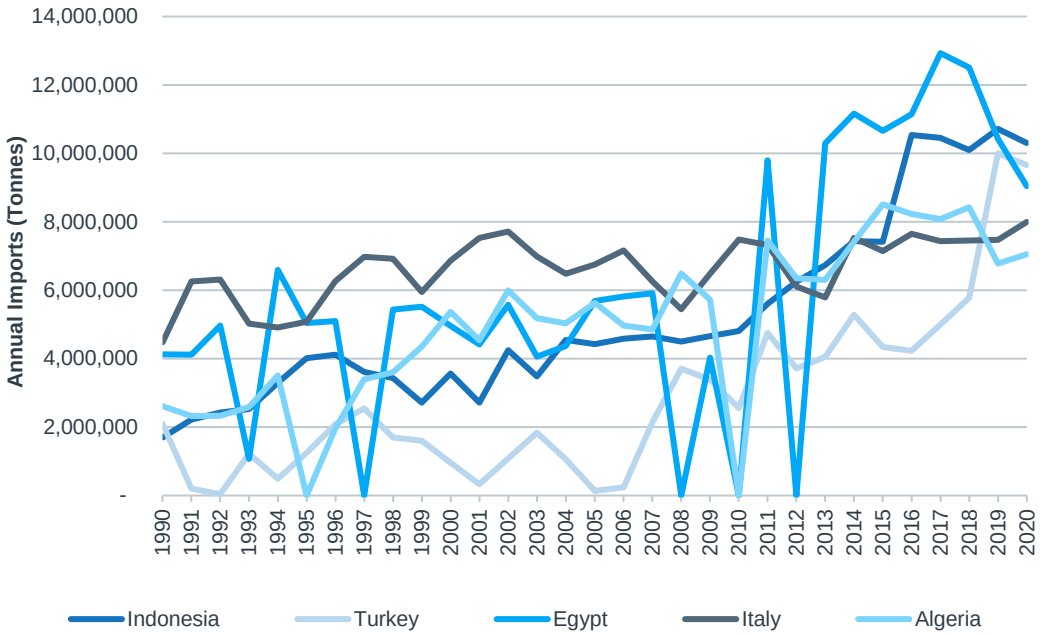
Historically Turkey has not been a significant importer of wheat on the global scale, however in 2020 the country took precedence as the second most prominent importer of the commodity. The emergence of Turkey as a key importer has been driven by factors including, lower domestic production, "higher domestic consumption, increased government imports to stabilise domestic prices and an explosion in the export of wheat-based products" (Farm Online, 2020). Consumption of wheat-based products has increased significant in recent years, with products such as flour and pasta (Farm Online, 2020).

The third largest importer of wheat in 2020 was Indonesia, importing 9.0 million tonnes. The country is completely reliant on imports to support domestic demand with the country being unable to produce wheat in its tropical climate (The Jakarta Post, 2013).

The USDA (undated) highlight that a significant portion of wheat is imported by countries with limited potential to produce the commodity, which are largely developing countries. "The largest growth markets for wheat imports include Africa – both North (Egypt, Algeria, and Morocco) and Sub-Saharan (Ethiopia, Kenya, Nigeria, South Africa,

and Sudan) – the Middle East (Iran, Jordan, Lebanon, Saudi Arabia, and Syria), and Southeast Asia (Indonesia, the Philippines, and Vietnam)" (USDA, Undated).

Figure 4.101. Top 5 Global Importers of Wheat, 1990 to 2020



Note: Import data for Egypt and Algeria are not available every year from the FAO.
Source: FAO (2022).

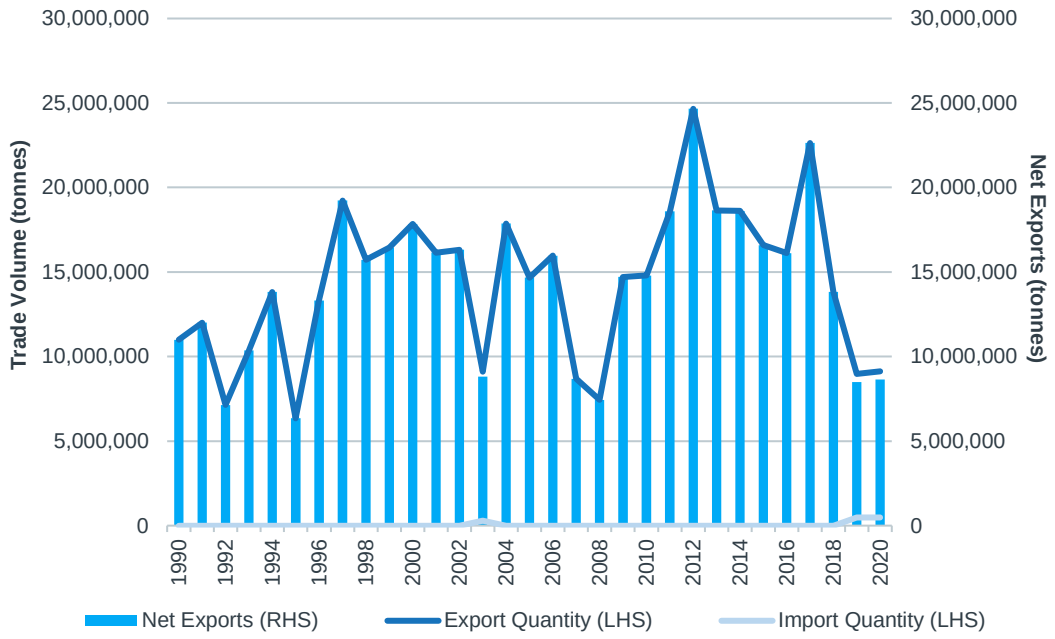
4.12.2 Export Markets

Australian Trade Balance

Of the total wheat production in Australia in 2020, approximately 63% was exported to global markets (equating to 9.1 million tonnes). Australia is a net exporter of wheat, with production in 2021-22 forecast to be the biggest yet (ABARES, undated).

ABARES (undated) highlight that "Prolonged poor seasonal conditions in Canada, the United States and the Russian Federation has meant that world supply of hard, high-protein milling wheat is significantly lower in 2021-22. Australian high-protein wheat is generally considered one of the best in the world and usually competes with Canadian and US wheat Exports".

Figure 4.102. Trade Balance Australia for Wheat, 1990 to 2020

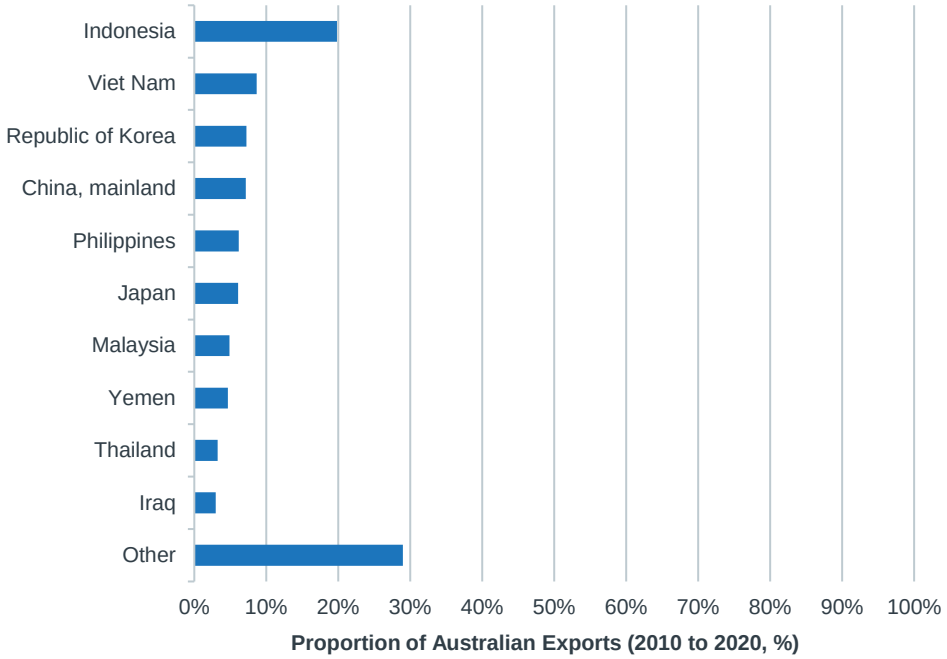


Source: FAO (2022).

Key Export Markets

From 2010 to 2020, Indonesia accounted to the largest portion of Australia's wheat exports on average (20%). This was followed by Vietnam which was estimated to account for 9% of Australia's wheat exports.

Figure 4.103. Key Export Markets for Australian Wheat (Top 10), 2010 to 2020



Source: FAO (2022).

Export Market Share

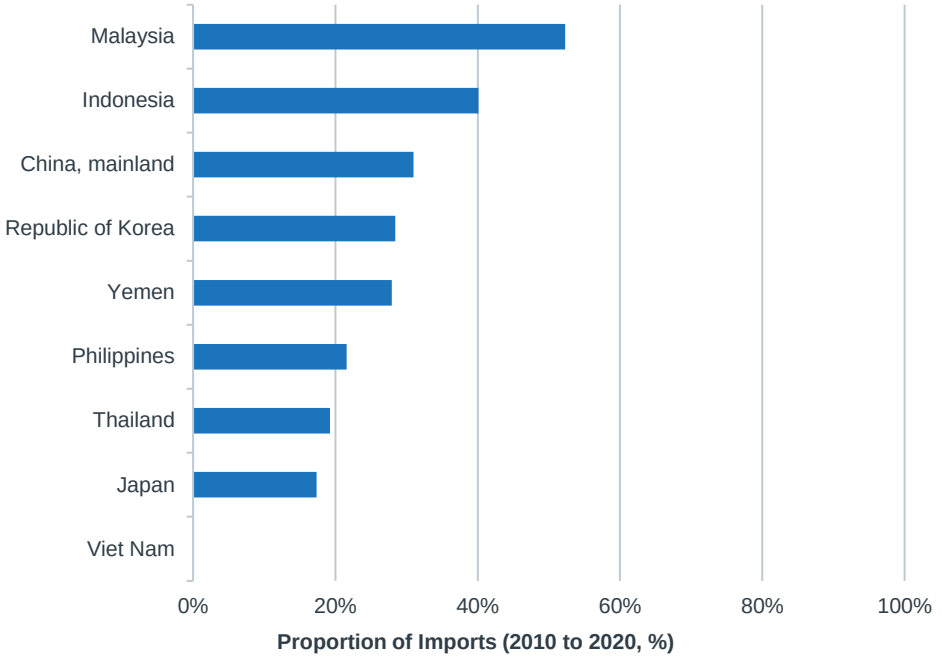
It must be noted that the detailed trade matrix data on the FAO does not include import and export volumes for Vietnam. Vietnam is a significant importer of Australian wheat and is the second largest export market for the country. *"Australia has been Vietnam's largest supplier of wheat for around 20 years. Since 2000, Australia usually supplied more than half of Vietnam's total wheat imports. In some years this was as high as 90%"* (AEGIC, 2021, p. 2).

The figure below highlights how much of Australia's wheat exports make up of each key market's imports from 2010 to 2020. As stated above, this figure excludes the consideration of Vietnam which is heavily reliant on wheat imports from Australia to meet domestic demand.

Indonesia was Australia's largest export market on average from 2010 to 2020, with imports of wheat from Australia accounting for 40% of the country's total imports from 2010 to 2020. This highlights that both Indonesia is largely reliant on Australia for wheat imports and Australia is largely reliant on Indonesia for wheat exports.

On the other hand, Malaysia has been Australia's 7th largest export market for wheat from 2010 to 2020. Malaysia is largely reliant on Australia for import of wheat with Australian imports accounting for 52% of the country's total wheat imports on average from 2010 to 2020.

Figure 4.104. Proportion of Australia's Exports make up to Total Key Imports (Australia's Top Export Markets)



Note: Vietnam has no recorded imports in the detailed trade matrix with FAO but represents one of Australia's largest export markets that is heavily reliant on Australian wheat to support domestic demand.
Source: FAO (2022).

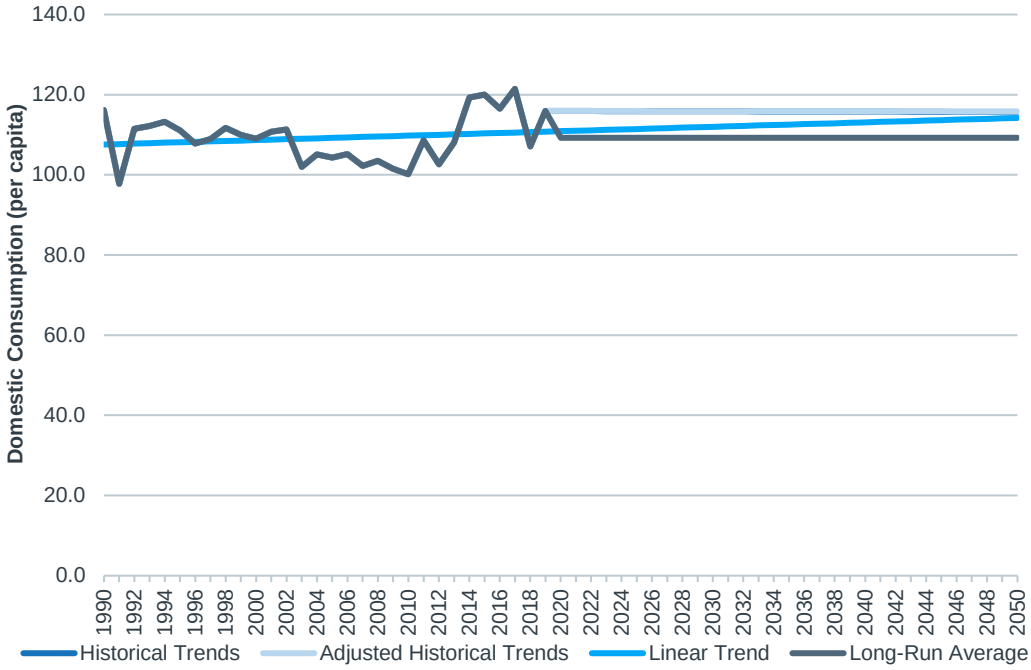
4.12.3 Consumption

Global Consumption

Wheat consumption on the global scale has remained relatively steady compared to consumption levels in Australia. Future domestic consumption of wheat on the global scale could reach between the long-run average (109.3 kilograms per capita) and the adjusted historical trends (115.8 kilograms per capita) in 2050.

Based on historical trends, there is a great potential that consumption will fall in line with the long-run average.

Figure 4.105. Domestic Consumption of Wheat for the Global Market, Excluding Australia, 1990 to 2050



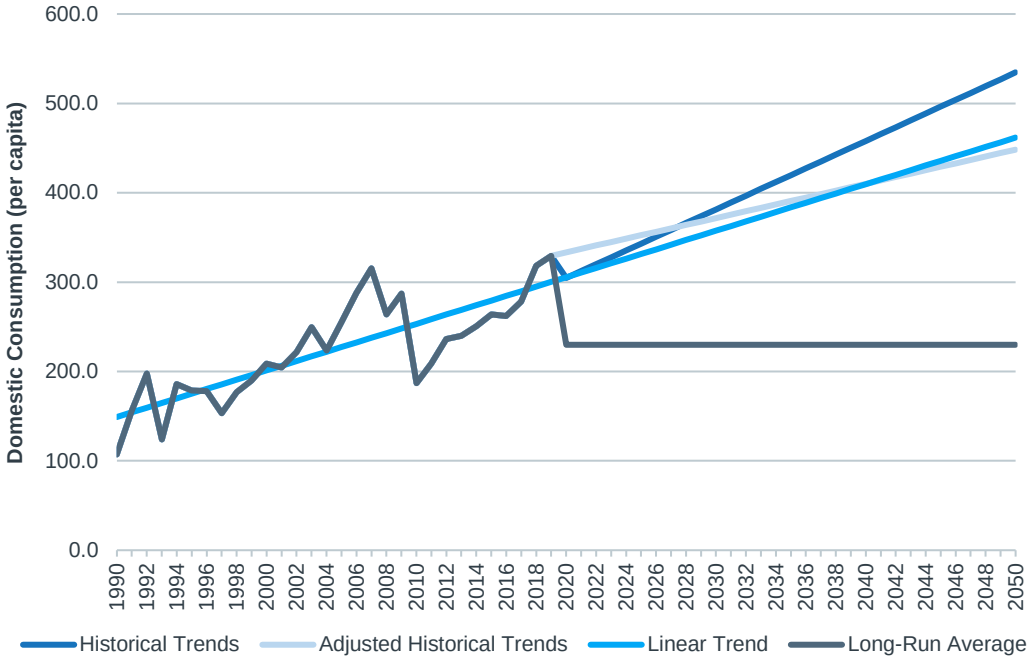
Source: FAO (2022), AEC.

Domestic Consumption

Four projection scenarios have been developed to highlight the potential projected domestic consumption per capita, per annum. Based on the historical domestic consumption trends for wheat in recent years, there is more potential for future domestic consumption to reach linear trend volumes.

Based on the linear trend volumes, consumption could total approximately 461.8 kilograms per capita in 2050.

Figure 4.106. Domestic Consumption of Wheat Per Capita, 1990 to 2050 (kilograms)

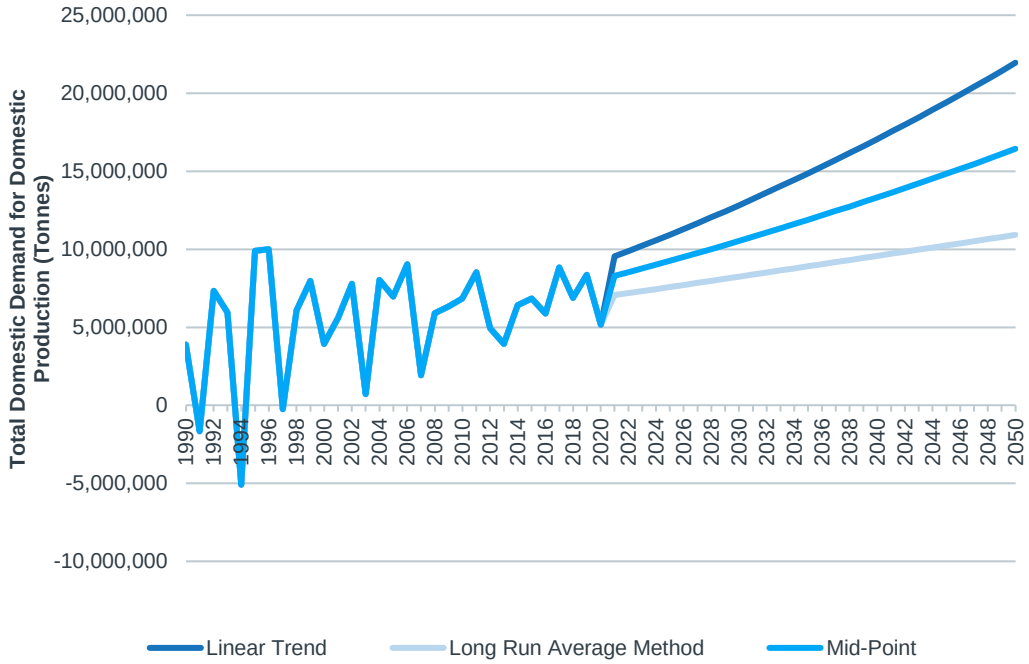


Source: FAO (2022), AEC.

Forecast Consumption in Domestic Market

Future domestic demand for domestic production could reach between the long-run average scenario at 10.9 million tonnes in 2050 or linear trends volumes at 21.9 million.

Figure 4.107. Total Domestic Demand for Domestic Wheat Production, 1990 to 2050

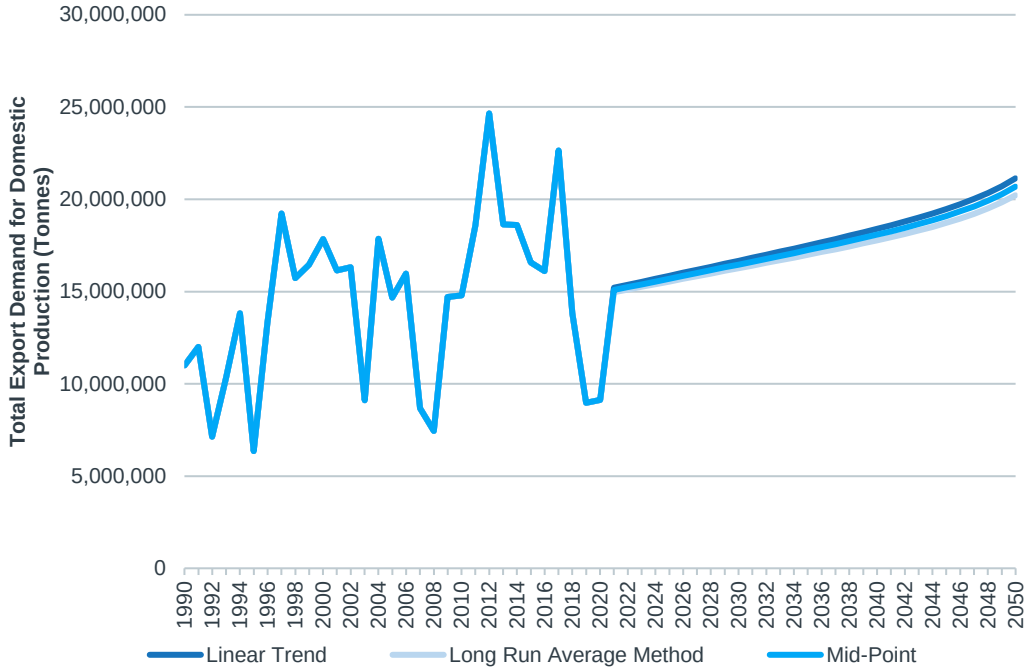


Source: FAO (2022), AEC.

Forecast Demand in Export Markets

Export demand for Australian Wheat has experienced volatility over the years, with significant decline in 2008 and 2008 and once again in 2018. Future export demand for domestic production could reach between the long-run average scenario at 20.2 million tonnes in 2050 or linear trend volumes at 21.1 million tonnes.

Figure 4.108. Total Export Demand for Domestic Production of Wheat, 1990 to 2050



Source: FAO (2022), AEC.

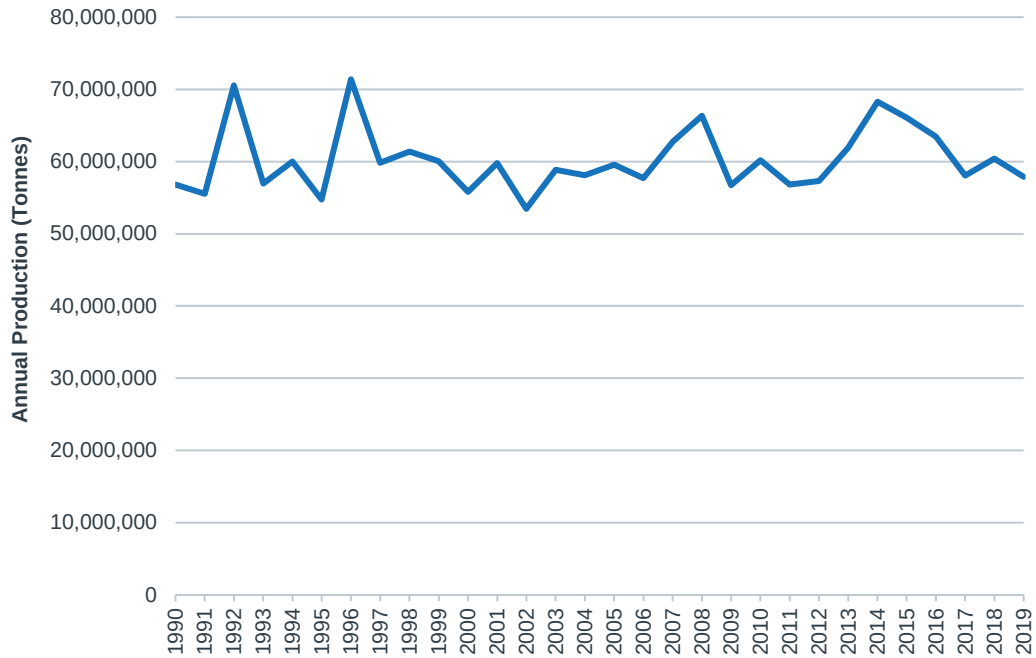
4.13 SORGHUM

4.13.1 Global Overview

Global Production

Global sorghum production has, on average, remained between 50-70 million tonnes per annum. In 2019 global sorghum production totalled approximately 57.9 million tonnes, increasing by an average annual rate of 0.1% per annum since 1990.

Figure 4.109. Global Sorghum Production, 1990 to 2019



Source: FAO (2021a).

Major Producers

The US is the largest global producer of sorghum in 2019, accounting for an average of 20% of total production from 1990. In 2019, the US produced approximately 8.7 million tonnes of sorghum, with production declining by an average rate of 1.8% per annum from 1990 to 2019.

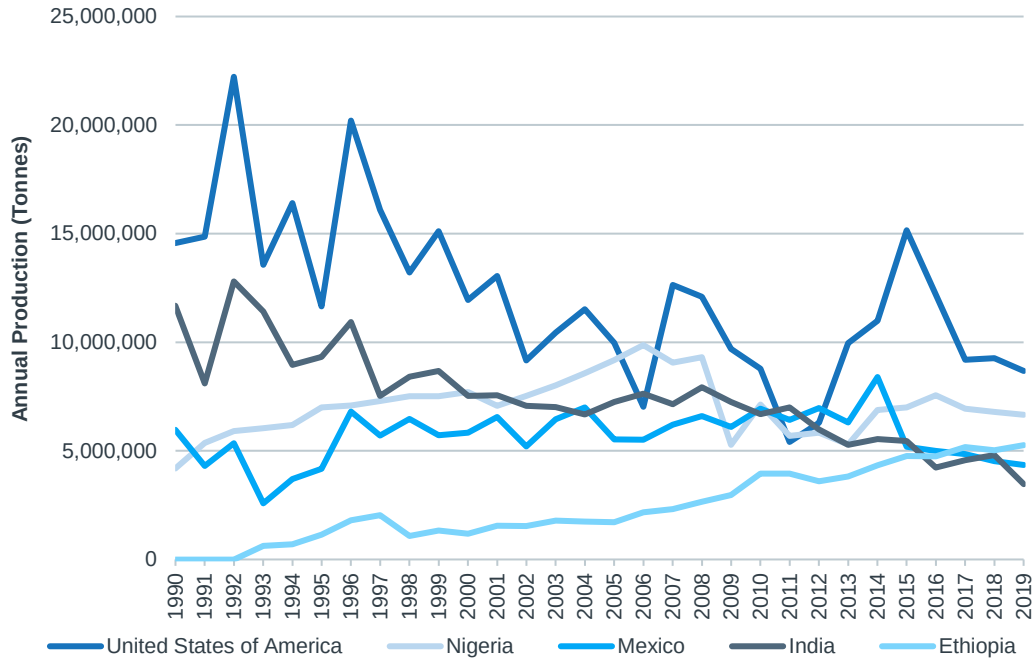
On average, the production of sorghum in the US has been on the decline since 1990. However, from 2013 to 2015, the US increased their production of sorghum which was largely driven by China wanting to use the commodity as livestock feed. This demand from China was driven by a substitute for domestically grown corn as the price of corn was higher than sorghum during that period (Hansen, J., Marchant, M., Zhang, W., & Grant, J, 2018).

The second largest global producer in 2019 is Nigeria, producing approximately 6.7 million tonnes of sorghum. In 2008-09 Nigeria experienced a decline in sorghum production of approximately 43%. This production decline is largely attributed to the reduction of area harvested and in part due to the declining yield levels (FAO, 2013 a). Additionally, local prices and demand for corn and soybean were experiencing an increase during this period of time (FAO, 2013 a).

Ethiopia is the world's third largest producer of sorghum as of 2019, producing approximately 5.3 million tonnes. Out of all top five global producers, Ethiopia has experienced the fastest growth in production, growing at an average annual rate of 8.2% since 2010. In this country, sorghum is a staple and the increase in production results from an average yield increase of 50% between 2004-05 and 2010-11 and an increase in sorghum area production of 51% (FAO, 2013 b).

The world's third and fourth largest producers, Mexico and India, have been experiencing an average annual decline of 1.1% and 4.1% on average per annum since 1990.

Figure 4.110. Top Five Global Producers of Sorghum, 1990 to 2019



Note:
- No data is available for Ethiopia between 1990-92.
- Note: Top five largest producers on average from 2010 to 2019.

Source: FAO (2021a).

Major Exporters

The US is by far the largest global exporter of sorghum, exporting approximately 2.8 million tonnes in 2019 (accounting for approximately 76% of total global exports). As stated above, the increase in US exports from 2013 to 2015 were largely driven by the demand from China for the use of livestock feed.

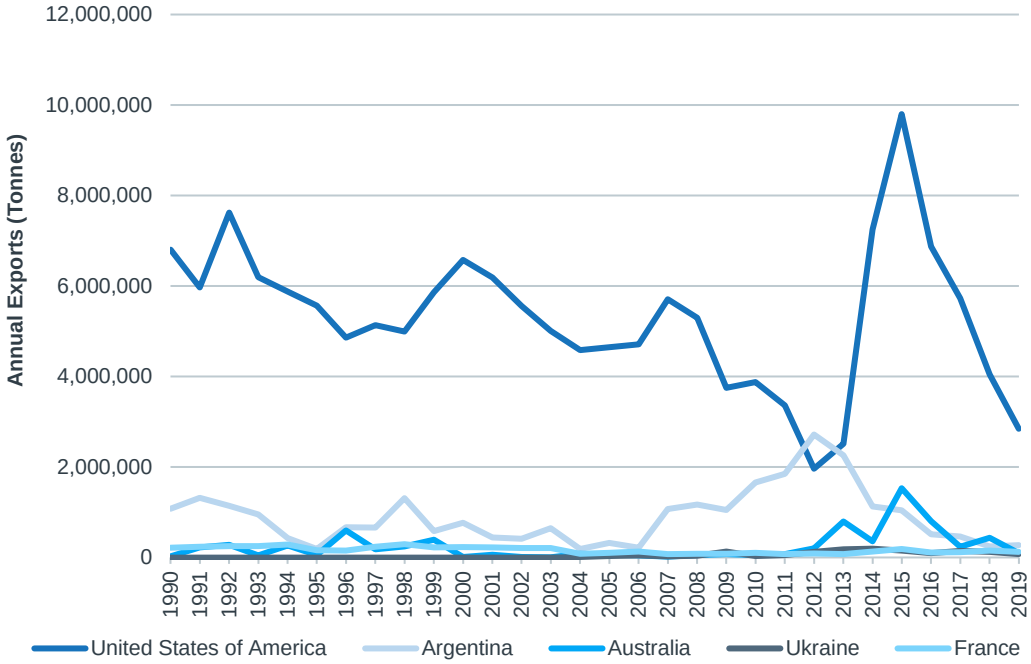
China's domestic corn priced were 1.5 times higher than the international market due to import restrictions with tariff-rate quotas and bans on unapproved genetically modified corn (Hansen, J, *et al*. 2018). Prior to 2012-13 the largest sorghum consuming markets did not include China, China has only emerged at the world's largest consumer in recent years (Hansen, J, *et al*. 2018). From 2016 onward the importance of sorghum began to decrease due to a number of reasons including (Hansen, J, *et al*., 2018):

- Large corn stockpiles
- Cheaper but limited corn imports from the world market
- Quality deterioration of Chinese corn stocks.

China changed its corn policy which resulted in a lower price for corn, subsequently increasing the countries domestic demand for corn. As a result, the demand for sorghum decreased significantly with corn being the substitute for livestock feed (Hansen, J, *et al*., 2018).

Argentina is the world's second largest exporter of sorghum, exporting approximately 270,000 tonnes in 2019. Exports from Argentina have been on the decline since 2012, declining by an average annual rate of 28% per annum from 2012 to 2019.

Figure 4.111. Top Five Major Exporters of Sorghum, 1990 to 2019



Note: Top five largest exporters on average from 2010 to 2019.
Source: FAO (2021a).

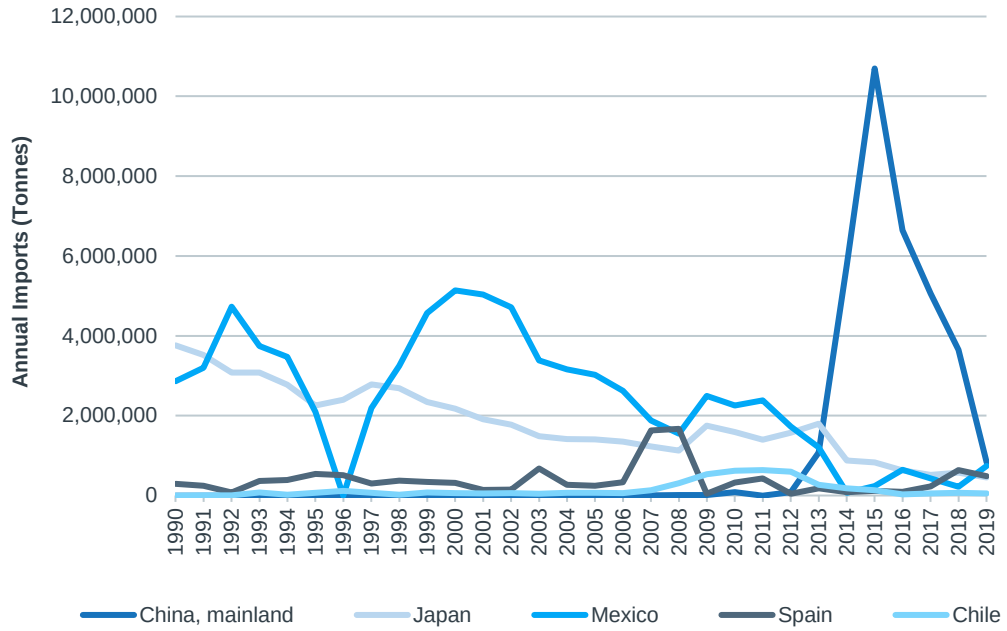
Major Importers

The largest importer of sorghum in 2019 was China, importing over 830,000 tonnes. China has not always been the largest importer or consumer of sorghum. Historically, Mexico was the largest importer up until 2012. As stated previously, the large spike and decline in China's sorghum imports from 2013-15 are a result of the higher price of corn which was the main commodity for livestock feed. The price of corn in China then lowered, and so too did China's demand for sorghum imports.

As the US increased its sorghum exports to China, exports to historically key countries including Japan and Mexico declined (Hansen, J, *et al*., 2018).

In 2019, China accounted for 25% of global sorghum imports, Mexico accounted for 22% and Spain accounted for 15%.

Figure 4.112. Top Five Importers of Sorghum, 1990 to 2019



Note:
- No Import data is available for Mexico in 1996.
- Top five largest importers on average from 2010 to 2019.

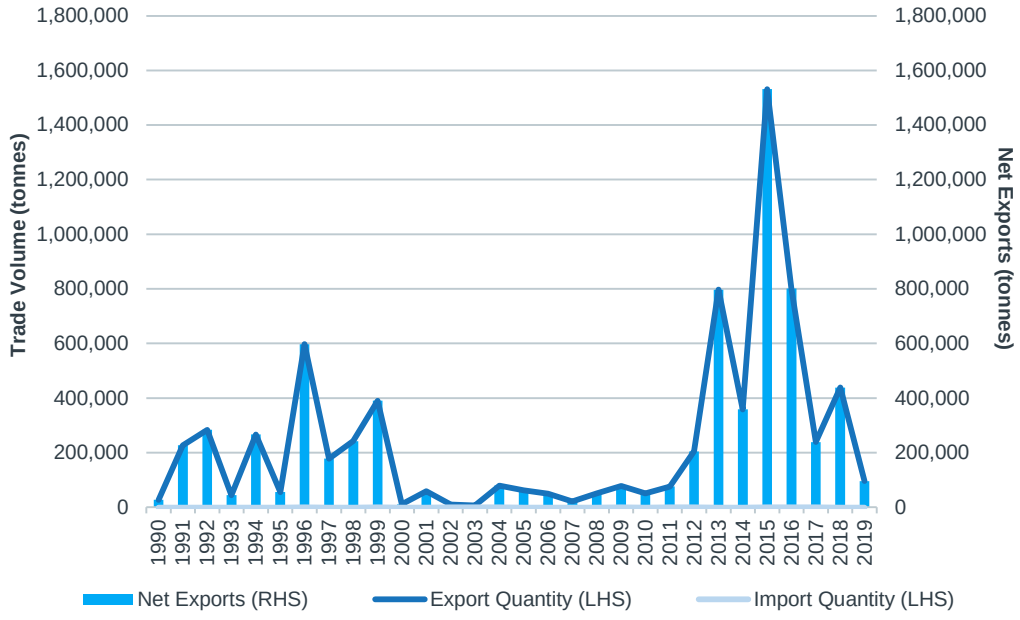
Source: FAO (2021a).

4.13.2 Export Markets

Australian Trade Balance

As of 2019, Australian sorghum exports totalled approximately 96,000 tonnes. Sorghum exports experienced a spike of 327% from 2014 to 2015, primarily driven by the boom in demand from China for sorghum. Exports to China between 2014-15 grew by 1.2 million tonnes and has since declined with the decline in demand from China as they switch to locally produced corn for livestock feed. Australia's imports of sorghum are close to zero, highlighting domestic production is sufficient to cover domestic consumption and demand.

Figure 4.113. Australia Trade Balance of Sorghum, 1990 to 2019

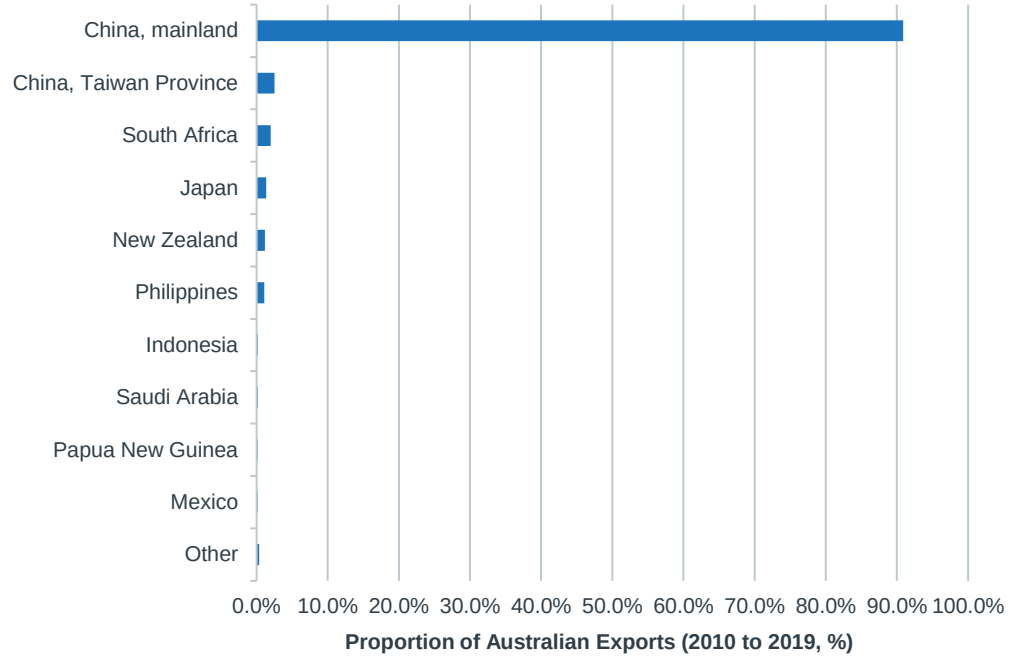


Source: FAO (2021a).

