The Impact of Freight Costs on Australian Farms

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AgriFutures Australia is the trading name for Rural Industries Research & Development Corporation (RIRDC), a statutory authority of the Federal Government established by the Primary Industries Research and Development Act 1989.

Foreword

Agriculture is a significant export industry for Australia with roughly two thirds of food and fibre exported to overseas markets. Consistent with megatrends identified by AgriFutures Australia, it is expected that global food demand will rise as the world's population increases over the next 20 years, creating new growth opportunities for the export of Australian produce.

One of the key determinants in ensuring that Australian agriculture can reach its full potential are least-cost pathways to transport food and fibre from paddock to port. At present, logistics are the largest single cost item in the production of many agricultural industries, amounting to as much as 48.5% of farm-gate cost in case studies.

Key to improving transport efficiencies for agriculture is to invest strategically in infrastructure and determining how best that infrastructure should be funded. It also requires a strategic planning and regulatory framework to ensure infrastructure can be efficiently utilised by industry.

Knowing how much farmers pay for transporting their produce to consumers is crucial to measure the competitiveness of Australian farmers and to find out where the transport of agricultural goods faces pinch points and bottlenecks.

AgriFutures Australia commissioned this study to provide an analysis of the freight costs facing Australian farmers when moving commodities from farm to processor, port and/or domestic market. The domestic analysis is complemented with research of international agricultural supply chains to provide a benchmark of Australia's performance and its ability to compete on agricultural transport costs at a global level.

It was also critical to look beyond the 'now' to consider future agricultural freight issues and to highlight possible options for potential improvement in transport infrastructure and regulation within the agricultural sector.

This report has been produced under AgriFutures Australia's National Rural Issues Program. It is an addition to AgriFutures Australia's diverse range of over 2000 research publications and it forms part of our National Challenges and Opportunities arena, which aims to identify and nurture research and innovation opportunities that are synergistic across rural sectors.

Most of AgriFutures Australia's publications are available for viewing, free downloading or purchasing online at: www.agrifutures.com.au.

John Harvey
Managing Director
AgriFutures Australia

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Glossary

Acronym	Full name
ABARES	Australian Bureau of Agricultural and Resource Economic
ABS	Australian Bureau of Statistics
AFI	Australian Farm Institute
ARTC	Australian Rail Track Corporation
CSIRO	Commonwealth Scientific and Industrial Research Organisation
GVAP	Gross Value of Agricultural Production
GRDC	Grains Research and Development Corporation
QTLC	Queensland Trade and Logistics Council

Executive summary

As an important and growing sector of the Australian economy, the agriculture industry plays strongly to Australia's natural and structural competitive advantages. Australian agriculture is a significant export industry with around two-thirds of what farmers annually produce exported overseas. Access to these global markets is critical to the health of our sector and our future growth.

A key determinant in ensuring that Australian agriculture can reach its full export potential is maintaining efficient and competitive transport of food and fibre from paddock to port. At present, this cost is one of the largest single cost items in the production of many agricultural commodities, and it has the potential to impact the global competitiveness of Australian agriculture and its export performance into the future. The impact of this transport cost on the viability of producers is further accentuated with the slowing of on-farm productivity across most sectors[1]. Aside from specific and limited case studies, there is very little information about the precise magnitude of this transport cost and its drivers.

For this reason, AgriFutures Australia has commissioned this study on the impact of freight costs on farm. The study provides an analysis of the freight costs facing Australian farmers when moving commodities from farm to processor, port and/or domestic market. In addition to a review of national-level commodity data, five case studies of individual commodities demonstrate the unique supply chains and costs involved in moving a range of commodities to market.

This domestic analysis is complemented with research of international agricultural supply chains to provide a benchmark of Australia's performance and its ability to compete on agricultural transport costs at a global level.

The study also considers future agricultural freight issues and developments, a discussion of the policy options outlines potential areas for improvement of transport infrastructure and regulation within the agricultural sector.

Current cost of freight for agricultural products within Australia

Freight costs vary significantly with each agricultural commodity, reflecting the role of factors such as perishability, weight, volume, labour intensiveness and geographic distribution play in contributing their overall cost of delivery. Analysis of farm freight costs (costs of moving commodities to and from agricultural properties and off-site storages) as a share of the Gross Value of Farm Production (GVAP) demonstrates the proportion of cost attributable to freight for each major commodity within the sector.

In Australia, freight costs are relatively highest for grains and fruit/vegetables, which represent 27.5% and 21% of GVAP, respectively. By comparison, poultry, which has more localised supply chains, has the lowest relative farm freight costs, totalling 1.0% of GVAP.

[1] ABARES (2018), http://www.agriculture.gov.au/abares/research-topics/productivity/agricultural-productivity-estimates#dairy (accessed Oct, 2018)

Table A Summary of Australian agricultural freight costs

Industry	Gross value of farm production (2015-16)	Total freight cost	Farm freight costs	Farm freight costs as a share of GVAP****
Beef	$13.1 billion	$766 million	$512 million	6.4%
Grains*** (winter cereals)	$8.5 billion	$2.64 billion	$2.43 billion	27.5%
Cotton	$1.5 billion	$90.1 million	$37.2 million	2.4%
Dairy	$4.3 billion	$889 million	$198 million	4.3%
Pigs	$1.4 billion	$54.8 million	$28.7 million	2.5%
Sugar	$1.3 billion	$62.2 million	$26.8 million	2.1%
Rice	$115 million	$134.2 million	$25.8 million	11.6%
Fruit and vegetables***	$3.6 billion	$617.8 million	$617.8 million*	21%
Sheep and goat meat	$3.4 billion	$268 million	$185.8 million	5.8%
Chicken meat	$2.7 billion	$63.1million	$28.2 million	1.0%

Source: Deloitte Access Economics analysis of CSIRO (2017); ABS Value of Agricultural Commodities Produced (2015-16)
*Farm freight costs could not be disaggregated from total freight.
** This table only includes selected (in-scope) varieties from CSIRO (2017). The selected varieties are described later in this report.
*** Note that this share was calculated using the GVAP for the year in which data was collected by CSIRO for the study, which varies between commodities.

Five case studies are included in the report to provide examples of the cost of moving specific commodities and products to market. These five case studies were selected to capture a diverse range of geographies within Australia, commodity types and transport modes. These case studies are summarised in the table below.

Table B case studies

Industry	Origin	Destination	Cost and distance from farm to port/domestic destination	Total cost to export destination
Beef	Dalby, Queensland	South Korea (sea)	$126/tonne (410km)	$343/tonne
Milk powder	Western Victoria	Singapore (sea)	$292/tonne (330km)	$391/tonne
Canola	Western Australia	Belgium (sea)	$33/tonne (250km)	$56/tonne
Poultry	Newcastle, NSW	Sydney, NSW	$210/tonne (300km)	n/a
Cherries	Huon, Tasmania	China (air)	$370/tonne (815km)	$1,370/tonne

Each of these five case studies were informed through desktop research and industry consultations, allowing an insight into the variability of freight costs even within the same commodity group.

International comparison

Building on the detailed analysis presented in the previous section, the report provides an overview of how Australian agricultural freight costs compare to Australia's international competitors for each commodity. For a number of commodities in Australia, freight can be a large driver of the overall cost of production. International comparisons can therefore provide an important basis for which Australia can assess its competitiveness across these commodities.

International benchmarking is undertaken in detail for the four exported commodity groups that were the subject of the case studies. Note that poultry has been excluded, since competition with overseas producers is negligible.

1. **Beef** - In beef export markets, Australia's main competitors are the US and Brazil. In general, Australian cattle producers face higher agricultural transport costs than US producers, while the cost differential with Brazilian producers remains unclear based on available research.
2. **Milk powder** - For the dairy industry, although exact cost benchmarks are difficult to obtain, Australia appears to have relatively higher dairy transport costs than its main competitor, New Zealand.
3. **Canola** - Differences in the grain supply chains (greater distances to port) and market structure (share of on-farm storage vs centralised handling system) drive the cost differences for freight in the Australian canola industry, relative to Canada.
4. **Horticulture (cherries)** – Similarly, differences in the distances to key Asian markets between Australia and Chile were a major driver of freight cost differences.

Future of agricultural freight in Australia

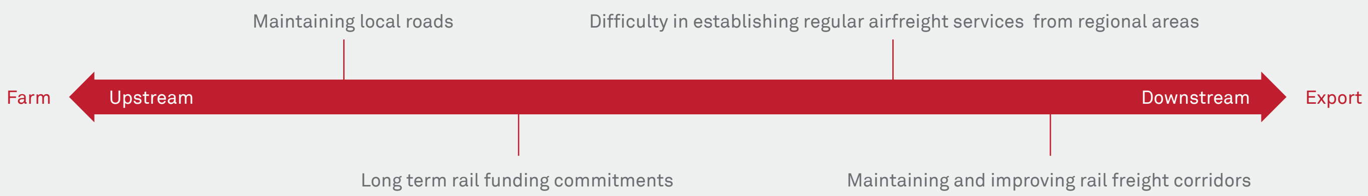
Building on the review of historic data, the study also explores how agricultural production trends are likely to influence the size of future freight demand. With an estimated freight task comprising 3.3 million vehicle movements and nearly 400,000 rail wagons per year, it is important for the industry to continue to refine and develop freight transport processes. Most major commodities are projected to increase in production by 2027-28. Delivery of agricultural goods to market will continue to be underpinned by freight services across the regions, servicing both the domestic and export markets.

A number of factors that are likely to influence the future of agricultural freight include:

1. Rising input costs, particularly wages and fuel costs
2. Technology developments
3. Climate change, through changes in volume, seasonal variability, and location of crop and livestock production.

Infrastructure issues continue to be a point of discussion in the industry, specifically their restriction on the productivity of transport in the agricultural freight industry. These issues exist both upstream (from the farm) and downstream (to export markets) in agricultural supply chains.

Figure A Summary – infrastructure issues.



Infrastructure bottlenecks have the potential to increase the cost of freight across local roads from farms to rail terminals, for regional access to airfreight services, and for efficient port access, further down the supply chain. While a number of states currently allocate a portion of their state budget to improving the regional rail freight network, further developments of rail, air and port infrastructure, along with the maintenance of existing infrastructure is also required to efficiently manage future growth.

An overview of current and upcoming infrastructure projects is included in this report to highlight the current initiatives being undertaken within, and across, different Australian states. Many of these projects will be critical in supporting the expected growth in agriculture to become a $100 billion industry by 2030[2], and the increased trade volumes being generated by the sector. We recognise that projects like Inland Rail will be important in meeting the increased transport demand that will result from this continued growth.

Policy and funding options

Finally, the report considers a range of potential policy options for areas to improve the efficiency of agricultural freight. In particular, we identify policy options for the delivery of improved transport infrastructure and regulation, recognising the potential benefits that these could deliver to farmers. Potential solutions to address these issues include changes to policy/regulation, use of appropriate funding solutions, or in most cases a combination of both. We also identify the range of different project funding and finance options for the delivery of new infrastructure, recognising for most regional infrastructure, private funding solutions are limited given the low and seasonal volumes of goods involved.

[2] NFF (2016), Agricultural Transport Infrastructure - A Discussion Paper

Section 1

Introduction

Introduction

Australia's size and wide geographic distribution of primary industries, means that the transport sector fulfills a pivotal role in the delivery of products from primary producers to final consumers. For those in the agricultural sector, efficient transport is pivotal and required at nearly every point of the supply chain. As a result, freight makes up a significant portion of their total cost of production for many agricultural commodities. Minimising this cost is relevant to those who are purchasing agricultural products domestically and ensuring Australia is able to remain competitive on the global stage.

Australia's openness to the trade market means that its agricultural producers are, to varying degrees, competing with overseas producers. Countries are therefore able to achieve a competitive advantage by minimising the cost of production through efficient freight. As the global marketplace is becoming increasingly competitive, and industry factors such as plateauing on-farm productivity occur, minimising these freight costs becomes key to the overall health and success of the industry.

Except for a limited number of specific case studies, there is very little information about the precise magnitude of the cost of agricultural freight and its drivers. This report summarises some of the information already available about the cost of agricultural freight, but builds on this knowledge base through a review of five case studies on different agricultural commodities. These case studies consider supply chain differences from a number of perspectives, including spatial, market, packaging and cost, demonstrating the diversity of freight requirements across Australian Agriculture. These insights further help develop an evidence-base to assist the agricultural sector in the development of a strategic plan for agricultural transport infrastructure policies and programs that deliver the lowest cost paths to market.

Specifically, this report helps address the following key questions:

- What are the current costs of freight for agricultural products within Australia, using both national-level data and individual case studies?
- How do the transport costs incurred by Australian producers relate to those of our international competitors?
- How is the freight task growing and changing over time, and what factors will shape the future of freight with respect to delivering farm products to market?
- What are the transport infrastructure and regulatory constraints facing the industry as it moves forward? What funding and policy options are available to address these constraints?

Section 2

The cost of freight now for agricultural industries

The cost of freight now for agricultural industries

This chapter provides an overview and summary of existing Australian literature on the current (and recent) costs of agricultural freight in Australia. The review examines the following questions across a broad group of livestock and cropping industries:

- How much farmers currently pay for freight to take primary farm produce to market - and what this amount represents as a share of what farmers receive for their primary product (e.g. cattle)?
- The total freight costs when a final product reaches its destination within Australia (e.g. port, supermarket, food service business) – and the amount that this represents as share of the final product (e.g. beef)?