Key Export Markets

From 2010 to 2019 China was the largest importer of Australian sorghum, accounting for approximately 91% of Australia's total sorghum exports. The second largest importer of Australian sorghum is the Province of Taiwan, accounting for 2.5% of Australia's total exports on average from 2010 to 2019.

Figure 4.114. Key Export Markets for Australian Sorghum

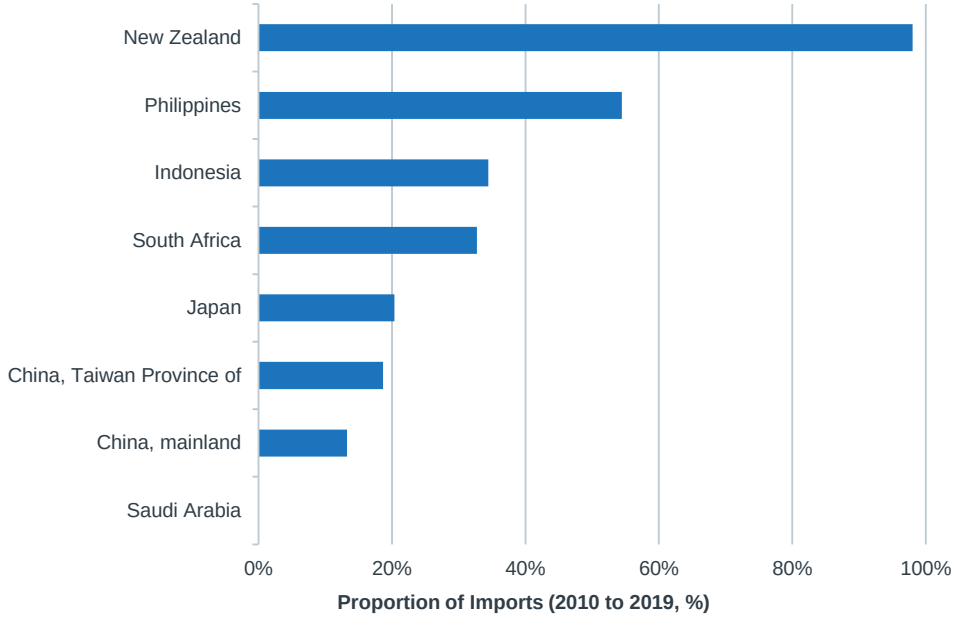


Source: FAO (2021a).

Export Market Share

From 2010 to 2019, 98.0% of New Zealand's total sorghum imports were from Australia (on average).

Figure 4.115. Proportion of Australia's Exports make up of Total Key Imports (Australia's Top 10 Export Markets)



Source: FAO (2021a).

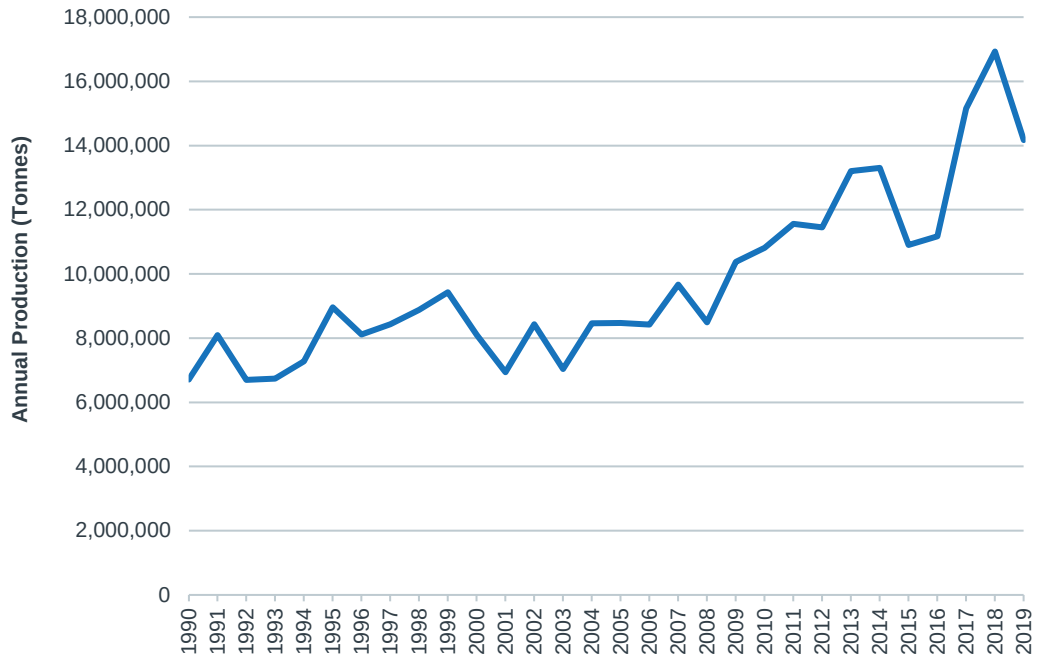
4.14 CHICKPEA

4.14.1 Global Overview

Global Production

In 2019, global chickpea production totalled approximately 14.2 million tonnes, having increased by an average annual rate of 2.6% per annum. Global production experienced relatively strong growth over 2016 and 2017, largely driven by production in Australia and India.

Figure 4.116. Global Production of Chickpeas, 1990 to 2019



Source: FAO (2021a), ABARES (2021b).

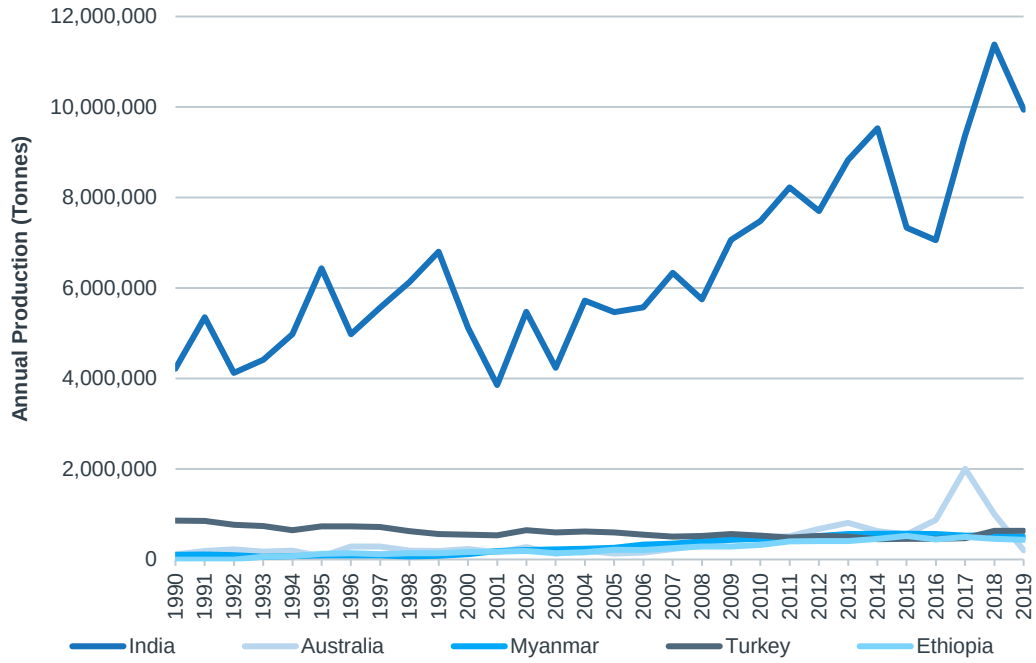
Major Producers

India has always been the most prominent producer of chickpeas on the global scale. In 2019, India produced 9.9 million tonnes of chickpeas, accounting for approximately 70% of the total global production. The second largest producer of chickpeas in 2019 was Turkey (630,000 tonnes), followed by Russia (506,166 tonnes) and Myanmar (499,438 tonnes).

Of significant note, Australia experienced a spike in chickpea production in 2017, peaking at a total of 2 million tonnes. In 2016, prices for chickpeas surged over the year due to a number of factors including an ordinary crop and shortages in India (Gunders, J., 2016). Australia exports majority of its chickpeas overseas (98% of total production in 2015), with India being the biggest export market in 2015 (The Guardian, 2016).

In 2016-17, India was the largest export market for Australia accounting for approximately 50% of gross value of exports (or $244 million) (DPI, 2020). This decreased to little over $95,000 in 2019-20 due to significant tariffs implemented by the Indian Government. In December 2017, India introduced a 30% tariff on imports of chickpeas and lentils to protect domestic prices and local farmers (Austrade, 2021). In June 2020 India reduced the tariff to approximately 10% for a period of three months following a rise in domestic prices (Austrade, 2021). The again in July 2021, India relaxed the tariff to 10% to keep domestic prices low (Forbes, L., & Beilharz, N., 2021).

Figure 4.117. Top Five Global Producers of Chickpeas, 1990 to 2019



Note:

- No data for Russia is available until 2016.
- Top five largest producers on average from 2010 to 2019.

Source: FAO (2021a), ABARES (2021b)..

India has increased its share of global production by around one percentage point from 1990, reflecting the country's increasing production. Over the same period, Australia, Myanmar, Ethiopia, US and Russia have experienced an increase in their share of global chickpea production.

Australia's share of the global market has grown by nearly two percentage points from 1990, reflecting the strong production over 2016.

Table 4.22. Top 10 Global Producers of Chickpeas

	Average % of Total Production		
Country	**From 1990**	**From 2000**	**From 2010**
India	66.5%	66.4%	67.5%
Australia	4.1%	4.7%	6.0%
Myanmar	3.0%	3.8%	4.1%
Turkey	6.2%	5.1%	4.0%
Ethiopia	2.5%	3.0%	3.4%
Pakistan	5.4%	4.8%	3.3%
United States of America	1.0%	1.3%	1.7%
Iran (Islamic Republic of)	2.5%	2.2%	1.6%
Russian Federation	0.6%	0.9%	1.4%
Mexico	1.9%	1.7%	1.4%
Other	6.3%	6.2%	5.5%
Total	**100.0%**	**100.0%**	**100.0%**

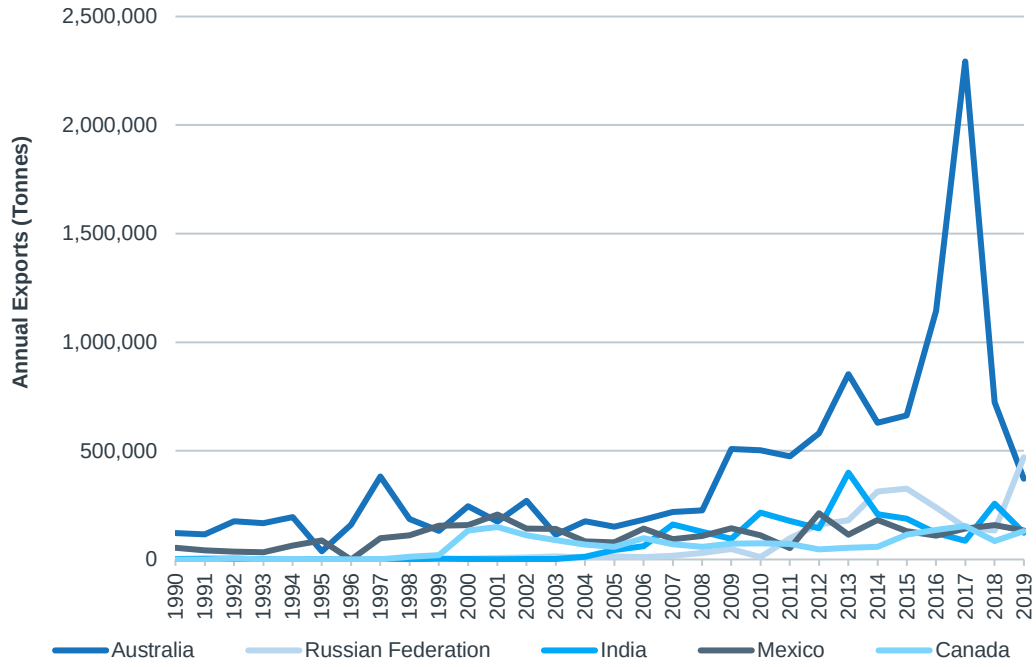
Source: FAO (2021a), ABARES (2021b).

Major Exporters

Australia has historically been the largest exporter of chickpeas as majority of the chickpeas grown are for export, with majority being sent to international markets (GWC Corporation, undated). The spike in exports over 2016 reflects the spike in domestic production.

Australia exports chickpeas to India, Pakistan, the UK and Canada (GWC Corporation, undated).

Figure 4.118. Top Five Major Exporters of Chickpeas, 1990 to 2019



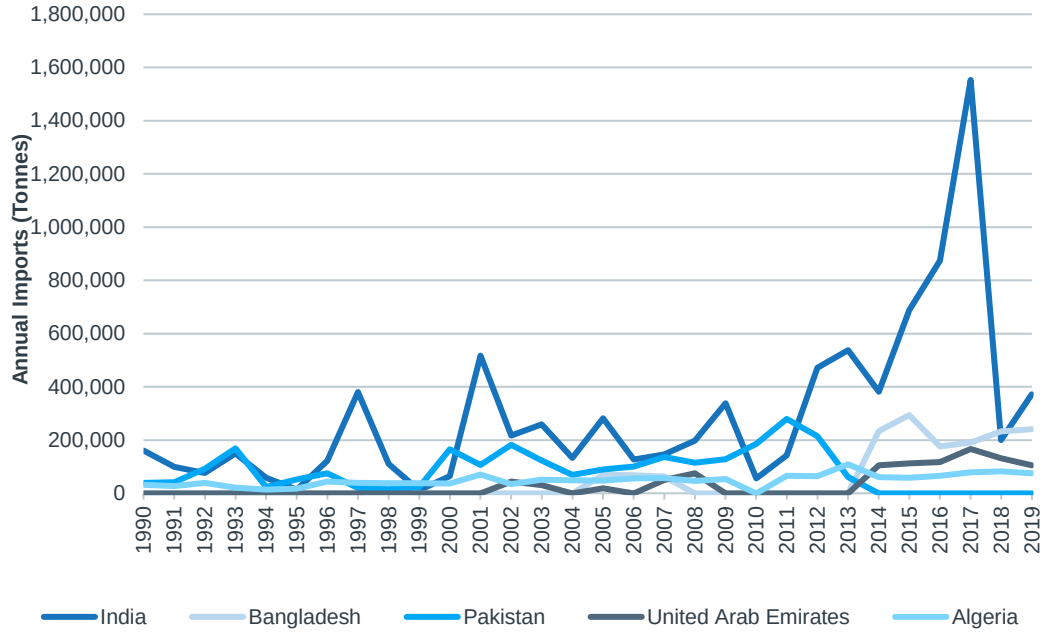
Note: Top five largest exporters on average from 2010 to 2019.
Source: FAO (2021a), ABARES (2021b).

Major Importers

In 2019, the largest importer of chickpeas was India, importing a total of 371,881 tonnes. Of important note, India's spike in imports over 2016 reflects Australia's spike in exports.

The second most prominent importer of chickpeas in 2019 was Bangladesh, importing around 241,000 tonnes.

Figure 4.119. Top Five Major Importers of Chickpeas, 1990 to 2019



Note:
- FAO import data for Egypt in 2019 has been excluded as the results were significantly varied compared to historical import volumes.
- Note: Top five largest importers on average from 2010 to 2019.

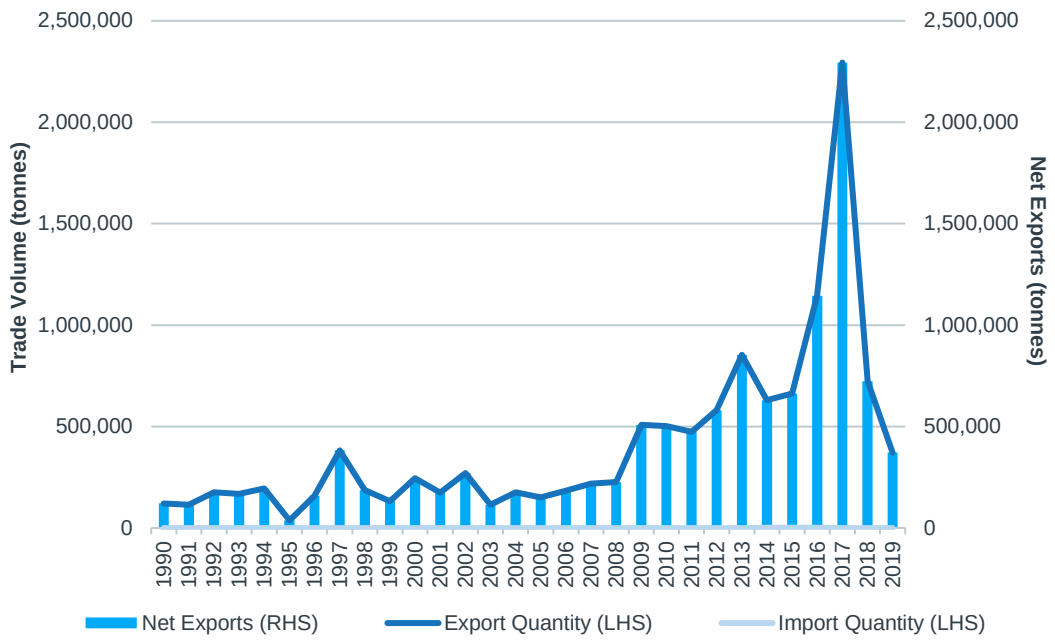
Source: FAO (2021a), ABARES (2021b).

4.14.2 Export Markets

Australian Trade Balance

In 2019 Australia exported more chickpeas than it produced. As stated above, this could result from storage and holding patterns for the commodity.

Figure 4.120. Trade Balance Australia of Chickpeas, 1990 to 2019

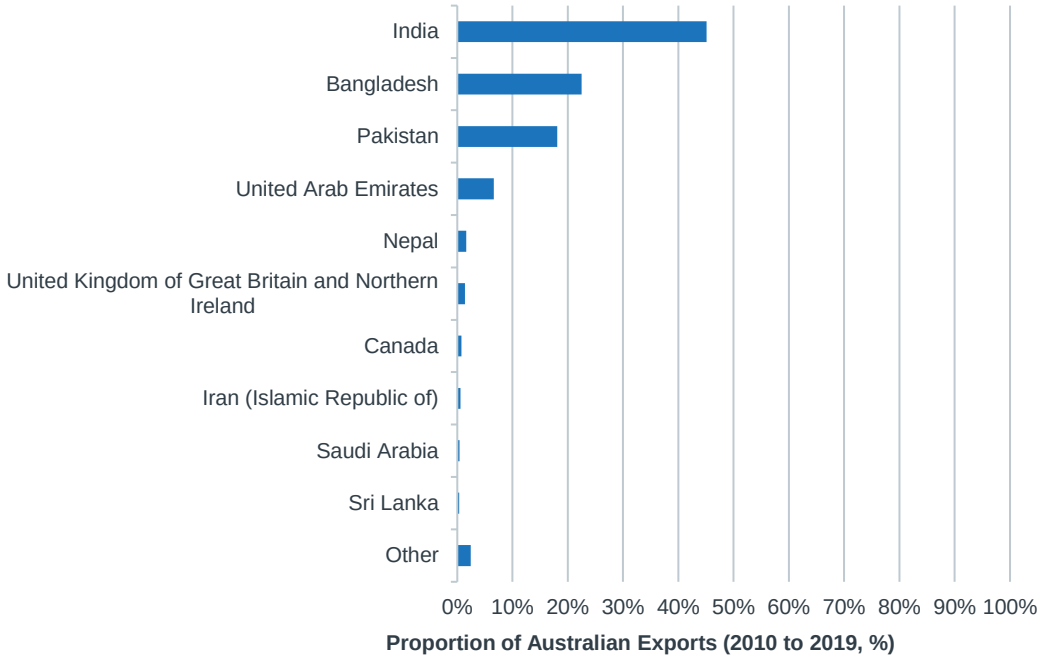


Source: ABARES (2021 b).

Key Export Markets

From 2010 to 2019, India accounted for 45.1% of Australia's total chickpea exports. Bangladesh was Australia's second largest export market for chickpeas, accounting for an average of 22.5% of exports from 2010 to 2019.

Figure 4.121. Key Exports Markets for Australia (Top 10) (Chickpeas)



Source: FAO (2021a).

The tables below highlight Australia's top chickpea export markets and their import seasonality for their largest chickpea imports (i.e., India is Australia's largest market for chickpea exports, but they also source chickpeas from Tanzania).

Table 4.23. India Chickpea Import Seasonality

Country	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Australia												
Tanzania												
Availability	High											

Source: Tridge (undated), Pulse Australia (2019).

Table 4.24. Bangladesh Chickpea Import Seasonality

Country	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Australia												
Myanmar												
India												
Availability	High											

Source: Australian Centre for International Agricultural Research (2017), Pulse Australia (2019).

Table 4.25. Pakistan Chickpea Import Seasonality

Country	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Australia												
Russia												
United States												
Canada												
Availability	High											

Source: Pulse Australia (2019), CEPII (2019).

Table 4.26. United Arab Emirates Chickpea Import Seasonality

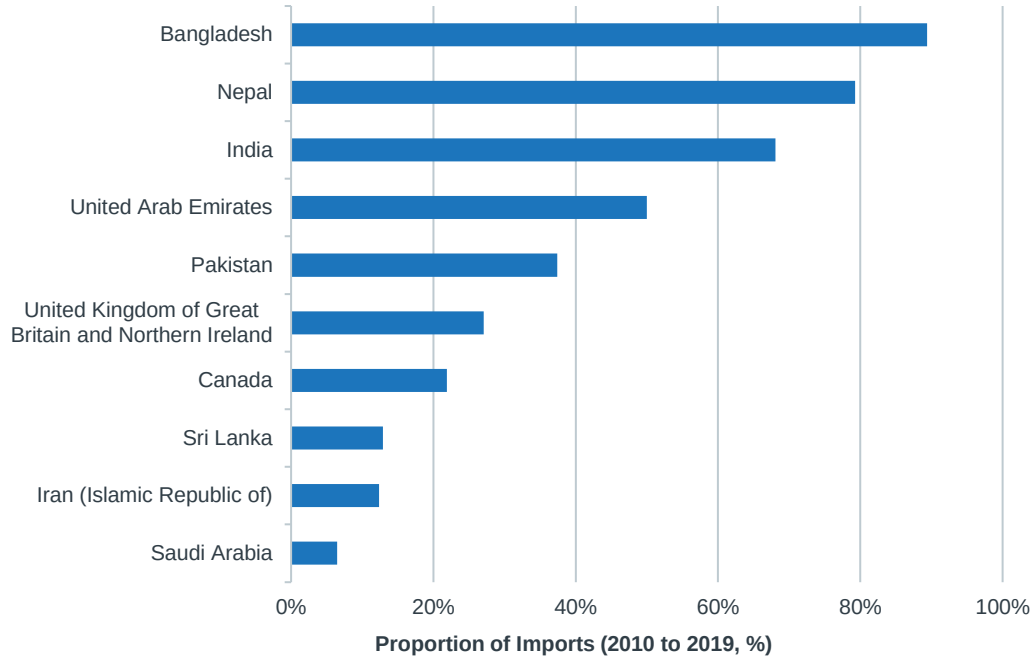
Country	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Australia												
Mexico												
India												
Canada												
Availability	High											

Source: Brad (2020), CEPII (2019).

Export Market Share

The figure below highlights how much of Australia's chickpea exports make up of each key market's imports on average from 2010 to 2019. Of Bangladesh's total chickpea imports, it is estimated that the country sourced approximately 89.4% of its chickpeas from Australia over 2010 to 2019.

Figure 4.122. Proportion of Australia's Exports make up of Total Key Imports (Chickpeas) (Australia's Top 10 Export Markets)



Source: FAO (2021a).

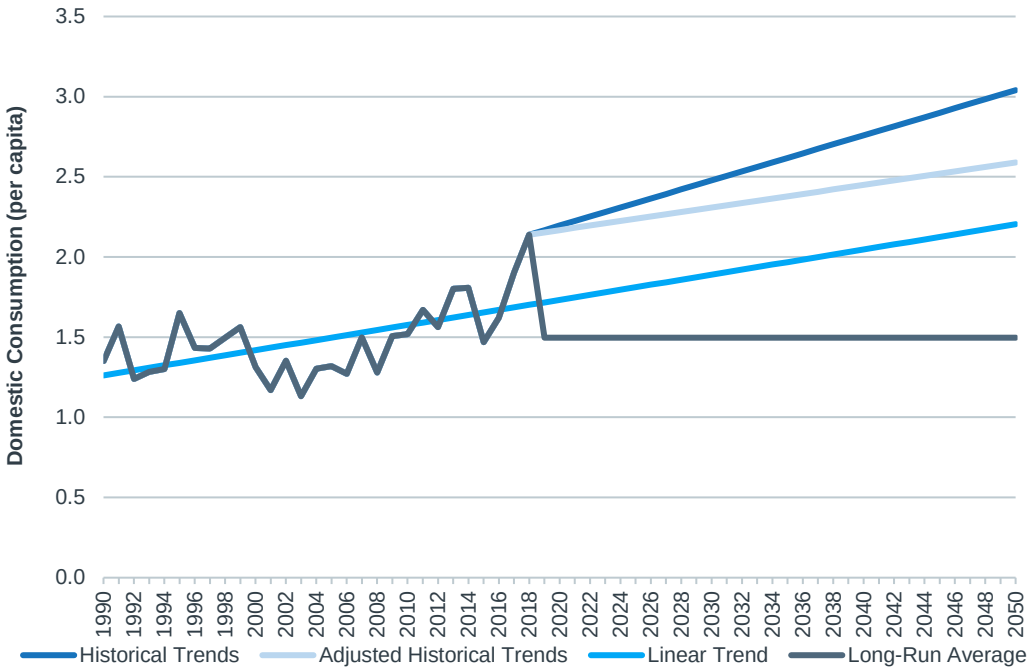
4.14.3 Consumption

Global Consumption

Historically, chickpea consumption on the global scale has been growing at a steadier rate than the consumption in Australia. Based on the historic consumption trends on a global scale, there is more potential for future domestic consumption to reach linear volumes in 2050.

Based on the linear trend volumes, consumption could total approximately 2.2 kilograms per capita in 2050.

Figure 4.123. Domestic Consumption for Global Market (Chickpeas), excluding Australia, 1990 to 2050



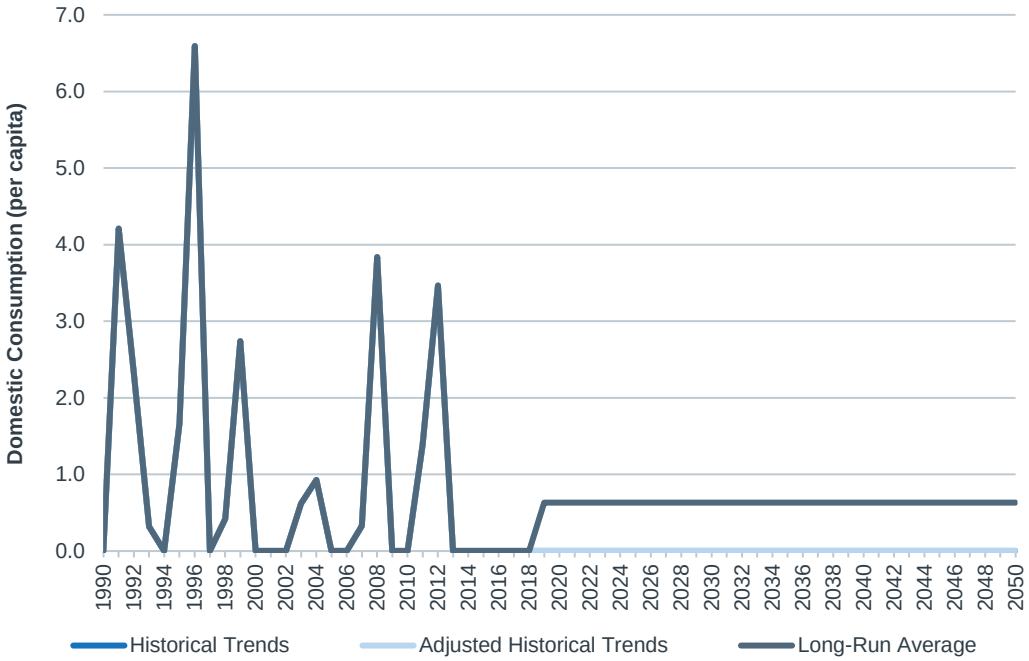
Source: FAO (2021a), AEC.

Domestic Consumption

Based on the historical domestic consumption trends for chickpeas in recent years, there is more potential for future domestic consumption to reach long-run average volumes in 2050.

Based on the long-run average trend volumes, consumption could total approximately 1.0 kilograms per capita in 2050.

Figure 4.124. Domestic Consumption Per Capita (Chickpeas), 1990 to 2050 (kilograms)



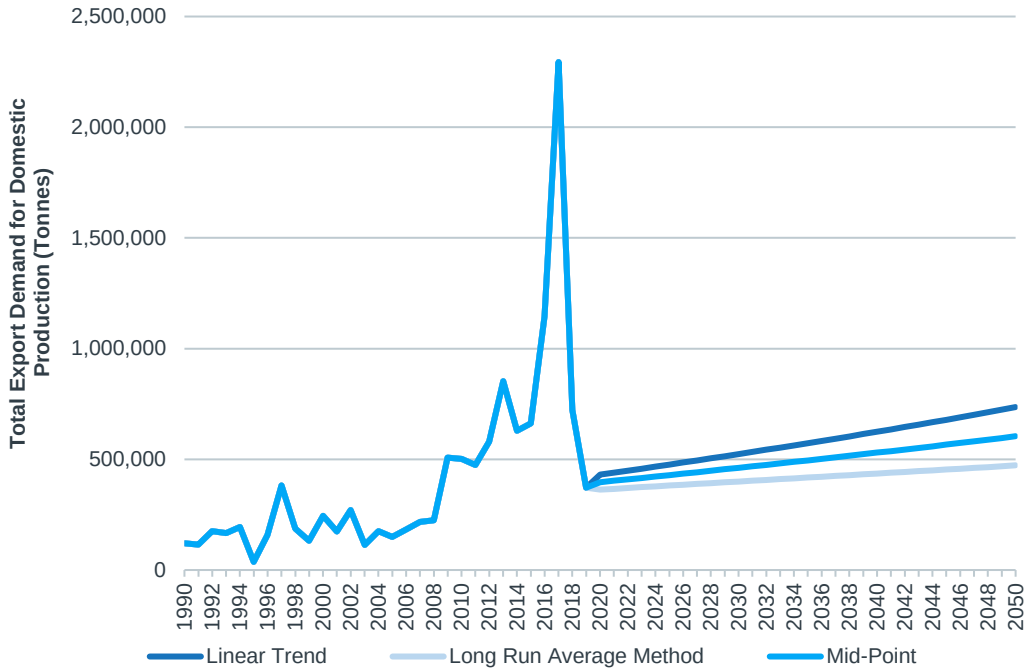
Source: FAO (2021a), AEC.

Forecast Consumption in Export Markets

Export demand for Australian chickpeas experienced significant growth up until 2017, with export demand for domestic production peaking at a total of 2.3 million.

Future export demand for domestic production could reach between the long-run average scenario at 473,048 tonnes in 2050 or linear trend volumes in 2050 at 736,055 tonnes.

Figure 4.125. Total Export Demand for Domestic Production (Chickpeas), 1990 to 2050



Source: FAO (2021a), AEC.

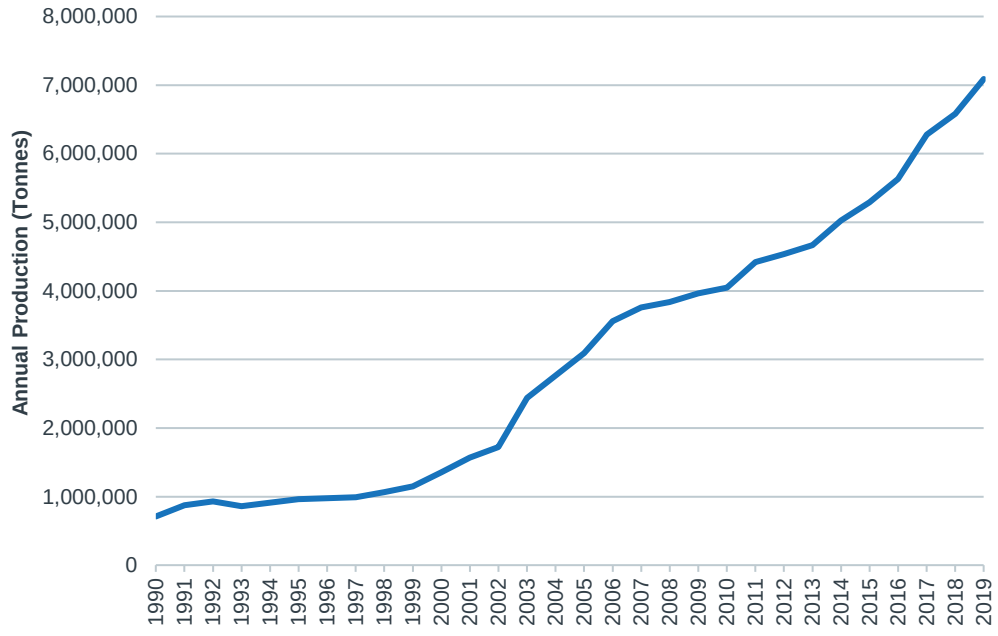
4.15 PRAWNS (INCL SHRIMP)

4.15.1 Global Overview

Global Production

Global shrimp and prawn production in 2019 totalled approximately 7.1 million tonnes, increasing by an average annual rate of 8.3% per annum from 1990 to 2019. Shrimp and prawn production is largely driven by the largest producer, China.

Figure 4.126. Total Global Production of Shrimps and Prawns, 1990 to 2019



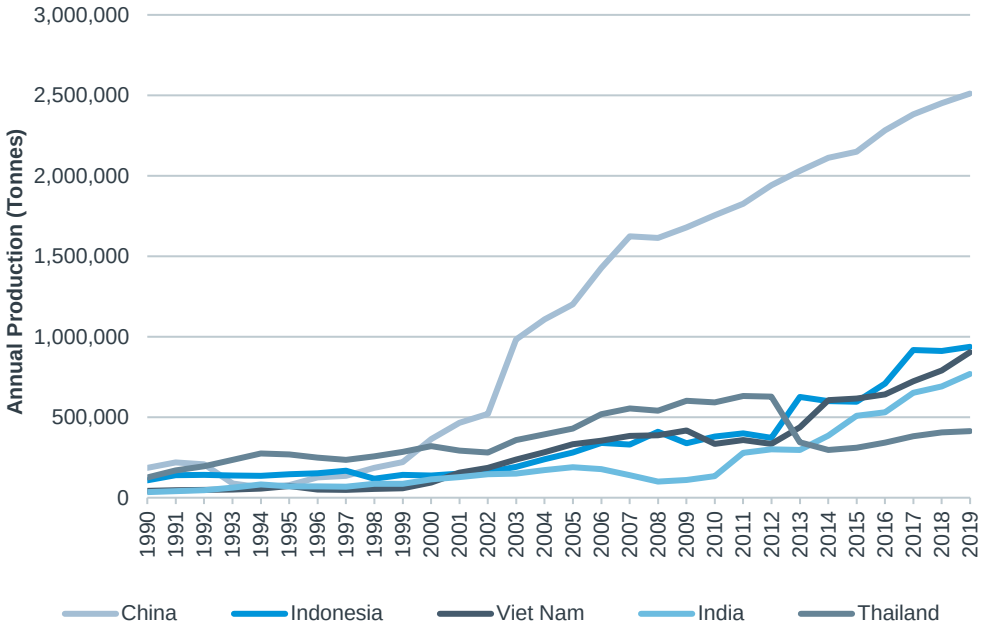
Source: FAO (2021b).

Major Producers

China emerged as the largest producer of shrimps and prawns from 2000 and has been the largest global producer even since. Since 2000, production of shrimp and prawns increased significantly, partially due to the development of large-scale farming of Vannamei shrimp (Roda International, 2020).

The second most prominent producer of shrimps and prawns in 2019 was Indonesia, producing 937,200 tonnes. This was closely followed by Vietnam who was estimated to produce 903,129 tonnes of shrimp and prawns in 2019.

Figure 4.127. Top Five Global Producers of Shrimps and Prawns, 1990 to 2019



Note: Top five largest producers on average from 2010 to 2019.
Source: FAO (2021b).

From 1990, China's average share of total production has experienced a 2.8 percentage point increase from 1990. Thailand on the other hand experienced the largest decrease in their average share of total production.

Table 4.27. Top 10 Global Producers of Shrimps and Prawns (+ Australia)

Country	Average % of Total Production		
	From 1990	From 2000	From 2010
China	37.3%	39.7%	40.0%
Indonesia	11.4%	11.1%	12.0%
Viet Nam	10.0%	10.5%	10.7%
India	7.3%	7.3%	8.5%
Thailand	12.0%	10.6%	8.1%
Ecuador	6.7%	6.1%	7.3%
Bangladesh	2.7%	2.5%	2.4%
Mexico	2.4%	2.5%	2.2%
Brazil	1.4%	1.5%	1.1%
Philippines	1.8%	1.2%	1.1%
Australia	0.1%	0.1%	0.1%
Other	6.9%	6.8%	6.2%
Total	**100.0%**	**100.0%**	**100.0%**

Source: FAO (2021b).