Included within this chapter are the findings for the five livestock and cropping industries that are the focus of the case studies and international benchmarking exercises, they being beef, dairy, grains, poultry and horticulture. Appendix A presents further research detailing the costs of agricultural freight in Australia for cotton, pigs, sugar, rice and sheep/goats.

The freight costs presented in this hapter largely draw on the findings of previous research undertaken in Australia estimating the cost of agricultural freight, including:

- CSIRO, 2017, *TraNSIT: Unlocking options for efficient logistics infrastructure in Australian Agriculture*
- Australian Farm Institute (AFI), 2011: *Transport Costs for Australian Agriculture*, a report prepared by Garry Goucher and Associates.

Additional research and statistics from bodies such as the Australian Bureau of Statistics and the Department of Infrastructure and Regional Development are also sourced when referenced.

As outlined throughout the chapter, freight costs vary significantly with each commodity, reflecting numerous factors such as its perishability, labour intensiveness and geographic distribution. Table 2.1 below summarises:

- **The gross value of farm production in 2015-16** – for each of the ten in-scope farm commodities outlined in CSIRO (2017)
- **An estimate of the farm freight costs** – which considers only the costs of moving commodities to and from agricultural properties and offsite storages, and in the instance of livestock, between farms. In some instances, estimates may also include some handling and storage charges
- **An estimate of total freight costs** – which includes the cost of transporting processed product (e.g. beef, finished dairy products, canned fruit) to either the port or domestic wholesaler
- **An estimate of farm freight costs as a share of the Gross Value of Farm Production (GVAP)** – which is calculated as farm freight costs divided by the gross value of farm production.

Table 2.1 Overview of Australian farm freight costs

Industry	Gross value of farm production (2015-16)	Farm freight cost	Total freight costs	Farm freight costs as a share of GVAP****
Beef	$13.1b	$512m	$766m	6.4%
Dairy	$4.3b	$198m	$889m	4.3%
Grains*** (winter cereals)	$8.5b	$2.43b	$2.64b	27.5%
Chicken Meat	$2.7b	$28.2	$63.1	1.0%
Fruit and Vegetables**	$3.6b	$617.8m*	$617.8m	21%
Cotton	$1.5b	$37.2m	$90.1m	2.4%
Pigs	$1.46b	$28.7m	$54.8m	2.5%
Sugar	$1.3b	$26.8m	$62.2m	2.1%
Rice	$115m	$25.8m	$134.2m	11.60%
Sheep and goat meat	$3.4b	$185.8m	$268m	5.8%

*Farm freight costs could not be disaggregated from total freight. **includes selected (in-scope) varieties only – as outlined below in the remainder of the chapter. *** Note that this share was calculated using the GVAP for the year in which data was collected by CSIRO for the study.

The remainder of the chapter takes a more in-depth look at the freight costs for the first five commodities listed in Table 2.1, with the later five commodities listed in Appendix A: Costs for other commodities

2.2 Beef

2.2.1 The Australian beef industry

Beef is one of Australia's most significant agricultural commodities, both in terms of the value of output and exports.

There are 42,800 meat cattle properties supporting a gross value of farm production of $12.7 billion in 2016-17, the highest value of production of all Australian agricultural commodities in that year. In the same year, the total volume of beef/veal production was 2.34 million tonnes. The domestic market consumed $8.5 billion worth of beef, with Australia exporting $7.1 billion worth of beef/veal and a further $1.2 billion worth of live exports.

2.2.2 Overview of freight movements throughout the beef supply chain

Beef supply chains, from property to point-of-export or domestic sale, vary based on a number of factors including end-market, geography, and feed availability. Road freight is the dominant land transport mode for livestock and meat products in Australia.

For live export markets, cattle tend to be moved straight from properties for aggregation at livestock depots, before being transported by road to port.

For meat products, cattle can move from property to abattoir via a range of different transport modes or intermediate steps:

- Finished cattle are transported via road to an abattoir, either directly or via a saleyard (where the cattle are sold at auction). In Queensland, a limited number of cattle are transported on road to a rail point, and transported to abattoirs via rail
- Cattle that require grain finishing, move from property to abattoir via a feedlot, which primarily occurs via road transport.

From the point of processing, beef products (carcasses and boxed beef) are either transported to a point of export (port or airport), or enter domestic distribution/wholesale channels.

Table 2.2 Overview of the Australian beef industry

Variable	Unit	Year	Value
Industry Scale			
Properties	No. of properties	2015-16	42,800 (beef cattle only)
Herd size	No. of head	2015-16	22.3 million (beef cattle)
Production			
Gross value of farm production	A$	2015-16	$13.1 billion
Beef/veal production	Tonnes (carcase weight)	2015-16	2.17 million
Beef/veal exports			
Volume	Tonnes	2015-16	1.12 million
Value	A$	2015-16	$1.3 billion
Live Exports			
Volume	Head	2015-16	1.11 million
Value	A$	2015-16	$1.3 billion
Consumption			
Domestic beef expenditure	A$	2016-17	$8.5 billion
Per person beef consumption	Kg/person	2016-17	26kg

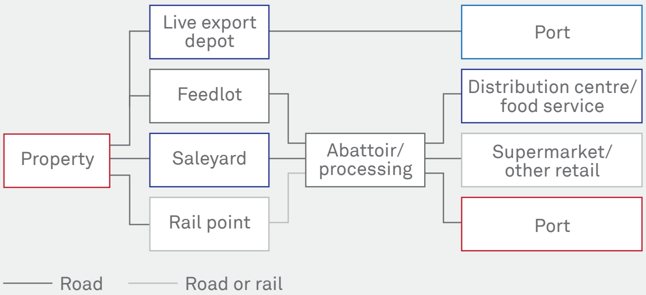
Data Sources: ABARES Agricultural Commodities (March 2018); Meat and Livestock Australia Beef Fast Facts (2017); ABS Agricultural Commodities (2016-17). Note, consumption figures are only available for 2016-17.

2.2.3 Freight costs throughout the supply chain

There are two recent studies that have estimated freight costs for Australian cattle and beef throughout the supply chain, namely CSIRO (2017), and the Australia Farm Institute (AFI) (2011).

CSIRO (2017) estimated that the annual average cost of freight for Australian cattle and beef was $766 million. This estimate was modelled based on transport volume data between 2009 and 2013, and live export volumes from 2014-15.

Figure 2.1 Overview of the beef supply chain



Source: Adapted from CSIRO (2017)

Table 2.3 Summary of freight costs – cattle and beef

Stage		Volume	Cost per unit	Total Cost
From	To	(Head)	(A$/head)	(A$)
Property	Property	5.3 million	$24.74	$184.6 million
Property	Saleyard	2.4 million	n/a	$134.5 million
Property	Feedlot	2.7 million	$13.28	$35.5 million
Property	Rail point	0.2 million	$24.86	$5.0 million
Property	Live export depot	0.75 million	$22.81	$17.1 million
Property	Abattoir	3.0 million	$45.30	$135 million
Feedlot	Abattoir	2.3 million	$32.72	$69.7 million
Saleyard	Abattoir	0.4 million	$22.9	$5.35 million
Rail point	Abattoir	0.24 million	$132.77	$31.7 million
Export depot	Port	0.75 million	$6.50	$4.9 million
Beef/veal		**(Tonnes)**	**($/tonnes)**	**(A$)**
Abattoir	Port	1.1 million	61.55	$67.1 million
Abattoir	DC/supermarket	0.6 million	124.58	$124.6 million
Total (road)				**$734 million**
Total (rail)				**$32 million**

Source: CSIRO (2017)

Analysis of figures from CSIRO (2017) and the ABS indicates that the cost of freight represents approximately 6.4% of the average value of gross farm production across the period from 2010-11 to 2013-14 (see Table 2.4 below).

It is important to note however, that in the years following that period, cattle prices increased significantly, contributing to a greater value of farm production. As a share of 2014-15 or 2015-16 values, cattle transport costs would represent around 4% of total farm production.

Table 2.4 Farm freight costs as a share of farm production value (average from 2010-11 to 2013-14)

Category	Value
Transport costs to and from properties	$512 million
Average value of gross farm production	$7.9 billion
Freight as a share of gross farm production	**6.4%**

Source: Deloitte Access Economics analysis of CSIRO (2017); ABARES Agricultural Commodity Statistics (2017)

As a share of final value of beef and cattle (estimated as the combined value of beef exports, live cattle exports and retail value), total transport costs (including beef and cattle) represented 5.7% of total value over the same period.

Table 2.5 Transport costs as a share of total final value (average between 2010-11 to 2013-14)

Category	Value
Value of beef exports	$5.0 billion
Value of live cattle exports	$0.7 billion
Value of domestic consumption	$7.6 billion
Transport costs	$766 million
Freight costs as a share of final value	**5.7%**

Source: Deloitte Access Economics analysis of CSIRO (2017); ABARES Agricultural Commodity Statistics (2017); Meat and Livestock Australia Beef Fast Facts (2017)

In a separate study, the AFI (2011) also researched the cost of transporting cattle from farm to processor, and beef from processor to port, across three specific freight routes in three different states.

Victoria

- Consignment of 44 head of cattle
- Transported from farm at Beverford to processor at Tongala (193km) by road
- From Tongala to Port of Melbourne (231km) by road in refrigerated containers.

Queensland

- Consignment of 88 head of cattle
- Transported from Surat to processor at Toowoomba (320km) by road
- From Toowoomba to Port of Brisbane (156km) by road in refrigerated container.

Western Australia

- Consignment of 66 head of cattle
- Transported from Gnowangerup to processor at Harvey (317km) by road
- From Harvey to Port of Fremantle (133km) by road in refrigerated container.

Table 2.6 Beef and cattle transport costs for three case studies

From	To	Victoria	Queensland	Western Australia
Transport costs		**(A$/ head)**	**(A$/ head)**	**(A$/ head)**
Farm	Processor	$21.23	$26.05	$33.23
Processor	Port	$36.19	$28.37	$35.88
Total transport costs		**$57.42**	**$54.42**	**$69.11**

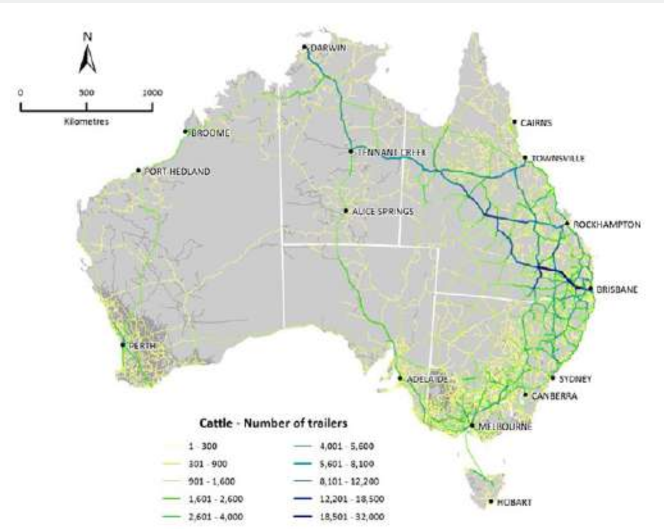
Source: AFI (2011). Note that cost estimates from processor to port express the equivalent cost of transporting each beef carcass.

The share of transport cost results of this AFI study align very closely with those outlined in Table 2.4 and Table 2.5 above. According to the study, the total cost of transport to port (within Australia) represented 5.1%, 5.7% and 8.7% of the estimated farmgate cattle prices in Victoria, Queensland in Western Australia, respectively.

2.2.4 Spatial distribution

Figure 2.2 shows the major freight routes for Australian cattle. In the northern beef cattle industry, which is strongly (live) export focussed, the distance between agricultural properties and processors and/or point of export is typically much further than it is for producers in southern areas, where the focus is more on boxed beef exports and the domestic market. Given that the vast majority of Australia's population lives in capital cities located in the south, northern beef must travel further to reach domestic markets.

Figure 2.2 Major freight routes for Australian cattle



Source: TraNSIT

2.3 Dairy

2.3.1 The Australian dairy industry

Dairy farming predominantly occurs in southeast Australia, where there is a favourable climate and natural resources for dairy. Most dairy production is located in coastal areas where pasture growth generally depends on natural rainfall, with inland locations often reliant on irrigation schemes. Reflecting both national and global trends, smaller dairy farms are giving way to larger, more intensive operating systems with greater economies of scale.[3]

There were an estimated 7,267 businesses in 2015-16, generating a gross value of farm production of over $4.28 billion. In the same year, the production volume was approximately 9,679 million litres of milk, 119 kilotonnes of butter and 344 kilotonnes of cheese.