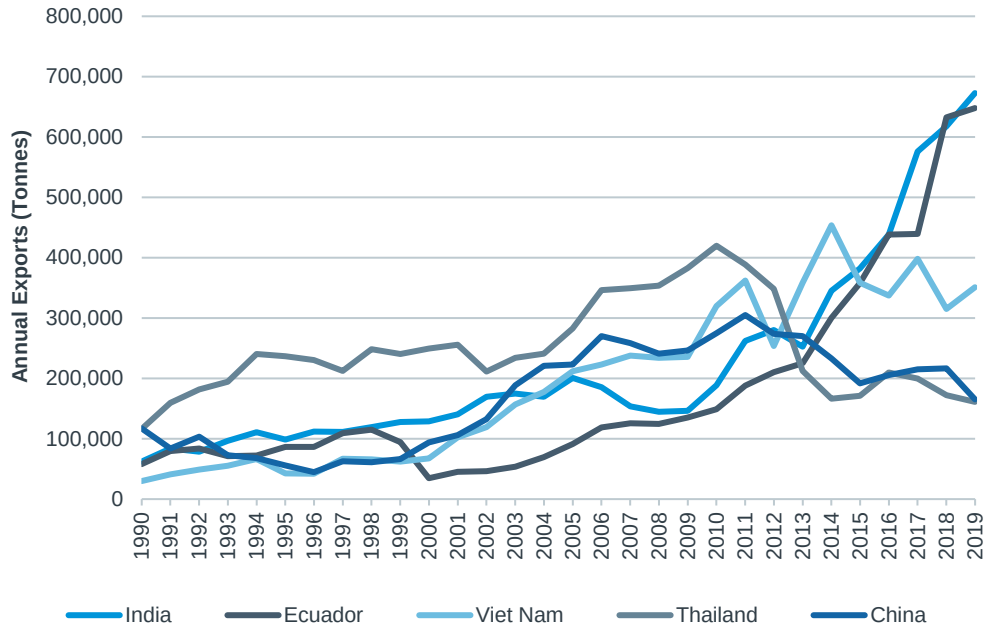
Major Exporters

From 1990 to 2019, global export of shrimps and prawns has experienced a 4.3% increase on average per annum. In 2019, global exports totalled approximately 3.3 million tonnes, largely driven by both India and Ecuador.

In 2019, India was the largest exporter of shrimps and prawns, exporting a total of 672,812 tonnes. Exports in India have experienced relatively strong growth over the years, increasing by an average of 8.6% per annum from 1990 to 2019. Growth in exports have increased at a faster rate over the last 10 years, increasing by an average annual rate of 15.2% through to 2019.

Ecuador was the second most prominent exporter of shrimps and prawns in 2019, exporting a total of 647,797 tonnes. Exports in Ecuador have increased by an average annual rate of 17.2% per annum from 2010 to 2019.

Figure 4.128. Top Five Global Exporters of Shrimps and Prawns, 1990 to 2019



Note:
- Excluding re-exports
- Top five largest exporters on average from 2010 to 2019.

Source: FAO (2021b).

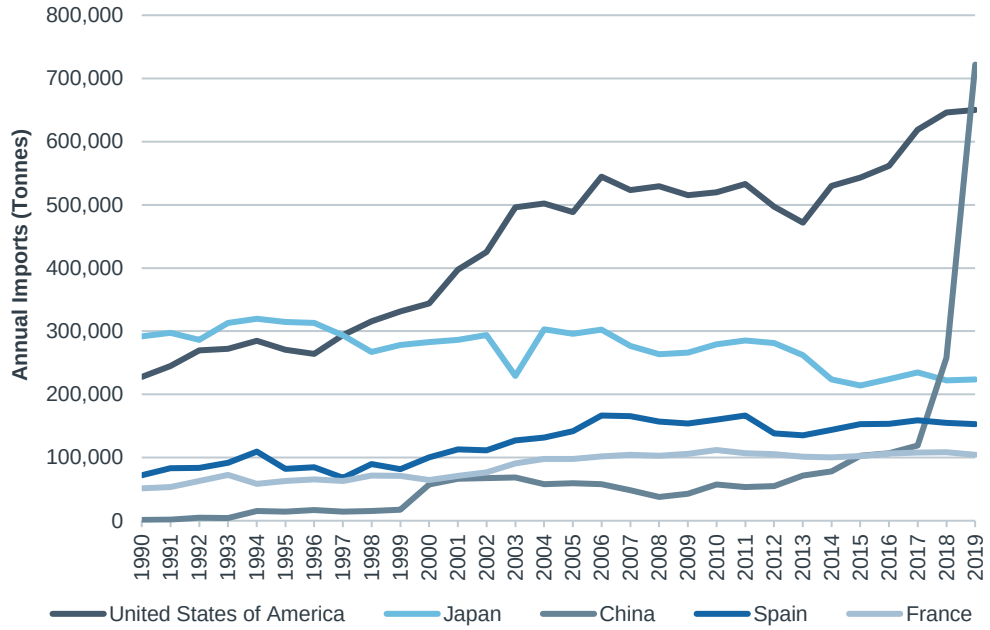
Major Importers

Global shrimp and prawn imports in 2019 totalled little over 3.1 million tonnes, increasing by an average annual rate of 3.7% from 1990 to 2019.

Historically, the US was the largest importer of shrimps and prawns, however in 2019 China surpassed the US as the largest importer after a large spike in imports from 2017 to 2019, due to the ASF outbreak impacting local pork production. In 2019, imports of shrimps and prawns totalled 721,962 tonnes.

In 2019, the US was the second most prominent importer of shrimps and prawns, importing an estimated 650,230 tonnes.

Figure 4.129. Top Five Global Importers of Shrimps and Prawns, 1990 to 2019



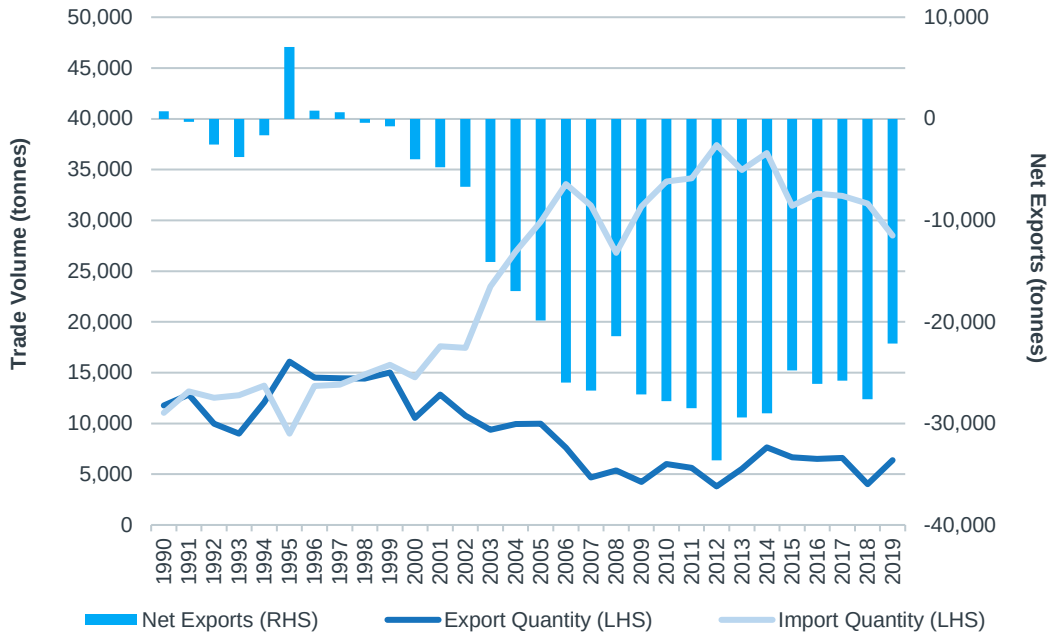
Note: Top five largest importers on average from 2010 to 2019.
Source: FAO (2021b).

4.15.2 Export Markets

Australian Trade Balance

In 2019, total shrimp and prawn exports were estimated at 6,363 tonnes, while imports were estimated to total 28,494 tonnes. This import and export quantity leaves net exports at -22,131 tonnes. Typically, Australia imports more shrimps and prawns than it exports.

Figure 4.130. Trade Balance Australia (Shrimps and Prawns), 1990 to 2019

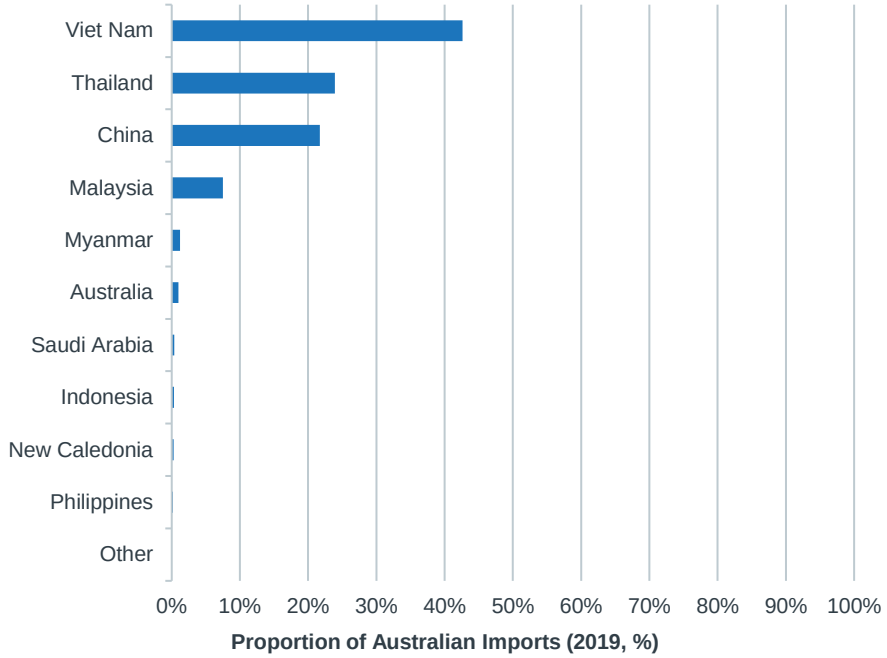


Source: FAO (2021b).

Key Import Markets

As seen above, Australia is largely a net importer of shrimps and prawns. In 2019, Australia sourced nearly 43% of its total shrimp and prawn imports from Vietnam. Thailand was Australia's second largest market for shrimp and prawn imports, with imports from Thailand totalling an estimated 24% in 2019.

Figure 4.131. Key Import Markets for Australia (Top 10), 2019 (Shrimps and Prawns)

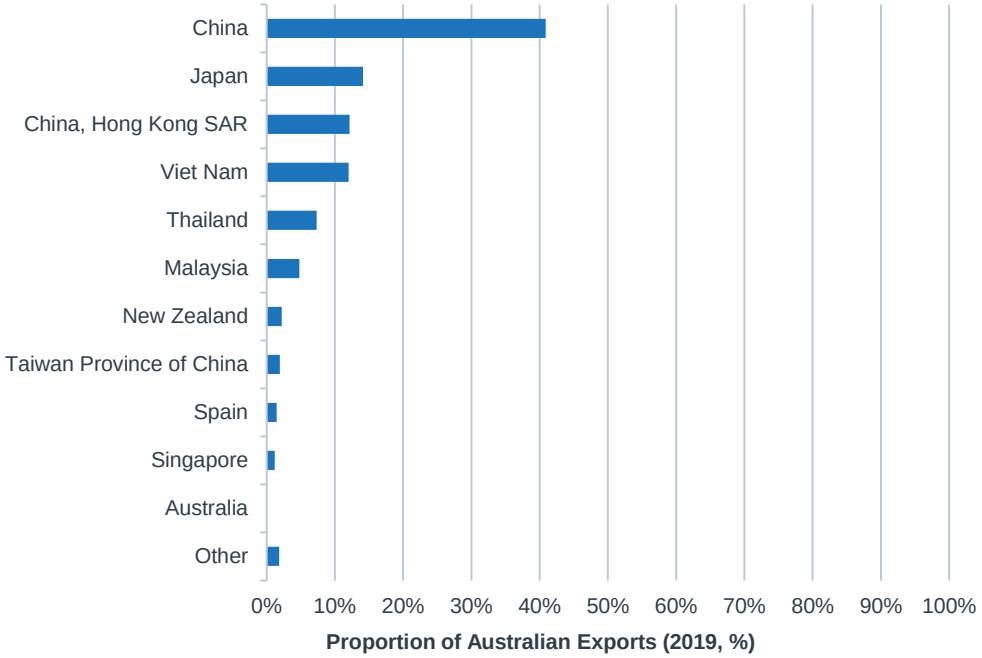


Source: FAO (2021b).

Key Export Markets

In 2019, China accounted for 40.9% of Australia's shrimp and prawn exports. Japan was Australia's second largest export market for shrimps and prawns, accounting for an average of 14.1% of exports in 2019.

Figure 4.132. Key Exports Markets for Australia (Top 10), 2019 (Shrimps and Prawns)

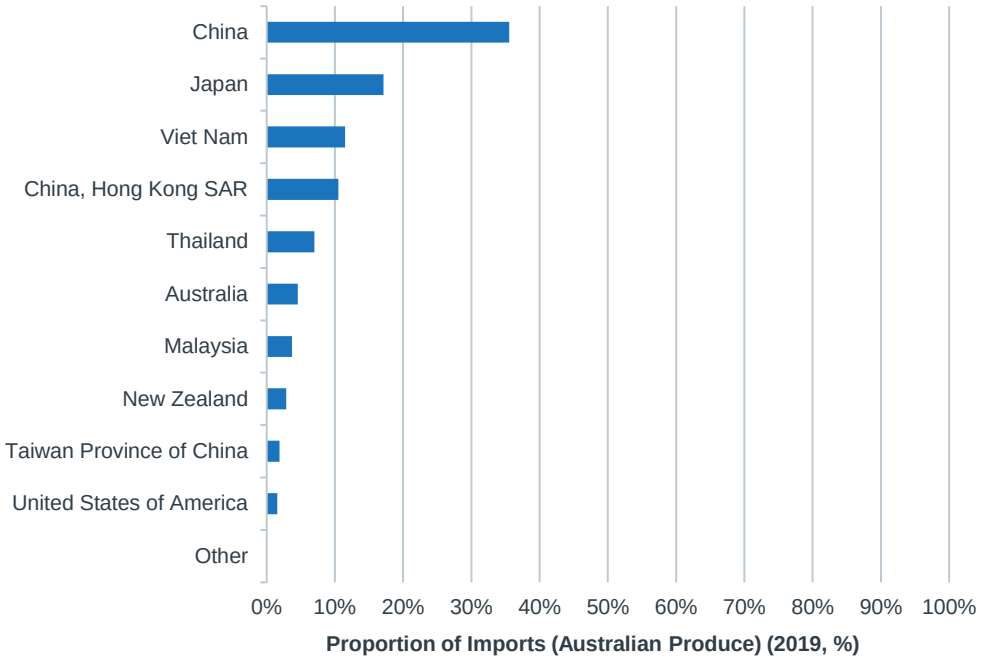


Source: FAO (2021b).

Export Market Share

The figure below highlights how much of Australia's shrimp and prawn exports make up of each key market's imports in 2019. China was Australia's largest export market for shrimps and prawns, with China's imports from Australia accounting approximately 35% of total imports.

Figure 4.133. Proportion of Australia's Exports make up of Total Key Imports (Shrimps and Prawns) (Australia's Top Export Markets)



Source: FAO (2021b).

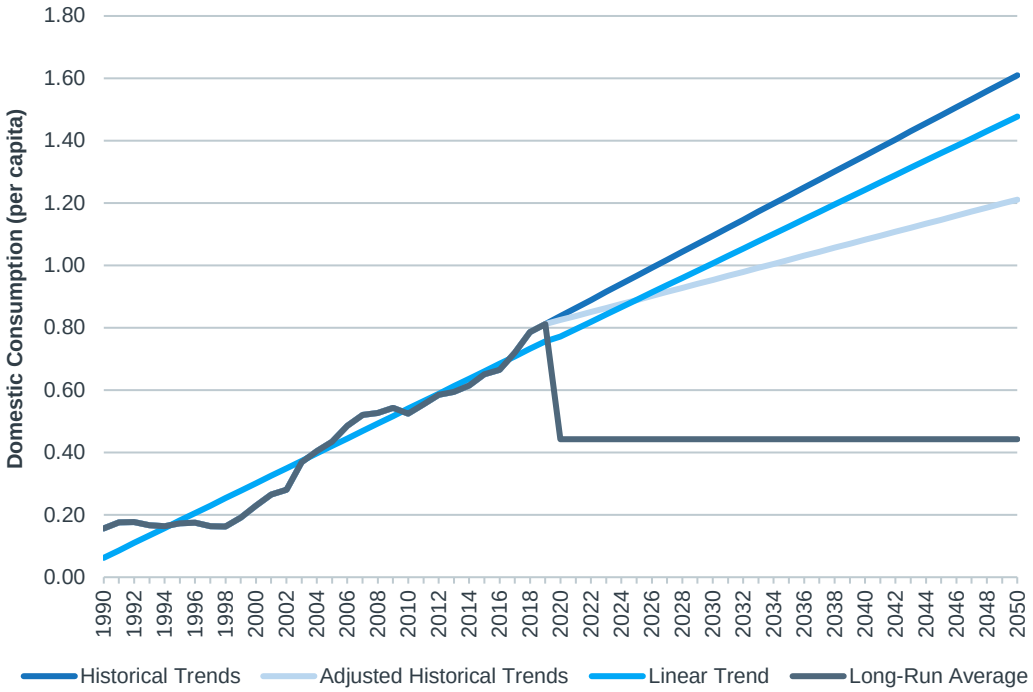
4.15.3 Consumption

Global Consumption

Based on the historic consumption trends on a global scale, there is more potential for future domestic consumption of shrimps and prawns to reach historical trend volumes in 2050.

Based on the historical trend volumes, consumption could reach 1.6 kilograms into 2050.

Figure 4.134. Domestic Consumption for Global Market (Shrimps and Prawns), excluding Australia, 1990 to 2050

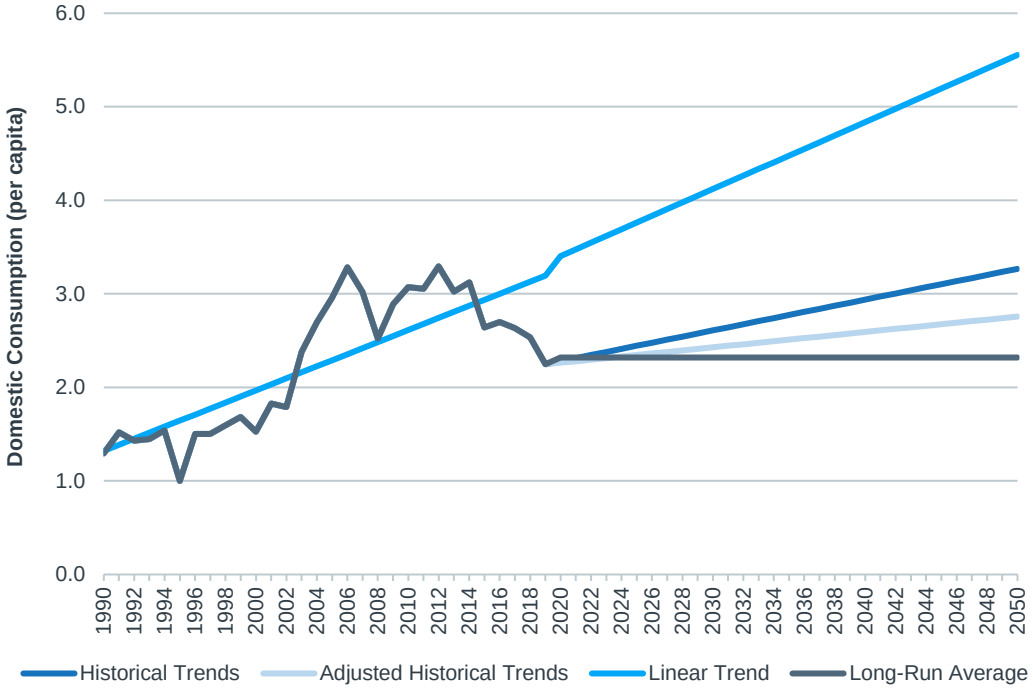


Source: FAO (2021b), AEC.

Domestic Consumption

Based on the linear trend volumes, consumption could total approximately 5.6 kilograms per capita in 2050.

Figure 4.135. Domestic Consumption Per Capita (Shrimps and Prawns), 1990 to 2050 (kilograms)



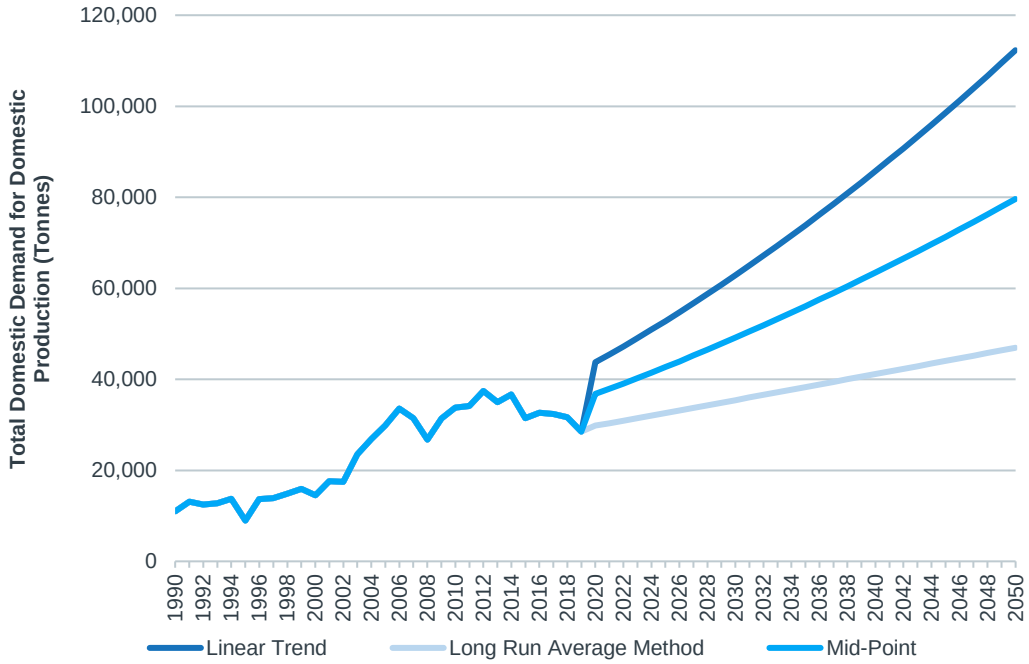
Source: FAO (2021b), AEC.

Forecast Consumption in Domestic Markets

Future domestic demand for domestic production could reach between the long-run average scenario at 46,954 tonnes in 2050 or the linear trend volumes in 2050 at 112,316 tonnes. Based on historical trends, there is more

potential for the future domestic demand for domestic production of shrimp and prawns to fall in line with the mid-point scenario.

Figure 4.136. Total Domestic Demand for Domestic Shrimp and Prawn Production, 1990 to 2050

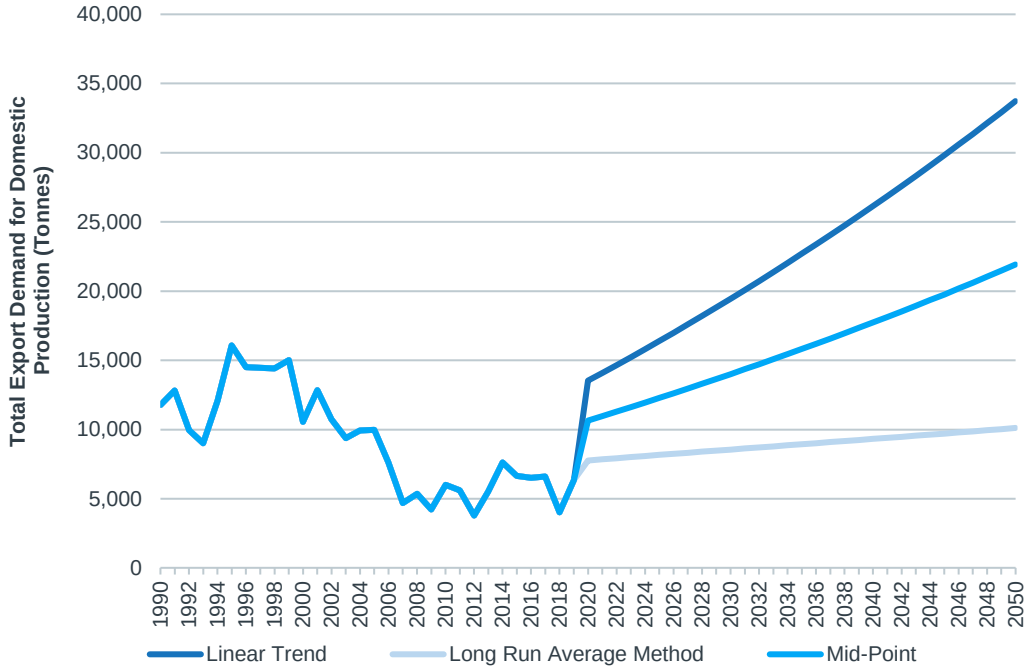


Source: FAO (2021b), AEC.

Forecast Consumption in Export Markets

Future export demand for domestic production of shrimps and prawns could reach between the long-run average scenario at 10,109 tonnes in 2050 or linear trend volumes in 2050 at 33,722 tonnes.

Figure 4.137. Total Export Demand for Domestic Production (Shrimps and Prawns), 1990 to 2050



Source: FAO (2021b), AEC.

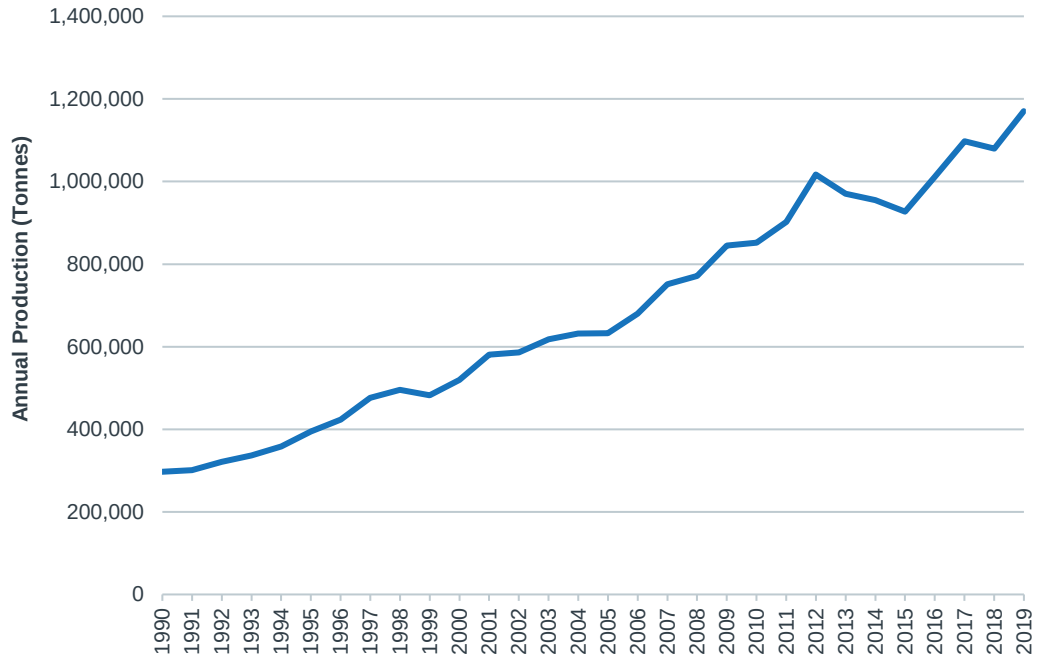
4.16 FISH (TROUT)

4.16.1 Global Overview

Global Production

Global trout production in 2019 totalled approximately 1.2 million tonnes. Since 1990, the growth of trout production has been significant, increasing by an average annual rate of 4.8% per annum from 1990 to 2019.

Figure 4.138. Total Global Production for Trout, 1990 to 2019



Source: FAO (2021b).

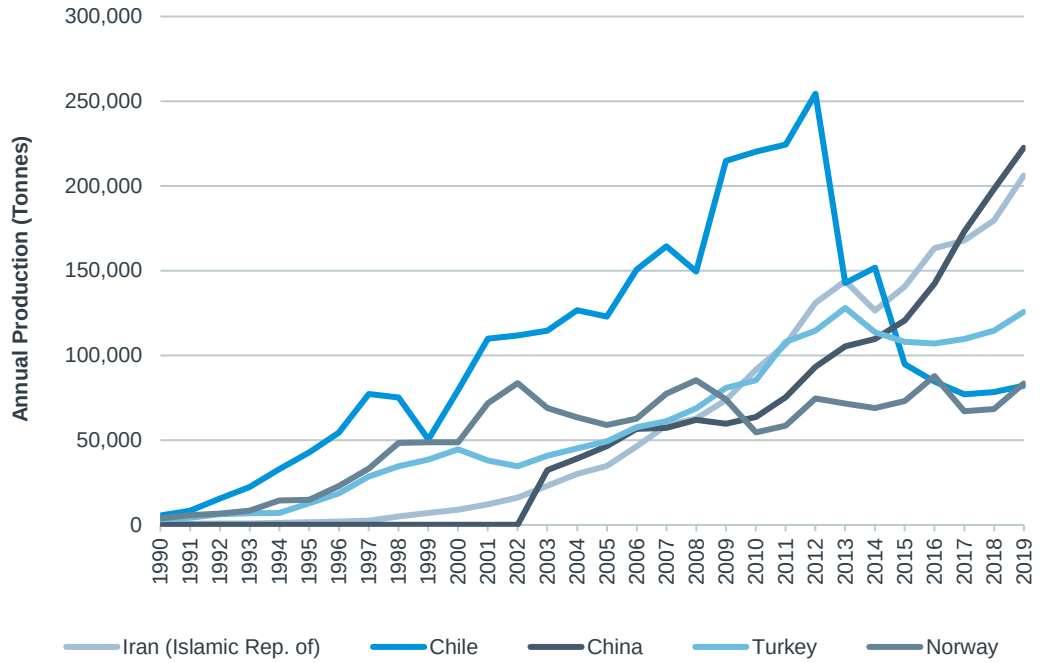
Major Producers

In 2019, the largest producer of trout was China, producing a total of 222,500 tonnes which accounted for 19% of total global trout production. Production in China experienced a significant spike over the years, increasing by an average annual rate of 14.9% from 2010 to 2019.

The second most prominent producer of trout was Iran, producing 206,050 tonnes in 2019. Production in Iran also experienced significant growth, increasing by an average annual rate of 20.6% from 1990 to 2019.

Of significant note, Chile was the largest producer of trout from 1990 to 2014. Production in Chile peaked in 2012, reaching a total of 254,353 tonnes. However, since 2012, production in Chile has largely been on the decline. There are a number of reasons behind the decline in production in Chile, including a volcanic eruption, decreased demand from the US, strikes and news of high antibiotic usage (SeafoodSource, 2015).

Figure 4.139. Top Five Global Producers for Trout, 1990 to 2019



Notes:
- FAO does not have production data for China from 1990 to 2002.
- Top five largest producers on average from 2010 to 2019.

Source: FAO (2021b).

From 1990, Iran's average share of total production has experienced a 5.6 percentage point increased from 1990. Similarly, China, Turkey, Peru and Russia have all increased their average share of total production, however not to the extent of Iran.

Table 4.28. Top 10 Global Producers for Trout (+ Australia)

Country	Average % of Total Production		
	From 1990	From 2000	From 2010
Iran (Islamic Rep. of)	9.0%	11.0%	14.6%
Chile	15.3%	16.6%	14.1%
China	8.1%	10.0%	13.1%
Turkey	8.8%	9.9%	11.2%
Norway	7.9%	8.5%	7.1%
Peru	2.2%	2.6%	3.8%
Italy	5.7%	4.3%	3.5%
France	5.7%	4.3%	3.3%
Denmark	5.3%	4.0%	3.2%
Russian Federation	1.9%	2.3%	2.8%
Australia	0.1%	0.1%	0.0%
Other	30.1%	26.5%	23.3%
Total	**100.0%**	**100.0%**	**100.0%**

Source: FAO (2021b).

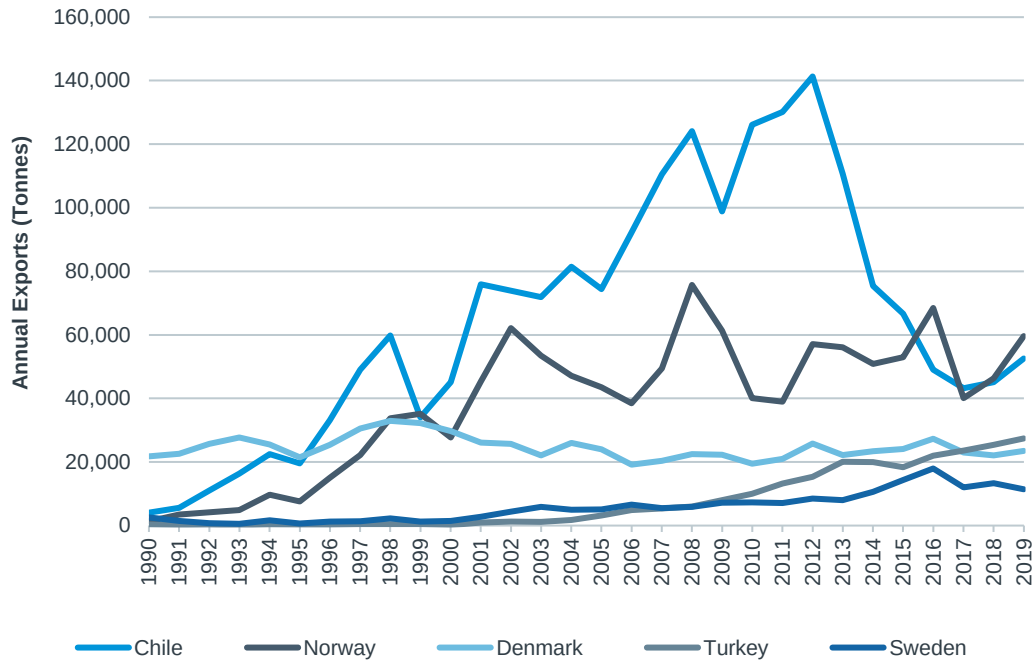
Major Exporters

Since 1990, global export of trout has experienced a 6.5% increase on average per annum. In 2019, global exports totalled approximately 280,450 tonnes, largely driven by both Chile and Norway.

In 2019 Norway was the world's largest exporter of trout, with exports estimated at 59,609 tonnes.

From 2000 to 2015, Chile was the largest exporter of trout, peaking at a total of 66,594 tonnes in 2015. However, in 2019, Chile was listed as the second most prominent exporter of trout, reaching a total of 52,578 tonnes. The decline was the result of a toxic algal bloom (The Guardian, 2016).

Figure 4.140. Top Five Global Exporters for Trout, 1990 to 2019



Note:
- Excluding re-exports.
- Top five largest exporters on average from 2010 to 2019.

Source: FAO (2021b).

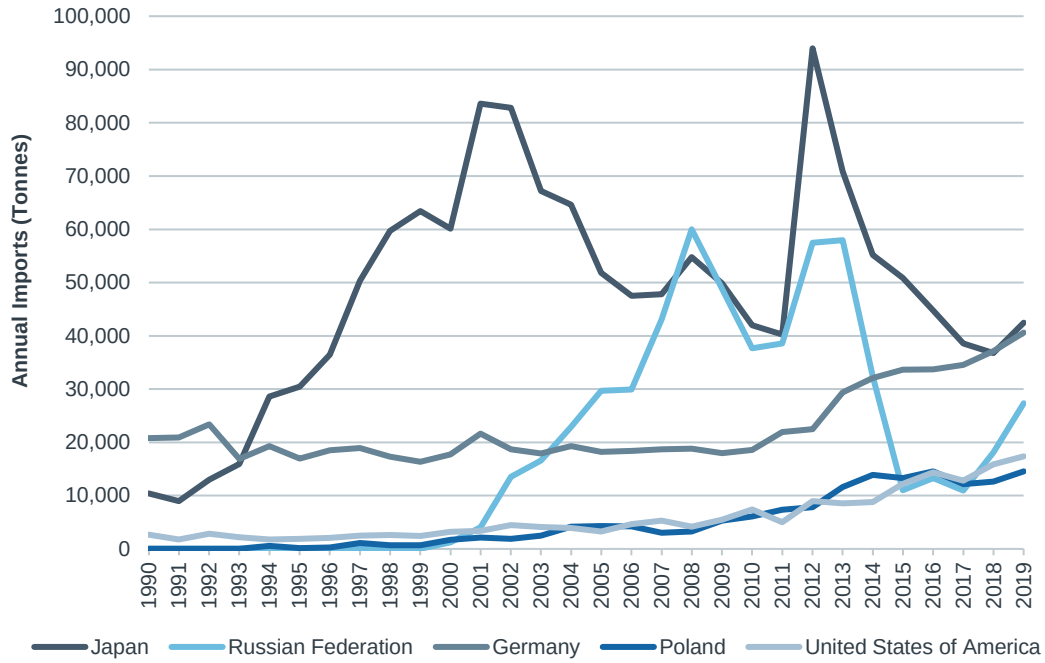
Major Importers

Global tout in 2019 totalled 278,447 tonnes, increasing by an average annual rate of 5.4% since 1990.

In 2019, Japan was the largest importer of trout, with imports totalling 42,469 tonnes. Historically, Japan has been the largest importer of trout over the years, with imports peaking at 93,980 tonnes in 2012, following concerns about food safety in the wake of the Fukushima nuclear disaster. Imports of trout to Japan have experienced significant fluctuation over the years, with two significant peaks (one in 2001 and the other in 2012).

The second most prominent importer of trout in 2019 was Germany, importing a total of 40,626 tonnes. Trout imports in Germany have been experiencing a steeper increase over recent years, increasing by an average annual rate of 9.1% from 2010 to 2019.

Figure 4.141. Top Five Global Importers for Trout, 1990 to 2019



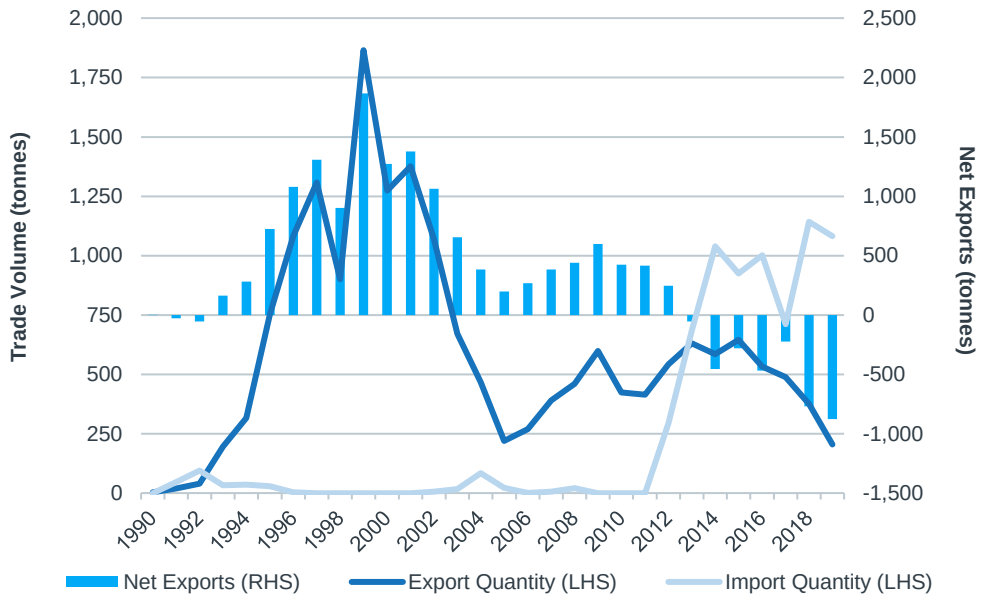
Note: Top five largest importers on average from 2010 to 2019.
Source: FAO (2021b).

4.16.2 Export Markets

Australian Trade Balance

In 2019, total trout exports were estimated to total 205 tonnes, while imports were estimated to total 1,082 tonnes. This import and export quantity leaves net exports at -877 tonnes in 2019.

Figure 4.142. Trade Balance Australia for Trout, 1990 to 2019

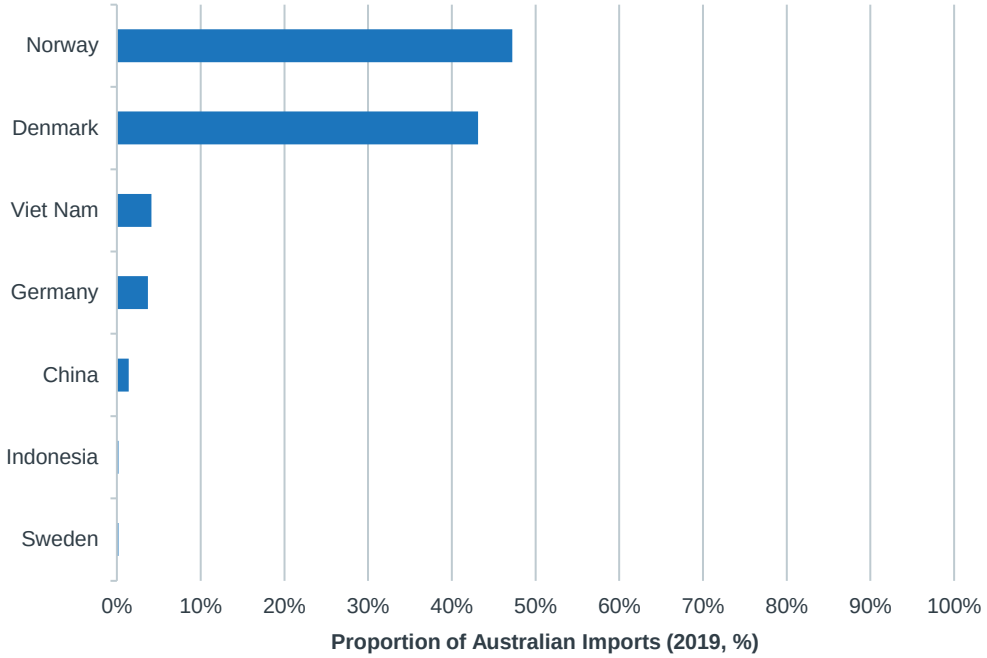


Source: FAO (2021b).

Key Import Origins

As seen above, from 2013 Australia was a net importer of trout. In 2019, Australia sourced 47% of its total trout imports from Norway. Denmark was Australia's second largest market for trout imports, with imports from Norway totalling an estimated 43% in 2019.

Figure 4.143. Key Imports Markets for Australia, 2019 (Trout)

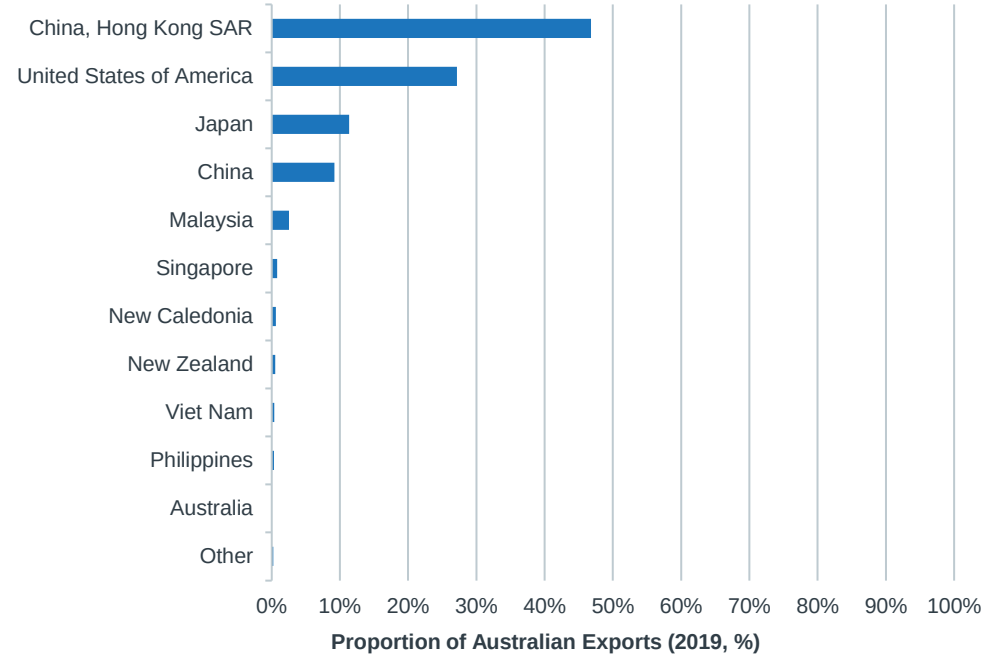


Source: FAO (2021b).

Key Export Markets

In 2019, Hong Kong accounted for 46.8% of Australia's trout exports. The US was Australia's second largest export market for trout, accounting for an average of 27.2% of exports in 2019.

Figure 4.144. Key Exports Markets for Australia (Top 10), 2019 (Trout)

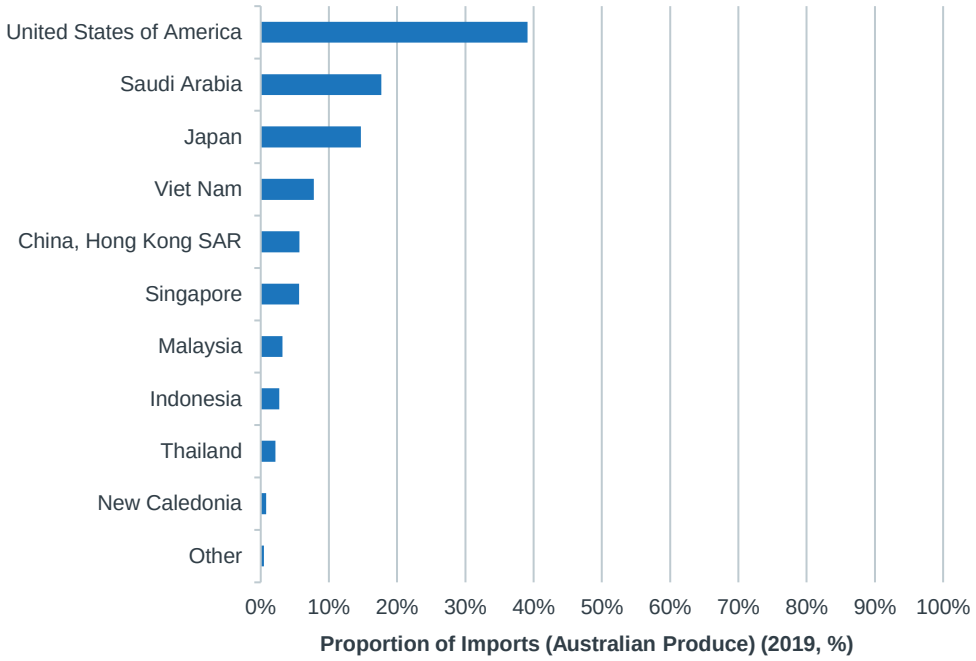


Source: FAO (2021b).

Export Market Share

The figure below highlights how much of Australia's trout exports make up of each key market's imports in 2019. The US was Australia's second largest export market for trout, with US imports from Australia accounting for approximately 39.1% of total imports.

Figure 4.145. Proportion of Australia's Exports make up of Total Key Imports (Trout) (Australia's Top 10 Export Markets)



Source: FAO (2021b).

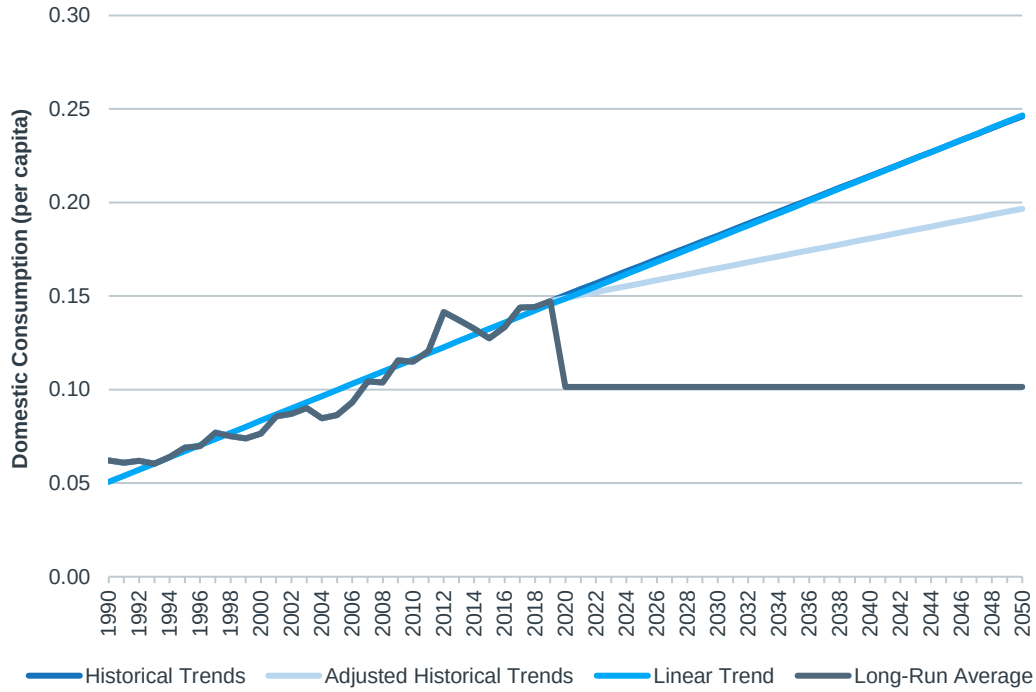
4.16.3 Consumption

Global Consumption

Based on the historic consumption trends on a global scale, there is more potential for future domestic consumption of trout to reach linear trend volumes in 2050.

Based on the linear trend volumes, consumption could reach 0.25 kilograms into 2050.

Figure 4.146. Domestic Consumption for Global Market (Trout), excluding Australia, 1990 to 2050

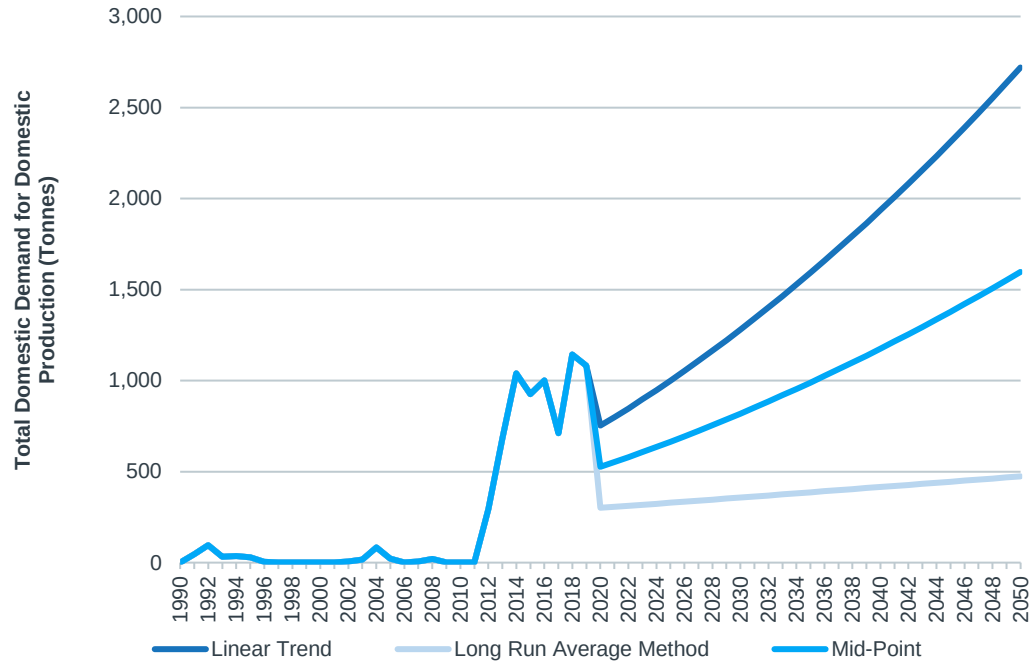


Source: FAO (2021b), AEC.

Forecast Consumption in Domestic Markets

Future domestic demand for domestic production could reach between the long-run average scenario at 474 tonnes in 2050 or the linear trend volumes in 2050 at 2,720 tonnes. Based on historical trends, there is more potential for the future domestic demand for domestic production of trout to fall in line with the linear scenario.

Figure 4.147. Total Domestic Demand for Domestic Trout Production, 1990 to 2050

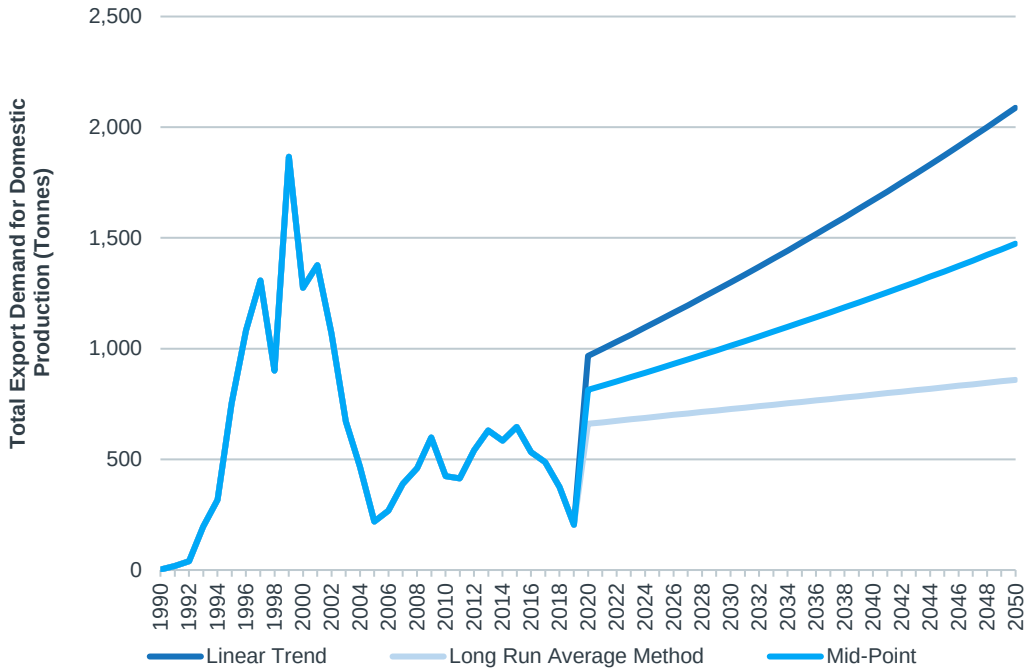


Source: FAO (2021b), AEC.

Forecast Consumption in Export Markets

Future export demand for domestic production of trout could reach between the long-run average scenario at 860 tonnes in 2050 or the linear trend scenario in 2050 at 2,008 tonnes.

Figure 4.148. Total Export Demand for Domestic Production (Trout), 1990 to 2050



Source: FAO (2021b), AEC.

5. HIGHER VALUE PRODUCTION OPPORTUNITIES

The MIW Region is already a highly productive agricultural region, with a long history in successful agricultural activity. However, there are potential opportunities to increase the value of agricultural production in the region.

KEY TAKEAWAYS

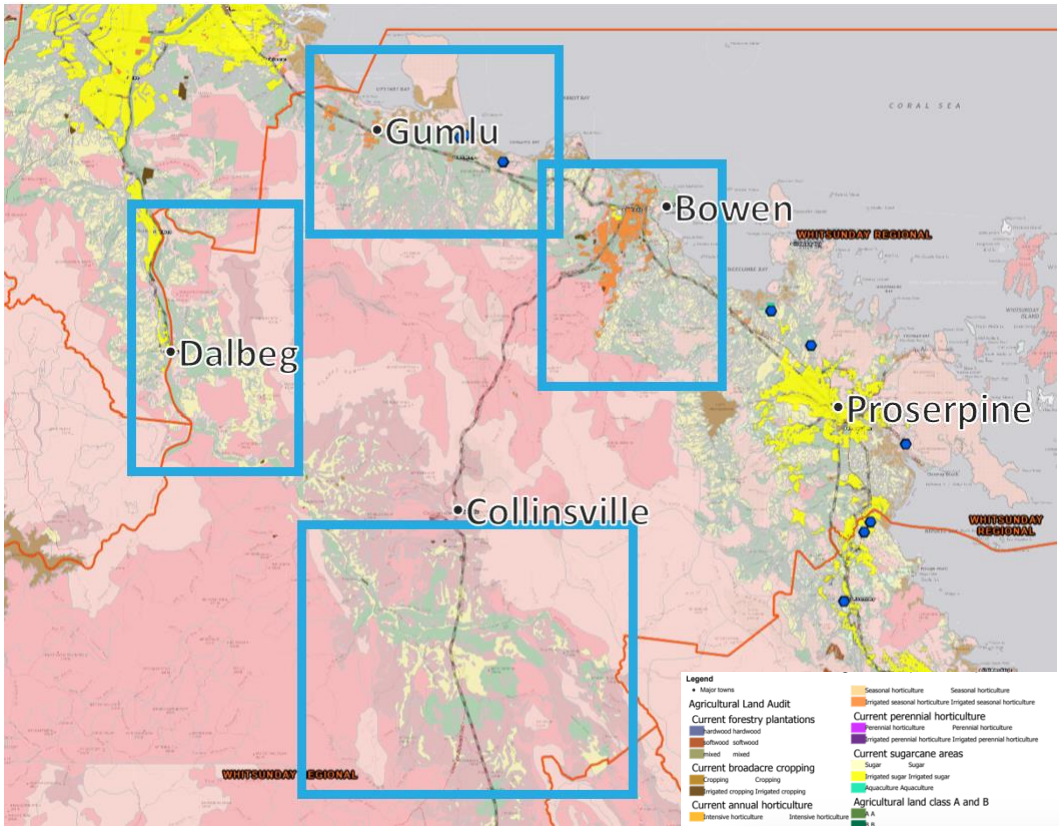
- The MIW region has a number of opportunities to support higher value agricultural production.
- Across the Whitsundays and Isaac LGAs, there are numerous areas of contiguous good quality agricultural land that remain undeveloped. Developing these areas would not only increase the value of agricultural production, but he increased volumes (and potentially counter-seasonal production) could also support further development of the region's agricultural supply chains.
- Aquaculture is a major development opportunity in the MIW region, with two designated Aquaculture Development Areas (ADAs) in the region – one being 316 hectares Northwest of Bowen and the other 2,126 hectares Northwest of Mackay. The MIW region also has considerable potential to develop a commercial sea-based oyster and seaweed industries.
- The Mackay LGA has two irrigation schemes (the Pioneer Valley Supply Scheme and the Eton Irrigation Scheme) that predominantly supply sugarcane farms. The certainty of water supply that comes with an irrigation scheme could support additional perennial cropping in the region.
- The MIW region has a number of proposed irrigation schemes and opportunities to expand irrigated agriculture, including:
    - Collinsville Irrigation Scheme (Bowen River Utilities) – Proposed
    - Bowen Pipeline (Bowen Pipeline Company) – Proposed
    - Burdekin to Moranbah Pipeline Duplication (SunWater) – Formerly Proposed
    - Connors River Dam and Pipeline (SunWater) – Formerly Proposed
    - Groundwater Reserves
    - Recycled Gas Water
    - Mine Water Reuse

  Securing additional water for irrigation from these opportunities could support additional higher value irrigated broadacre or irrigated perennial cropping.
- The MIW region also has considerable potential to incorporate rotational growing into the sugarcane production system, which can not only increase productivity of cane production, but also produce an alternative crop. Key opportunities include broadacre legumes (such as soybean).
- The MIW does not have a significant feedlot industry despite having a large cattle herd and a major abattoir. Developing a local feed lotting industry could provide an opportunity to not only improve value in livestock in the region, but also provide a new market for additional broadacre production in the region.

5.1 UNDEVELOPED GOOD QUALITY AGRICULTURAL LAND

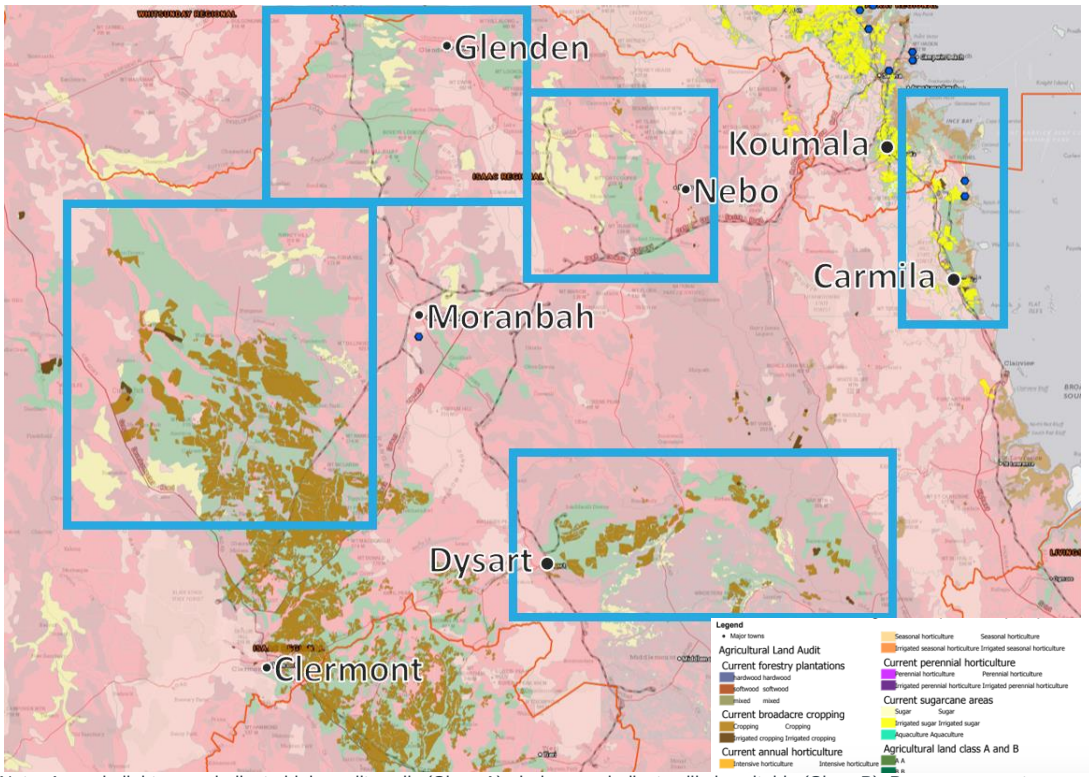
Figure 5.1 and Figure 5.2 below show areas of good quality agricultural land (Class A and B) and current cropping activity, indicating there are areas of good quality soils in the region that are currently underdeveloped. Specific localities where substantial development opportunities exist include Dalbeg, Gumlu, Glenden, Clermont and Dysart.

Figure 5.1. Additional Production Areas in Whitsundays LGA



Note: Areas in light green indicate high quality soils (Class A); dark green indicates likely suitable (Class B). Brown represents current cropping, yellow is current sugarcane, orange is current horticulture and light blue is current land-based aquaculture.
Source: Department of Agriculture and Fisheries (2022)

Figure 5.2. Additional Production Areas in Isaac LGA



Note: Areas in light green indicate high quality soils (Class A); dark green indicates likely suitable (Class B). Brown represents current cropping, yellow is current sugarcane, orange is current horticulture and light blue is current land-based aquaculture.
Source: Department of Agriculture and Fisheries (2022)

5.2 NEW IRRIGATION AREAS

There are a number of new irrigation opportunities in the MIW region, enabling the conversion of cattle grazing land to higher value irrigated cropping uses.

Collinsville Irrigation Scheme (Bowen River Utilities) – Proposed

The Urannah Project is $2.9 billion project in the Burdekin Catchment which includes a 970,000 ML dam (Urannah Dam), a water distribution network to Peter Faust Dam, Bowen and Abbot Point, Eungella Dam and Moranbah, the Collinsville Irrigation Scheme and an 8 GWh pumped hydroelectric power storage and power generator.

The Collinsville Irrigation Scheme is a proposed 25,000 ha master planned agricultural precinct along the Bowen River 20 km south of Collinsville, utilising water from the proposed Urannah Dam. Within the irrigation precinct, there is 9,850 ha of suitable high value cropping land and 12,250 ha of area available for improved grazing (Coordinator General, 2022a).

The additional 9,850 ha of additional high value cropping area is equivalent to a near duplication of the existing horticultural area in the Whitsundays region (current area of irrigated horticulture in Whitsundays LGA is 12,147 ha).

The supply chain logic for the irrigation scheme is to transport product direct to markets via road. The irrigation precinct has both Type 1 and Type 2 Road Train access.

The Urannah Project is currently proceeding through detailed technical assessments and environmental approvals.

Bowen Pipeline (Bowen Pipeline Company) – Proposed

The Bowen Pipeline is a 100 km long underground pipeline connecting the Burdekin Falls Dam (via the Burdekin River at Home Hill) in the Burdekin Catchment, to high quality agricultural soils around the existing production areas of Gumlu, Guthalungra and Bowen. The pipeline is expected to be capable of transferring up to 100 GL of water per year, providing water for an additional 40,000 ha of land (National Water Grid 2022). The additional 40,000 ha of irrigated area is equivalent to a 330% increase in the existing horticultural area in the region.

The project is currently proceeding through a Detailed Business Case, due for completion in 2023.

The additional water to be supplied from the Burdekin Falls Dam is expected to come from existing allocations, but also through the raising of the Burdekin Falls Dam (which is also proceeding through a Detailed Business Case).

Burdekin to Moranbah Pipeline Duplication (SunWater) – Formerly Proposed

In 2012, SunWater proposed to duplicate the existing 220 km pipeline that supplies water from the Gorge Weir on the Burdekin River (downstream from the Burdekin Falls Dam) to Moranbah and coal mines in the Bowen Basin (The Mining Advocate, 2012). The proposal to duplicate the pipeline was first raised as the existing pipeline's capacity reached 100%. The duplication of the Burdekin to Moranbah pipeline would enable an additional 23,000 ML to supply up to 3,300 ha high quality agricultural land near Moranbah and Glenden.

The project was assessed by SunWater, but no details were publicly released.

The additional water to be supplied from the Burdekin Falls Dam is expected to come from existing allocations, but also through the raising of the Burdekin Falls Dam (which is also proceeding through a Detailed Business Case).

Connors River Dam and Pipeline (SunWater) – Formerly Proposed

The Connors River Dam and Pipeline is $928 million project in the Fitzroy Catchment which includes a 373,662 ML dam (Connors River Dam) and a 133 km water transfer pipeline to Moranbah, originally designed to supply additional resources projects in the Isaac region (Coordinator General, 2022b).

The Connors River Dam is expected to yield up to 49,500 ML/year of high priority water, which would be sufficient to irrigate at least 7,000 ha of irrigated agricultural land in the vicinity Dysart along the Isaac River. Additional good quality land in the area could be irrigated if the water were to be converted to a medium priority.

The supply chain logic for a potential irrigation scheme in the vicinity of Dysart is to transport product direct to markets via road. The irrigation precinct would have Type 1 Road Train access.

The EIS approval for the project was granted on 19 April 2012 and lapsed on 3 July 2021.

Groundwater Reserves

MIW region has relatively constrained available groundwater reserves, with only 750 ML available from a general reserve in the non-alluvial aquifers of the Isaac Connors Groundwater Management Plan Area, in the Fitzroy Basin (GW3, 2021). This water source could support an additional 100 ha of irrigated agriculture in the good quality agricultural soils east of Dysart.

Recycled Gas Water

As the gas industry develops in the MIW region, there is an opportunity to use recycled gas water for irrigated agriculture. Arrow Energy's Bowen Gas Project expected to produce between 5,000 and 10,000 ML water per year in Glenden Moranbah and Dysart areas (GW3, 2021), sufficient water to irrigated up to 1,500 ha of land (equivalent to a 12% increase in the existing horticultural area in the region).

Accessing this water would require Environmental Approvals to discharge the water for irrigated agriculture purposes.

Mine Water Reuse

The MIW region has 31 mine sites storing up to 185,570 ML of water (GW3, 2021). This volume of water is able to irrigate up to 23,200 ha of additional farming land, representing a 190% increase in the existing horticultural area in the region.

As mines reach their end of life, there is an opportunity to transition these water resources to develop a number of irrigated agricultural precincts across the MIW region.

5.3 EXISTING IRRIGATION SCHEMES

The MIW region has two supplemented water supply schemes (Pioneer and Eton schemes), both located in the Mackay LGA. The supplemented water provided through these irrigation scheme currently supplies irrigators who predominantly grow sugarcane, with some sorghum, peanuts, soy, and rice production.

Water from the irrigation schemes could support an additional 27,000 ha of higher value agricultural activity (such as rotational sugarcane cropping or horticultural production), representing a 220% increase in the existing horticultural area in the region.

Pioneer Valley Supply Scheme

Pioneer Valley Water Co-operative Limited (PVWater) is a small, not-for-profit company that supplies up to 47,390 ML of water to 250 irrigation customers who hold water allocations in the far west of the Mackay sugarcane producing region. Water from irrigation system is sourced from natural stream flows in the Pioneer Valley, and from Teemburra Dam (PV Water, 2021).

Eton Irrigation Scheme

The Eton Irrigation Scheme is a water distribution system owned and operated by Eton Irrigation, a not for profit company that supplies up to 50,000 ML of water to 300 irrigation customers who hold water allocations in the area east of the Pioneer Valley Water Scheme to the south of Mackay (Eton Irrigation, 2022).

Water supplied through the Eton Irrigation Scheme is supplied from the Kinchant Dam, which is filled by harvesting water from the Pioneer River in high flow events.

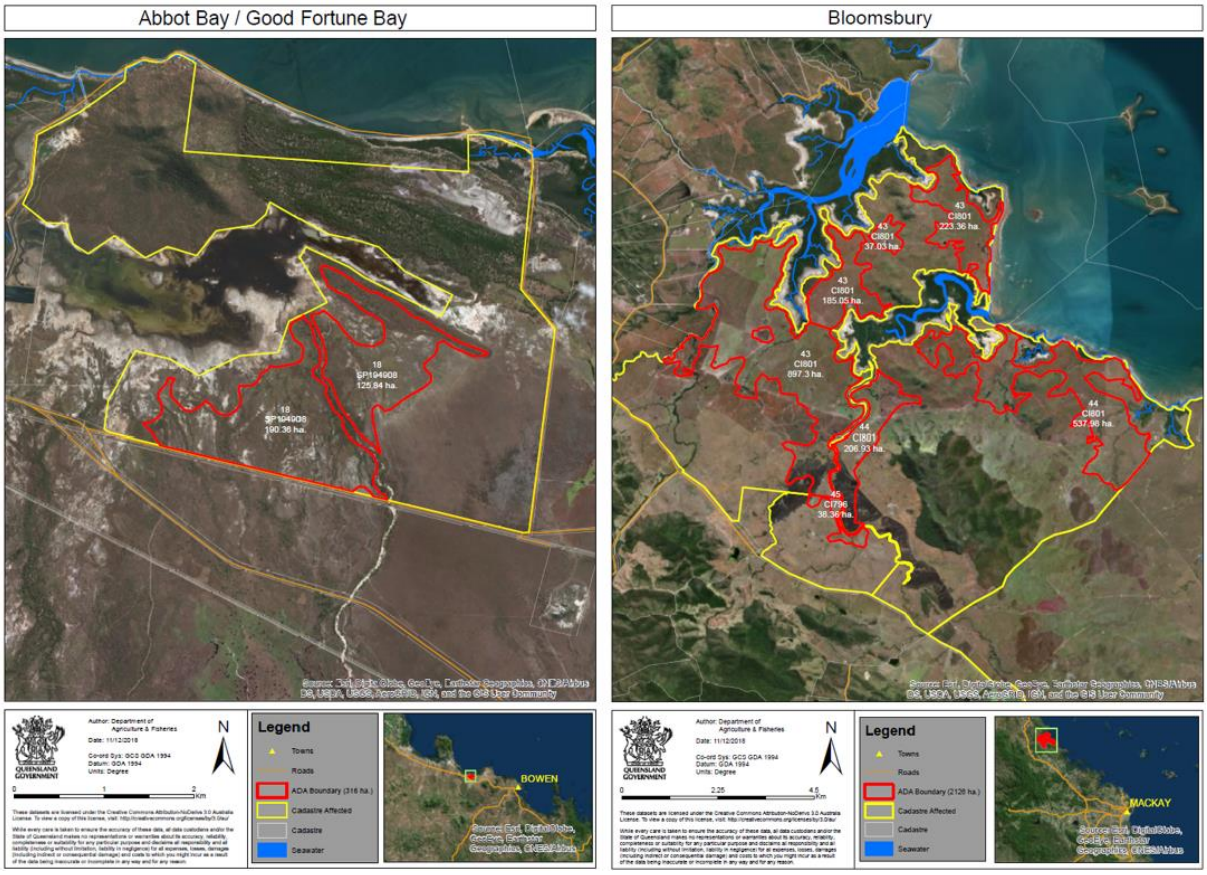
5.4 EXPANSION OF AQUACULTURE

Land-based Aquaculture

The Queensland Government has established two Aquaculture Development Areas (ADAs) in the MIW region. The first is a 316 ha area located 30km North West of Bowen at Abbot Bay and the second is a 2,126 ha area 70km North West of Mackay at Bloomsbury.

The Queensland Government has indicated they areas would be suitable to produce black tiger or banana prawns, barramundi or marine finfish (Business Queensland 2022a,b). Both ADAs are profiled in Figure 5.3 below.

Figure 5.3. Aquaculture Development Areas (ADAs) in MIW Region



Source: Business Queensland (2022a, b)

The additional yields the combined 2,442 ha of additional ponded aquaculture could produce an additional 27,600 tonnes of aquaculture product.

Oysters and Seaweed

Stakeholders in the region indicated that there was considerable potential to develop a commercial sea-based oyster and seaweed industry in the region. While, there is insufficient public information about the potential for oyster and seaweed industry development, the opportunity should be further explored.

5.5 ROTATIONAL SUGARCANE CROPPING

Local productivity boards in the sugarcane industry are exploring opportunities to incorporate rotational growing into the sugarcane production system. Breaking the sugarcane monoculture by growing other crops in rotation with sugarcane has proven environmental and productivity benefits. Some farmers also choose to grow rotation crops that generate income. A range of crops have been tried or suggested as possibilities and this information gives a realistic idea of their likely success (SRA, 2014).

In the Central Region, the following crops have been identified as suitable rotational crops:

- Grain legumes (peanuts, mung breans and navy beans, soybeans)
- Vegetables (pumpkins, potatoes, zucchini)
- Fruits (bananas, paw paws)

5.6 LIVESTOCK FEEDLOTTING

Despite having a productive cattle industry and a major abattoir, the MIW region does not have a significant feedlot industry. Most of the feedlot activity that occurs is done to the region's south, in the Central Highlands region.

Developing the local feed lotting industry provides an opportunity to improve the value of both livestock and broadacre output in the region. Through feed lotting, the region can also increase the region's resistance to droughts and prolonged periods of low rainfall.

6. AGRICULTURAL SUPPLY CHAINS

KEY TAKEAWAYS

- As a major food and fibre producing region, nearly all agricultural output is moved beyond the MIW region to processors and customers in both Australia's major population centres and internationally.
- Agricultural commodities produced in the MIW region, have established supply chains that work effectively to meet the region's needs. For example, horticultural produce from the Bowen region does have access to the required cold chain with road transport. Sugar and grains also have dedicated facilities both connecting to and at the Port of Mackay for storage and export.
- The key challenge for producers in the MIW region is distance to market. Where product is grown closer to major domestic markets (and major produce export ports adjacent to these markets), producers in the MIW region are relatively less competitive due to higher transport costs (a simple factor of distance, not an inefficiency in the transport value chain). This is true for most agricultural product.
- Alternatively, the MIW region does have a number of products that are relatively closer to market than other producing regions, such as sorghum and mangoes.

6.1 LIVESTOCK/BEEF

Supply Chain Overview

Within the MIW Region, there are 941 beef cattle farms which supply beef cattle in the region. In the beef cattle production system, finishing can either occur in an improved pasture or in a feedlot.

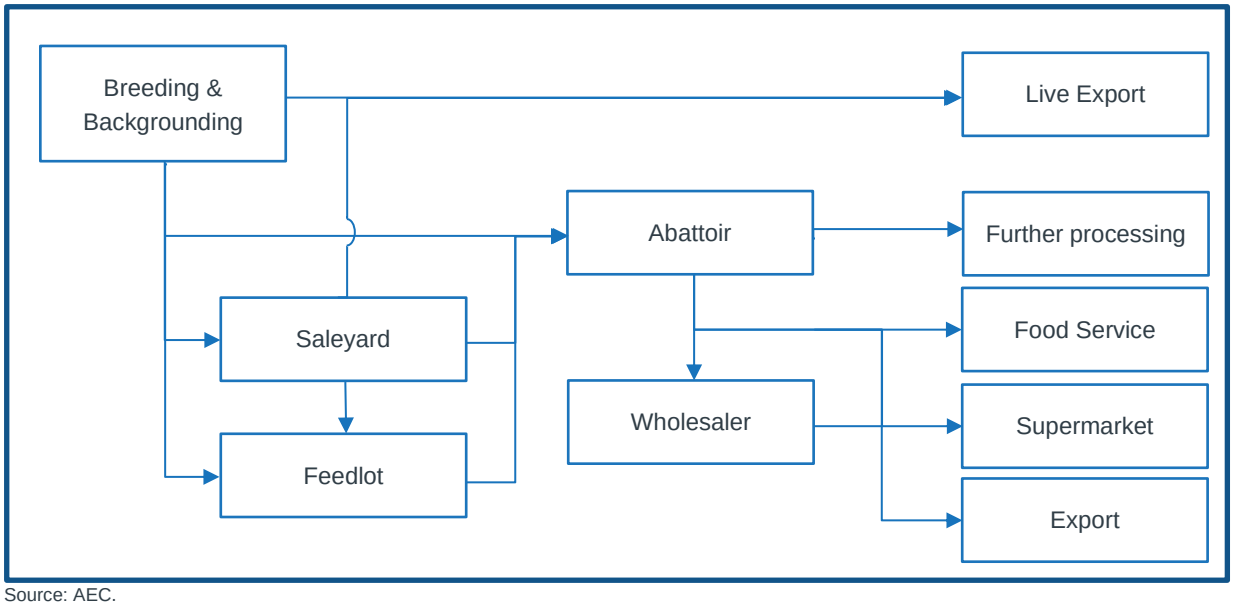
Cattle are either sold to buyers directly or via one of six key sale yards in vicinity of the region. Buyers include feedlots, abattoirs, and live exporters. Cattle can travel to buyers via road or rail transport in the region.