2.3.2 Overview of the dairy supply chain

Raw milk is initially stored at farms in refrigerated vats before being transported in a refrigerated tanker to a manufacturing plant. The collection of raw milk is time sensitive given its high perishability, meaning that it is transported from farms to dairy processors every 24-48 hours.[4]

The location of dairy processors takes into account the access to dairy farms, domestic customers, skilled labour and transport infrastructure.[5] Fresh milk manufacturing facilities locate close to local urban markets given the cost of transporting bulk milk is lower before it is processed into the finished product. Whereas, manufacturing operations focusing on less perishable dairy products (cheese/butter) often locate closer to dairy farms. The predominant mode of transport for dairy is road transport given the collection of raw milk from numerous farms by processors.[6] Approximately 80% of Australia's raw milk is processed in southeast Australia.[7]

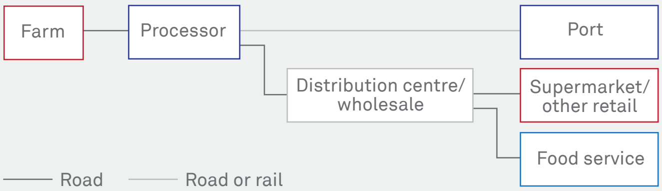
Table 2.7 Overview of the Australian dairy industry

Variable	Unit	Year	Value
Industry Scale			
Businesses	No. of businesses	2015-16	7,267
Yield	Litres	2015-16	6,198 litres per cow
Production			
Gross value of farm production	A$	2015-16	$4.28 billion
Production volume - milk	Million litres	2015-16	9,679 million litres
Production volume - butter	Kilotonne	2015-16	119
Production volume - cheese	Kilotonne	2015-16	344
Exports			
Volume	Kilotonne	2015-16	1,268
Price - butter	A$/tonne	2015-16	$4,629
Price - cheese	A$/tonne	2015-16	$4,998
Value	A$	2015-16	$4.79 billion

Data sources: ABS Agricultural Commodities; ABARES Agricultural Commodities (March 2018)

[3] <https://dairyaustralia.com.au/publications/australian-dairy-industry-in-focus-2017?id=0B6288F1D65C4155998FCC67356182AF> , page 6 [4] <https://www.pc.gov.au/inquiries/completed/dairy-manufacturing/report/dairy-manufacturing.pdf> , page 37 [5] Ibid <https://www.pc.gov.au/inquiries/completed/dairy-manufacturing/report/dairy-manufacturing.pdf>, page 36 [6] Ibid <https://www.pc.gov.au/inquiries/completed/dairy-manufacturing/report/dairy-manufacturing.pdf>, page 81 [7] Ibid <https://www.pc.gov.au/inquiries/completed/dairy-manufacturing/report/dairy-manufacturing.pdf>, page 36

Figure 2.3 Overview of the Australian dairy supply chain



Source: Adapted from CSIRO (2017)

After the manufacturing process, dairy products may be transported to other plants for packaging (if required), otherwise they are transported directly to distribution centres or to container ports for export. While a large share of dairy products are transported by road, some dairy processors utilise rail networks (Rail Futures Institute, 2016[8]) to deliver containers of dairy products to port. For the domestic market, dairy products may be transported to supermarkets and food service businesses via warehouses and distribution centres.

2.3.3 Freight costs throughout the supply chain

Dairy product distribution can be costly in comparison to other agricultural products due to the perishable nature of fresh drinking milk and other dairy products (although to a lesser extent). In addition, given that dairy product manufacturing is concentrated in southeast Australia, finished dairy products often have to be transported a significant distance to deliver to domestic customers in other parts of the country. Research by the Australian Dairy Industry Council indicated that farm milk collection charges averaged approximately 2.5-3.0 cents per litre in Australia in 2012.[9]

A number of factors that influence the freight costs for dairy products include:

- Distance from dairy farms to processor
- Size and distribution of dairy farms
- Number of dairy processors collecting milk in a specific region.[10]

CSIRO (2017) provides an analysis of specific freight costs incurred throughout the dairy supply chain. They estimate the total cost incurred by transporting milk from dairy farms to the processor is approximately $198 million a year, estimated across 2013-14 to 2015-16. The freight cost is then substantially more for transport from the processor to the distribution centre per supermarket warehouse, estimated at $691 million a year over the same time period.

Table 2.8 Average annual transport costs and other fees for dairy production in Australia - 2013-14 to 2015-16

From	To	Mode	Volume	Cost/ unit	Total cost
Dairy			**(Kilolitres)**	**(A$/ tonne)**	**(A$)**
Property	Milk factory	Road	9,700,000	19.48	$198 million
Milk/ cheese factory	DC/ super-market	Road	6,400,000	126.55	$691 million
Total (road)					**$889 million**

Source: CSIRO (2017)

Analysis of CSIRO estimates and ABS production data indicates that the cost of freight for farmers (that is, the cost to deliver milk to processors) represents approximately 4.3% of the average value of gross farm production across 2013-14 to 2015-16 (see Table 2.9).

Table 2.9 Summary of farm freight costs as a share of farm production (2013-14 to 2015-16)

Category	Value
Transport costs to and from properties	$198 million
Average value of gross farm production	$4.58 billion
Freight as a share of gross farm production	**4.3%**

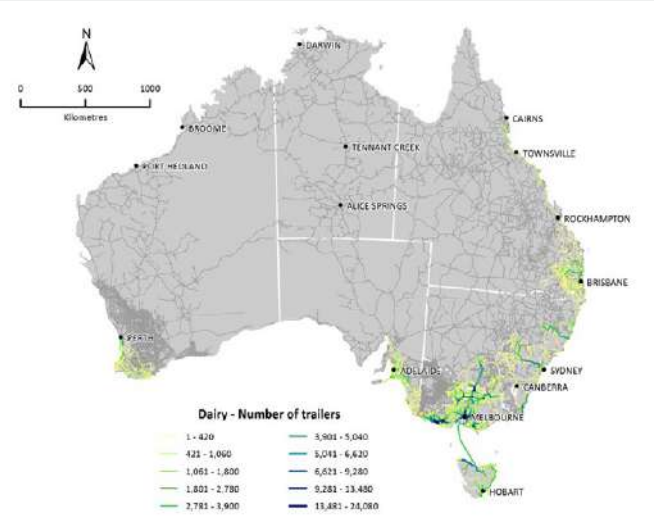
Source: Deloitte Access Economics analysis of CSIRO (2017); ABARES Agricultural Commodities (March 2018)

[8] Rail Futures Institute, Getting freight back on track in Victoria, June 2016
[9] <https://www.pc.gov.au/inquiries/completed/dairy-manufacturing/report/dairy-manufacturing.pdf>, page 81 [10] Ibid <https://www.pc.gov.au/inquiries/completed/dairy-manufacturing/report/dairy-manufacturing.pdf>, page 83-84

2.3.4 Spatial distribution

Dairy farms and processors are concentrated in southeast Australia, with most exports passing through Victorian ports. Farms located in other areas of the country typically service their local market. This is particularly evident in cities such as Brisbane and Perth, as shown in Figure 2.4.

Figure 2.4 Australian freight flows for dairy



Source: CSIRO (2017)

2.4 Grains

2.4.1 The Australian grains industry

Grains are one of Australia's largest export commodities. The gross value of Australian production of cereal grains, oilseeds and pulses was $12.7 billion in 2015-16, accounting for 22% of Australia's gross value of farm production in that year.

Table 2.10 Overview of the Australian grains industry

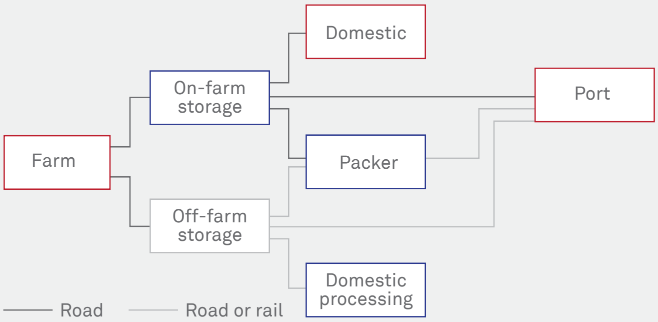
Variable	Unit	Year	Value
Industry scale			
Properties	No. of properties	2015-16	24,000
Gross value of farm production			
Cereal grains	A$	2015-16	$9.6 billion
Oilseeds	A$	2015-16	$1.5 billion
Pulses	A$	2015-16	$1.5 billion
Volume of production			
Cereal grains	Tonnes	2015-16	35.2 million
Oilseeds	Tonnes	2015-16	3.8 million
Pulses	Tonnes	2015-16	2.3 million
Exports (cereals, oilseeds and pulses)			
Volume	Tonnes	2015-16	27.1 million
Value	A$	2015-16	$10.7 billion

Data Sources: ABARES Agricultural Commodities (March 2018); GRDC Annual Report (2016-17)

2.4.2 Overview of the grains supply chain

For this study, the grains supply chain commences at the farm gate and concludes at either the point of processing, or the port from which it is exported. In many grain-growing areas across the country, there are a range of options available to growers and buyers as to how grain is stored and transported. As a result, there are a number of paths from farm to port or processor.

Figure 2.5 Overview of Australian grain supply chains



Source: Adapted from CSIRO (2017)

From the point of production, grain can either be stored on-farm or transported by road to an off-farm silo. The Australian bulk grain storage network is mostly owned and operated by major grain traders. From storage, grain can be transported in bulk either by road or rail to a domestic buyer or to port for export.

Larger grain companies (such as GrainCorp, CBH, Cargill, Viterra and Emerald Grain) operate long-established rail storage sites which allow grain to be transported by rail in bulk, to a number of major ports around the country.

Grain can also be exported in shipping containers, rather than in bulk. Containerised grain is usually transported to port on road – since many grain container-packing facilities do not have the rail infrastructure required to load and unload trains.

Most grain destined for the domestic market is transported from storage by road. Only a limited number of domestic grain buyers (such as flour mills and stockfeed mills) have access to rail facilities that allow them to receive grain via rail.

2.4.3 Freight costs throughout the supply chain

CSIRO's TraNSIT report includes estimates of transport costs for winter cereals (wheat, barley and oats) moving from farm to port or domestic end user. This information was based on 2015-16 throughputs from grain storage facilities, and is summarised in the Table 2.11.

Table 2.11 Average transport costs – winter grains (wheat, barley and oats) – 2015-16

		Mode	Volume	Cost/ unit	Total Cost
From	**To**	**Road/ rail**	**(Tonnes)**	**(A$/ tonne)**	**(A$)**
Paddock	Storage	Road	43 million	$4.91	$938 million
Storage	Flour mills	Road	1.1 million	$34.60	$35.8 million
Storage	Flour mills	Rail	1.5 million	$27.80	$40.4 million
Storage	Port	Road	14.2 million	$44.01	$625 million
Storage	Port	Rail	16.9 million	$26.50	$447 million
Storage	Feedlot or mill	Road	9.3 million	$37.40	$348 million
Feedlot/ feed mill	Livestock business	Road	7.2 million	$28.03	$201 million
Total (rail)					**$572 million**
Total (road)					**$2,148 million**

Source: CSIRO (2017)

When analysing the table above, it is important to note that:

- The cost of moving grain from paddock to storage includes the movements to both on-farm and off-farm storages. This means that the average cost of transporting grain from farm to off-farm storage is higher than the $4.91 tonne as expressed in the table, which is the average cost of all movements
- The figures in Table 2.11 do not include storage and handling fees, receival fees, terminal storage, vessel loading, etc. – they only represent freight costs. These figures were however included in the 2011 AFI study which is summarised below.

Analysis of figures from the CSIRO (2017) and the ABS production data indicates that the cost of freight represented approximately 27.5% of the gross farm production for the three varieties of cereal grains modelled (see Table 2.12 below).

Table 2.12 Farm freight costs as a share of farm production

Category	Value
Transport costs to and from properties, storages, domestic users and ports	$2.43 billion
Value of gross farm production (wheat, oats, barley)	$8.84 billion
Freight as a share of gross farm production	**27.5%**

Source: Deloitte Access Economics analysis of CSIRO (2017); ABARES Agricultural Commodities (March 2018)

The AFI (2011) also researched the cost of transporting 200 tonnes of grain from farm to port, via off-site storage, in two different states:

New South Wales:

- From farm at Come by Chance to storage at Burren Junction (78km) by road
- From Burren Junction to the Port of Newcastle (500km) by rail

Western Australia:

- From farm at Tampu to storage at Bonnie Rock (60km) by road
- From Bonnie Rock to Kwinana (390km) by rail

Table 2.13 Transport costs and other fees – based on 200 tonnes of wheat, 2010-11 season

From	To	Mode	New South Wales	Western Australia
Transport costs			(A$/ tonne)	(A$/ tonne)
Paddock	Up-country storage	Road	$22.50	$12.00
Storage	Port	Rail	$42.40	$29.72
Total transport costs			**$64.50**	**$41.72**
Other fees and charges				
Up-country silo receival fee			$6.35	$11.05
Up-country silo storage			$5.52	$8.00
Other port loading and marketing fees			$16.10	$18.30
Port charges			$0.49	$1.32
Total other fees and charges			**$28.46**	**$38.67**

Source: Australian Farm Institute (2011)

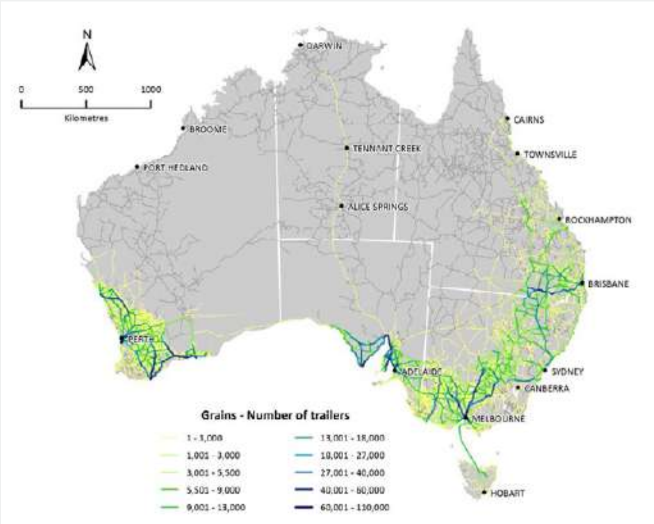
According to the AFI study, the total cost of transport and other fees and charges represented 26.5% and 23.4% of the estimated pool return price in New South Wales and Western Australia, respectively, for the 2010-11 season (excluding the cost of sea freight, which was out of scope from the CSIRO study).