Meat products produced can either be sold (directly or via a wholesaler) for value adding/further processing, domestic consumption (to supermarkets or for food service) or for export.

Supply Chain Map

Figure 6.1 below shows the supply chain maps for the MIW livestock and meat products industry.

Figure 6.1. Livestock and Meat Products Industry Supply Chain

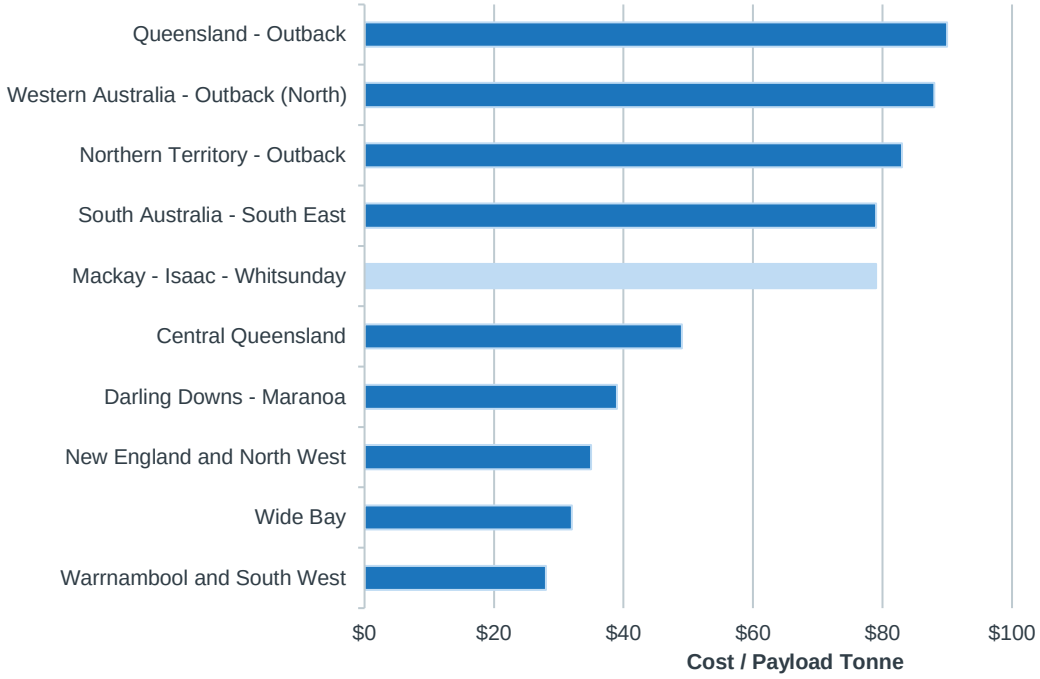


Source: AEC.

Supply Chain Costs

Figure 6.2 highlights the relative supply chain costs of the Mackay-Isaac-Whitsunday region compared to the largest production volume regions for beef cattle.

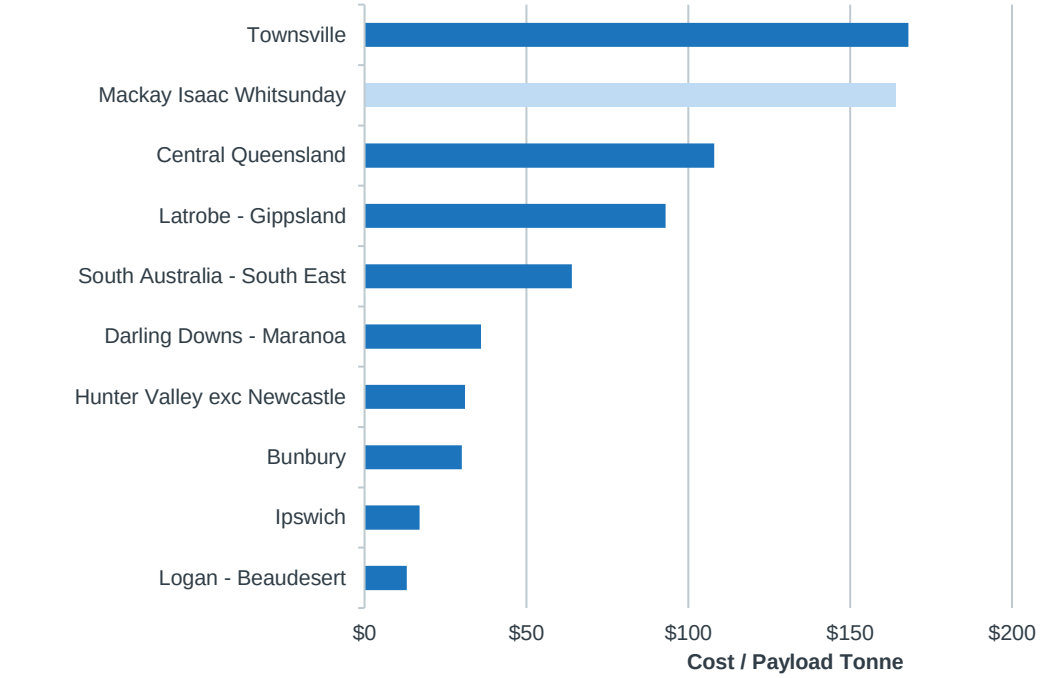
Figure 6.2. Relative Supply Chain Costs for Beef Cattle



Source: ABS (2021), CSIRO (2022).

Figure 6.3 highlights the relative supply chain costs of the Mackay-Isaac-Whitsunday region compared to the largest production volume regions for beef meat.

Figure 6.3. Relative Supply Chain Costs for Beef Meat



Source: CSIRO (2022).

6.2 SUGARCANE

Supply Chain Overview

Within the MIW region, there are approximately 1000 farming enterprises across three main production regions, being Proserpine, Mackay and Plane Creek (the area surrounding Sarina and its southern extension). Farmers produce cane that is harvested and then transported to a local sugar mill, generally by mill-owned railway systems that reach into the cane production regions.

Once milled, raw sugar is then transported to the Mackay Bulk Sugar Terminal by road or rail (depending on the supplying mill), where it is then exported in bulk. Some white sugar is produced in the region, using local raw sugar, which is then transported in bulk by sea for conversion into food products and product packing.

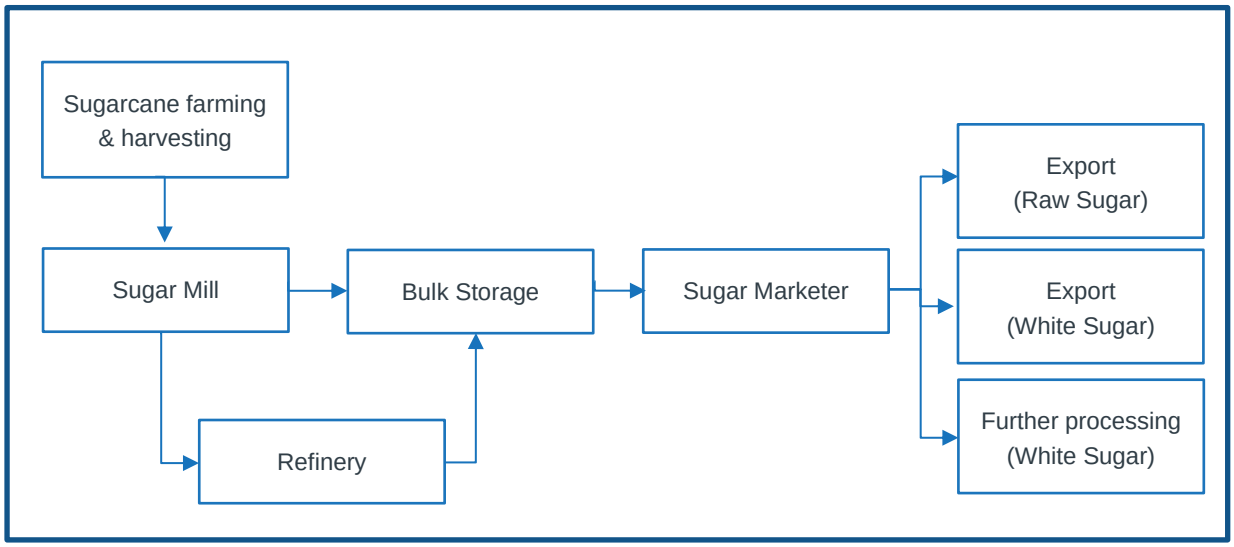
The sugarcane industry has very efficient supply chains.

The sugar milling process also produces a number of other commodities (such as molasses, ethanol and electricity through cogeneration) but these products have not been included in this supply chain analysis.

Supply Chain Map

Figure 6.4 below shows the supply chain maps for the MIW sugarcane and sugar industry.

Figure 6.4. Sugarcane and Sugar Industry Supply Chain

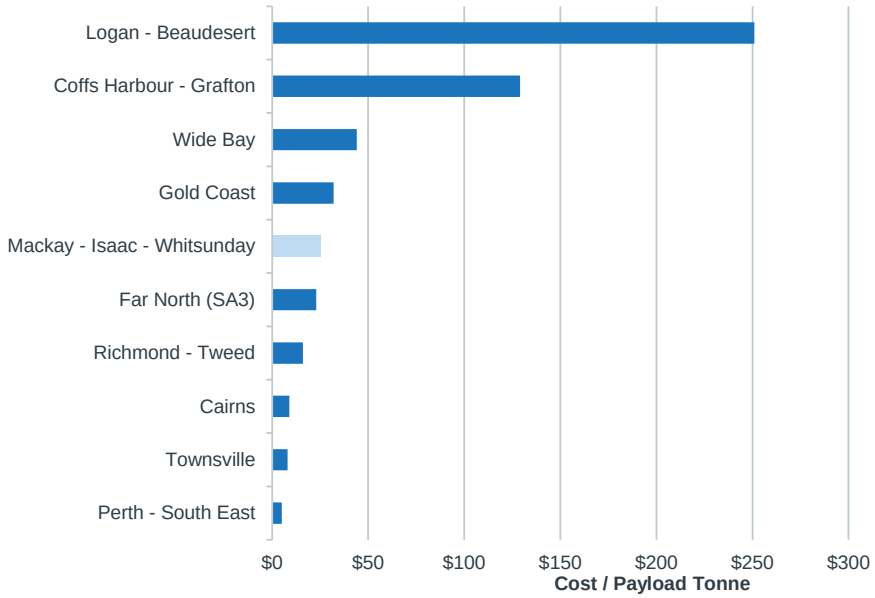


Source: AEC.

Supply Chain Costs

Figure 6.5 highlights the relative supply chain costs of the Mackay-Isaac-Whitsunday region compared to the largest production volume regions for sugar.

Figure 6.5. Relative Supply Chain Costs of Sugar



Source: CSIRO (2022).

6.3 HORTICULTURE

Supply Chain Overview

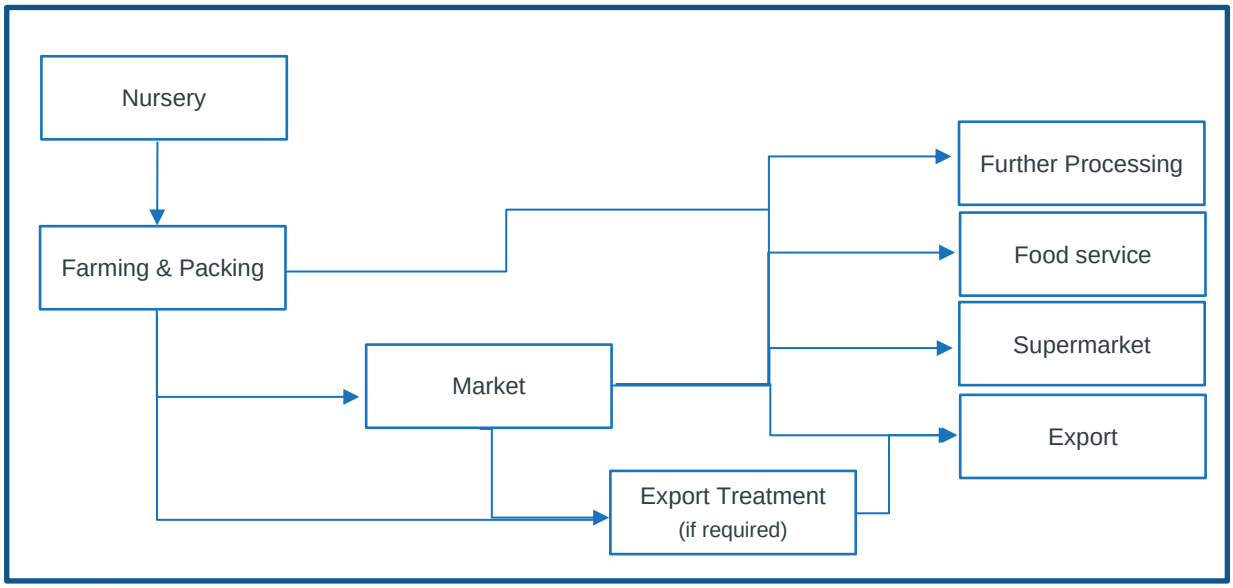
Horticultural product in the MIW region is generally produced in the Bowen region and then transported by road direct to customers (either food service, supermarkets or the fresh produce markets).

Most agricultural produce is exported from Brisbane, where export treatment facilities have been established and where most sea and air freight capacity exists. Some horticultural product is exported through Townville Port and historically through Cairns Airport.

Supply Chain Map

Figure 6.6 below shows the supply chain map for the MIW horticultural industries.

Figure 6.6. Horticultural Industries Supply Chain

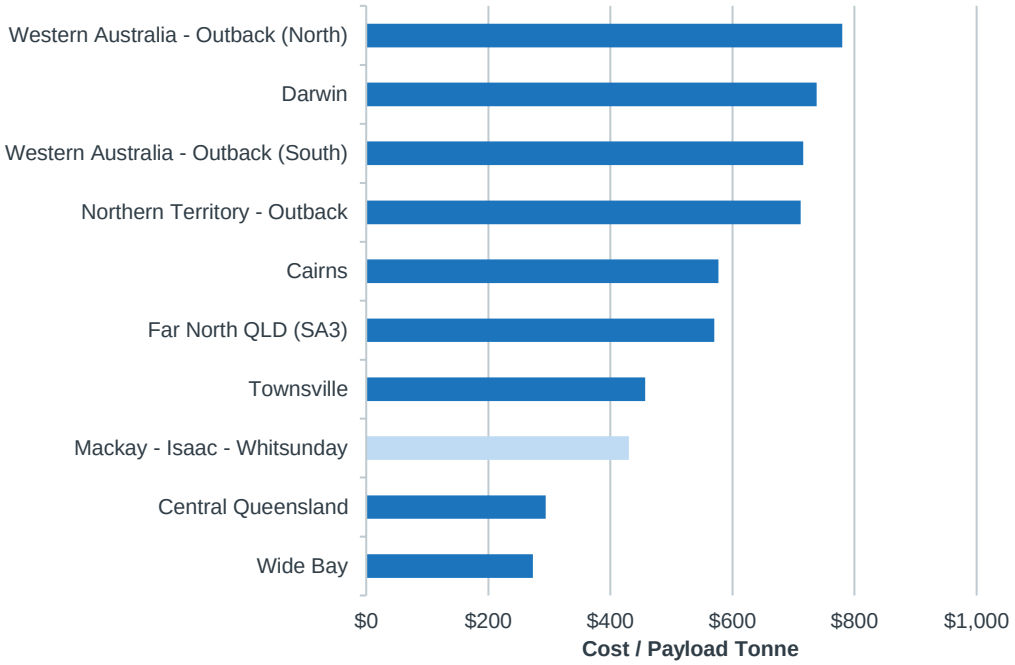


Source: AEC.

Supply Chain Costs

Figure 6.7 highlights the relative supply chain costs of the Mackay-Isaac-Whitsunday region compared to the largest production volume regions for mangoes.

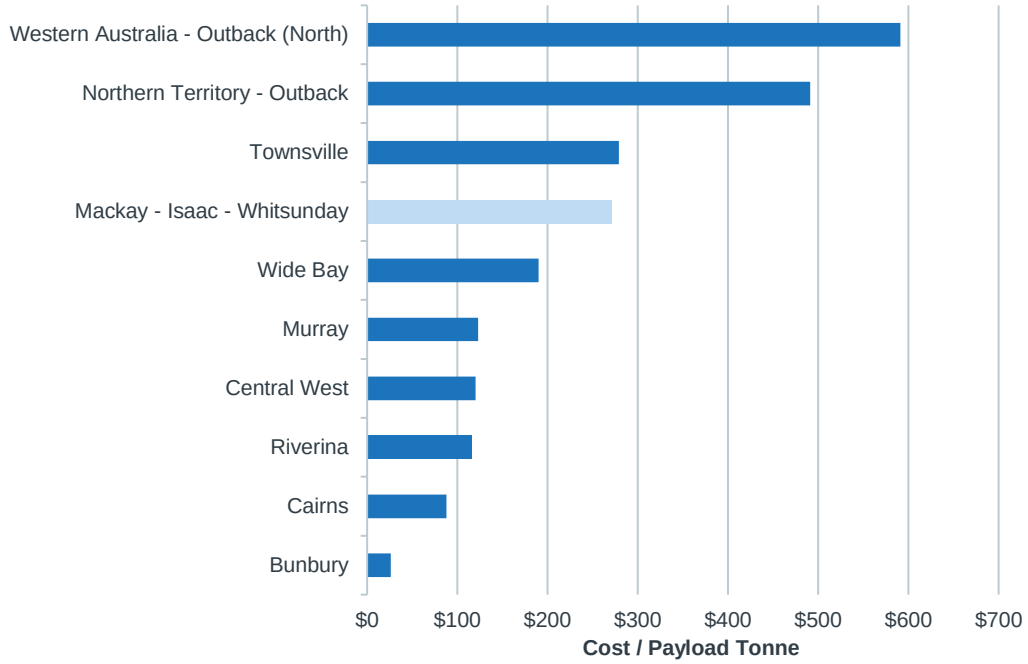
Figure 6.7. Relative Supply Chain Costs for Mangoes



Source: CSIRO (2022).

Figure 6.8 highlights the relative supply chain costs of the Mackay-Isaac-Whitsunday region compared to the largest production volume regions for melons.

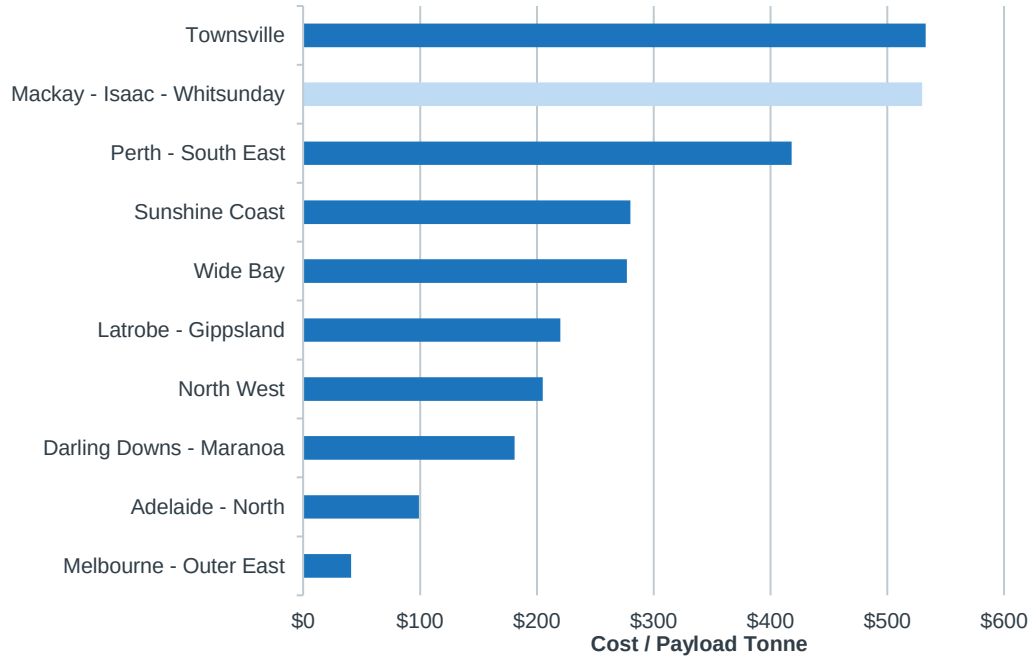
Figure 6.8. Relative Supply Chain Costs for Melons



Source: CSIRO (2022).

Figure 6.9. highlights the relative supply chain costs of the Mackay-Isaac-Whitsunday region compared to the largest production volume regions for Chillies and Peppers (Green).

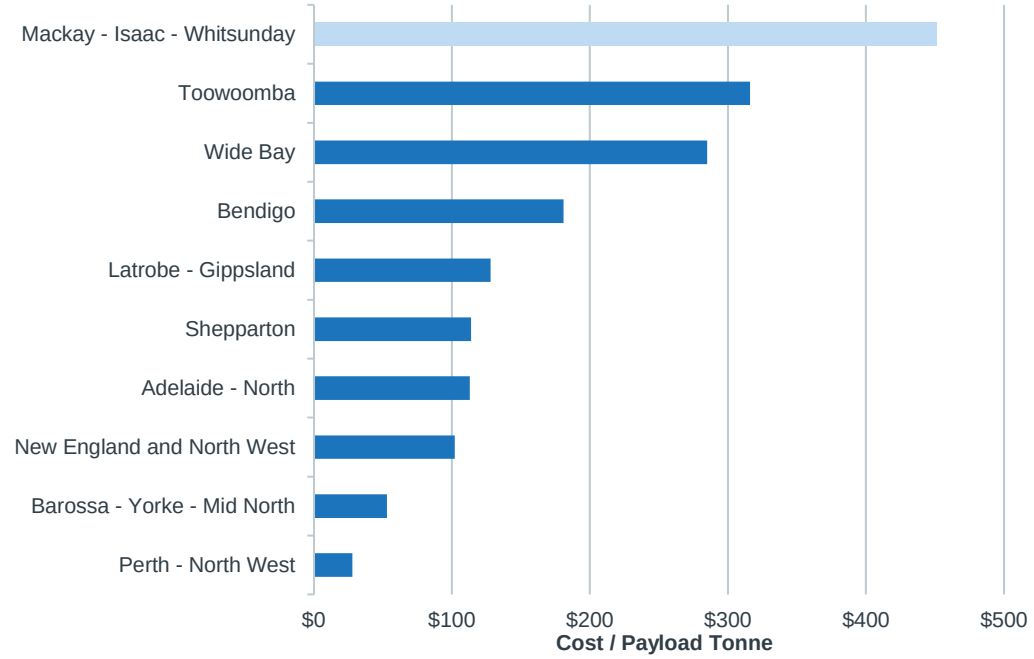
Figure 6.9. Relative Supply Chain Costs for Chilies and Peppers (Green)



Source: CSIRO (2022).

Figure 6.10 highlights the relative supply chain costs of the Mackay-Isaac-Whitsunday region compared to the largest production volume regions for tomatoes

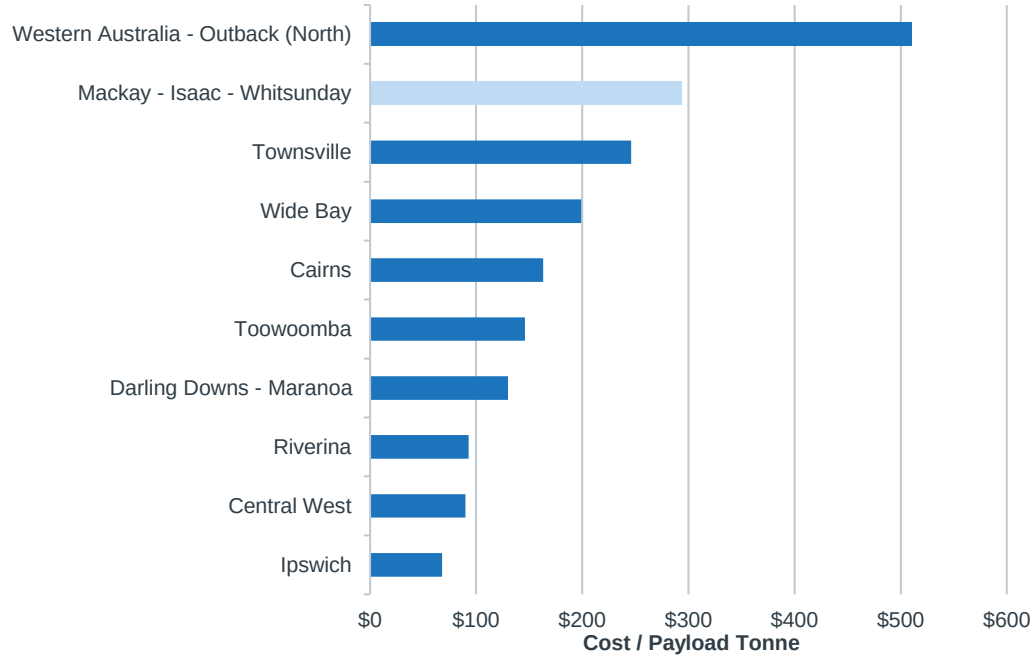
Figure 6.10. Relative Supply Chain Costs for Tomatoes



Source: CSIRO (2022).

Figure 6.11 highlights the relative supply chain costs of the Mackay-Isaac-Whitsunday region compared to the largest production volume regions for pumpkins.

Figure 6.11. Relative Supply Chain Costs for Pumpkins



Source: CSIRO (2022).

6.4 BROADACRE CROPS

Supply Chain Overview

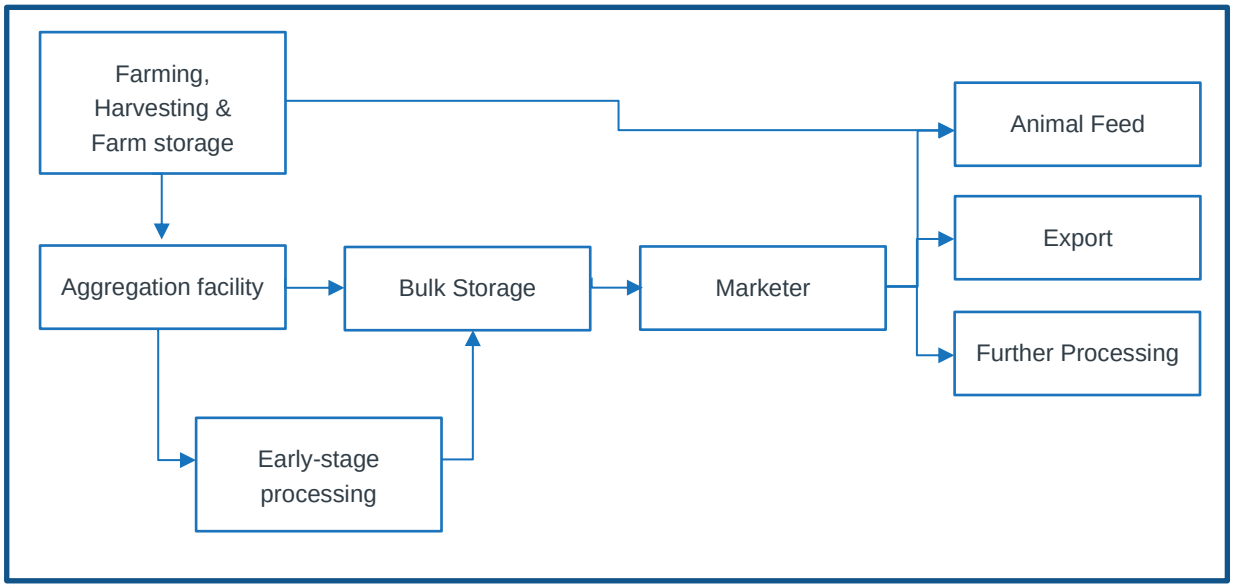
Broadacre supply chains in the in the MIW region vary based on the crop typology. Generally, broadacre crops are grown and harvested and either stored on farm, sent to an up-country aggregation facility or sent direct to a customer (such as a food processor or feed lot). In the MIW region's broadacre supply chain, there are gaps in early-stage processing facilities in the region, particularly for chickpeas.

Once product is received at an aggregation facility, it is transported by rail to the port for bulk storage (which can also receive trucks direct from farm) for export.

Supply Chain Map

Figure 6.12. Broadacre Industries Supply Chain below shows the supply chain map for the MIW broadacre cropping industries.

Figure 6.12. Broadacre Industries Supply Chain

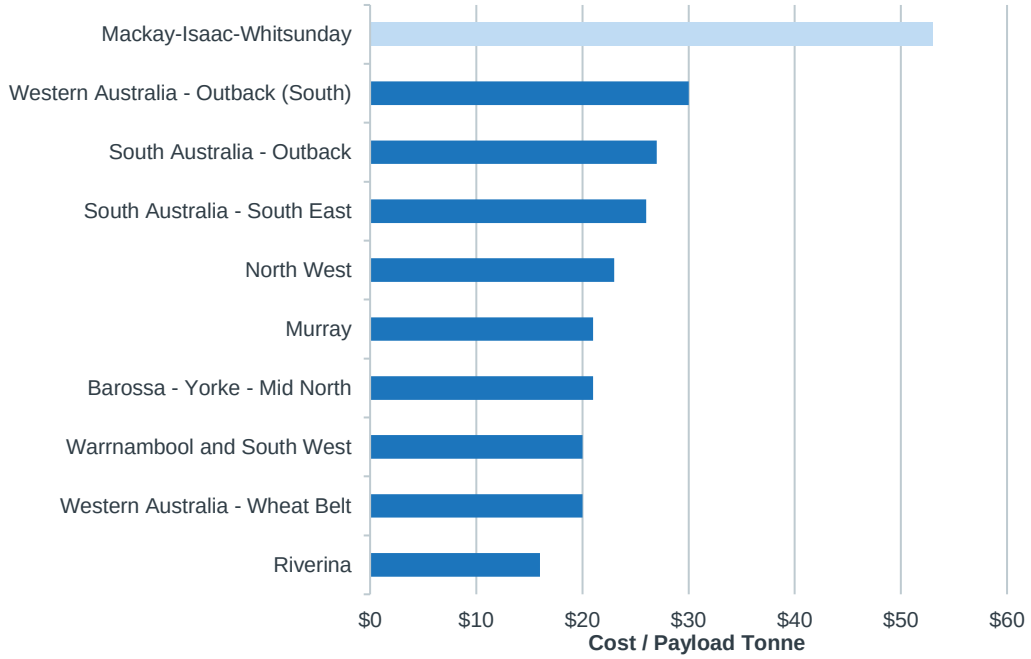


Source: AEC.

Supply Chain Costs – Wheat

Figure 6.13 highlights the relative supply chain costs of the Mackay-Isaac-Whitsunday region compared to the largest production volume regions for wheat.

Figure 6.13. Relative Supply Chain Costs for Wheat

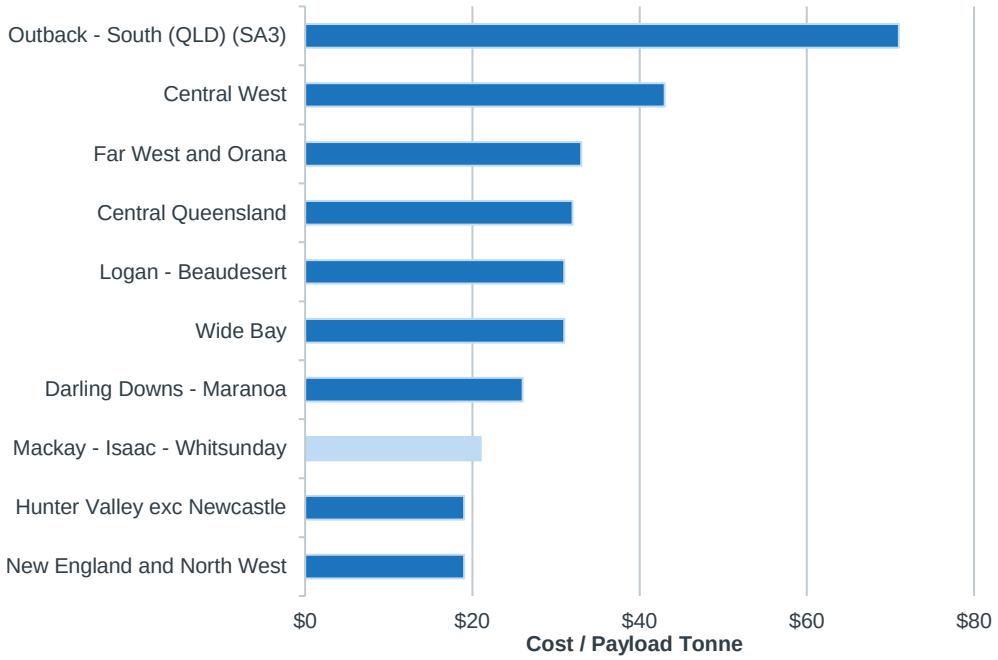


Source: CSIRO (2022).

Figure 6.14 highlights the relative supply chain costs of the Mackay-Isaac-Whitsunday region compared to the largest production volume regions for sorghum.

Supply Chain Costs – Sorghum

Figure 6.14. Relative Supply Chain Costs for Sorghum

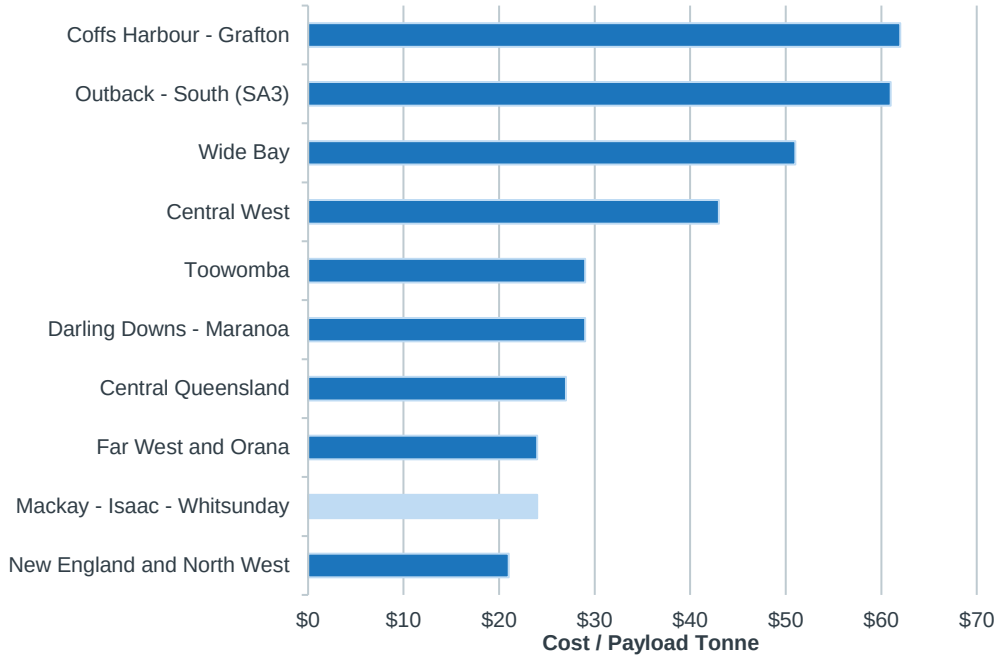


Source: CSIRO (2022).

Figure 6.15 highlights the relative supply chain costs of the Mackay-Isaac-Whitsunday region compared to the largest production volume regions for chickpeas.

Supply Chain Costs – Chickpeas

Figure 6.15. Relative Supply Chain Costs for Chickpeas



Source: CSIRO (2022).

6.5 SEAFOOD

Supply Chain Overview

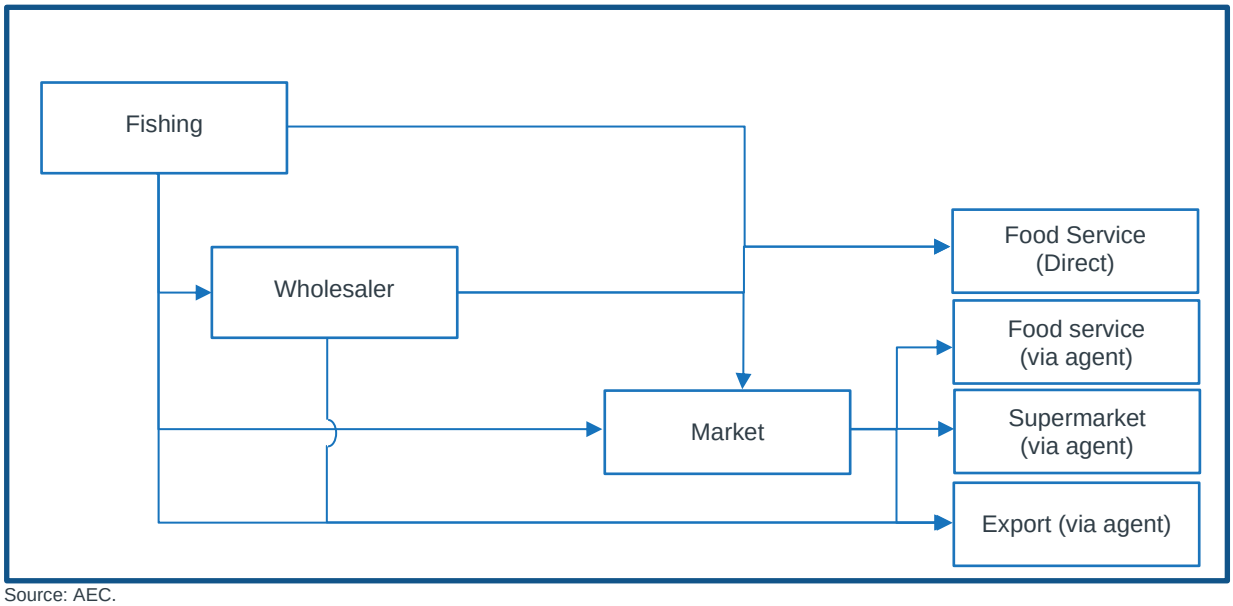
The seafood industry supply chain in the MIW region is centred around receiving ports and aquaculture facilities. Once received and processed (either by boat or from farm), seafood is frozen and transported by road to southern markets (Brisbane, Sydney, or Melbourne) or direct to customers (in food service or supermarkets).

The MIW region also has a live fish export industry, where live red fish are transported by road to Cairns Airport, where they are exported principally to Hong Kong.

Supply Chain Map

The figure below shows the supply chain map for wild caught seafood in the MIW region.