2.4.4 Spatial distribution

Movements of grain across Australia, as modelled and shown in Figure 2.6 below reflect a number of factors:

- Australia exports around two thirds of its grain production so most of the major freight routes are from grain producing areas to ports with bulk loading capacity, including:
  - **Victoria:** Melbourne, Portland and Geelong
  - **Western Australia:** Fremantle, Albany, Esperance and Geraldton
  - **South Australia:** Port Adelaide, Port Giles, Port Lincoln, Thevenard, Wallaroo
  - **Queensland:** Brisbane, Gladstone and Mackay
  - **New South Wales:** Port Kembla and Newcastle.
- There is relatively strong domestic demand for grain in New South Wales and Queensland, (predominantly from livestock businesses/feedlots, industrial and food manufacturing), resulting in a greater share of transport movements to inland destinations than other states. Victoria, South Australia and Western Australia are strongly export focused, and therefore have more grain traffic moving towards the major ports.

Figure 2.6 Australian freight flows for winter grains



Source: CSIRO (2017)

2.5 Chicken Meat

2.5.1 The Australian poultry industry

The gross value farm production for Australian poultry was $2.7 billion in 2015-16, accounting for approximately 5% of Australia's gross value of farm production. As a domestically focused industry, chicken meat exports represent a relatively small share of output. Exports were valued at $50 million in 2015-16 (Table 2.14).

Table 2.14 Overview of Australian chicken meat industry

Variable	Unit	Year	Value
Industry Scale			
Number of properties	No. of properties	2015-16	530
Number of chickens (for meat)	No. of head	2015-16	90 million
Production			
Gross value of farm production	A$	2016-16	$2.7 billion
Volume of chicken meat produced	Tonnes	2015-16	1.2 million
Exports			
Value of exports	A$	2015-16	$50 million
Volume of exports	Tonnes	2015-16	27,300

Data sources: ABS Agricultural Commodities, ABARES Agricultural Commodities (March 2018)

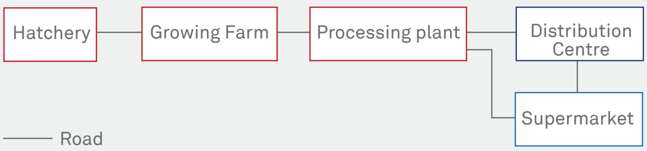
2.5.2 Overview of the poultry supply chain

Chicken meat production in Australia is highly concentrated. There are a small number of large, vertically-integrated, privately-owned businesses that typically contract out the growing stage to independent chicken growers.[11]

Chicken farms (for broiler production) tend to be concentrated adjacent to major capital cities (often within 50km) for access to the domestic market. Hatcheries, growing farms and processing plants are often located in close proximity to one-another, which minimises transport costs.

From the point of processing, chicken meat is prepared and/or packaged and is typically distributed into retail and hospitality channels on road via major wholesale and distribution centre networks.

Figure 2.7 Overview of chicken meat supply chain



Source: Adapted from CSIRO (2017)

2.5.3 Freight costs throughout the supply chain

CSIRO (2017) estimates that freight costs for chickens and poultry meat totalled $63 million. Of this, around $28 million relates to transporting live chickens to processing plants, and the remaining $35 million relates to the transport of chicken meat to Australian distribution centres and supermarkets. Unlike other commodities, the year in which this analysis was based is not specified.

[11] <http://www.agrifutures.com.au/rural-industries/chicken-meat/> <http://www.agrifutures.com.au/rural-industries/chicken-meat/>

Table 2.15 Summary of freight costs for Australian chicken meat (year not specified)

From	To	Volume	Cost/ unit	Total Cost
Chickens		**(Head)**	**(A$/ head)**	**(A$)**
Growing farm	Processor	540 million	$0.052	$28.2 million
Chicken meat		**(Tonnes)**	**(A$/ tonne)**	**(A$)**
Processor	DC/ supermarket	900,000	38.56	$34.9 million
Total (road)				**$63.1 million***

Source: CSIRO (2017)

Based on the estimated freight costs above, freight costs for chickens transported from growing farms represents 1% of the gross value of agricultural production in 2015-16. Note that this estimate does not include the cost of transporting inputs, such as grains, to poultry farms.

Table 2.16 Summary of farm freight costs as a share of farm production of chickens (2015-16)

Category	Value
Transport costs to and from properties	$28.2 million
Average value of gross farm production	$2.75 billion
Freight as a share of gross farm production	**1.0%**

Source: Deloitte Access Economics analysis of CSIRO (2017), ABARES Agricultural Commodities (March 2018)

As a share of the final value of chicken meat consumed in Australia in 2015-16, freight costs (for both live chickens and meat) represented 1.3% of final value.

Table 2.17 Transport costs as a share of total final value of chicken meat consumed (2015-16)

Category	Value
Total transport costs	$63.1 million
Value of chicken meat consumption	$4.9 billion
Freight as a share of final consumption value	**1.3%**

Source: Deloitte Access Economics analysis of CSIRO (2017), ABARES Agricultural Commodities (March 2018), ABARES Agricultural Commodity Statistics (2017)

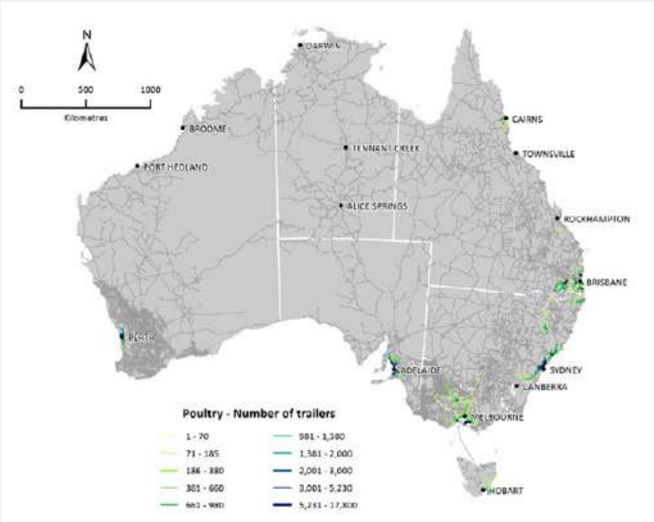
2.5.4 Spatial distribution

The poultry industry has relatively intensive production techniques, allowing poultry producers to operate with a lower land input requirement than pasture-based industries. Furthermore, with a large share of production occurring indoors, climate conditions do not play a significant role, meaning.

For these reasons, poultry farms and processors are sited close to domestic markets, allowing for shorter freight routes and subsequently lower costs. Unlike other agricultural industries, which require space and/or particular growing conditions (soil types or climates), there are few benefits to being located in remote areas of the country.

The map below highlights how freight movements of poultry across Australia largely consist of relatively short movements from regional and peri-urban fringes of major cities, into major large domestic markets.

Figure 2.8 Poultry freight movements throughout Australia



Source: CSIRO (2017)

2.6 Horticulture

2.6.1 The Australian horticulture industry

Australia's horticulture industry comprises the production of fruit, vegetables and nuts. The industry is highly competitive both in the domestic and international market and farms are currently seeing a trend towards medium to larger scale operations.[12] The production of individual fruit and vegetable types are often concentrated in particular regions based on growing conditions. Some examples include:

- Banana, pineapple, mandarin, avocado, mango, fresh tomato, capsicum, and zucchini production is concentrated in Queensland
- Stonefruit, oranges and grapes in New South Wales, Victoria and South Australia
- Processing potatoes in Tasmania
- Fresh pears, canning fruit and processing tomatoes in Victoria
- Apples and fresh vegetables in all states.

Tree nut crops are grown throughout Australia, although some regions such as the Riverina and Northern Rivers regions of New South Wales are major producers. Table 2.18 contains a summary of production and exports for these products.

Table 2.18 Summary of Australia's horticulture industries

A$	Unit	Year	Value
Number of businesses			
Fruit and nuts	No. of properties	2015-16	4,982
Vegetables	No. of properties	2015-16	3,741
Gross value of production			
Fruit & tree nuts	A$	2016-17	$4.2 billion
Vegetables	A$	2015-17	$3.5 million
Exports			
Fruit & tree nuts	A$	2015-17	$1.9 billion
Vegetables	A$	2015-17	$354 million

Data sources: ABS Agricultural Commodities; ABARES Agricultural Commodities (March 2018)

The CSIRO (2017) study examined the transport costs associated with selected fruit and vegetables, for which comprehensive data existed for farm location and production volume. This list of vegetables is outlined in Table 2.19 and Table 2.20.

2.6.2 Overview of the horticulture supply chain

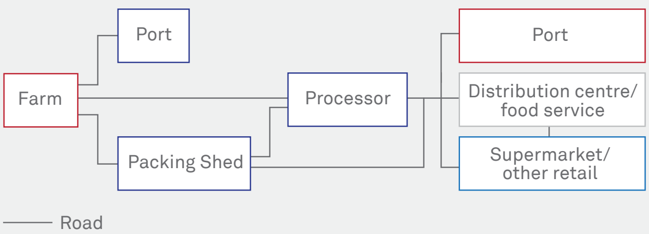
The supply chains of horticultural products vary significantly, as do the horticultural commodities themselves, which means that there is no single depiction representative of all fruit, vegetables and nuts.

There are three primary channels for marketing Australian horticultural produce:

- DDomestic fresh consumption
- Domestic processing
- Horticultural products destined for export.

Figure 2.9 depicts a generic supply chain for horticulture products, although is not representative of all products. For example, some products, such as citrus fruit, are supplied into export markets, as well as fresh domestic markets and processing markets. Other products, such as bananas, are destined almost exclusively for domestic fresh consumption, and therefore have negligible freight costs for export-bound freight movements.

Figure 2.9 General horticulture supply chain



Source: Adapted from CSIRO (2017)

[12] <http://www.agriculture.gov.au/ag-farm-food/hort-policy/horticulture_fact_sheet>

2.6.3 Freight costs throughout the supply chain

CSIRO (2017) estimates the total cost incurred to transport selected horticultural products in Australia was $618 million a year, based on data from 2010-11. The selected horticultural commodities are included in the table below.

Table 2.19 Average transport costs and other fees of horticulture in Australia (based on 2010-11 production)

From	To	Volume	Cost/ unit	Total Cost
By Stage		(Tonnes)	(A$/ tonne)	(A$)
Property	Packer/ processor	3.0m	$78.80	
Property	Port	0.4m	$109.20	
Packing shed/ processor	DC/super-market	2.1m	$245.30	
Vegetables	A$	2015-17	$3.5m	
By commodity				
Apples		0.3m	$128.40	$38.5m
Bananas		0.2m	$445.90	$90.4m
Broccoli		0.05m	$251.30	$12.3m
Lettuce		0.1m	$186.50	$27.0m
Mandarins		0.1m	$195.00	$29.1m
Mangoes		0.04m	$636.70	$23.3m
Melons		0.2m	$284.70	$60.3m
Onions		0.3m	$197.40	$65.3m
Oranges		0.3m	$149.40	$43.5m
Pears		0.1m	$155.10	$19.1m
Pineapples		0.1m	$135.10	$11.2m
Potatoes		1.1m	$129.20	$145.7m
Pumpkins		0.1m	$239.10	$24.6m

Source: TraNSIT: Unlocking options for efficient logistics infrastructure in Australian agriculture (2017); ABS Agricultural Commodities (2010-11)

Tropical fruits (bananas and mangoes) face the highest freight costs per tonne of all horticultural commodities, reflecting the long distances required to travel to domestic markets and, in the case of mangoes, points of export. These costs also likely reflect the need for temperature control of these products.

Analysis of freight estimates from CSIRO (2017) and the ABS production data indicates that transport costs represent 21% of the gross value of farm production of all in-scope horticultural commodities. This value is typically higher for lower value, bulkier goods, with freight costs representing over 25% of farm production value for potatoes, pumpkins, melons, carrots, onions and bananas.

Table 2.20 Transport costs as a share of value of farm production (2010-11) – all horticultural commodities

Commodity	Value of production (2010-11)	Total transport cost	Transport cost (share of farm value)
Apples	$526.1m	$38.5m	7%
Bananas	$234.1m	$90.4m	39%
Broccoli	$117.2m	$12.3m	11%
Carrots	$149.2m	$37.3m	25%
Lettuce	$193.3m	$27.0m	14%
Mandarins	$155.5m	$29.1m	12%
Mangoes	$106.9m	$23.3m	22%
Melons	$181.6m	$60.3m	33%
Onions	$263.9m	$65.3m	25%
Oranges	$275.44m	$43.5m	16%
Pears	$106.9m	$19.1m	18%
Pineapples	$59.1m	$11.2m	19%
Potatoes	$519.1m	$145.7m	28%
Pumpkins	$86.1m	$24.6m	29%
Total	**$2,974.4m**	**$617.8m**	**21%**

Note – Value of production based on 2010-11 volumes, at 2015-16 prices

By comparison, a separate study undertaken by the Australian Farm Institute (2011) indicated that freight costs for bananas and apples were lower than estimated by CSIRO (2017), when expressed as a share of gross value of agricultural production. According to the AFI study:

- **Bananas** - The cost of transporting bananas 2,705km from Tully (Queensland) to Melbourne (Vic) were estimated at $227.50 per tonne, representing 13.4% of farmgate price (based on a price of $25 per 13kg box, which was high for the time because of Cyclone Yasi). Based on previous year banana prices, transport costs would represent 24.6%of the value of the produce
- **Apples** - The cost of transporting apples 250km from Nashdale (NSW) to Sydney Markets in Flemington (NSW) was $75.50 per tonne, representing 4.1%of grower price (based on a market value of $1.90 per kg)
- **Grapes** - The cost of transporting table grapes 533km from Mildura Victoria to Melbourne Airport Victoria was $98.50 per tonne, representing 4.9% of grower price (based on a market value of $2 per kg). The cost of exporting table grapes from Melbourne to Singapore was a further $571.43 per tonne, including quarantine and customs certification (for a 10 tonne consignment).