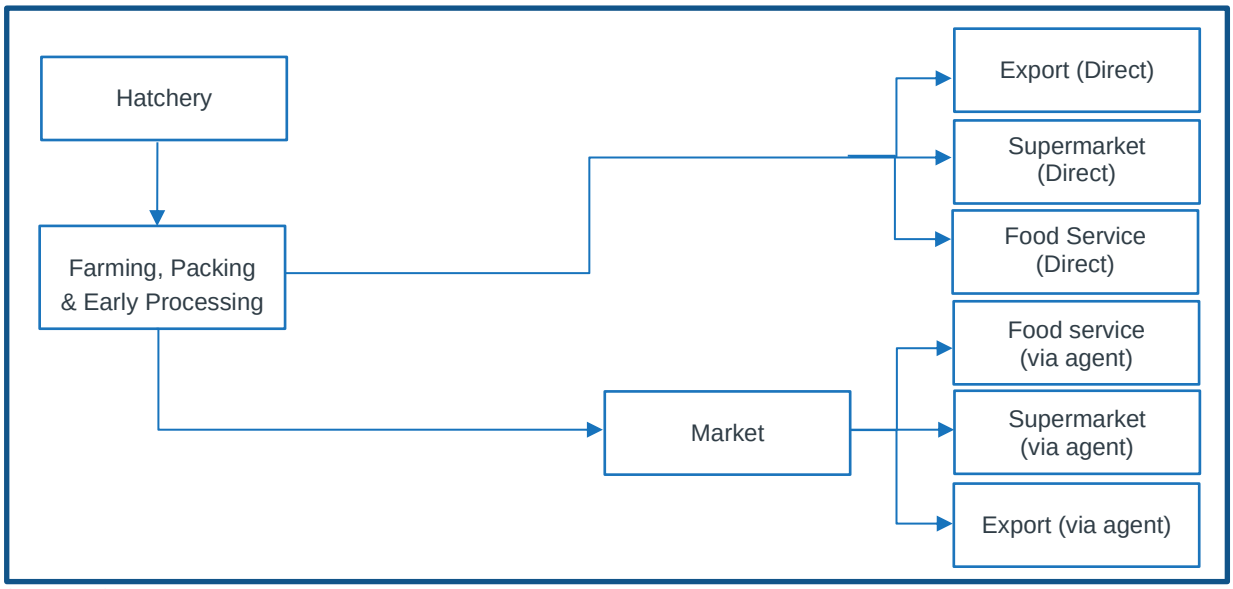
Figure 6.16. Wild Caught Seafood Industries Supply Chain



Source: AEC.

The figure below shows the supply chain map for aquaculture produced in the MIW region.

Figure 6.17. Aquaculture Industries Supply Chain

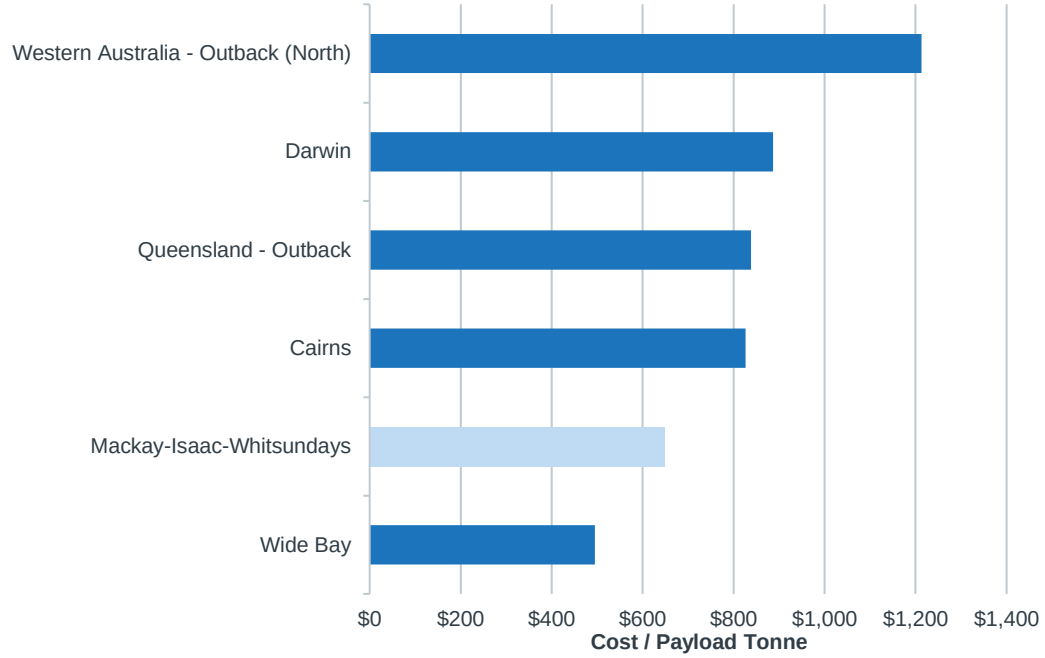


Source: AEC.

Supply Chain Costs

Figure 6.18 highlights the relative supply chain costs of the MIW region compared to the largest production volume regions for barramundi.

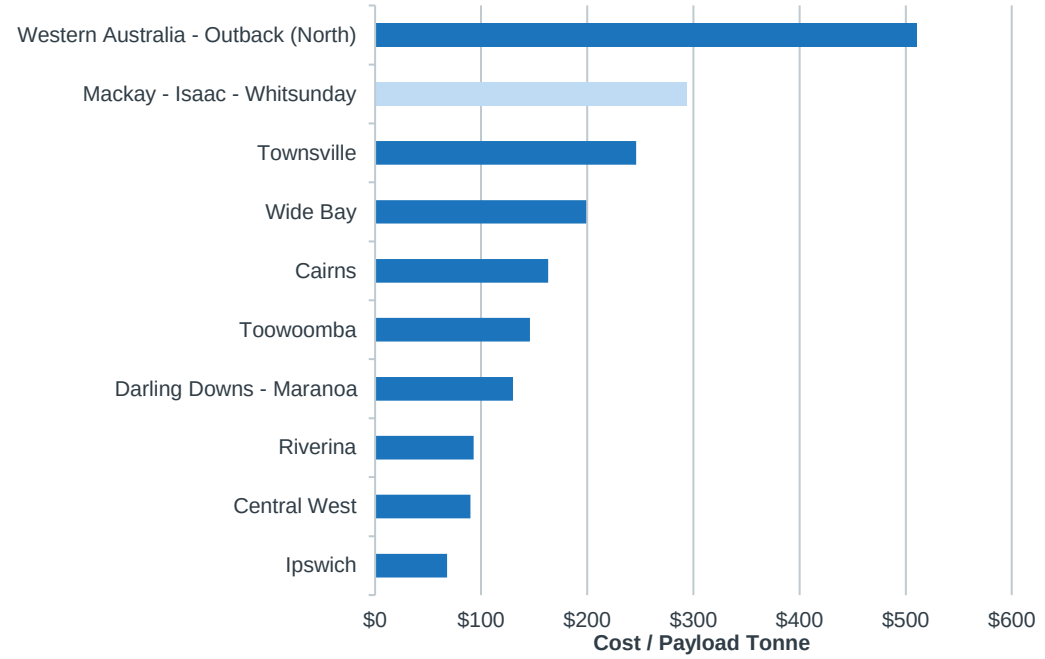
Figure 6.18. Relative Supply Chain Costs for Barramundi



Source: CSIRO (2022).

Figure 6.19 highlights the relative supply chain costs of the MIW region compared to the largest production volume regions for fish.

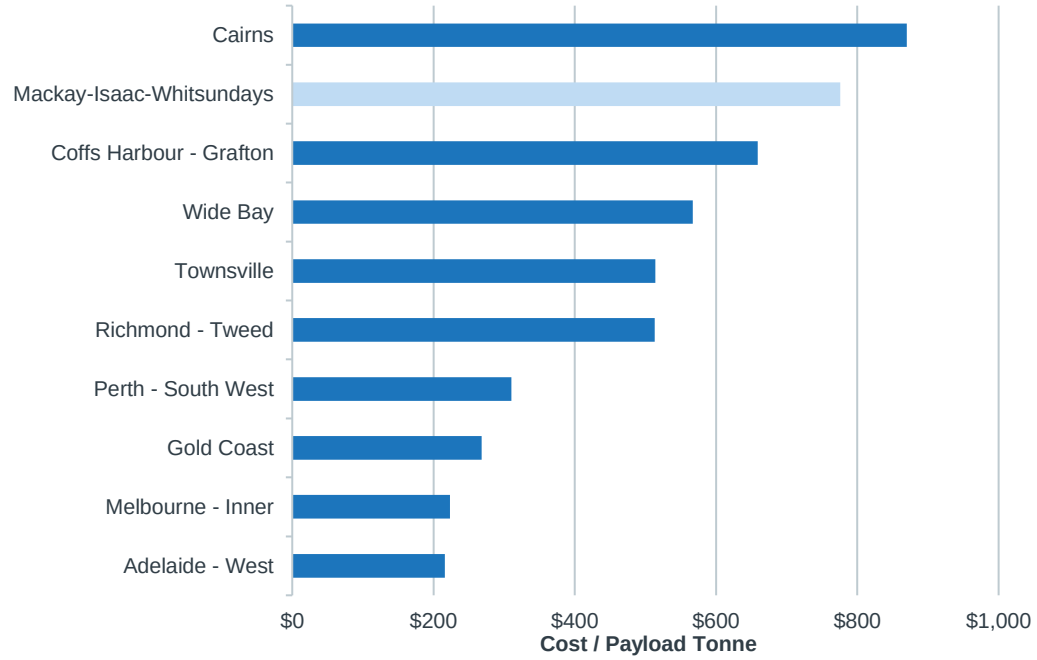
Figure 6.19. Relative Supply Chain Costs for Fish



Source: CSIRO (2022).

Figure 6.20 highlights the relative supply chain costs of the MIW region compared to the largest production volume regions for prawns.

Figure 6.20. Relative Supply Chain Costs for Prawns



Source: CSIRO (2022).

7. SUPPLY CHAIN INFRASTRUCTURE

This section profiles the supply chain infrastructure in the region.

KEY TAKEAWAYS

- The MIW region has high quality infrastructure that has been established to support efficient supply chain movement and value adding of agricultural product prior to export.
    - The key value adding infrastructure in the MIW region includes the five sugar mills and a sugar refinery, as well as two abattoirs and a seafood processing plant (exclusively for Tassal product) near Proserpine.
    - The dedicated supply chain infrastructure in the MIW region includes three livestock sale yards (which have very low throughput, relative to sale yards in nearby regions), upcountry grain receival and dedicated port storage and export facilities, as well as a sugarcane rail network, sugar receival, port storage and export facilities for the sugar industry.
- Currently, all perishable produce exported through air freight utilise either the Cairns or Brisbane airports. The MIW region has a number of airports that can support domestic air freight but require airline freight and ground handling capacity (including cold storage at the airport). The MIW region's airports require infrastructure upgrades to support the wide-bodied aircraft required for international air freight.
- The Port of Mackay currently supports bulk product export (principally grains and sugar). Agricultural product exported in containers (including refrigerated containers) utilise both the Port of Brisbane (and a lesser extent the Port of Townsville), as it is the port with the greatest access to international shipping lines. With the development of the required infrastructure (such as a container crane, multi-modal terminal and container farm), the Port of Mackay can be well placed to support coastal shipping, providing additional competition into the region's freight market, while providing better connectivity to export ports.
- Beyond export infrastructure, the MIW region has a number of gaps in the export value chain. The MIW region's lack of phytosanitary treatment providers, in-region freight forwarders and exporters means local horticultural producers are, in most circumstances, committed to supplying product to the Brisbane Markets.
- Additional gaps in the MIW region's supply chain infrastructure includes:
    - Livestock feedlotting and additional abattoir capacity in the beef industry
    - A live export port
    - Processing and packing capacity for chickpeas
    - Broadacre aggregation facilities in coastal areas to support rotational cropping in the sugarcane industry

7.1 VALUE ADDING INFRASTRUCUTRE

Abattoirs

The MIW region is home to two abattoirs, one located in Bakers Creek near Mackay (Thomas Borthwick & Sons) and the other near Clermont (Signature Beef). The Thomas Borthwick & Sons facility was built by the Queensland Government in 1964 and Thomas Borthwick & Sons in 1978. In 1994, NH Foods Group, a Japanese food producer and distributor purchased the facility, which can now process up to 750 head of cattle a day, producing an estimated 12,750 tonnes of saleable beef per year. The beef is sold both in Australia and exported to various countries such as Japan, Europe Union, Asia, Middle East, China and the Americas (Borthwicks, 2022). The facility can receive cattle either by road (up to B-Double) or by rail.

Signature OnFarm has recently been constructed and is expected to process up to 50,000 head of cattle per year, producing up to 3,400 tonnes of beef (NAIF 2018). Meat products produced in the facility are expected to be sold to China, the EU and other markets across Asia. The facility can receive cattle by road (up to Road Train Type 2).

There are also large abattoirs in adjacent regions that process cattle from the MIW region. The JBS Townsville facility provides the highest daily abattoir capacity with the ability to process 903 head of cattle per day. Teys Rockhampton, JBS Rockhampton and Teys Biloela in the Central Queensland region have a processing rate of around 700 head of cattle per day.

Table 7.1. Regional Abattoir Capacity

Region	Abattoir	Estimated Beef Output (T)	Capacity (Head / day)
North Queensland	JBS Townsville	15,351	903
Mackay-Isaac-Whitsunday	Borthwicks Mackay	12,750	750
Mackay-Isaac-Whitsunday	Signature OnFarm	3,400	200
Central Queensland	Teys Rockhampton	11,832	696
Central Queensland	JBS Rockhampton	11,900	700
Central Queensland	Teys Biloela	11,951	703

Note: Beef output is calculated at 200 days operations and 85kg saleable beef yield per 440kg live weight (Future Beef 2017).
Source: Department of Agriculture (2015).

Sugar Mills

The MIW region has five sugar mills, three in Mackay owned by Mackay Sugar/Nordzucker (Marian, Farleigh and Racecourse) and two by Wilmar (Proserpine and Plane Creek).

Invicta and Victoria mills from the Burdekin and Herbert River sugar areas were the largest mills by crush volume last season with crush volumes of 3,119,625 and 2,898,446 tonnes respectively. The Marian mill in the MIW region crushed through a volume of 2,185,000 tonnes of sugar cane and was the fourth largest amount in Queensland with Farleigh (1,583,000 tonnes) and Proserpine (1,535,660 tonnes) mills also seeing large crush volumes.

Table 7.2. Australian Sugar Mill Capacity

Region (SA4)	Sugar Mill	Owner	Total Cane Volume (T)	Crush Rate (T/hr)
Cairns	Mossman Central	Mossman Central Mill Company	758,576	233
Queensland - Outback	Tableland	MSF Sugar	486,217	116
Cairns	Mulgrave	MSF Sugar	288,171	76
Cairns	South Johnstone	MSF Sugar	1,483,185	391
Cairns	Tully	Tully Sugar	2,463,558	497
Townsville	Macknade	Wilmar Sugar	1,351,953	350
Townsville	Victoria	Wilmar Sugar	2,898,446	750
Townsville	Invicta	Wilmar Sugar	3,119,625	807
Townsville	Kalamia	Wilmar Sugar	1,527,009	379
Townsville	Pioneer	Wilmar Sugar	1,616,267	401
Townsville	Inkerman	Wilmar Sugar	1,642,192	425
Mackay-Isaac-Whitsunday	Proserpine	Wilmar Sugar	1,535,660	366
Mackay-Isaac-Whitsunday	Farleigh	Mackay Sugar	1,583,000	372
Mackay-Isaac-Whitsunday	Marian	Mackay Sugar	2,185,000	500
Mackay-Isaac-Whitsunday	Racecourse	Mackay Sugar	1,382,000	319
Mackay-Isaac-Whitsunday	Plane Creek	Wilmar Sugar	1,234,483	402
Wide Bay	Millaquin	Bundaberg Sugar	1,047,595	455
Wide Bay	Maryborough*	MSF Sugar	633,914	189
Wide Bay	Isis Central	Isis Central Sugar Mill	808,815	241
Gold Coast	Rocky Point	The Heck Group	281,109	98

Note: * - Has ceased operations
Source: Canegrowers (2021).

Sugar Refineries

The MIW region is home to one of four sugar refineries in Australia, where raw sugar is refined to white sugar. The Racecourse refinery accounts for 37% of Australia's sugar refining capacity. Detail on Australia's sugar refining capacity is outlined in the table below.

Table 7.3. Australian Sugar Refinery Capacity

Region (SA4)	Sugar Mill	Owner	Production Capacity per year (t)
Mackay-Isaac-Whitsunday	Racecourse	Sugar Australia	450,000
Wide Bay	Millaquin	Bundaberg Sugar	220,000
Melbourne-West	Yarraville	Sugar Australia	300,000
Coffs Harbour-Grafton	Harwood	Sunshine Sugar	260,000

Source: Sugar Australia (2018), ISSUU (2019).

Broadacre Processing Facilities

The MIW region currently does not have facilities to process broadacre crops. Despite having a large local production volume of chickpeas, the nearest pulse processing facilities are located in the Darling Downs/Toowoomba region.

The development of broadacre grain and pulse processing facilities in the region remains a considerable opportunity, especially if rotational sugarcane cropping systems develop in prominence throughout the region.

Fruit and Vegetable Processing Facilities

The MIW region currently does not have facilities to process waste picked horticultural products. Despite having a concentrated production of large volumes of specific commodities, there are no processing facilities (juicing or canning) facilities in North or Central Queensland.

The development of horticultural processing facilities in the region remains a considerable opportunity, especially considering the high volume of for waste product (both picked and unpicked) generated in the region.

Seafood Processing Facilities

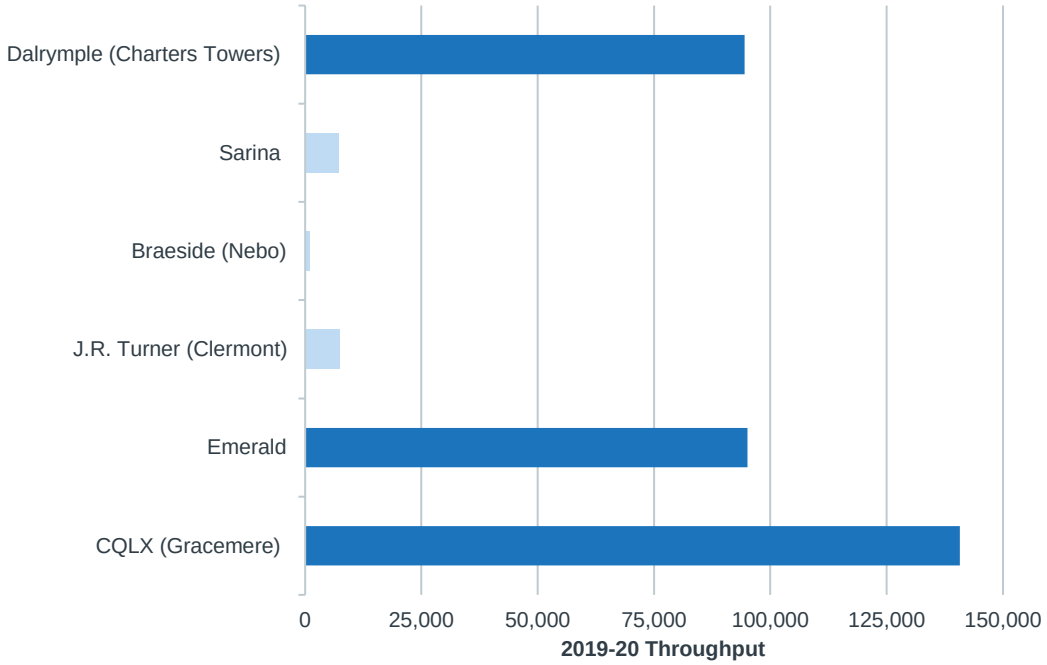
Tassal, a major aquaculture producer in the MIW region has a processing facility on its Gregory River (Proserpine) prawn farm, which is used to process prawns produced on its Proserpine and Mission Beach operations.

7.2 INDUSTRY-SPECIFIC LOGISTICS INFRASTRUCTURE

Livestock Sale Yards

As shown in the table below, the MIW region has several small sale yards at Clermont (owned by Isaac Regional Council) and Sarina and Nebo (privately owned), despite the region being one of the larger cattle producing regions in Australia. The major livestock sale yards in Northern Queensland are located outside of the MIW region.

Figure 7.1. Regional Saleyard Throughput



Source: MLA (2020).

Live Export Ports

There is no live export port in the MIW region. The Port of Townsville has the largest live export throughput of any port within Queensland with just under 270,000 cattle exported through the port in 2020, followed by the Port of Brisbane with just under 14,000 cattle exported and Alma with just under 4,000 (although Port Alma can support high export volumes, as evidenced in 2019).

Table 7.4. Live Export Port Throughput

Live Export Throughput	2017	2018	2019	2020	2021
Port Alma (Rockhampton)	-	2,199	45,835	3,957	-
Port of Brisbane	12,375	12,716	14,640	13,859	11,159
Port of Townsville	203,862	257,751	364,046	268,481	163,267

Note: Latest data from November 2021.
Source: Department of Agriculture, Water and the Environment (2021)

Bulk Sugar Terminals

The Australian sugar industry has the amongst the most efficient supply chains in the world. The efficiency of Australia's supply chains is largely due to dedicated bulk sugar terminals at all major ports in Queensland (including some dedicated sugar export ports, such as Lucinda and Mourilyan).

The Townsville and Mackay ports have the largest bulk sugar terminals in Queensland with capacities of 755,000 and 737,000 tonnes respectively. There are also smaller sheds to service smaller growing areas such as Bundaberg with a capacity of 316,000 tonnes, Lucinda with a capacity of 231,000 tonnes, Mourilyan with a capacity of 1750,000 tonnes and Cairns with a capacity of 234,000 tonnes.

Table 7.5. Bulk Sugar Terminals in Queensland (Sugar Terminals Limited)

Local Government Area	Bulk Sugar Terminal	Storage Capacity (T)	Proportion of Regional Capacity	Proportion of state storage capacity
Cairns	Cairns	234,000	69.6%	5.4%
Casowary Coast	Mourilyan	175,000	34.4%	13.9%
Hinchinbrook	Lucinda	231,000	39.7%	15.0%
Townsville	Townsville	755,000	63.0%	27.9%
Mackay	Mackay	737,000	64.4%	28.0%

Local Government Area	Bulk Sugar Terminal	Storage Capacity (T)	Proportion of Regional Capacity	Proportion of state storage capacity
Bundaberg	Bundaberg	316,000	86.0%	9.8%
Total	**-**	**2,448,000**	**(Average) 59.2%**	**100.0%**

Source: STL (2022), Canegrowers (2021).

Grain Receival and Aggregation Facilities (GrainCorp)

The MIW Region is home to one grain receival facility at Mount Mclaren, which is operated by GrainCorp. The grain received at this facility is transported by rail to the GrainCorp storage and loading facility at Mackay Port. The relative throughput of the Mount Mclaren facility cannot be disclosed due to commercial sensitivities.

Grain Export Ports (GrainCorp)

GrainCorp operates a bulk export terminal in the Mackay Port, consisting of 32,000 tonnes of concrete bins (vertical storage) and a further 40,000 tonnes of bunker storage capacity.

The tables below show the relative gain storage capacity across Queensland.

Table 7.6. Bulk Grain Terminals in Queensland

Local Government Area	Bulk Grain Terminal	Total Storage Capacity (T)	Proportion of Total Capacity	Average Export Volume (T)	Proportion of Regional Export
Mackay	Mackay (GrainCorp)	72,000	20%	190,000	38%
Gladstone	Gladstone (GrainCrop)	90,500	25%	160,000	57%
Brisbane	Fisherman Island (GrainCorp)	112,700	31%	530,000	21%
Brisbane	Murarrie (QBT)	85,200	24%	120,000	71%
Total	**-**	**360,400**	**-**	**-**	**(Average) 36%**

Source: GrainCorp (2012), ACCC (2020), QBT (2022)

7.3 AIR FREIGHT INFRASTRUCTURE

Whitsunday Coast (Proserpine) Airport

Whitsunday Coast Airport is owned by the Whitsunday Regional Council and is located 14 km south of Proserpine. The airport providing passenger services to between the Whitsundays and Cairns and Rockhampton (SkyTrans) Brisbane (Virgin and Jetstar), Sydney (Jetstart) and Melbourne (Jetstar).

The airport currently handles low volumes of live seafood freight:

- Importing live crayfish from the Torres Strait for high-end food service in the Whitsundays
- Exporting live mud crabs to seafood markets in Sydney

The Whitsunday Coast Airport Masterplan identifies air freight as a driver of both future growth at the airport and an enabler for wider economic activity in the region (Whitsunday Regional Council, 2015).

The Whitsunday Regional Council is actively pursuing the opportunity to develop a common-user freight distribution hub within the airport precinct (Whitsunday Regional Council, 2021).

Mackay Airport

Mackay Airport is a privately owned airport 3 km from the Mackay CBD and provides passenger services to between Mackay and Cairns, Townsville and Rockhampton (QantasLink) and Brisbane (Virgin, Qantas and Jetstar).

Mackay Airport currently operates two freight warehouses approximately 300m^2 each. Blenners Transport offers cold storage facilities in the nearby industrial estate, Paget.

The Mackay Airport has previously proposed to develop a new commercial enterprise precinct incorporating an air freight capability on the western side of the airport called the Milton Precinct (Mackay Airport, 2014).

Mackay Airport is owned by North Queensland Airports Group, a private infrastructure fund consortium, managed by JP Morgan Asset Management.

Moranbah Airport

Moranbah Airport is located 6 km south of Moranbah and is operated by BHP Mitsubishi Alliance, a coal mining company operating in the region. The airport supports flights between Moranbah and Cairns (QantasLink), Emerald (Alliance Airlines) and Brisbane (QantasLink and Alliance Airlines), principally in support of Fly-In, Fly-Out (FIFO) mining operations in the region.

Moranbah Airport does not have any freight capability or public plans to develop freight capability.

Cairns Airport

Cairns Airport is an international airport in Far North Queensland and supports direct flights to major cities in Australia including, Sydney, Melbourne, Brisbane, Perth, Adelaide, Canberra, Gold Coast, as well as regional services to Townsville, Mackay, Rockhampton and various communities in the Torres Strait, Cape York and Gulf of Carpentaria. Cairns Airport previously operated numerous continuous and seasonal international destinations including Tokyo Narita, Osaka, Seoul, Singapore, Denpasar, Hong Kong, Port Moresby, Shanghai, Shenzhen, Guangzhou, Manila, and Auckland.

Cairns Airport currently has two onsite freight facilities and operates as a consolidation point and export hub for live seafood and horticultural produce from the MIW region.

Air Freight Handling Services is currently developing a Regional Trade Distribution Centre (RTDC) at Cairns Airport, featuring state-of-the-art large cold and freezer rooms, and both temperature-controlled and ambient transit areas. The development is being supported by a $10m grant from the Queensland Government and is expected to be operational in 2022 (State Development, 2021).

Cairns Airport is owned by North Queensland Airports Group, a private infrastructure fund consortium, managed by JP Morgan Asset Management.

Brisbane Airport

Brisbane Airport is the largest airport in Queensland and operates an extensive passenger network across Queensland and Australia. Brisbane Airport also has a large international network operated by Australian and international carriers into major destinations in North America, Oceania, Middle East and throughout East and South East Asia.

Brisbane Airport's Export Park purpose-built facilities and is suited to warehousing, freight forwarding and logistics operations with airside access for exporters and customs and biosecurity facilities. Major exporters including DHL, Australia Post and FedEx have facilities at Export Park (BAC, 2018).

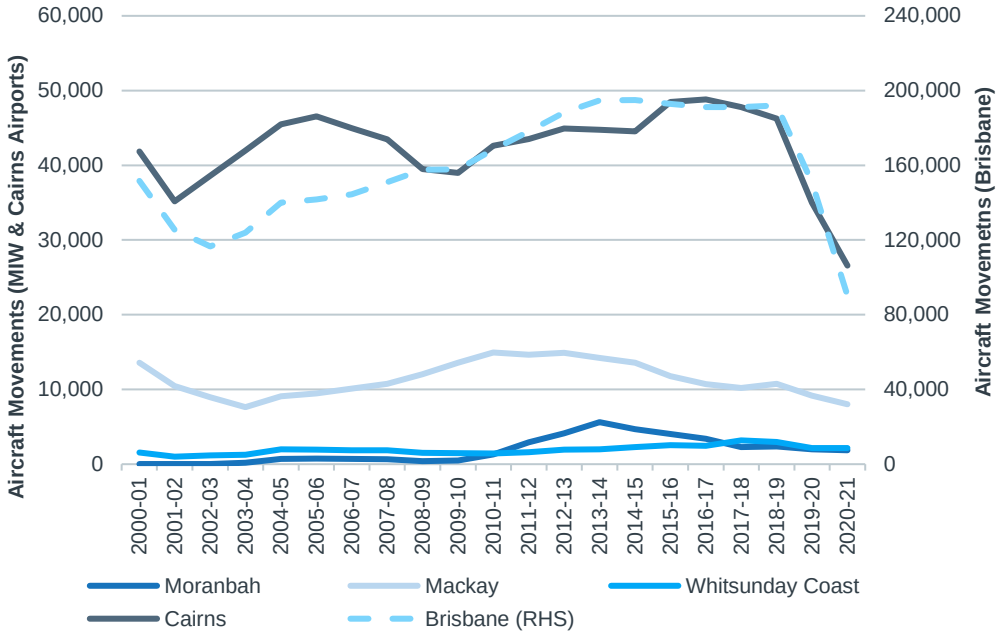
Brisbane Airport is the primary airport used for the export of agricultural commodities from Queensland.

Brisbane Airport is owned by a private infrastructure fund consortium of international and Australian investors.

Comparative Data

Figure 7.2 below shows the number of aircraft movements at profiled airports. Note: Brisbane movements are on the right axis.

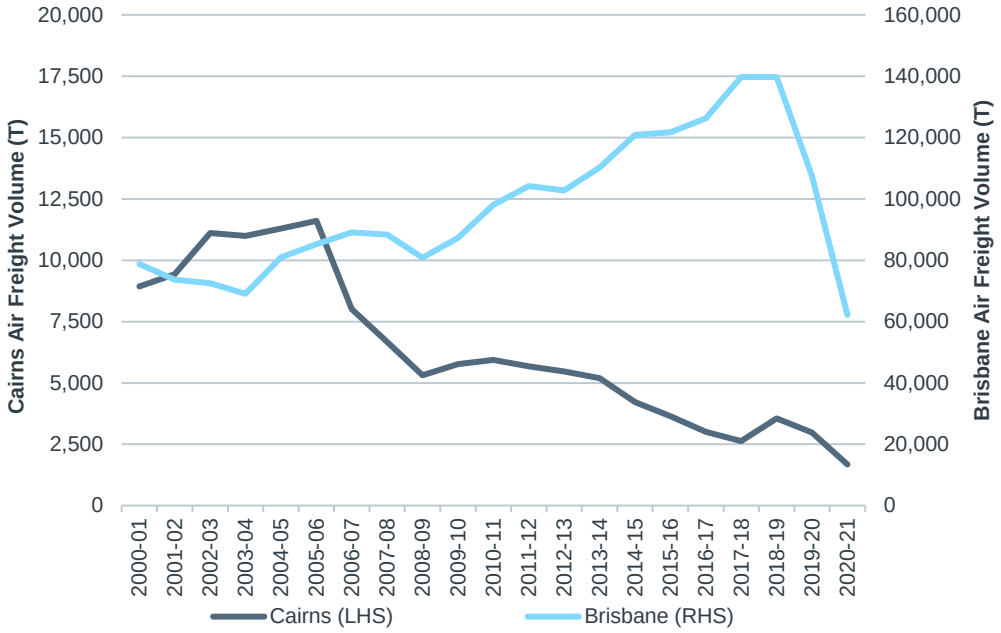
Figure 7.2. Aircraft Movements (Inbound and Outbound)



Source: BITRE (2022).

Figure 7.3 below shows the volume of inbound and outbound international air freight (excluding mail) at profiled airports. Note: Brisbane volumes are on the right axis.

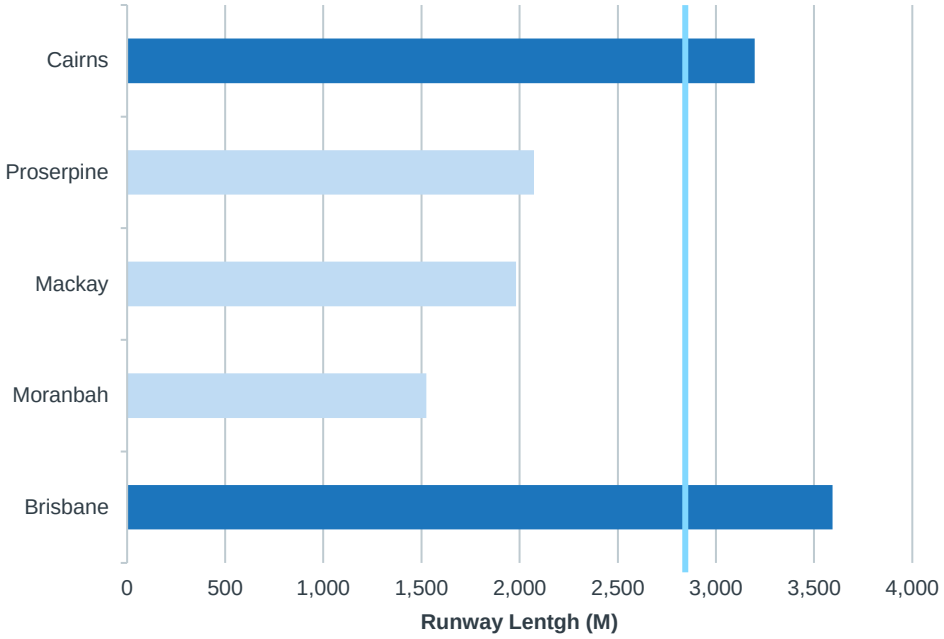
Figure 7.3. Air Freight Volumes (Inbound and Outbound)



Source: BITRE (2022).

Figure 7.4 below shows the relative runway lengths at profiled airports. The horizontal line represents the length of runway required to support wide bodied aircraft/international flights (2,800m).

Figure 7.4. Selected Runway Lengths



Source: Airport Guide (2022)

7.4 SEA FREIGHT INFRASTRUCTURE

Port of Mackay

The Port of Mackay has a berth depth of 16.5m (Berth 1), is located 7 km north of Mackay CBD and enables important import/export activity in the MIW region. Key commodities traded through the Port of Mackay's three operational berths include fuel, sugar (raw and refined), grain, magnetite, fertiliser, scrap metal and tallow, as well as break bulk products used in the mining and renewable energy sectors (NQBP, 2022). In 2019-20, the port processed 3,177,893 tonnes of cargo, made up by 789,672 tonnes of raw sugar, 256,305 tonnes of refined sugar and 77,105 tonnes of grain.

The Port of Mackay has a range of strategic benefits, including limited (if any) ship queuing (demurrage), a quarantine wash-down facility and licensed customs depot, ready access to major rail and road transportation corridors and an extensive land bank for laydown areas (NQBP, 2022).

Despite being Queensland's fourth busiest multi-product port (by freight throughput), the Port of Mackay is currently underutilised. The port is currently only handling one third of its capable volume and is able to support increased import/export trade to/from the region.

While a berth is available to support container import/export at the port, the Port of Mackay does not have dedicated container facilities and has some constraints in receiving high productivity road vehicles due to a number of road infrastructure constraints between the port and Nebo along the Peak Downs Highway.

Port of Townsville

The Port of Townsville is located on Cleveland Bay, approximately 3km east of the city centre of the Townsville CBD and has a berth depth of 12.2 m (Berth 3). Key commodities traded through the Port of Townsville's nine operational berths include fuel, sugar (raw), grain, fertilizer, live cattle, bulk molasses, mineral concentrates, containers, break bulk and motor vehicles. The Port of Townsville also has dedicated facilities for visiting cruise ships (Port of Townsville, 2021).

The Port of Townsville has five mobile harbour cranes, a dedicated container precinct, onsite cold storage and Type 2 Road Train and rail access direct to the port. Several shipping lines connect the Port of Townsville to major ports in Eastern and South East Asia, as well as New Zealand and Pacific island countries.

The Port of Townsville is utilised to export several agricultural products from the MIW region, including live cattle and chilled horticultural product.

Port of Gladstone

The Port of Gladstone, located adjacent to the Gladstone CBD, is Queensland's largest multi-commodity port, handling more than 30 different industrial products. While the Port of Gladstone has several dedicated berths for coal, LNG, alumina, aluminium, and grains, the port also has capacity to facilitate break-bulk cargoes, cruise ships and limited container movements. The container berth (Auckland Point 4) has a berth depth of 11.4m.

While the Port of Gladstone does not have a dedicated container crane or cold storage capacity, Gladstone Ports Corporation is actively planning to develop the Port of Gladstone as Australia's next major container terminal on Australia's east coast. The containerised freight initiative is being delivered in anticipation for connecting Gladstone to the Inland Rail project, where 1.5 million twenty-foot equivalent unit containers (TEUs) are expected to be traded through the Port of Gladstone's Port Central precinct (GPC, 2021).

Should the Port of Gladstone develop its container capacity as planned, it provides a unique opportunity to shorten export supply chains from the MIW region and potentially open new supply chain routes for the region.

Port of Rockhampton (Port Alma)

Port Alma is situated approximately 60km by road from the city of Rockhampton on the southern end of the Fitzroy River delta. While the principal cargoes handled are explosives, ammonium nitrate, bulk tallow and military equipment, the port remains a key cattle export port in Australia, which has approved capacity to handle 7500 lighter cattle (350kg average) or 5000 heavier cattle (500kg). Port Alma is a key export port for live cattle from the MIW region.

Port of Brisbane

The Port of Brisbane is located at the mouth of the Brisbane River. Containers, oil (both crude and refined), grains, woodchips, cotton and cottonseed, motor vehicles, chemicals, fertilisers, cement and coal are the primary import/export activity types. The Port of Brisbane also has a dedicated cruise ship terminal.

The Fisherman Islands section at the Port of Brisbane has eight x 300m container berths leased by three stevedores, with automated post-panamax automated container handling equipment, a multi-modal terminal and is serviced by most major global shipping lines. The berth depth at Fisherman Islands is 14m (Port of Brisbane, 2022).