2.6.4 Spatial distribution

Fruit, nuts and/or vegetables are grown in all Australian states and territories. There are many major significant horticultural growing areas, including:

- Goulburn Valley of Victoria
- Murrumbidgee Irrigation Area of New South Wales
- Sunraysia district of Victoria and New South Wales
- Riverland region of South Australia
- Northern Tasmania
- Southwest Western Australia
- Northern New South Wales
- Northern Queensland.

Horticultural commodities typically display long transport routes that cross from one side of the continent to the other, reflecting a number of factors:

- Many horticultural commodities can only be grown in specific areas (depending on factors such as climate conditions, soil and water availability). For example, tropical fruits have long transport routes, from the north of the continent where they are produced, to the south where they are consumed
- In order to secure year-round supply of fresh produce in all states, supermarket chains source produce from different parts of the country depending on when the produce is in season. To highlight this, the table below demonstrates how strawberry production shifts between states during different times of the year.

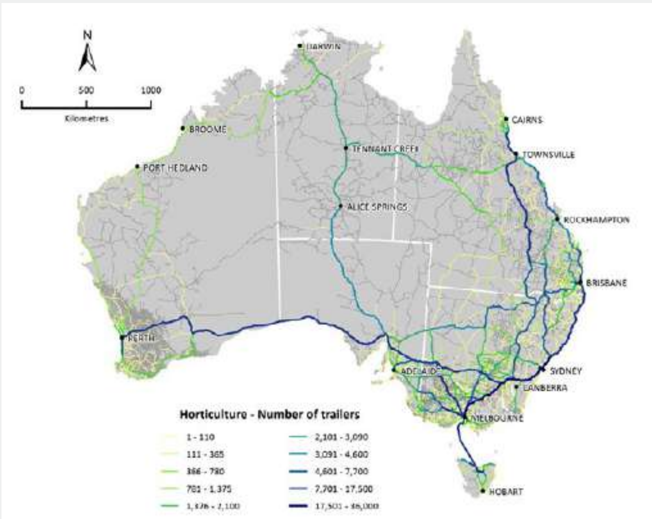
Figure 2.10 Strawberry production, by state

State	J	F	M	A	M	J	J	A	S	O	N	D	% of total production
VIC	■	■	■	■	■					■	■	■	32%
QLD						■	■	■	■	■			33%
WA						■	■	■	■	■	■	■	22%
SA	■	■	■	■	■					■	■	■	10%
TAS	■	■									■	■	2%
NSW	■	■									■	■	1%

Source: FoodPrint Melbourne, based on data from Strawberries Australia Inc.

The production and initial transport occurs predominantly along the population denser areas of the east Australian coast as well as major cities. The most congested transportation routes exist between capital cities, notably between Melbourne, Sydney and Brisbane. Some Tasmanian horticultural products also travel to Melbourne by ship, either for domestic consumption or for export via Melbourne International Airport.

Figure 2.11 Horticulture freight movements throughout Australia



Source: CSIRO (2017)

2.7 Summary

Freight costs vary significantly with each agricultural commodity, reflecting the role of factors such as perishability, weight, volume, labour intensiveness and geographic distribution play in contributing their overall cost of delivery.

Our analysis of farm freight costs has demonstrated the proportion of cost attributable to freight for each major commodity within the sector. In Australia, freight costs are relatively highest for grains and fruit/vegetables, reflecting the significant travel distance and bulky nature of those products. By comparison, industries with localised supply chains, such as poultry, have the lowest relative farm freight costs.

[3] https://dairyaustralia.com.au/publications/australian-dairy-industry-in-focus-2017?id=0B6288F1D65C4155998FCC67356182AF , page 6 [4] https://www.pc.gov.au/inquiries/completed/dairy-manufacturing/report/dairy-manufacturing.pdf , page 37 [5] Ibid, page 36 [6] Ibid, page 81 [7] Ibid, page 36 [8] Rail Futures Institute, Getting freight back on track in Victoria, June 2016 [9] https://www.pc.gov.au/inquiries/completed/dairy-manufacturing/report/dairy-manufacturing.pdf, page 81 [10] Ibid, page 83-84 [12] http://www.agriculture.gov.au/ag-farm-food/hort-policy/horticulture_fact_sheet

Section 3

Case studies

Case studies

The purpose of this chapter is to provide examples of the cost of moving specific commodities and products to export or domestic markets, from a specific location. For example, whereas the previous chapter examined the cost of transporting all dairy products within Australia in a given year, this chapter examines the cost of transporting milk powder from Western Victoria to Singapore. The case studies also help identify some of the policy issues involved in transporting agricultural products to market. These are further discussed in Chapter 5.

These case studies were selected in consultation with AgriFutures Australia and NFF, to capture a diverse range of geographies within Australia, commodity types and transport modes.

Broadly speaking, the approach for each case study will be to follow the journey of a single 'unit of output' (a consignment of cattle, a tonne of canola, etc.) from the farm gate to either:

- The retail stage in the domestic market
- The destination port in the case of exports.

3.1 Queensland beef from Dalby, Queensland to South Korea

Overview

This beef supply chain is representative of a fairly typical supply chain for Australian boxed beef exports from Southern Queensland – in terms of the distance travelled, the steps involved (from farm to abattoir to port) and the method of transport (containerised, shipped from Brisbane).

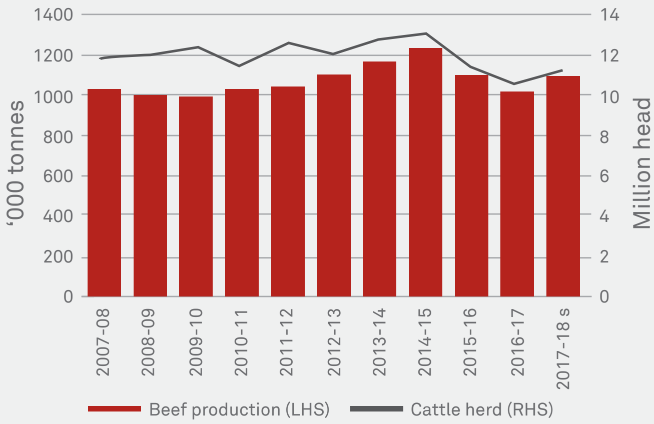
From farm to destination Port – transport costs are estimated at $343 per tonne. Assuming an average export price of $6,000 per tonne for boneless frozen beef, transport costs represents around 6% of the export unit value.

No specific issues were identified by stakeholders with this particular supply chain – however public reports have identified some issues impacting transport costs. In particular, that road use restrictions and lack of investment in roads and bridges is a barrier to the use of higher-productivity vehicles, which would decrease transport costs.

Beef cattle production is Queensland's largest agricultural sector industry. In 2016-17, the gross value of Queensland cattle production was $5.7 billion, accounting for around 30% of the value of cattle production in Australia[13]. Cattle are raised throughout Queensland, with 95% of Queensland's production area classed as grazing. The state has 14,568 beef cattle properties, with a further 889 grain, sheep and cattle properties, and 538 sheep/beef properties.

In recent years Queensland beef production has fluctuated around 1.1 million tonnes (carcase weight), with the local herd rebuilding following high rates of turn-off between 2011–12 and 2014–15. Most beef produced in Queensland is destined for the export market (~70%), with Japan, the Republic of Korea, the United States and China the primary destinations.

Chart 3.1: Beef production and cattle in Qld, 2007-08 to 2017-18



Source: ABARES Agricultural commodity statistics, 2017

The Queensland Trade and Logistics Council[14] estimates that:

- The total head movements/year are 9.57 million in Queensland, or an average of 2.3 unique transport movements/head
- Cattle typically travel in a four-deck, 27-head average per deck unit of movement (the equivalent of a B-Triple or Type 1 road train).

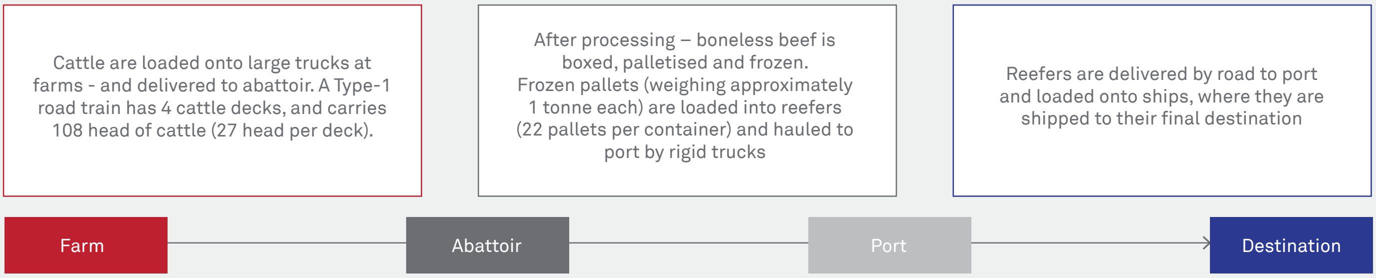
The majority of Queensland's meat products are exported through the Port of Brisbane, with a small volume exported through Townsville. The Port of Brisbane is the largest export port due to its proximity to 72% of the meat processing capacity in Queensland.

Meat travels primarily by refrigerated container ("reefer"), with average payloads ranging from 20 to 23 tonnes/vehicle movement. Dedicated rail services, known as sea-freighters, are also used in Queensland to move processed meat to markets from abattoirs. These trains can carry standard 20-foot and 40-foot refrigerated containers and have the capacity to move more than 20,000 twenty foot equivalents (TEU) a year from central and northern Queensland meat processors to Brisbane for export.[15]

The simplified beef freight case study outlined in this report is summarised in the diagram below. It involves road freight of cattle directly from farm to abattoir, and road freight for containerised frozen beef from abattoir to port.

[13] ABARES (2017), Agricultural Commodity Statistics [14] Queensland Transport and Logistics Council, Supply Chain Perspective - Livestock/meat [15] Queensland Transport and Logistics Council, Supply Chain Perspective - Livestock/meat

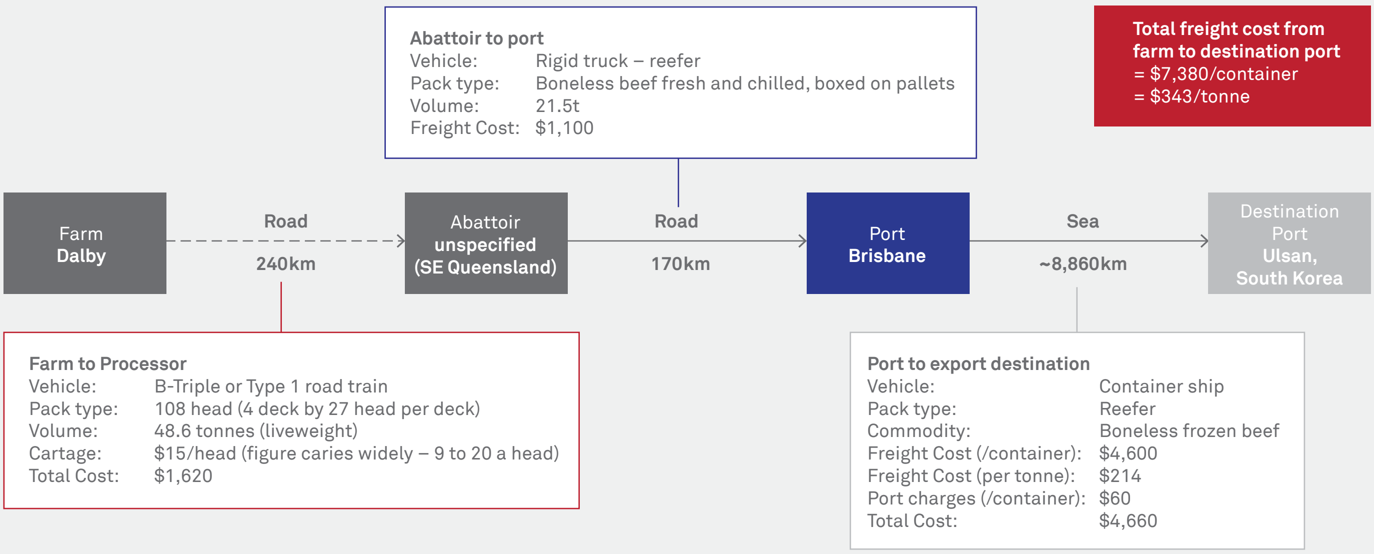
Figure 3.1 Beef case study overview



The diagram below contains a summary of the freight costs for this case study. Cattle are transported 240km by road from Dalby to an abattoir in Southeast Queensland (location unspecified). Frozen meat is boxed and palletised at the abattoir and loaded into a refrigerated shipping container, which is delivered to Port of Brisbane by road (a distance of approximately 170km) and shipped to South Korea (around 9,000 km).

The total estimated freight cost incurred in delivering one container-full of frozen beef to Korea is $7,380 – at an average cost of approximately $343 per tonne. The cost to deliver to port (i.e. excluding shipping costs) is $2,720.

Figure 3.2 Beef case study indicative costs



Source: Deloitte Access Economics analysis of industry sources and consultation. Note that total calculation assumes that live animals are 450kg/head, and a liveweight to retail weight conversion factor of 0.438 (Source: Agriculture and Agrifood Canada Website – 'Red Meat and Livestock Conversion Factors'). Under these assumptions, one consignment of 108 head of cattle will yield 1 tonne of beef (retail weight).

In a 2017 report produced for Meat and Livestock Australia, Juturna[16] identified the following red meat freight supply-chain issues:

- **Barriers to productivity growth** - regulatory and investment barriers inhibit the productivity of road freight. High-productivity vehicles are not able to be fully utilised on road networks, resulting in a drag on productivity
- **Monopoly infrastructure** - seaports and the shipping interface are critical infrastructure, but can be subject to monopoly pricing
- **Lost productivity** - road and rail approaches to seaports constitute the largest single cost to moving a container through the port. Where road freight deliveries to ships do not arrive at optimal weights, significant productivity is lost.

[16] Juturna Consulting (2017), Australia's red meat freight supply chain: Challenges to sector productivity, opportunities for planning and investment reform, A report for Meat and Livestock Australia in alliance with AMPC/RMAC, September.

3.2 Milk powder from Western Victoria to Singapore

Overview

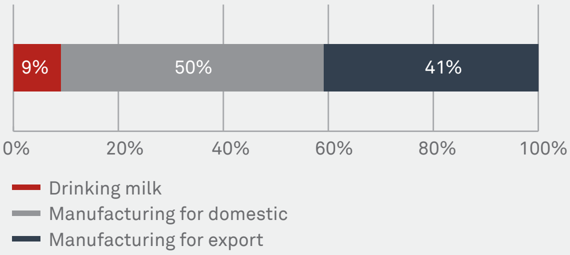
This dairy supply chain is representative of a typical export supply for Victorian dairy products. Transport distances have been estimated based on the typical distance from one of Victoria's dairy regions (South West Victoria) to the state's major container port, Port of Melbourne.

From farm collection to destination Port in Singapore – transport costs are estimated at $419 per tonne. Assuming an average export price of $6,000 per tonne for skim milk powder, transport costs represents around 14% of the export unit value.

On-farm truck and 'first-mile infrastructure' access remains an issue for smaller farms that can't accept higher productivity vehicles, who are charged higher transport costs.

Victoria is Australia's largest dairy producing state, with around 4,000 dairy farms producing over 6 billion litres of milk each year. It is one of the state's largest agricultural industries, with an annual gross value of production of around $3 billion. This amounts to almost a quarter of Victoria's total agricultural output. Victoria has three distinct dairy production areas – in the state's north (Murray region), south west (surrounding Warrnambool) and southeast (Gippsland).

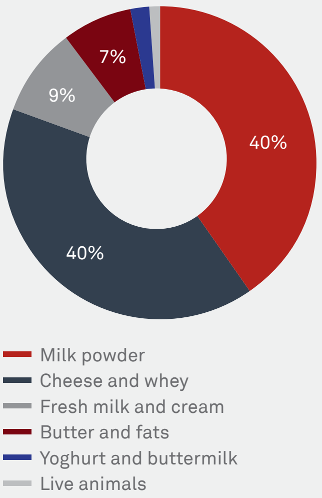
Chart 3.2: Use of Victorian milk, 2015-16



Source: Agriculture Victoria, Invest in Victorian agriculture and food – Dairy, 2018

Only 9% of Victorian milk is processed into fresh milk, with the remainder manufactured into dairy products. Around 41% of the state's milk production is used in manufactured products for the export market. In 2015-16, Victoria exported $1.9 billion of dairy products. Of this, approximately 40% was powdered milk, making it (along with cheese) the main product for export for the state.

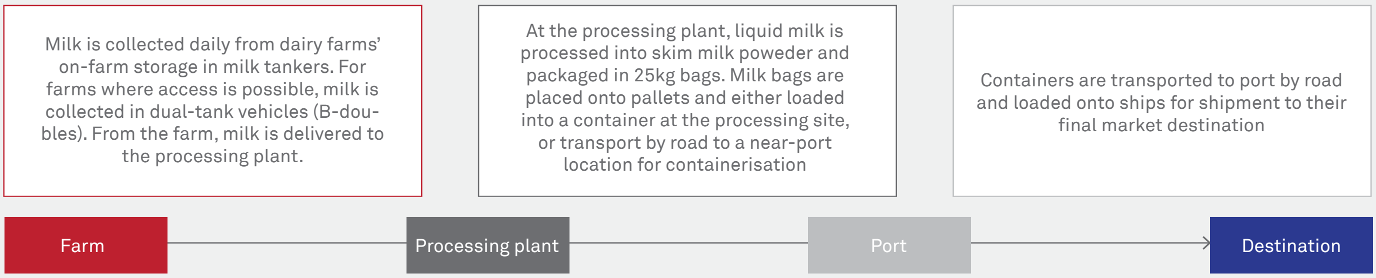
Chart 3.3: Victorian dairy exports, 2015-16



Source: Agriculture Victoria, Invest in Victorian agriculture and food – Dairy, 2018

The simplified dairy supply chain used for this case study is summarised in the diagram below. It involves collection of raw milk from farms, delivery to milk processor, and containerised milk powder from processor to port before export by sea.

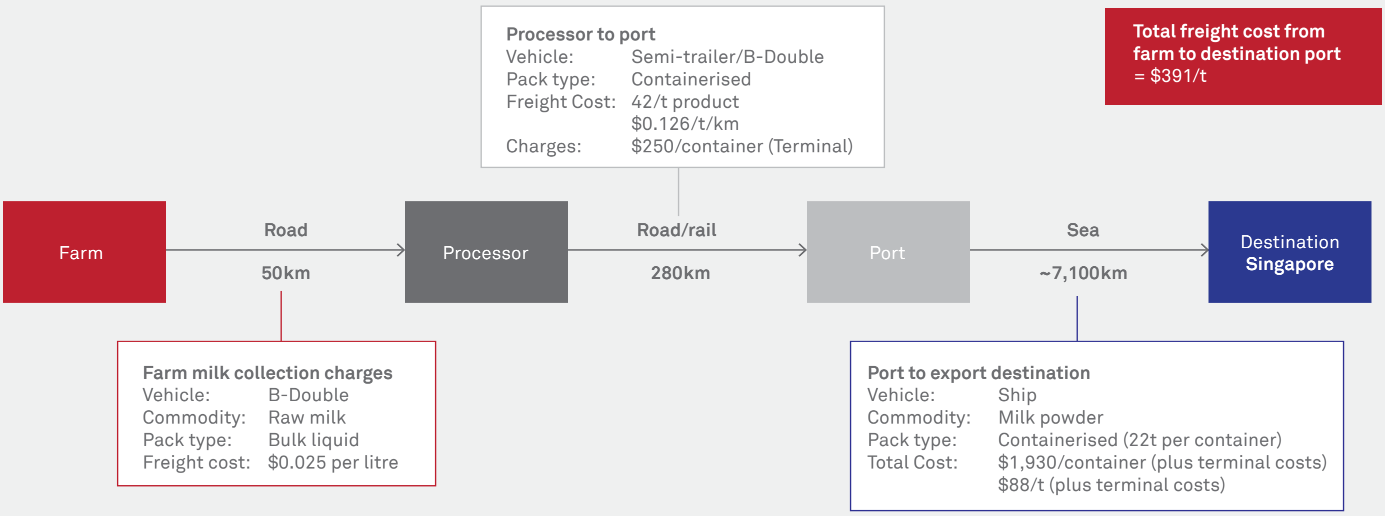
Figure 3.3 Milk case study overview



The diagram below contains a summary of the freight costs for this case study. Milk is transported 50km by road from farm to milk processor, at a cost of 0.025c/l. Milk is processed to milk power at the processor, is bagged, palletised and then loaded into shipping containers at the site for delivery to port by road.

The average cost to deliver one tonne of milk powder to the Port of Melbourne for export is $292 (excluding terminal charges). The total estimated freight cost incurred in delivering one shipping container of milk powder is $391 per tonne (inclusive of the raw milk freight costs from farm to processor) to the destination port in Singapore. This estimate assumes that one tonne of skim milk powder requires 10,000 litres of raw milk as input.

Figure 3.4 Milk case study indicative costs



Source: Deloitte Access Economics, based on consultation with industry participants

There are a number of issues affecting freight costs in this industry supply chain. These include:

- **Road and bridge weight limits** - Many commonly used road vehicles often cannot fully load due to mass constraints on roads. Seeking approval from road management authorities for the higher mass limits is time consuming and expensive for individual companies
- **On-farm truck access** - Dairy farms that cannot accommodate B-double trucks face an additional cost, as semi-trailer vehicles are more costly on a per-litre basis. However, upgrading farm access for larger, heavier vehicles can often outweigh the costs
- **Agreements between processors** - Agreements between processors (swaps) enable dairy farms to deliver fresh milk to local processors with latent capacity, when their supply agreement is with another processor. Swaps can reduce the total mileage of raw milk overall, however competitive tension between processors can prevent opportunities for farmers to benefit from such arrangements.

3.3 Canola from Western Australia to Belgium

Overview

This canola supply chain is representative of a fairly typical export bulk supply chain for Western Australia canola – utilising the bulk handling rail network. However, given the size of the Western Australia wheat belt, there is significant geographical variation across the state, which cannot be captured in a single case study such as this.

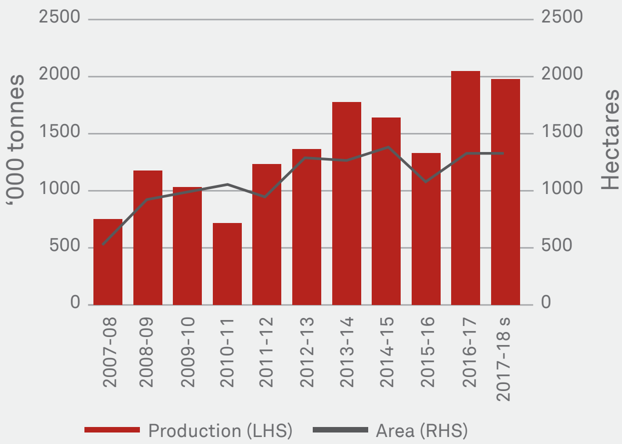
From farm collection to destination port in Singapore – transport costs are estimated at $58.57 per tonne. Assuming an average export price of $530 per tonne (2016-17 average), transport costs represents around 11% of the export unit value.

Two particular issues impacting grain transport costs in Western Australia are the closure of grain-only lines across the rural rail network, and a lack of competition in bulk-handling services.

Canola is one of Western Australia's major grains, behind only wheat and barley in terms of average annual production. It is grown in the traditional wheat–sheep belt and mixed farming regions of Western Australia. Canola plantings are becoming increasingly common in Western Australia, with the area planted in 2017-18 approximately double that of a decade prior.

As with other Western Australia grain crops, most canola grown in the state is exported, with the majority destined for countries in Northern Europe, including France, Belgium, Germany, the Netherlands and Denmark where it is used as bio-diesel feedstock. In 2016-17, the gross value of canola production in Western Australia was $1.18 billion.

Chart 3.4 Canola production in Western Australia, 2007-08 to 2017-18



Source: ABARES Crop report, June 2018

In Western Australia, most canola is transported in bulk, with a large percentage utilising the rail network to deliver it from up country storage to Port. There is one major bulk grain handler in Western Australia. Cooperative Bulk Handling (CBH) is a farmer-owned cooperative, which owns and operates most of the bulk handling grain network in Western Australia. The rail network connects CBH's 195 up-country receival sites to bulk export facilities located at Geraldton, Kwinana, Albany and Esperance.

As a result, the majority of grain moves from receival site to port by rail - an average of 10-12 million tonnes of grain per annum from up-country receival sites. The Western Australian rail network is owned by the Government of Western Australia and is under a long-term operating lease to Arc Infrastructure (formerly Brookfield Rail), who manages track access, train control, signaling and communication systems and rail construction and maintenance. Around 2,400 kilometres of Brookfield's 5,500 kilometre rail network is dedicatedsolely to transporting grain.

Figure 3.5 Western Australian grain rail lines by tier and volume of grain handled

Source: Brookfield Rail (now Arc Infrastructure)

The grain rail network comprises 16, 19 and 21+ tonne axle load capable rail, and includes both standard gauge and narrow gauge track. Brookfield have categorised the network into three 'tiers':

- **Tier 1 lines** - core line sections that form the basic structure of the network
- **Tier 2 lines** – branch lines where rail services are viable based on access rates and above rail costs; and
- **Tier 3 lines** – branch lines that are not competitive with road networks because of low volumes, light track or inefficient loading schedules.

In 2014, Arc (then Brookfield) ceased operating all Tier 3 rail lines, which make up around 500km of track. CBH and Arc have yet to form an agreement that would see Tier 3 lines reopened.

The simplified canola supply chain used for this case study is summarised in the diagram below. It involves movements from farm, to bulk storage, to port and finally to export destination.