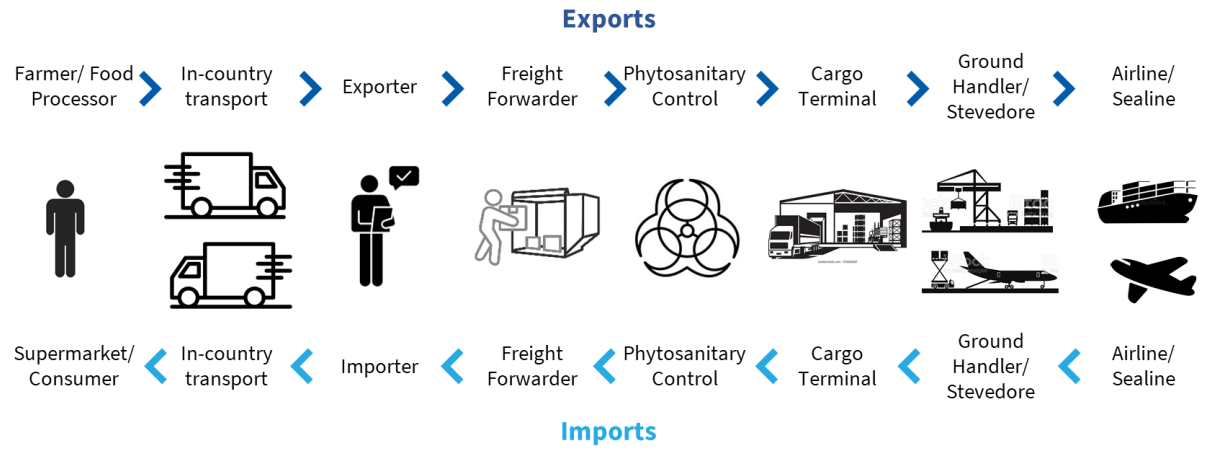
Most containerised freight (including cold containers/reefers) exported from the MIW region are traded through the Port of Brisbane.

7.5 EXPORT VALUE CHAINS

Value Chain Overview

The export value chain consists of businesses who have specific roles in the handling of import and export cargoes. The parties involved are basically the same for import and export cargoes, however, the flow works in the opposite direction. Figure 7.5 describes the various components and their relationship to each other.

Figure 7.5. Export/Import Value Chain



Source: AEC.

Air Freight Value Chain Map

The MIW region currently does not have the infrastructure or value chain to enable air freight exports direct from the region. To enable this activity, the region would need to develop cargo terminals (with cold storage), establish freight forwarders in region, construct international-capable runways, establish international passenger air services and develop the required phytosanitary treatments.

Tthere are opportunities to support domestic air freight (such as exporting direct to the Brisbane/Sydney/Melbourne markets), and whilst there are some practical disadvantages associated with utilising domestic air freight to connect to international air freight (such as multiple additional contact points, packing/unpacking from narrow to wide bodied aircraft, risk of cold-chain disruption and unit cost per kg), this will continue to be the way of working for the foreseeable future due to the significant investment required to be direct export ready.

Table 7.7. Air Freight Value Chain highlights the air freight value chains in the region**.** Successful direct export requires all components of the freight value chain to exist and operate efficiently.

Table 7.7. Air Freight Value Chain

Airport	Airlines		Cargo Terminal	Freight Forwarders	Phyto-sanitary treatment	Ground handlers	Exporters/ Importers
	Domestic	International					
Whitsunday Coast	YES	NO	DEV	DEV	NO	YES	NO
Mackay	YES	NO	DEV	NO	NO	YES	NO
Moranbah	YES	NO	NO	NO	NO	NO	NO
Townsville	YES	NO	YES	YES	NO	YES	NO
Cairns	YES	YES	YES	YES	YES	YES	YES
Brisbane	YES	YES	YES	YES	YES	YES	YES

Note: DEV indicates in development
Source: AEC

Sea Freight Value Chain Map

While the MIW Region does have efficient export facilities for bulk grain and bulk sugar, there are no sea-based supply chains for containerised freight. This limitation in the local supply chain exposes the region to reduced competition (and therefore potentially higher prices), as well as disruption in extreme weather events across the coast of Queensland that impact road and rail routes. Feedback received during stakeholder engagement indicated that coastal shipping services could be provided at comparable prices to existing rail services.

Importantly, using coastal shipping to connect to export freight opportunities is dissimilar to air freight, as containerised freight (including using refrigerated reefers) does not have the double handling and unpacking/re-packing issues associated with moving between narrow- and wide-bodied aircraft. Further, coastal shipping enables wharf-to-wharf connections for freight export, which overcomes a range of rail and road connectivity issues in Townsville and Brisbane ports.

Efforts to develop a costal shipping service from the Mackay Port to both Townsville and Brisbane would deliver stronger export freight links for the region, by connecting Mackay Port with the ports of Townsville and Brisbane, both of whom have varied liner shipping services to key export markets for the region's agricultural produce.

To realise the opportunity associated with coastal shipping from the MIW region, the Queensland Government needs to deliver on its commitment to invest $21 million into delivery of coastal shipping services. Initially, coastal shipping services can utilise on-ship cranes to load/unload containers at the Port of Mackay. However longer-term, Mackay Port will require a dedicated container (and reefer) storage yard and a dedicated container crane.

As container volume increases at Mackay Port, a longer-term goal can be the attraction of direct liner services.

Table 7.8 below highlights the sea freight value chains in the region. Successful direct export requires all components freight value chain to exist and operate efficiently.

Table 7.8. Sea Freight Value Chain

Port	Multi-modal port access	Shipping Lines (incl Agents)		Storage and Handling (incl Stevedores)				Phyto-sanitary treatment	Freight Forwarders	Exporters/ Importers
		Coastal	Liners	Dry Bulk	Cold Storage	Containers	Livestock			
Mackay	DEV	DEV	NO	YES	DEV	DEV	NO	NO	DEV	NO
Cairns	YES	NO	YES	YES	NO	YES	NO	NO	NO	NO
Townsville	DEV	DEV	YES	YES	YES	YES	YES	NO	YES	YES
Rockhampton (Alma)	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO
Gladstone	YES	NO	NO	YES	NO	YES	NO	NO	NO	NO
Brisbane	YES	DEV	YES	YES	YES	YES	YES	YES	YES	YES

Note: DEV indicates in development
Source: AEC

7.6 SPECIFIC HORTICULTURAL EXPORT REQUIREMENTS

Exporting Goods

In order to export agricultural products, individuals must register with Department of Agriculture, Water and the Environment (DAWE, 2021). There are numerous steps in the registration process that can either be done as the exporter or through DAWE or an industry service. These steps include:

- Become an Accredited Property (where required). It is important to understand the importing country's requirements as some products may be subject to additional requirements. These markets are known as protocol markets, and when these protocol agreements are in place, the property is required to be accredited by DAWE.
- Becoming a registered establishment to pack and prepare your own products or use a third-party industry registered establishment. The organisation is required to become a registered establishment if the goods are being exported in all instances unless the export products include narcotic goods, plant-based oils or shipments of prescribed goods that are less than or equal to 10 litres.
- Become an Authorised Officer (AO) to inspect your products or use departmental or other industry AO. The Authorised Officers are appointed to inspect the products before export to ensure that they comply with Australian export laws, comply with the importing country requirements and any other requirements outlined on the Plant Export Operations Manual as highlighted by the DAWE (DAWE, 2021).

Of important note, products that are defined and/or labelled as organic, bio-dynamic, ecological or similar label, the exporter will need to meet additional requirements under Australian export laws.

Importing Country Requirements

The import conditions for each product will vary depending on a number of factors including the import country, the product being imported, and the end use of the product. The requirements for each importing country vary depending on product and can include declaration of pest-free area status, identification of how and where the product is grown, how the product is treated (i.e., some herbicides/treatments may not be authorised in some countries), and where the product is packed. Each country may also require different certificates, declarations, and forms (i.e., phytosanitary certificates).

If the product being exported does not meet the requirements of the importing country, then the product could be destroyed on site, returned to Australia, or diverted to another international market. Not meeting requirements for the importing country will result in significant costs to the exporter and impact future export opportunities.

The Manual of Importing Country Requirements (Micor) is a key information point for identifying importing country requirements for plants and pant products. It is the responsibility as the exporter to verifying the information in the Micor database with the importing country's National Plant Protection Office (NNPO) before relying on it. Official information in writing from the importing country's NNPO and must be done before exporting.

Volume of shipment

Depending on the volume of the shipment of products, a phytosanitary inspection and export permit maybe required. Shipments that are over 10 litres for liquid products and over 10 kilograms for all other products do not need an export permit. A phytosanitary certificate will be required if stated by the importing country.

It is also important to note any tariff or quota implications for the import country. Generally, under Free Trade Agreements, there will be no tariff implications and therefore no additional costs to the exporter however research must be undertaken to identify tariff implications by product and country. Quotas are sometimes implemented by the importing countries government to support domestic production and protect local growers. Quotas have the potential to impact the volume of shipment from Australia.

Prepare your products for export

As stated previously, the exporter must make sure the products meet the importing country requirements, comply with Australian export laws and all other requirements outlines on the Plant Export Operations Manual. Products are required to be treated to target the control and eradication of pests, depending on the import country

requirements for each product. Different treatments for varying markets and products are identified on Micor plants database.

Some horticultural products may be required to be moved after they have been prepared for inspection. If this is the case, products must maintain the phytosanitary security during transit.

Present your products for inspection

As stated previously, an AO must inspect products before exporting however, a phytosanitary inspection is not required for:

- Export of fresh fruit and vegetables where a phytosanitary certificate is not required by the importing country
- Consignments of plant-based oils

The AO will inspect product and documentation to confirm it meets importing country requirements, complies with Australia export laws and all other requirements outlined in the Plant Export Operations Manual. During the inspection, the AO will check both the products packaging and transport unit to ensure they meet standards and there is no contamination.

Request approval to export your products

Once the AO has inspected the products and has approved that they have met the requirements, the exporter will:

- Need to request the Request For Permit (RFP) authorisation from the DAWE, and
- Submit and required post-inspection supporting documentation to DAWE.

After authorisation of RFP, the exporter will be issued an export permit and phytosanitary certificate which is valid for 28 days after the AO's inspection. If no inspection was required, then the export permit will be valid for 28 days from the date that the permit is issued.

Phytosanitary Treatments

Horticulture and broadacre products must also be packed, treated (if necessary) and inspected in an establishment registered with the Government for the export of horticulture and broadacre products from Australia.

Treatments include a range of processes aimed at controlling or eradicating pests and contaminants from products, empty containers and bulk vessels for export. Treatments may include, but are not limited to, any of the following measures necessary to eradicate pests or contaminants:

- Fumigation
- Irradiation
- Controlling of atmosphere or temperature
- The application of a chemical substance
- Dismantling, repairing, or cleaning
- Repacking
- Blending.

8. MARKET IDENTIFICATION

This chapter identifies potential markets that could be developed as export markets for agricultural products produced in the MIW region. The market identification analysis provides decision makers with a simple and targeted overview of export market opportunities.

KEY TAKEAWAYS

The following commodities have been identified as potential export opportunities in key target markets:

Table 8.1. Summary of Market Identification

Country	Current Product Opportunities	Alternative Product Opportunities
Singapore	Beef, prawns, mangoes, tomatoes.	Avocado, rice, bananas and cocoa beans.
Japan	Beef, prawns, fish, sugar, mangoes and wheat	Soybeans, coffee, bananas, offal, bananas, prepared fruit and frozen vegetables
USA	Beef, fish, sugar, tomatoes, capsicums, beans, and mangoes	Coffee, prepared fruit, avocados, bananas, and grapes
Taiwan	Beef, prawns, mangoes, and beans	Avocado, soybean, corn, wheat, and cotton
South Korea	Beef, corn	Wheat, soybeans, coffee, and bananas
Arab Gulf countries	Livestock, beef, fish, watermelons, mangoes, wheat, chickpea, and sugar	Rice, bananas, dates, and soybeans
New Zealand	Watermelons, prawns, mangoes, beans, capsicums, tomatoes, wheat, and raw sugar	Soybeans, prepared fruit, and bananas

Source: AEC

- Despite being a large exporter of agricultural product, Australia continues to import large volumes of certain food products that could be produced in Australia. Key products produced in the MIW region that Australia imports include capsicum (from New Zealand) and large volumes of seafood (from South East Asia)
- The following food products are also imported but could potentially be produced and manufactured in the region: soybean cake, prepared fruit, coffee, rice, animal feed and beverages (both distilled alcoholic and non-alcoholic). The total market value of these products alone is estimated to be $3.5 billion (US$2.5 billion).

8.1 APPROACH

A Multi-Criteria Assessment (MCA) is the formal market identification process used to identify export market opportunities for agricultural products in the MIW region. The criteria used in the MCA are profiled below.

Assessed Countries

The countries in the figure below were selected to be tested in the MCA as they either have or could have a potentially favourable, multi-commodity trade relationship.

Figure 8.1. Countries Selected for the MCA

Source: AEC

Assessed Commodities

The commodities assessed in the MCA were limited to those that are grown (or could be grown) in the region and required a viable cold chain. Bulk commodities (such as broadacre grains and pulses, sugar and live cattle) were excluded as their supply chain access is dependant on bulk carriers.

Commodities included: beef, prawns, fish, mangoes, melons, beans, chillies and peppers, tomatoes, as well as commodities with production potential in the region, such as avocados, lemons and limes, oranges and bananas.

Market Opportunity

The available market opportunity was assessed through identifying if the target country was either a major importer or a current Australian export market destination of the focus commodities.

Free Trade Agreements

Australia has Free trade Agreements (FTAs) with the countries shown in Figure 8.2

Figure 8.2. Australia's Free Trade Agreements

Source: AEC

Direct Air Connection

The following countries have a direct sea freight connection to the Port of Townsville and Port of Brisbane.

Figure 8.3. Countries and Cities with Direct Sea Links to Cairns and Brisbane Airports

Source: AEC

Direct Sea Connection

The following countries have a direct sea freight connection to the Port of Townsville and Port of Brisbane.

Figure 8.4. Countries and Ports with Direct Sea Links to Townsville and Brisbane Ports

Source: AEC

Global Economic indicators

The following global economic indicators were used to further explore market the suitability of the market:

- GDP per capita: A market's level of disposable income and capacity to pay for high quality food products
- Urban population: The potential market size in established urban distribution networks
- Quality of port index: The ease at which to import product into a country
- Logistics performance indicator: The ease at which to transport product in destination countries
- Market proximity indicator: A proxy for the cost of transporting a product to market
- Political stability index: Risk of political interruption in commercial business activity
- Government effectiveness indicator: Capacity to enforce commercial arrangements and contracts and resolve potential disputes
- Arable land per capita: Ability for the country to produce food for its domestic population

8.2 MCA OUTCOMES

Summary

The following figure shows the summary of the market analysis MCA.

Figure 8.5. Countries and Ports with Direct Sea Links to Townsville and Brisbane Ports

Source: AEC

East Asia

The following figure shows the market analysis MCA outcomes for East Asia.

Figure 8.6. Market Analysis MCA – East Asia

East Asia	Has FTA	Large Market	Existing Australian Market	Direct air link (CNS/BNE)	Direct sea link (TSV/BNE)	GDP per capita ($US)	Urban Population (M)	Logistics performance indicator	Quality of port index	Market Proximity (km)	Political stability index	Governmetn effectiveness indicator	Arable land per capita (ha)	Overall favourability
Taiwan	O	0	5	Y	Y	$27,998	19	3.7	5.2	5,878	0.8	1.6		H
Japan	Y	3	3	Y	N	$39,539	116	4.0	5.3	6,068	1.0	1.6	0.03	H
South Korea	Y	0	1	Y	Y	$31,489	42	3.7	5.2	6,696	0.6	1.4	0.03	H
China	Y	2	3	Y	Y	$10,500	843	3.6	4.6	6,168	-0.3	0.6	0.09	M

Source: AEC

South East Asia

The following figure shows the market analysis MCA outcomes for South East Asia.

Figure 8.7. Market Analysis MCA – South East Asia

South East Asia	Has FTA	Large Market	Existing Australian Market	Direct air link (CNS/BNE)	Direct sea link (TSV/BNE)	GDP per capita ($US)	Urban Population (M)	Logistics performance indicator	Quality of port index	Market Proximity (km)	Political stability index	Governmetn effectiveness indicator	Arable land per capita (ha)	Overall favourability
Singapore	Y	0	4	Y	Y	$59,798	6	4.1	6.7	5,534	1.5	2.3	0.00	H
Malaysia	Y	0	3	N	Y	$10,402	24	3.3	5.4	5,864	0.1	1.0	0.03	M
Indonesia	Y	0	3	Y	Y	$ 3,870	152	3.1	4.0	3,976	-0.5	0.4	0.10	M
Thailand	Y	0	2	N	Y	$ 7,189	35	3.4	4.3	6,633	-0.6	0.3	0.24	L
Brunei	Y	0	1	N	N	$27,466	0	2.8	3.9	4,728	1.1	1.4	0.01	L
Philippines	Y	0	1	N	N	$ 3,299	51	2.9	2.9	4,754	-0.8	0.1	0.05	L
Vietnam	Y	0	1	N	N	$ 2,786	35	3.2	3.7	5,877	-0.1	0.2	0.07	L
Laos	Y	0	0	N	N	$ 2,630	3	2.5	2.3	6,771	0.7	-0.8	0.22	L
Cambodia	Y	0	0	N	N	$ 1,513	4	2.7	3.7	6,191	-0.2	-0.4	0.24	L
Myanmar	Y	0	0	N	N	$ 1,400	17	2.3	0.0	7,201	-1.5	-1.0	0.21	L

Source: AEC

Southern Asia

The following figure shows the market analysis MCA outcomes for Southern Asia.

Figure 8.8. Market Analysis MCA – Southern Asia

Southern Asia	Has FTA	Large Market	Existing Australian Market	Direct air link (CNS/BNE)	Direct sea link (TSV/BNE)	GDP per capita ($US)	Urban Population (M)	Logistics performance indicator	Quality of port index	Market Proximity (km)	Political stability index	Governmetn effectiveness indicator	Arable land per capita (ha)	Overall favourability
India	O	0	0	N	N	$ 1,901	471	3.2	4.6	9,054	-0.9	0.4	0.12	L
Pakistan	N	0	0	N	N	$ 1,194	80	2.6	4.0	10,107	-1.9	-0.5	0.14	L
Sri Lanka	N	0	0	N	N	$ 3,682	4	2.7	4.5	8,129	-0.0	-0.1	0.06	L

Source: AEC

North America

The following figure shows the market analysis MCA outcomes for North America.

Figure 8.9. Market Analysis MCA – North America

North America	Has FTA	Large Market	Existing Australian Market	Direct air link (CNS/BNE)	Direct sea link (TSV/BNE)	GDP per capita ($US)	Urban Population (M)	Logistics performance indicator	Quality of port index	Market Proximity (km)	Political stability index	Governmetn effectiveness indicator	Arable land per capita (ha)	Overall favourability
United States	Y	8	2	Y	N	$63,544	271	3.9	5.8	11,542	-0.0	1.3	0.48	H
Canada	Y	0	1	N	N	$43,258	31	3.8	5.4	12,753	1.1	1.6	1.04	M
Mexico	Y	0	0	N	N	$ 8,347	103	3.1	4.3	12,954	-0.9	-0.2	0.19	L

Source: AEC

South America

The following figure shows the market analysis MCA outcomes for South America.

Figure 8.10. Market Analysis MCA – South America

South America	Has FTA	Large Market	Existing Australian Market	Direct air link (CNS/BNE)	Direct sea link (TSV/BNE)	GDP per capita ($US)	Urban Population (M)	Logistics performance indicator	Quality of port index	Market Proximity (km)	Political stability index	Governmetn effectiveness indicator	Arable land per capita (ha)	Overall favourability
Chile	Y	0	0	N	N	$13,232	17	3.3	4.9	12,379	0.1	1.0	0.06	M
Uruguay	N	0	0	N	N	$15,438	3	2.8	4.9	13,453	1.1	0.8	0.57	L
Argentina	N	0	0	N	N	$ 8,442	41	2.9	3.7	12,821	0.0	-0.2	0.88	L
Brazil	N	0	0	N	N	$ 6,797	183	3.0	3.1	15,454	-0.4	-0.4	0.27	L
Peru	Y	0	0	N	N	$ 6,127	25	2.8	3.7	14,126	-0.3	-0.2	0.11	L
Ecuador	N	0	0	N	N	$ 5,600	11	2.8	4.6	14,191	-0.4	-0.4	0.06	L
Colombia	O	0	0	N	N	$ 5,333	41	2.8	3.8	15,109	-0.7	0.0	0.12	L
Venezuela	N	0	0	N	N	$ 3,573	25	2.4	2.7	15,975	-1.5	-1.8	0.09	L

Source: AEC

Middle East and Africa

The following figure shows the market analysis MCA outcomes for Middle East and Africa.

Figure 8.11. Market Analysis MCA – Middle East and Africa

Middle East and Africa	Has FTA	Large Market	Existing Australian Market	Direct air link (CNS/BNE)	Direct sea link (TSV/BNE)	GDP per capita ($US)	Urban Population (M)	Logistics performance indicator	Quality of port index	Market Proximity (km)	Political stability index	Governmetn effectiveness indicator	Arable land per capita (ha)	Overall favourability
Saudi Arabia	O	1	3	N	N	$20,110	29	3.1	4.7	12,639	-0.7	0.1	0.10	H
United Arab Emirates	O	0	1	Y	N	$36,100	8	3.9	6.2	11,448	0.6	1.3	0.00	H
Qatar	O	0	0	Y	N	$50,805	3	3.5	5.6	11,769	0.7	0.9	0.01	H
Israel	N	0	0	N	N	$43,611	8	3.4	4.7	13,476	-0.8	1.1	0.04	M
South Africa	N	0	0	N	N	$52,742	40	3.6	.	11,864	-0.2	0.3	0.21	L
Kuwait	O	0	0	N	N	$25,979	4	3.0	3.8	12,239	0.2	-0.2	0.00	L
Bahrain	O	0	0	N	N	$19,955	1	3.1	5.1	11,861	-0.6	0.4	0.00	L
Turkey	N	0	0	N	N	$ 8,538	63	3.3	4.5	13,542	-1.2	-0.0	0.24	L
Lebanon	N	0	0	N	N	$ 4,891	6	2.7	3.5	13,416	-1.6	-1.2	0.02	L
Jordan	N	0	0	N	N	$ 4,283	9	2.8	4.5	13,275	-0.3	0.1	0.02	L
Iraq	N	0	0	N	N	$ 4,157	28	2.2		12,638	-2.5	-1.3	0.13	L
Egypt	N	0	0	N	N	$ 3,548	43	3.0	4.7	13,939	-1.2	-0.5	0.03	L
Iran	N	0	0	N	N	$ 2,283	63	2.7	4.0	11,682	-1.7	-1.0	0.18	L

Source: AEC

Pacific

The following figure shows the market analysis MCA outcomes for the Pacific.

Figure 8.12. Market Analysis MCA – Pacific

Pacific	Has FTA	Large Market	Existing Australian Market	Direct air link (CNS/BNE)	Direct sea link (TSV/BNE)	GDP per capita ($US)	Urban Population (M)	Logistics performance indicator	Quality of port index	Market Proximity (km)	Political stability index	Governmetn effectiveness indicator	Arable land per capita (ha)	Overall favourability
New Zealand	Y	0	5	Y	Y	$41,478	4	3.7	5.5	3,171	1.5	1.6	0.10	H
Papua New Guinea	Y	0	3	Y	Y	$ 2,637	1	2.3		1,801	-0.7	-0.8	0.03	M
Solomon Islands	Y	0	0	N	Y	$ 2,258	0	2.5		1,746	0.6	-0.9	0.03	M
New Caledonia	N	0	2	N	Y	$33,474	0			1,690	-	-	0.02	L
Vanuatu	Y	0	1	N	N	$ 2,783	0			2,056	0.9	-0.5	0.07	L
Cook Islands	Y	0	0	N	N	$21,884	0			5,483	1.1	-		L
Tonga	Y	0	0	N	N	$ 4,714	0			3,707	1.0	0.2	0.19	L
Niue	Y	0	0	N	N	$ 4,666	0			4,275	1.4	-		L
ꞌamoa	Y	0	0	N	N	$ 4,067	0			4,179	1.2	0.5		L
Kiribati	Y	0	0	N	N	$ 1,671	0			3,578	1.1	-0.1	0.02	L
Fiji	Y			Y	N	$ 4,882	1	2.4		3,140	0.7	0.3	0.19	L

Source: AEC

Europe

The following figure shows the market analysis MCA outcomes for Europe.

Figure 8.13. Market Analysis MCA – Europe

Europe	Has FTA	Large Market	Existing Australian Market	Direct air link (CNS/BNE)	Direct sea link (TSV/BNE)	GDP per capita ($US)	Urban Population (M)	Logistics performance indicator	Quality of port index	Market Proximity (km)	Political stability index	Governmetn effectiveness indicator	Arable land per capita (ha)	Overall favourability
United Kingdom	Y	4	0	N	N	$40,285	56	4.0	5.5	15,646	0.5	1.4	0.09	M
Netherlands	O	4	0	N	N	$52,397	16	4.1	6.8	15,393	0.9	1.9	0.06	M
France	O	5	0	N	N	$39,030	54	3.9	5.1	15,946	0.3	1.2	0.27	L
Germany	O	4	0	N	N	$46,208	64	4.2	5.5	15,156	0.7	1.4	0.14	L
Russia	N	4	1	N	N	$10,127	108	2.7	4.2	10,513	-0.7	0.0	0.84	L
Spain	O	3	1	N	N	$27,063	38	3.8	5.5	16,841	0.4	0.9	0.25	L
Poland	O	1	0	N	N	$15,656	23	3.5	4.2	14,554	0.6	0.4	0.29	L
Italy	O	0	0	N	N	$31,676	43	3.7	4.4	15,259	0.4	0.4	0.11	L

Source: AEC

8.3 TARGET COUNTRY PROFILES

This section provides an overview of each target market.

Singapore

Current opportunities include: beef, prawns, mangoes, avocados, tomatoes.

Alternative product opportunities include: rice and cocoa beans.

Key facts and figures

- Free Trade Agreements: AANZFTA, SAFTA
- Population: 5.45 million (2021)
- GDP per capita: US$59,797

Singapore has been assessed as a target export market due to the diverse advantages it offers the MIW region. The Singapore Australia Free Trade Agreement (SAFTA) entered into force in 2003 and subsequent amendments were made in 2006, 2007, 2011, 2017 and 2020. Singapore is also a party to the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). Under these agreements, all number of tariffs for Australian agriculture have been eliminated.

Produce with high demand in Singapore includes fruit, vegetables, meats, dairy, grains, pulses and aquaculture (all major foods and ingredients). Singapore's retail food sector is one of the most advanced in the world. The mature nature of Singapore's mass grocery retail sector is evidenced by intense competition, which ensures retailers must be highly innovative to compete.

Singapore imports over 90 per cent of its food requirements due to limited land available for agriculture — creating opportunities for international products and brands to export to Singapore. Australia, China, Indonesia, Malaysia and United States are Singapore's main suppliers of food. A favourable GDP per capita indicates a high capacity to pay, and behavioural preference towards Australia's premium agriculture products. The region will need to establish competitive advantage through quality and brand value to maintain valuable market share.

Singapore's geographic proximity to the region offers a great opportunity to increase cold chain export opportunities through secondary market exporting. Singapore's logistical performance, particularly around cold chain supply means market access is extremely efficient, ideal for the cold supply products secondary market access. Singapore has more than twenty FTAs; goods that travel to other destinations through Singapore do not incur import tariffs in the final country by the original exporter.

Singapore is becoming a hub for perishable products that move from one part of the world to another. At Coolport @ Changi, a $16 million 8,000 square metre building is the transit point for 90 percent of the perishable goods that pass through the airport. The facility has 18 temperature zones that range from -28° C to 18° C.

Singapore's quality of transport infrastructure ranks third in the World Economic Forum Global Competitiveness Index of 140 countries. All aspects of infrastructure, from road to rail, ports and air, are consistently rated in the top ten in the world.

The table below shows the top 20 imported food products into Singapore by value.

Table 8.2. Singapore: Top 20 Commodities by Value ($M USD), 2019

Commodity	$M (USD)
Beverages, distilled alcoholic	$1,670
Food prep nes	$980
Cigarettes	$789
Wine	$620
Oil, boiled etc	$379
Pastry	$271
Crude materials	$263

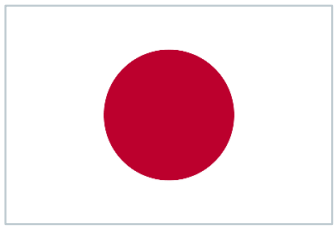
Commodity	$M (USD)
Beverages, non alcoholic	$252
Chocolate products nes	$249
Meat, chicken	$248
Rice, paddy (rice milled equivalent)	$239
Rice, milled	$218
Cocoa, beans	$216
Meat, pork	$201
Milk, whole dried	$197
Meat, cattle, boneless (beef & veal)	$195
Oil, palm	$173
Oil, essential nes	$173
Eggs, hen, in shell	$147
Chickens	$147

Note: Not Elsewhere Specified (nes) indicates an aggregation of products into groupings of commodity types
Source: FAO (2021a).

Japan

Current opportunities include: beef, prawns, fish, sugar and wheat.

Alternative product opportunities include: soybeans, coffee, bananas, offal, prepared fruit and frozen vegetables



Key facts and figures

- Free Trade Agreements: JAEPA, CPTPP
- Population: 126 million (2021)
- GDP per capita: US$40,193

Japan has been considered a target market due to its established trading relationship with Australia and the region. Japan is Australia's second largest agricultural goods market, able to afford high-quality fresh produce due to its high average income. This is also supported by a lack of agricultural land, a highly urbanised population, and a general lack of food security.

The Japan-Australia Economic Partnership Agreement (JAEPA) entered into force in January 2015. Under this agreement, the import tariff on most Australian agricultural imports will be abolished in 2023 for the largest part of the Australian export season (1 June to 30 November). The tariff for other periods of the year will be abolished in 2025.

Japan has favourable international and domestic logistical capabilities. These capabilities support the identified commodities as targets for export to Japan, especially cold supply commodities.

The table below shows the top 20 imported food products into Japan by value.

Table 8.3. Japan: Top 20 Commodities by Value ($M USD), 2019

Commodity	$M ($USD)
Meat, pork	$4,620
Maize	$3,525
Meat, cattle, boneless (beef & veal)	$3,504
Tobacco products nes	$2,903
Meat, chicken, canned	$2,470
Crude materials	$2,317
Cigarettes	$2,237
Wine	$1,796
Food prep nes	$1,548
Soybeans	$1,535
Wheat	$1,473
Cheese, whole cow milk	$1,285
Meat, chicken	$1,245
Coffee, green	$1,149
Rubber natural dry	$1,116
Rapeseed	$1,033
Bananas	$958
Offals, edible, cattle	$917
Vegetables, frozen	$866
Fruit, prepared nes	$863

Note: Not Elsewhere Specified (nes) indicates an aggregation of products into groupings of commodity types
Source: FAO (2021a).

United States

Current opportunities include: beef, fish, sugar, tomatoes, capsicums, beans and mangoes.

Alternative product opportunities include: coffee, prepared fruit, avocados, bananas and grapes.

Key facts and figures

- Free Trade Agreements: AUSFTA
- Population: 332 million (2021)
- GDP per capita: US$63,413

The United States of America has been assessed as a target market. The United States remains the world's largest economy, with an annual gross domestic product of over US$18 trillion and a population of more than 327 million people. The United States is one of Australia's largest trading and investment partners and Australia's largest two-way investment partner (EFA, 2021). Strong consumer demand and high capacity to pay in the United States makes the market an attractive opportunity for Australian exporters, but it is highly competitive and supplied by countries in South America with lower production costs than Australia. Australia enjoys considerable market access advantages under the Australia-United States Free Trade Agreement (AUSFTA).

United States has a favourable ranking for logistical performance meaning market access is efficient for cold supply, and related custom and regulatory requirements.

Opportunities exist for Australian exporters to the United States that have strong product or service and having the ability to articulate a competitive advantage which will distinguish your product or service from those that already exist. Additionally, Australia's agriculture sector has gained recognition with a reputation for quality. (Specialty Food Association and Mintel, 2015).

The table below shows the top 20 imported food products into the USA by value.

Table 8.4. USA: Top 20 Commodities by Value ($M USD), 2019

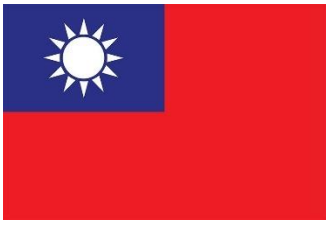
Commodities	$M (USD)
Beverages, distilled alcoholic	$9,539
Food prep nes	$8,285
Wine	$6,487
Beer of barley	$5,853
Crude materials	$5,791
Pastry	$5,422
Meat, cattle, boneless (beef & veal)	$4,959
Coffee, green	$4,742
Beverages, non alcoholic	$3,502
Fruit, prepared nes	$3,446
Chocolate products nes	$2,957
Avocados	$2,864
Bananas	$2,529
Tomatoes	$2,420
Sugar confectionery	$2,008
Cattle	$1,808
Grapes	$1,804
Chillies and peppers, green	$1,794
Rubber natural dry	$1,681
Oil, rapeseed	$1,605

Note: Not Elsewhere Specified (nes) indicates an aggregation of products into groupings of commodity types
Source: FAO (2021a).

Taiwan

Current opportunities include: beef, prawns, mangoes, avocados and beans.

Alternative product opportunities include: soybean, corn, wheat and cotton.



Key facts and figures

- Free Trade Agreements: CPTPP entry under consideration
- Population: 23.6 million (2021)
- GDP per capita: US$24,828

Taiwan has been assessed as a target market with close proximity and an appetite for imported agriculture products. With a population of 23.6 million, Taiwan is a thriving democracy with a vibrant market economy. In 2020, Taiwan's GDP grew by 2.98 percent. Taiwanese consumers are increasingly health-conscious and value food quality and safety.

Australia does not have an FTA in place with Taiwan. Australia faces relatively high tariff and non-tariff barriers to agriculture and is increasingly disadvantaged compared to competitors with preferential trade access. Taiwan will remove most remaining tariffs on New Zealand agricultural products by the end of 2021. Taiwan has indicated interest in joining the Comprehensive and Progressive Agreement for Transpacific Partnership (CPTPP), which if approved, will reduce trade barriers to Taiwan.

The table below shows the top 20 imported food products into Taiwan by value.

Table 8.5. Taiwan: Top 20 Commodities by Value ($M USD), 2019

Commodity	$M (USD)
Soybeans	$1,027
Meat, cattle, boneless (beef & veal)	$981
Maize	$980
Food prep nes	$932
Beverages, distilled alcoholic	$761
Crude materials	$564
Wheat	$367
Apples	$255
Wine	$210
Meat, chicken	$198
Beer of barley	$198
Meat, pork	$189
Cotton lint	$185
Pet food	$185
Food preparations, flour, malt extract	$162
Rubber natural dry	$155
Cigarettes	$148
Pastry	$146
Feed, compound nes	$134
Oil, palm	$131

Note: Not Elsewhere Specified (nes) indicates an aggregation of products into groupings of commodity types
Source: FAO (2021a).

South Korea

Current opportunities include: beef

Alternative product opportunities include: corn, wheat, soybeans, coffee and bananas

Key facts and figures

- Free Trade Agreements: KAFTA
- Population: 51.7 million (2021)
- GDP per capita: US$31,489

South Korea has been considered as a target market due to its established trading links with Australia dating back to the KAFTA agreement which started in December 2014. South Korea is Australia's fourth largest trading partner primarily due to technology and ore exports from Australia, however beef exports are one of major shipments from Australia. South Korea's current agricultural production is limited by mountainous land with only 22% of the country's land arable land with less rainfall than most neighbour countries, and South Korea therefore focuses on primarily high-cost agriculture (U.S Library of Congress, n.d).

The Korea-Australia Free Trade Agreement (KAFTA) went into effect in April 2014. The agreement provided benefits for Australian exporters including tariffs of up to 300% eliminated on many Australian agricultural exports including beef, wheat, sugar, dairy, wine, horticulture, and seafood.

South Korea has many current connections to Australia with current direct sea and air links from Brisbane allowing for the export of bulk commodities by sea and high value freight by air.

The table below shows the top 20 imported food products into South Korea by value.

Table 8.6. South Korea; Top 20 Commodities by Value ($M USD), 2019

Commodity	$M (USD)
Maize	$2,353
Food prep nes	$2,074
Meat, cattle, boneless (beef & veal)	$1,985
Meat, pork	$1,599
Wheat	$990
Meat, cattle	$938
Crude materials	$935
Cake, soybeans	$738
Sugar Raw Centrifugal	$577
Soybeans	$557
Cheese, whole cow milk	$512
Rubber natural dry	$504
Coffee, green	$435
Oil, palm	$349
Forage products	$341
Chocolate products nes	$328
Food wastes	$327
Pastry	$308
Bananas	$302
Meat, chicken	$287

Note: Not Elsewhere Specified (nes) indicates an aggregation of products into groupings of commodity types
Source: FAO (2021a).

Arab Gulf Cooperation Council Countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates)

Current opportunities include: livestock, beef, fish, watermelons, mangoes, wheat, chickpea and sugar

Alternative product opportunities include: rice, dates and soybeans.

Key facts and figures

- Free Trade Agreements: Under Negotiation
- Population: 56 million (2021)
- GDP per capita: US$28,571

The Arab Gulf region is a key export market for agricultural products from Australia such as livestock, beef, fish, horticultural products, sugar, and wheat. Countries in the Gulf including Saudi Arabia, United Arab Emirates and Qatar are important markets to develop with generally a higher GDP per capita than other regions in the region, and with direct air links from Brisbane to United Arab Emirates and Qatar, and with an existing Australian market in Saudi Arabia. The three countries have medium to high logistics performance indicators with good quality ports to make them a favourable market for Australian agriculture.

The Middle East has no current free trade agreements between Australia however the Australia-Gulf Cooperation Council (GCC) FTA is currently in development with the GCC renewing interests to develop an FTA with Australia.

The tables below show the top 20 imported food products into the United Arab Emirates, Saudi Arabia and Qatar by value.

Table 8.7. United Arab Emirates: Top 20 Commodities by Value ($M USD), 2019

Commodities	$M (USD)
Meat, chicken	$811
Meat, cattle, boneless (beef & veal)	$809
Food prep nes	$739
Chocolate products nes	$673
Cigarettes	$644
Rice, paddy (rice milled equivalent)	$535
Rice, milled	$529
Pastry	$474
Milk, whole dried	$461
Dates	$408
Beverages, distilled alcoholic	$398
Alfalfa meal and pellets	$348
Wheat	$340
Tobacco products nes	$322
Rapeseed	$318
Almonds shelled	$299
Wine	$296
Meat, sheep	$287
Cheese, whole cow milk	$232
Sugar Raw Centrifugal	$230

Note: Not Elsewhere Specified (nes) indicates an aggregation of products into groupings of commodity types
Source: FAO (2021a).

Table 8.8. Saudi Arabia: Top 20 Commodities by Value ($M USD), 2019

Commodity	$M (USD)
Rice, paddy (rice milled equivalent)	$1,415
Rice, milled	$1,325
Meat, chicken	$1,292
Food prep nes	$1,087
Barley	$883
Maize	$715
Infant food	$581
Sheep	$566
Cigarettes	$517
Chocolate products nes	$515
Pastry	$471
Milk, whole dried	$423
Cheese, whole cow milk	$398
Meat, cattle, boneless (beef & veal)	$390
Cake, soybeans	$352
Sugar Raw Centrifugal	$338
Oil, palm	$337
Forage products	$275
Soybeans	$262
Cheese, processed	$260

Note: Not Elsewhere Specified (nes) indicates an aggregation of products into groupings of commodity types
Source: FAO (2021a).