Figure 3.6 Overview of case study

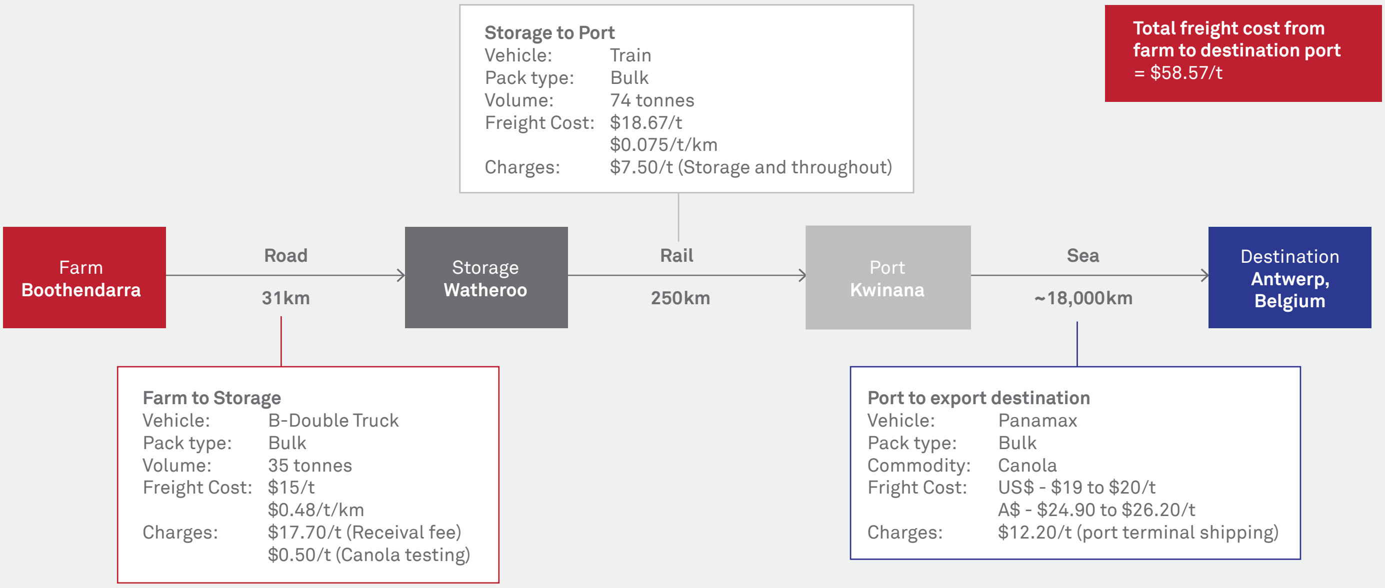
Farm	Off-farm storage	Port	Destination
Canola is harvested and loaded onto bulk tipper road trailers fitted with bulk bins. Canola is either stored on-farm for future sale, or delivered by road to an off-site bulk storage facility.	Following a period in storage, the canola is consigned for export and loaded into bulk rail carriages for delivery to a grain port terminal. Western Australian grain trains are among the largest in Australia, with each wagon holding around 74 tonnes of grain.	Once delivered to port, the grain is discharged, elevated and stored in grain cells awaiting shipment. During shipment, the grain is inspected for quality during loading and conveyed to a bulk carrier moored alongside for loading directly into the ship's holds.	Following completion of loading and final export clearance, the bulk carrier sails for its destination market (Belgium), where the cargo undergoes pre-inspection before discharge into the care of the buyer.

Source: Deloitte Access Economics

The diagram below contains a summary of the freight costs for the Western Australian canola case study.

The total estimated freight cost incurred in delivering canola from farm to final export $58.57 per tonne. The total cost to deliver to port (i.e. excluding shipping costs) is approximately $33 per tonne.

Figure 3.7 Indicative costs of Western Australian exports of canola into Belgium



Source: Deloitte Access Economics

There are two main issues affecting freight costs in this area:

- **Closure of grain-only rail lines** - The closure of rail lines leaves road transport as the only option of moving grain to market. Road transport costs are higher than bulk rail, and have higher externality costs than compared to rail such as higher congestion, noise, safety and emissions
- **Competition Issues** - Given the high entry costs of rail versus road, there is limited competition between rail providers across Australia, despite all rail networks having open access regimes. Competition in some states is further constrained due to the different rail gauges operating across some networks, adding further costs for rail operators wanting to operate across multiple state networks.

3.4 Broilers from Newcastle, New South Wales to Sydney domestic market

Overview

This is representative of a typical poultry supply chain – with primary production and processing both relatively close to the domestic market.

From broiler farm to domestic distribution – transport costs are estimated at 21cents per kg. Assuming an average chicken retail price of $5.30 per kg (2016-17 average), transport costs represents around 4% of this value.

The main issues impacting transport costs in this supply chain are caused by traffic delays in metropolitan areas.

Chicken meat is one of Australia's largest domestically focused livestock industries. With relatively limited requirements for land, poultry farms and processing plants have historically developed close to markets and labour sources, with many of the largest operations within 100km of a capital city. In New South Wales, the major areas of chicken meat growing are on outskirts of the Sydney metropolitan area, Mangrove Mountain / Central Coast, Newcastle, Tamworth and Griffith areas and Byron Bay.

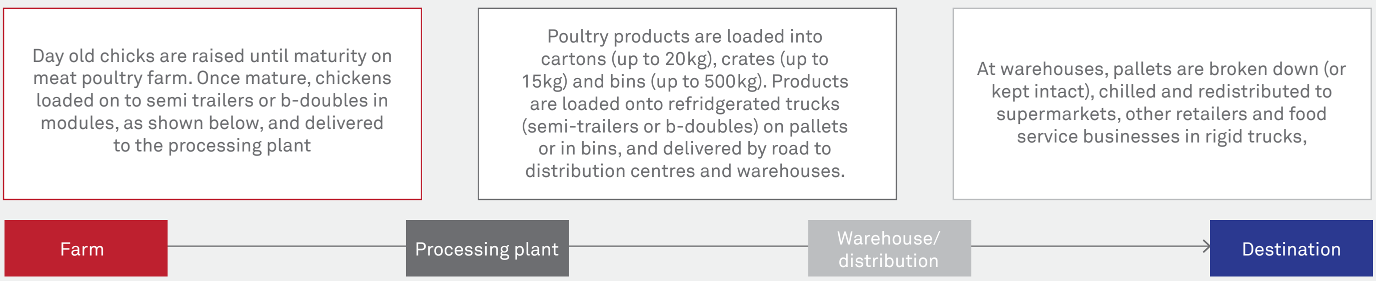
Table 3.1 New South Wales poultry industry profile (2016-17)

Description	Value
Number of chickens slaughtered	190.8 million
Volume of meat produced	397.7 kilotonnes
Gross value of production	$771.1 million
Number of agricultural properties	242
Domestic consumption	49.3 kg/person
Exports (Australia)	36.4 kilotonnes

Data sources: ABS (2017) Agricultural Commodities; ABS International Trade

The simplified poultry supply chain from farm to domestic market is summarised in the diagram below.

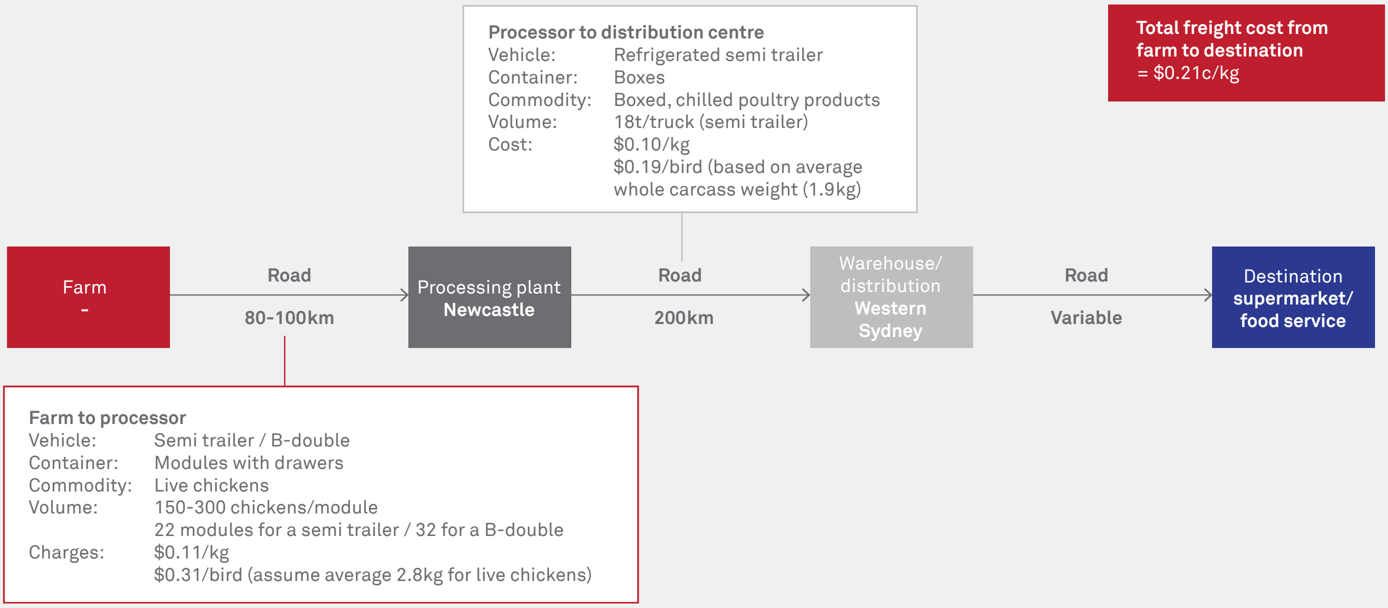
Figure 3.8 Poultry case study overview



Source: Deloitte Access Economics, based on industry consultation

The diagram below contains a summary of the freight costs for the New South Wales poultry case study. The total estimated freight cost incurred in delivering one kg of poultry meat from farm to warehouse / distribution centre is $0.21 per kg. This cost does not include the cost of delivering the poultry meat to supermarket, other retailer or food service sector – because it is often transported with other chilled goods by this point of the supply chain.

Figure 3.9 Poultry case study indicative costs



Source: Deloitte Access Economics analysis; industry consultation

A potential issue for the industry is the exposure to road traffic and associated delays. As an industry that tends to be closely located to metropolitan areas, traffic delays can be a significant issue in the chicken meat industry. Road congestion can put upward pressure on the cost of transport services, and cause scheduling delays at processing facilities.

3.5 Cherries – Huon Valley, Tasmania to China

Overview

Horticultural supply chains are highly variable in nature. This supply chain demonstrates a range of unique elements – in particular seasonality, time-sensitivity and product perishability. This supply chain also demonstrates how the need to export via mainland Australia (for air freight services) impacts freight costs.

From producer to destination airport (China), the cost of transport is estimated at $1.37 per kg. Assuming an average export price of $17 per kg for cherries sent to China (the 2016-17 average export unit value), transport costs represents around 8% of the export unit value.

The main issues driving transport costs in this supply chain are timing – with peak air freight demand periods increasing the cost and potentially resulting in delays. Furthermore, the lack of direct international services from Tasmania increases the distance (and cost) between producers and point of export. However, some major airlines have announced plans to offer services between Hobart and China.

In 2015-16, there were around 70 cherry producers that collectively producer 5,200 tonnes of cherries. Tasmanian cherries are strongly export focused, and are currently exported to over 20 countries across the world – mostly in Asia, Middle East and Europe (see Chart 3.5). Tasmanian cherry season commences in mid to late December and continues through to late February, with a peak occurring in mid to late January (Source: Cherry Growers Australia).

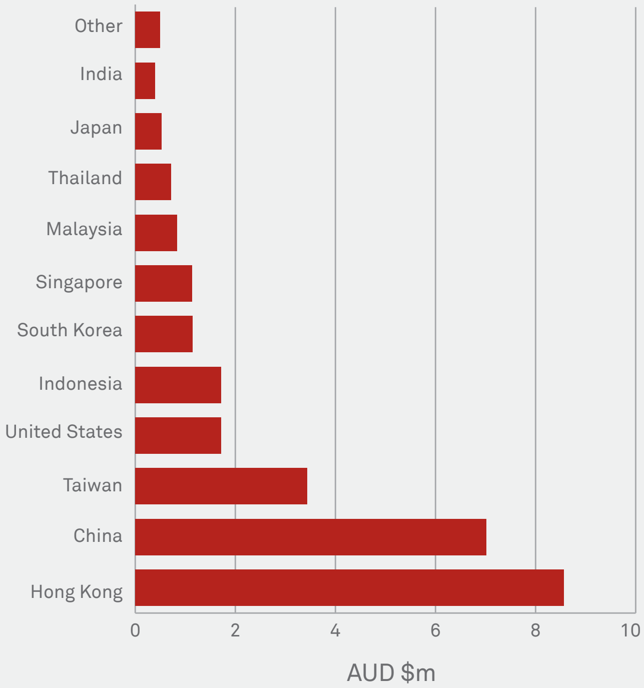
Table 3.2 Tasmania fresh cherry industry profile (2016-17)

Description	Value
Volume harvested	3,768 tonnes
Gross value production	$56.7 million
Number of agricultural properties	68
Number of trees	679,720
Exports (Tasmania)	$27.4 million
Share of Aus cherry exports	64%

Data sources: ABS (2017) Agricultural Commodities; ABS International Trade

Tasmania's major cherry export markets are Asian markets – with Hong Kong and China represented more than half of Tasmania's cherry exports in 2016-17.