Table 8.9. Qatar: Top 20 Commodities by Value ($M USD), 2019

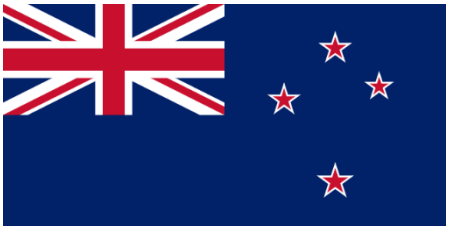
Commodities	$M (USD)
Meat, chicken	$210
Meat, sheep	$202
Rice, paddy (rice milled equivalent)	$162
Rice, milled	$161
Food prep nes	$140
Sheep	$119
Barley	$104
Chocolate products nes	$102
Pastry	$82
Meat, cattle, boneless (beef & veal)	$77
Wheat	$56
Eggs, hen, in shell	$52
Milk, whole dried	$46
Cigarettes	$45
Crude materials	$44
Cheese, processed	$44
Milk, whole evaporated	$41
Beverages, non alcoholic	$38
Infant food	$36
Plantains and others	$35

Note: Not Elsewhere Specified (nes) indicates an aggregation of products into groupings of commodity types
Source: FAO (2021a).

New Zealand

Current opportunities include: watermelons, prawns, mangoes, beans, capsicums, tomatoes, wheat, and raw sugar

Alternative product opportunities include: soybeans, prepared fruit, bananas



Key facts and figures

- FTAs: ANZCERTA, AANZFTA, CPTPP
- Population: 4.9 million (2021)
- GDP per capita: US$41,478

New Zealand is one of Australia's closest and oldest trading partners and is considered a target market due to its established trading relationship with both Australia and the oceanic region and Southeast Asia. Although being Australia's seventh largest trading partner it remains an important export market for high-quality agricultural (particularly horticulture) products due to its high GDP per capita.

New Zealand remains a safe market and high importance for Australian agricultural products due to its many trade agreements with Australia including, Pacific Agreement on Closer Economic Relations Plus (PACER) and The ASEAN-Australia-New Zealand Free Trade Area (AANZFTA) and particularly Australia-New Zealand Closer Economic Relations Trade Agreement (ANZCERTA) which is powerful in the harmonisation of Trans-Tasman food standards between the two countries allowing for lower compliance costs for exporter and minimising market distortions. The agreement also prohibits all tariffs and quantitative import or export restrictions of goods between the countries.

Being a close trading partner and close geographically, New Zealand provides multiple links from Queensland ports and airports for agricultural exports therefore providing a high logistics indicator.

The tables below show the top 20 imported food products into New Zealand by value.

Table 8.10. New Zealand: Top 20 Imports by Value ($M USD), 2019

Commodities	$M (USD)
Food prep nes	$619
Cake, palm kernel	$246
Pastry	$173
Chocolate products nes	$166
Wine	$137
Meat, pork	$133
Beverages, distilled alcoholic	$132
Pet food	$129
Wheat	$124
Lactose	$121
Cake, soybeans	$114
Crude materials	$110
Cigarettes	$104
Beverages, non alcoholic	$103
Fruit, prepared nes	$75
Bananas	$71
Beer of barley	$71
Dregs from brewing, distillation	$71
Sugar confectionery	$69
Sugar Raw Centrifugal	$66

Note: Not Elsewhere Specified (nes) indicates an aggregation of products into groupings of commodity types
Source: FAO (2021a).

Import Replacement Opportunities

Despite being a large exporter of agricultural product, Australia continues to import large volumes of certain food products that could be produced in Australia. Key products produced in the MIW region that Australia imports include capsicum (from New Zealand) and large volumes of seafood (from South East Asia).

The following food products are also imported, and could potentially be grown and manufactured in the MIW region: soybean cake, prepared fruit, coffee, rice, animal feed and beverages (both distilled alcoholic and non-alcoholic). The total market value of these products alone is estimated to be $3.5 billion (US$2.5 billion).

The tables below show the top 20 imported food products into Australia by value.

Table 8.11. Australia: Top 20 Commodities by Value ($M USD), 2019

Commodities	$M (USD)
Food prep nes	$2,222
Pastry	$671
Beverages, distilled alcoholic	$665
Cigarettes	$649
Wine	$603
Meat, pork	$593
Chocolate products nes	$496
Cheese, whole cow milk	$454
Crude materials	$387
Cake, soybeans	$361
Beer of barley	$359
Fruit, prepared nes	$332
Pet food	$310
Coffee, green	$288
Beverages, non alcoholic	$268
Infant food	$262
Rice, paddy (rice milled equivalent)	$216
Rice, milled	$203
Sugar confectionery	$202
Feed, compound nes	$195

Note: Not Elsewhere Specified (nes) indicates an aggregation of products into groupings of commodity types
Source: FAO (2021a).

9. ALTERNATIVE SUPPLY CHAINS

Identifying the potential viability of alternative supply chains requires an understanding of the relative freight rates of different components of the supply chain: namely road, sea and air freight movements. This section explores a cost build-up of different supply chain routes to market.

KEY TAKEAWAYS

There are two key findings to this analysis:

1 Although it seems counter-intuitive to send products south (to Brisbane), only for them to travel north again to their destination, the cost of road transport is a small component of total cost of getting products to market.

2 On a direct comparison, air freight (especially dedicated air freight services) is generally more expensive than other options and are likely too expensive for most high volume, low margin agricultural produce.

9.1 APPROACH

In each type of supply chain movement (road, sea and air) calculating a total supply chain freight rate is difficult, as each component of the supply chain is highly volatile and can frequently change by considerable magnitudes, depending on prevailing market conditions and pricing strategy employed.

To calculate the order of magnitude differences in different supply chains to common destination markets, AEC developed a basic model to assess the relative cost of accessing the same market by different means (such as by sea or air at different ports).

The data used to inform the model includes:

- Road freight: rates provided by Bowen-based freight companies that supply transport services to the local horticultural sector. Road freight rates were based on average rates per pallet.
- International Air Freight:
    - IFAM: As a proxy for under-belly air freight cargo, rates from the International Freight Assistance Mechanism (IFAM) have been used. While these rates are above historical averages, they are below current market rates.
    - DHL: As a global freight provider that provides air freight services, DHL rates were used as a proxy for dedicated air freighter rates. The DHL quote was calculated based on 4.3m^3 at 1,500kg.
- Liner shipping: Using market quotes from Keune Nagel, DHL for liner shipping services using loose rate quotes, shipping 2,000kg pallets at 1.2m^3.

Importantly, the model does not include the supply chain costs which are assumed to be similar for each supply chain route, such as biosecurity treatments (VHT, irradiation etc), customs costs, port-side warehousing, and freight forwarder fees etc.

There are a number of supply chains that do not currently exist (such as air freight from Cairns to Dubai or Los Angeles) and therefore cannot be priced. The supply chains that do not exist have been excluded from the model outcomes.

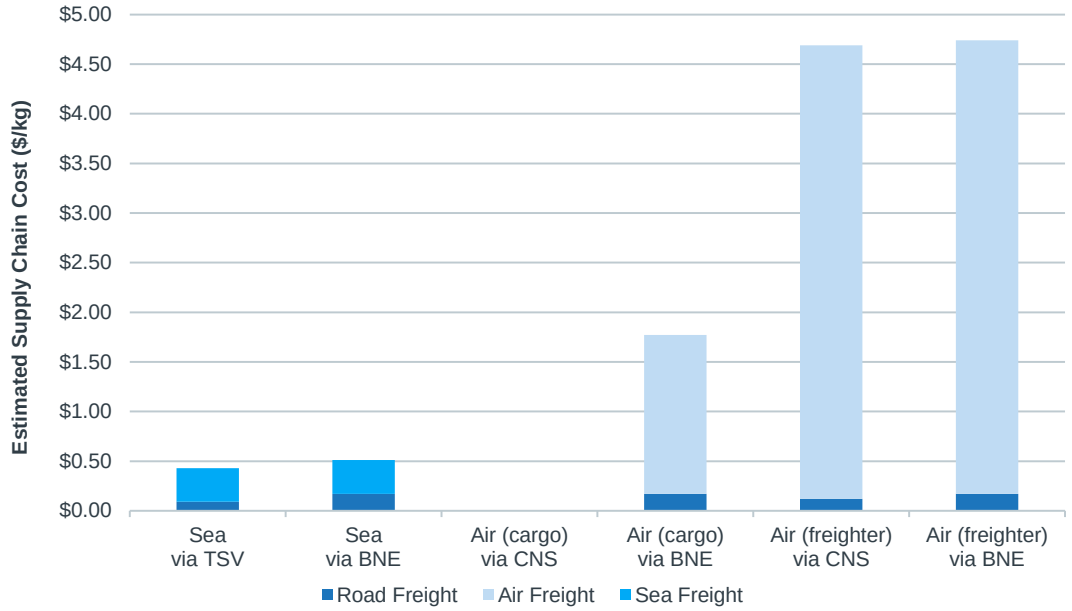
9.2 MODEL OUTCOMES

This section outlines the total price outcomes for different supply chains by different markets.

MIW to Japan (Tokyo/Narita)

Figure 9.1 below shows the order of magnitude price estimates to access Japanese markets.

Figure 9.1. Supply Chain Costs to Japan

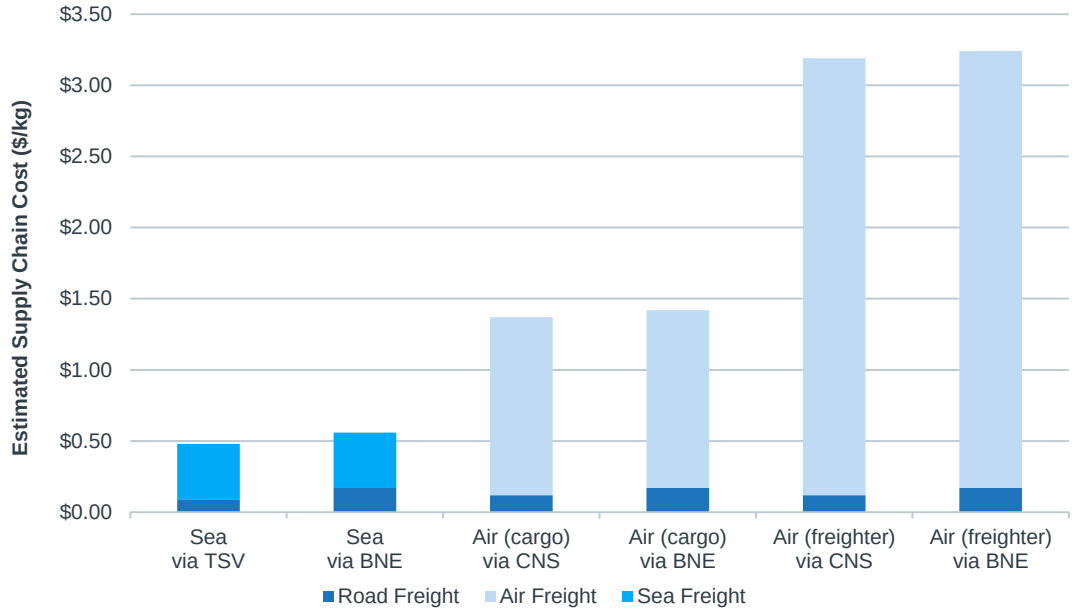


Note: Commercial flights have traditionally existed between Cairns and Tokyo (Narita) and Osaka. However, the air route was not subject to IFAM and is not currently operational and therefore excluded from this analysis.
Source: AEC, Avistra

MIW to Singapore

Figure 9.2 below shows the order of magnitude price estimates to access Singaporean markets.

Figure 9.2. Supply Chain Costs to Singapore



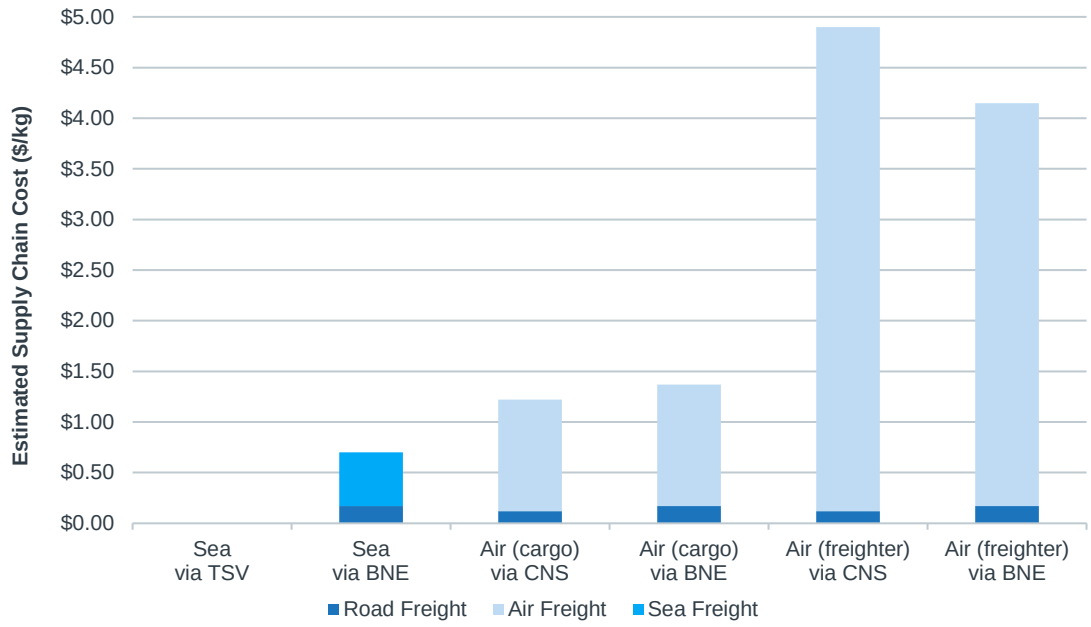
Source: AEC, Avistra

MIW to Hong Kong

below shows the order of magnitude price estimates to access Hong Kong/Chinese markets.

Figure 9.3 below shows the order of magnitude price estimates to access Hong Kong/Chinese markets.

Figure 9.3. Supply Chain Costs to Hong Kong

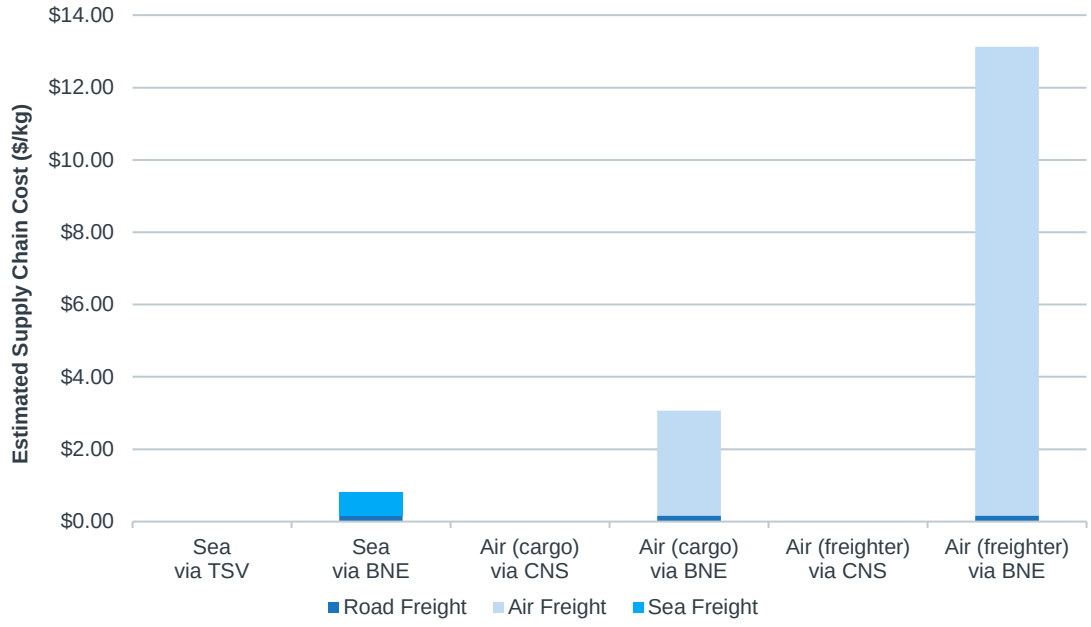


Source: AEC, Avistra

MIW to USA (Los Angeles)

Figure 9.4 figure below shows the order of magnitude price estimates to access North American markets.

Figure 9.4. Supply Chain Costs to Los Angeles

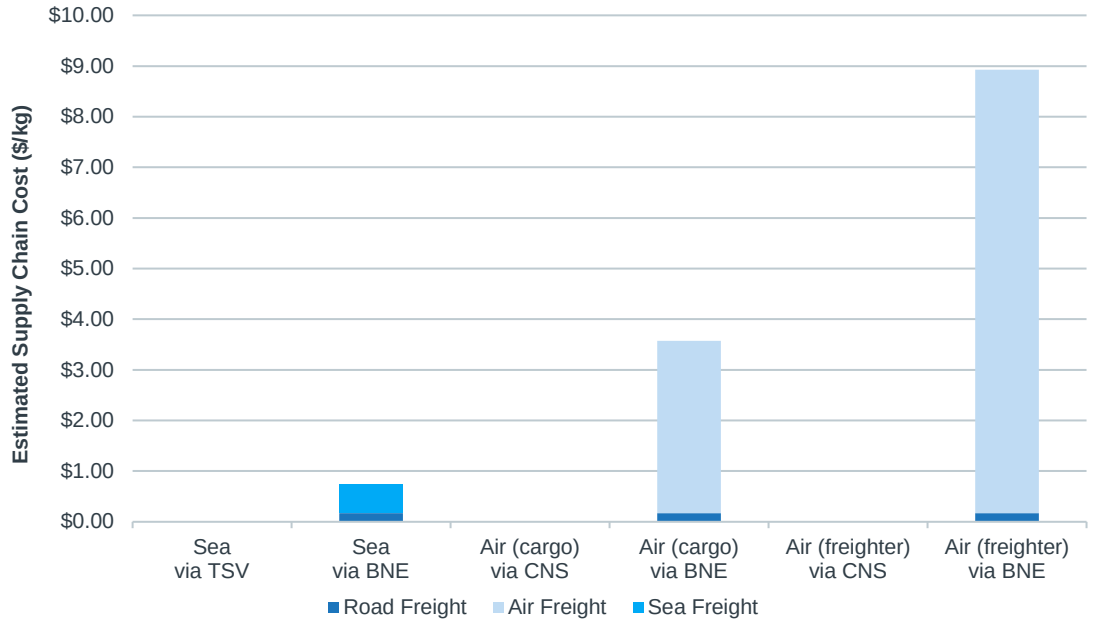


Source: AEC, Avistra

MIW to Arab Gulf (Dubai)

Figure 9.5 below shows the order of magnitude price estimates to access Arab Gulf markets.

Figure 9.5. Supply Chain Costs to Dubai

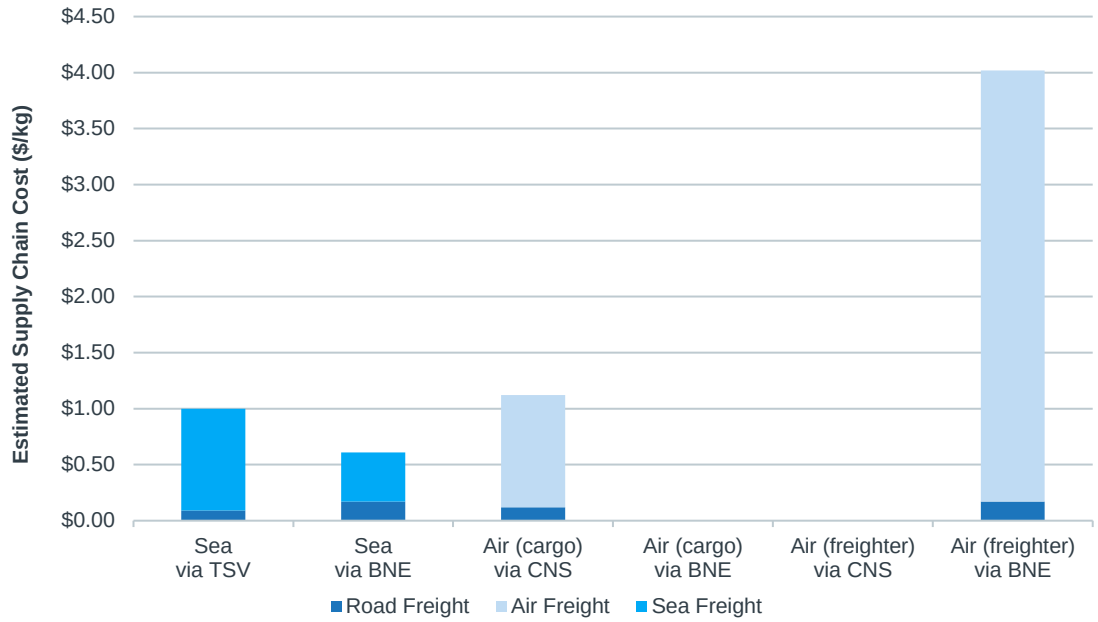


Source: AEC, Avistra

MIW to New Zealand

Figure 9.6 below shows the order of magnitude price estimates to access New Zealand markets.

Figure 9.6. Supply Chain Costs to New Zealand



Source: AEC, Avistra, North Queensland Airports (2022)

10. PATHWAY TO MARKET

This section explores how producers in the MIW region can access new markets and different commercial supply methods that could be employed.

KEY TAKEAWAYS

- There are a range of different pathways to market for local producers. While reaching further into the supply chain (such as direct exporting) may capture additional value, it can also come at high risk, which may be beyond the capacity of many small and medium-scale producers
- Lower risk export options include contract production for major food businesses in target markets (where food is produced in accordance with pre-agreed quality and price parameters) or to export through existing product exporters in established markets.
- For producers interested in direct exporting, there are a range of government-led programs that can support business-to-business relationship development and ensure compliance with both export and import requirements.

10.1 EXPORT METHODS

There are four general methods to exporting agricultural product, all with increasing risk (and potential reward):

1 **Import replacement.** Producing commodities in the MIW region that would otherwise be imported from other countries.

2 **Export via importer/consolidator**. Selling products at a market where a consolidator (importer) takes ownership of the product and is responsible for all further supply chain movements to the export market. This approach enables the aggregation of products at a point in the supply chain from a range of smaller producers. Often, smaller producers will not be aware of their products being aggregated and exported.

3 **Export via large exporter.** Large exporters access the market to identify and maintain markets. Once exporters have identified the markets, they develop relationships with importers and are responsible for the transport and payment of the exported goods. This approach allows producers to grow products for exporters and can conclude a supply agreement with known prices for certain commodities.

4 **Export as individual producer.** In this approach, individual producers are responsible for their own exports. Once producers seeking and establish relationships with import companies, it is their responsibility to export products directly to importers. However, the producer is responsible for handling all aspects of the supply chain, including transport, payment and border risks. The process can capture value in the supply chain, but poses a higher risk to producers.

When assessing different export methods, it is also important to consider the supply arrangements with export/import partners. The two common methods include market-based selling (engaging an agent to ensure product sales in markets) or contract production (whereby the buyer engages the producer to supply a known quantity of product at an agreed quality specification and agreed price), which is a lower risk option for exporting producers.

10.2 ACCESSING MARKETS

Regardless of the export method, there are two effective market access methods, which can be used in parallel:

1 **Industry Engagement.** Most Australian agricultural Research and Development Corporations (RDCs) fund industry-based export development programmes, specifically designed to build industry export capability and capacity, to assist growers to develop and maintain export markets.

Most industry associations have an Industry Export Strategy and also often have dedicated export development resources, designed to support their members to (AUSVEG, 2022):

- Provide latest market data and information (often in partnership with AusTrade and Trade and Investment Queensland – TIQ)
- Become export ready
- Identify export opportunities
- Develop commodity-specific market entry strategies
- Facilitate relationships with international customers
- Connect with international value chain stakeholders
- Resolving market access issues

2 **Government Export Advice.** Government agencies such as AusTrade and TIQ have global trade networks and can offer advice on establishing or expanding export markets. The types of services provided by export agencies include market profiling, identifying buyers, distributors and international investors as well as opportunities available in Free Trade Agreements.

For agricultural produce, the Australian Department of Agriculture, Water and Environment has produced a Manual of Importing Country Requirements (MICOR).

Government export agencies also provide targeted grant programs to support market development and market access.

10.3 RECOMMENDED MARKET ACCESS METHOD

To leverage the expertise and resources available for export market development, future export attempts should be executed in accordance with the industry developed Industry Export Strategy (for access to potential markets), in partnership with TIQ and AusTrade (for assistance in commercial networking).

11. SUPPLY CHAIN DEVELOPMENT OPPORTUNITIES

This chapter identifies key findings from the analysis and stakeholder engagement to identify opportunities to improve the performance of agricultural supply chains from the MIW region with a focus on infrastructure, policy, trade and investment.

KEY TAKEAWAYS

- Generally, the MIW region has efficient, fit-for-purpose supply chains
- The MIW region has a number of opportunities to increase the value of agricultural output, but these opportunities are generally not constrained by problems in the supply chain.
- The primary driver for the region's higher cost supply chains is distance from market
- Direct export opportunities to new markets are limited by the lack direct sea and air connections to international markets. Establishing these connections will require a cross-sectoral demand for the freight services and considerably higher volumes of production
- There are a number of specific trade barriers that may impede exports from the MIW region, but Australia does have market access to most key markets with established Free Trade Agreements (FTAs)
- Australia does import a range of agricultural products. Supplying domestic market is a lower risk option to pursuing new export markets
- There are several infrastructure investments and policy changes that the Queensland Government can make to support more efficient freight movement and increased agricultural production in the MIW region
- There are a range of private investment opportunities, across a range of commodities, in the region that can take advantage of identified supply chain opportunities

11.1 KEY FINDINGS FROM ANALYSIS AND STAKEHOLDER ENGAGEMENT

The key findings from the extensive stakeholder engagement and data analysis conducted in the formation of this report include:

Supply & Value Chains – General:

- Developing efficient supply chains requires two-way trade and typically, the higher yielding freight is on the inbound leg. Focus to date is one-way
- Freight viability requires a mix of product. Focus to date is agriculture only (lower value)
- Freight availability is decreasing across Australia (can't get containers or liners to visit, which is a short term impact due to COVID impact on supply chains)
- Freight costs are increasing globally and in Australia
- Global oil prices are increasing, impacting on fuel prices across the world.

Supply & Value Chains – MIW Region:

- Region has high-cost supply chains – but this is due to distance, not inherent inefficiency. MIW Region supply chains are very sensitive to high fuel prices
- The MIW region is a substantial supplier of a select number of cold chain products (horticulture and seafood). Increasing the range of products will increase freight value chain development
- There are specific infrastructure limitations in the region, profiled in more detail in Section 10.2

- Alternative supply chains (ex Townsville, Cairns or Mackay) lack infrastructure, value chains and volume to be considered viable opportunities in the short term. Progressive re-commencement of international flights from Cairns will alleviate a key barrier to a northern supply chain opportunity
- There are opportunities to process and value-add more product locally, increasing value per KG, but it also reduces volumes and increases shelf life, making it easier to use alternative supply chains to maximise efficiencies
- Agricultural freight can underpin coastal shipping (but trade needs to be 2-way and in-bound freight needs to be identified)
- Air freighting produce on narrow body aircraft to southern markets may present an opportunity (but are risks).
- While a long-term opportunity, developing direct international air travel to the MIW region will enable air freight export opportunities

Increasing value of agricultural production:

- Supply chains aren't the limiting factor in increasing agricultural value
- Limited agronomic information is available to assist growers understand alternative cropping opportunities. Existing Queensland Government soil suitability studies are limited to cane expansion. It is important to note that the Queensland Department of Agriculture and Fisheries has commenced a work program to deliver this information
- Market data (domestic and international for both horticulture and seafood markets) is hard to access. This limits capacity to identify new opportunities
- Access to reliable water will enable higher-value agricultural production. These opportunities are explored in more detail in Section 11.2
- There are significant policy barriers limiting agricultural output across all sectors. These barriers are explored in more detail in Section 11.3
- There are opportunities to process and value-add more product locally. These opportunities are explored in more detail in Section 11.5

Trade Barriers:

- Australia's FTAs have enabled considerable access to existing and new markets
- Taiwan is a potentially viable market for agricultural product from the MIW region, but considerable trade barriers exist. Taiwan's ascension into the Comprehensive and Progressive Agreement for Trans-Pacific Partnership would remove these trade barriers
- Chickpea access to India remains challenging, with a 40% tariff on access
- Chinese trade is increasingly risky across a range of farm and non-farm commodities

Market opportunities –Domestic production of currently imported produce:

- Seafood: Both wild caught and aquaculture can expand to meet domestic need.
- Horticulture: Lemons and Limes, avocados, capsicums
- Broadacre: Soybean, coffee, rice and animal feed
- Processed products: Alternative protein demand (soybean) can be met through broadacre and rotational cane cropping, frozen fruit, juices and dried product (from horticultural waste), and beverages (both distilled and non-alcoholic)

Market opportunities – Export:

- New markets will be limited by viable supply chains (air and sea). There is an opportunity for cross-sector development opportunities, with international tourism providing air freight capacity

- The priority countries for MIW region export include: Singapore, Japan, South Korea, the United States, Taiwan, New Zealand, and countries in the Arab Gulf (Qatar, Saudia Arabia, UAE).
- There is considerable depth in the above target markets to expand the volume of exports
- Alternative products in demand in target markets could be viable in the region (citrus, table grapes, bananas, coffee, dates, rice) but require agronomic analysis

11.2 INFRASTRUCTURE OPPORTUNITIES

There are a number of investments in regional supply chain infrastructure that can support more efficient agricultural export supply chains. The following identified infrastructure barriers should be progressed to at least a "Stage 1 Submission" according to infrastructure Australia's Project Assessment Guideline.

Transport Infrastructure

- Containerisation facilities at the Port of Mackay, including a dedicated container crane, container park (including cold storage/reefer capacity) and multi-modal loading/unloading facilities, in support of coastal shipping services. Developing coastal shipping services at Mackay Port will enable greater competition and resilience in the domestic supply chain
- Resolve the "missing links" in port access roads to enable Type 1 Road Train access to the Mackay Port, providing more efficient and safer road freight to the port. Specific roads include:
    - Peak Downs Highway– estimated $180 million cost
    - Mackay-Slade Point Road – estimated $20 million cost
- Development of an international airport in the MIW region, ideally in vicinity to fresh and frozen produce supply areas. Generating passenger/tourist-driven international air traffic direct to the MIW region will enable air freight capacity that can be utilised by local producers
- Expanded rail siding access at Bakers Creek (southern Mackay), to enable more efficient unloading of cattle at the Thomas Borthwick's and Sons abattoir. Rail is used to transport cattle and improving the rail siding enables more efficient transport to the abattoir
- Improved flood resilience of the Bruce Highway near Goorganga Plains, between Proserpine and the Whitsunday Coast Airport, enabling year-round, weather resistant access to southern markets for horticultural producers in the Bowen region
- Sealing of major arterial road corridors, such as the Bowen Development Road, between Collinsville and the Belyando Crossing. Dirt roads reduce freight efficiency (both speed and cost of transport)

Common User Supply Chain Facilities

- Development of a freight distribution centre at Proserpine Airport, to enable efficient receipt and dispatch of freight utilising domestic air connections
- Phytosanitary treatment facilities, namely irradiation, (either in Bowen, Townsville and/or Cairns) to provide supply chain flexibility and support export of horticultural products from alternative ports
- Multi-modal rail hub at Bowen, to support alternative cold chain supply chain into the Brisbane Markets. Development of alternative modes of transport provides additional competition into the freight market
- Broadacre aggregation facilities in sugarcane producing areas, simplifying the supply chain for sugarcane farmers and enabling greater industry participation in rotational cropping opportunities

Water Infrastructure

Realising the following water infrastructure opportunities can increase agricultural output in the MIW region:

- Urannah Dam and Collinsville Irrigation Scheme
- Raising Burdekin Falls Dam
- Bowen Pipeline

- Burdekin to Moranbah Pipeline Duplication
- Connors River Dam, Pipeline and Irrigation Scheme
- Irrigation schemes at Glenden, Nebo and Belyando (for mine and gas water reuse).

Importantly, increasing the volume output of agricultural product in the MIW region will support more efficient agricultural supply chains, through additional economies of scale.

11.3 POLICY OPPORTUNITIES

The Queensland Government has a number opportunities to increase the value of the MIW region's agricultural sector and improve the viability of agricultural supply chains through policy change:

Transport

- Delivering election commitments to support the establishment of regular coastal shipping services. Developing coastal shipping services will increase competition in the freight market between the MIW region and Brisbane and Townsville
- Support airline route development for direct flights from the MIW region to domestic international export hubs and international hubs. Attracting additional direct passenger flights to the MIW region will enable freight capacity that can be utilised to export local produce
- Reducing pressure on fuel prices through reducing/freezing taxes on liquid fuels, which account for approximately 40% of retail fuel costs

Agricultural Output

- Improve the availability of crop suitability mapping in areas with high quality agricultural soils, with available soils data (note: this work is already underway with Department of Agriculture and Fisheries). This will enable producers to identify opportunities to pursue higher value agricultural activity
- Regularly provide price market price data (both seafood and horticulture) at no cost, to enable local producers to identify new production opportunities of higher valued products
- Replace current controls on farm fertiliser and chemical use in Great Barrier Reef catchments with incentive programmes. This will enable farmers to maximise the output of agricultural products
- Proactively approve land-based aquaculture developments within set performance frameworks to remove regulatory uncertainty, costly approvals processes and unnecessary delays for investors seeking to develop/expand aquacultural production in the MIW region
- Remove clearing regulations on broadacre and livestock industries, enabling producers to maximise the use of available good quality agricultural soils in the region. Current restrictions are prohibiting the improvement of pastoral land and realisation of new irrigation developments and broadacre cropping opportunities
- Facilitate improvements in water trading, to better utilise available water resources and distribution infrastructure in the MIW region

11.4 TRADE OPPORTUNITIES

There are a number of trade barriers that need to be resolved to realise the export potential from the region. While best progressed through industry bodies, GW3 can add weight to the importance of resolving these issues for the region's future growth. Trade opportunities include:

- Improving acceptance of irradiation as an effective, low-cost treatment method in key export markets, where appropriate for the produce type. For example, alternative phytosanitary treatments (such as Vapour Heat Treatment – VHT) for mangoes are both expensive and can impact on produce quality
- Supporting Taiwan's ascension to the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), to provide more favourable market access to Taiwan. Most horticultural products into Taiwan pay a 27% tariff (International Trade Centre, 2022)

- Reducing/removing tariffs of chickpeas into India, currently at 40% (International Trade Centre, 2022). Resolving these tariff barriers will provide considerable market opportunities for the largest broadacre crop in the MIW region

11.5 INVESTMENT OPPORTUNITIES

There are a number of investment opportunities in the MIW region that can take advantage of identified opportunities. Specifically:

- Greenfield irrigated horticultural development (taking advantage of new water infrastructure developments)
- Greenfield aquaculture development in identified Aquaculture Development Areas
- Processing and packing local chickpea production, noting the MIW region is the second largest chickpea producing region in Australia
- Processing rotational cane crops (such as soybean or rice), leveraging the region's 100,000+ ha of existing sugarcane addition production area
- Feed lotting in the cattle industry (including production of feed, such as sorghum, for finishing)
- Fruit and vegetable processing (such as frozen fruit and vegetables, juices and dried products), taking advantage of picked and unpicked waste product
- Commercial fishing enterprises, realising domestic opportunities and taking advantage of under-utilised quotas for wild caught seafood

12. RECOMMENDATIONS

KEY TAKEAWAYS

- As the MIW region's independent economic development organisation, there is a role for GW3 to pursue policy changes and infrastructure investments that can improve the economic performance of the MIW region.
- GW3 is also uniquely placed to de-risk investment opportunities and deliver a regional agribusiness investment attraction campaign.
- Industry associations in the MIW region (either commodity-based, such as AgForce or Queensland Seafood Industry Association or those with a specific geographic interest, such as Bowen-Gumlu Growers Association) have an opportunity to support their members to realise additional development opportunities.

The specific lines of effort industry associations can offer include:

- Market development efforts (in partnership with national commodity associations and TIQ/Austrade)
- Regular provision of commodity price and production benchmarking data
- The CRCNA's future research program can support additional de-risking and development of both supply chain improvement and agricultural production opportunities identified in this research.

12.1 RECOMMENDATIONS FOR GW3

As the MIW region's economic development organisation, there is a role for GW3 to pursue specific policy changes and infrastructure investments that can improve the economic performance of the MIW region. These include:

- Advocate for policy change that supports development of alternative supply chains (such as coastal shipping and international passenger route development)
- Advocate for policy change to enable increased agricultural output (such as removal of land management restrictions)
- Advocate for policy change to reduce the price of fuel throughout the agricultural supply chain, such as reducing taxes on fuels which account for approximately 40% of retail prices.

GW3 is also uniquely placed to de-risk specific investment opportunities and deliver a place-based, regional agribusiness investment attraction campaign for the whole region. Focus opportunities could include realising higher value opportunities, such as:

- Considering the opportunities associated with new water infrastructure proposals in there region, landholders could transition from cattle grazing only enterprise to a mixed grazing/broadacre or irrigated horticultural farming enterprise, which generate higher economic returns.
- Incorporating a rotational horticultural or broadacre crop in the sugarcane farming system
- Developing new aquaculture enterprises
- Developing local value adding industries, such as feedlotting, chickpea processing or fruit and vegetable processing
- Commercial fishing enterprises, to take advantage of under-utilised quotas

GW3 is also uniquely placed to support continued de-risking of infrastructure and investment opportunities, thorough targeted business cases of specific opportunities.

12.2 RECOMMENDATIONS FOR INDUSTRY ASSOCIATIONS

The following recommendations have been developed for the region's agricultural industry associations, based on the research conducted in this report:

- Support market development efforts **(**In partnership industry associations and TIQ**):**
  - Facilitate direct engagement on export contract production opportunities
  - In-bound delegations (inviting exporters and other value chain participants to the region)
  - Out-bound delegations (regional delegations to markets to meet buyers)
  - Encourage local producers to be "export ready" and support compliance with export protocols, regardless of current export intentions.
- Facilitate the regular publication of commodity price and production benchmarking data to enable local producers to identify alternative market and process improvement opportunities.

12.3 RECOMMENDATIONS FOR THE CRCNA

The following recommendations apply to the CRCNA's future research investments:

- For supply chain development, research focus needs to expand to all freight products and two-way trade. Successful supply chain development requires multiple commodities and two-way freight volumes
- For specific agricultural commodity market access, a pan-northern approach should be taken as major commodities are grown across geographical regions and success in market access will require geographic diversity in production
- Explore the viability of alternate crop production in Northern Australia, specifically for raw and processed products that have an identified market opportunity, such as rice, dates, coffee and soybean, prepared fruit and frozen vegetables

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