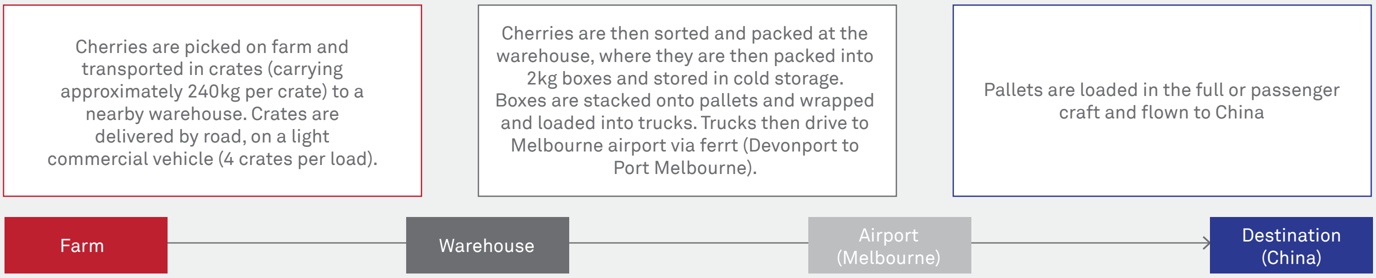
Chart 3.5: Tasmanian cherry export value, 2016-17



Source: ABS, International Trade, Cat No. 5368.0

The simplified Tasmanian cherry export supply chain, from farm to export market, is summarised in the diagram below.

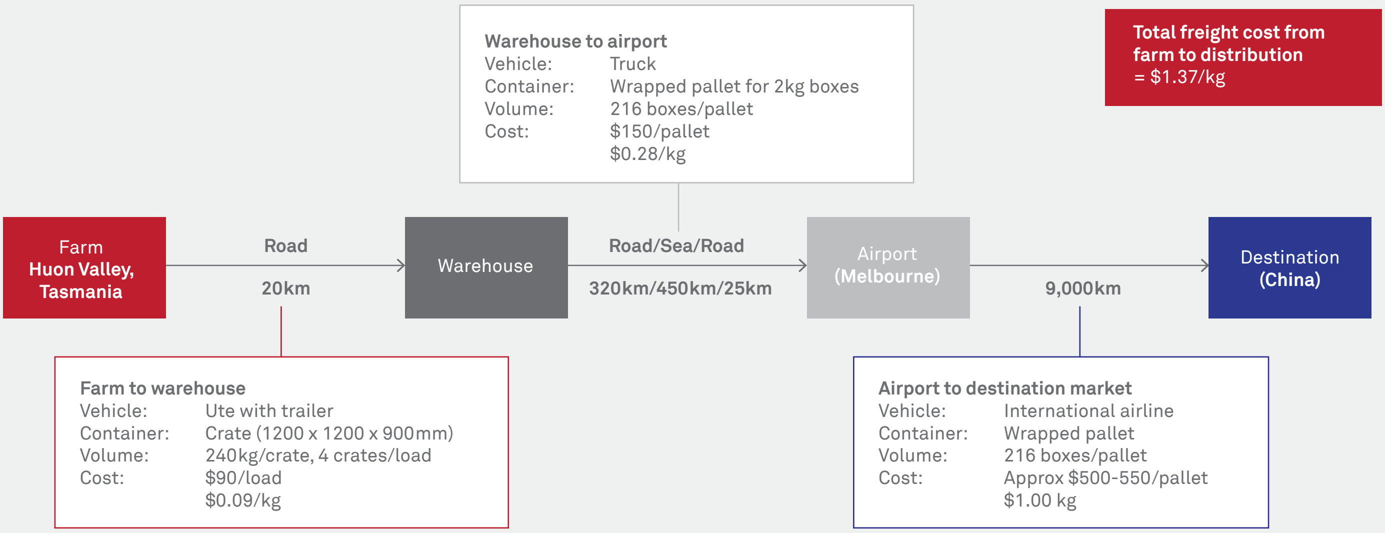
Figure 3.10 Cherries case study overview



Source: Deloitte Access Economics analysis; industry consultation

The diagram below contains a summary of the freight costs for Tasmanian cherry exports. The total estimated freight cost incurred in delivering one kg is $1.37 per kg.

Figure 3.11 Cherries case study overview



Source: Deloitte Access Economics analysis; industry consultation

There are a number of issues affecting freight costs in this area:

- **Supply chain time constraints** - Following harvest, cherries can be kept in cold storage for up to two weeks. However, once cherries are packed, they need to reach their destination within three to four days to meet importers' quality standards
- **Delays and elevated costs during peak period**s - Tasmanian cherry harvest season (December to February) coincides with Chinese New Year. During this period, there is increased demand for freight services into China. Competition with other Tasmanian premium produce (e.g. lobsters) can cause delays and drive up freight rates
- **Without direct international services to export markets, Tasmanian producers face additional shipping costs when exporting via the mainland.** The Tasmanian Freight Equalisation Scheme offers a subsidy to Tasmanian producers when transporting goods to the Australian mainland, but the scheme only applies to goods for permanent use or sale on the mainland (not for export). However, some major airlines announced plans to offer services between Hobart and China in 2018, which (depending on the competitiveness of freight rates) could significantly reduce the transport distance within Australia.[17]

[17] <https://www.abc.net.au/news/2018-07-04/virgin-hobart-to-perth-flights-announced/9938524> <https://www.abc.net.au/news/2018-07-04/virgin-hobart-to-perth-flights-announced/9938524>

3.6 Summary

These five case studies have demonstrated some of the specific costs incurred in moving commodities and products to market, across a diverse range of geographies within Australia, commodity types and transport modes as summarised below.

Table 3.3 Case studies

Industry	Origin	Destination	Cost and distance from farm to port/domestic destination	Total cost to export destination
Beef	Dalby, Queensland	South Korea (sea)	$126/tonne (410km)	$343/tonne
Milk powder	Western Victoria	Singapore (sea)	$292/tonne (330km)	$391/tonne
Canola	Western Australia	Belgium (sea)	$33/tonne (250km)	$56/tonne
Poultry	Newcastle, New South Wales	Sydney	$210/tonne (300km)	n/a
Cherries	Huon, Tasmania	China (air)	$270/tonne (815km)	$1370/tonne

The case studies have identified a number of important freight related issues for these commodities. These include:

- **Regulatory and investment barriers** - High-productivity vehicles unable to be fully utilised on road networks; mass constraints on roads and bridges; first mile access issues due to regulation or constraints; improved port connections
- **Infrastructure maintenance costs on low volume road and rail networks** – Operating restrictions or closure of rail freight lines; first mile access issues due to degraded roads and bridges
- **Competition Issues** - Limited competition between rail providers due to high investment costs and different rail gauges operating across some networks; seasonal competition between commodities for scarce freight resources (Tasmanian produce).

Section 4

Competition - international benchmarking

Competition - international benchmarking

This chapter builds on research and analysis presented in previous chapters by assessing how agricultural freight costs in Australia compare with its competitors. As freight can be a large driver of the overall cost of production of exportable commodities, international comparison can provide a useful basis for which Australia can assess its global competitiveness. The extent to which estimates from Chapters 2 and 3 will be able to directly compare to estimates of freight costs in other countries will be limited by the available data and clearly noted throughout.

Australia's competitors vary significantly by commodity. The research in this chapter focuses primarily on those commodities included in the case studies in Chapter 3, and Australia's main export competitors for these commodities. While this approach allows for a clear comparison of transport costs between Australia and its competitors, significant data gaps remain and could be a topic for future research.

4.1 Beef

Summary of findings

Australia's main competitors in beef export markets are the United States and Brazil. Research shows that the Australian cattle producers face higher transport costs than United States producers, while the cost differential with Brazilian producers is unclear.

- **Largest global exporters:** The United States, Australia, Brazil and India
- **Australia's primary export markets:** Japan, Korea, China and the United States
- **Australia's main competitors:** United States, Brazil.

Key differences in Australia's market compared to the United States:

1. Lower cattle loading capacity by road
2. Lower road infrastructure quality
3. Higher diesel prices.

Key differences in Australia's market compared to Brazil:

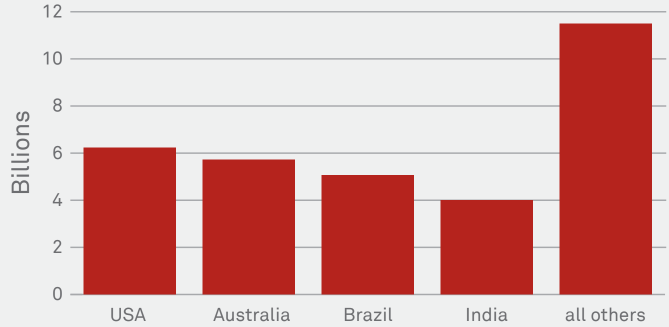
1. Higher cattle loading capacities
2. Higher road infrastructure quality
3. Lower diesel prices
4. Lower average wages.

4.1.1 Australia's competitors

Around 70% of Australian beef is exported, and a further 1 million head of cattle are exported live. In 2017, Australia exported 1.1 million tonnes (shipped weight) of beef valued at around $7.5 billion. Japan was the largest market (accounting for 28% of the total export volume), followed by the United States (22%), the Republic of Korea (15%) and China (11%).

Global beef exports are dominated by Brazil, India, Australia and the United States. These countries collectively account for around two-thirds of world exports. However, direct competition amongst these countries is limited mainly due to disease-related differences in the regulations for importing countries.

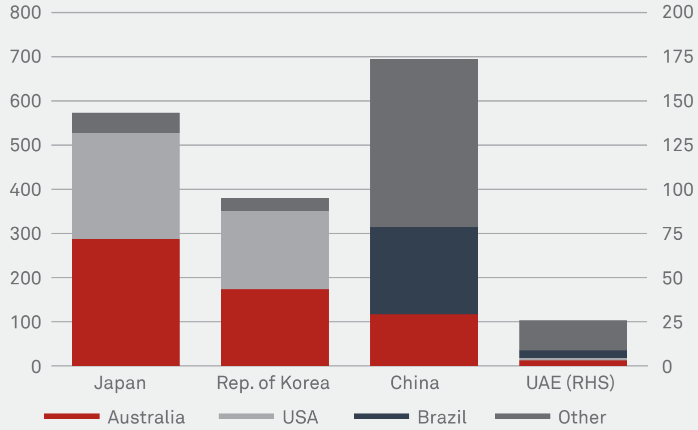
Chart 4.1: World beef exports, 2017 (US$)



Source: UN Comtrade Database (Frozen/fresh meat of bovine animals)

In Japan and Korea, beef imports are effectively restricted to just the United States and Australia. In China, market access can be considered more liberal, although the United States was only able to gain access late in 2017 and as a consequence, imports of US beef remains negligible. Australia's most significant competitor in China is Brazil, with Indian exports banned due to animal disease concerns. Indian beef is mostly exported to developing countries in South East Asia and the Middle East, where it competes with Australian exports.

Chart 4.2: Beef imports by supplier in major Australian export markets, 2017 (US$)



Source: UN Comtrade Database (Frozen/fresh meat of bovine animals)

As the United States and Brazil are Australia's principle competitors in Australian beef export markets, their comparative freight costs are explored in more detail below.

4.1.2 Comparative freight rates, cost components

The cost of transporting cattle by road in the United States is estimated to be cheaper than in Australia (see Table 4.1). This mainly reflects a greater loading capacity of trucks, allowing freight costs to be spread across a greater number of, on average, heavier animals. Lower cattle transport costs in the United States also likely reflect comparatively better transport infrastructure and lower fuel costs.

No comparable transport rates were found for Brazil and little work has been done analysing transport costs for Brazilian agriculture supply chains. One exception is the USITC[18], which compared the United States and Brazilian agri-transport sectors. The report found Brazilian logistics infrastructure (which includes storage, handling and transport) was estimated to account for an average of almost 30% of agricultural production costs, compared with just 5.5% in the United States.

Brazil's poor transport infrastructure is reflected in the World Economic Forum (WEF) global competitiveness report (2017), which ranked Brazil's transport infrastructure, was at 65th in the world (see Table 4.1). This was well behind Australia (19th) and the United States (6th). Brazil's logistics sector is also likely subject to comparatively high insurance costs, with crime and strikes increasingly affecting the flow of agricultural products.

Table 4.1 Cattle transport input costs for Australia, the United States and Brazil, various years

	Australia	United States	Brazil
Cattle			
Load Type	B-double	8b truck	Boiadeiro
Average load size (head)	60	75	20
Lifetime transport frequency	>3	2-3	1
Average distance travelled to processor (km)	~450	~700	~500
Average highway speed (km/hour)	95	105	80
Indicative costs (c/kg(cwt)/km)	10.86	9.16	na
Beef			
Primary export port	Brisbane	Los Angeles	Sao Paulo
Distance from major processing regions	~50km	>1,500	>1,200
Transport indicators			
Labour costs (US$/hour)	38.19	39.03	7.98
Fuel prices - Diesel (US$/litre) (4)	1.11	0.83	0.87
Transport infrastructure (1-lowest to 7-highest rating)	5.1	6.0	3.7
– Roads quality (1-lowest to 7-highest rating)	4.8	5.7	3.1
– Ports quality (1-lowest to 7-highest rating)	4.9	5.8	3.1

Sources: The Global Competitiveness Report 2017-2018, www.globalpetrolprices.com [20], [21], [22], [23], [24], [25], [26] Notes: (2) Specifically, labour costs refer to the 2016 hourly compensation costs in manufacturing. (3) Excludes intra-NAFTA and Mercosur trade. (4) 6 August 2018

[18] United States International Trade Commission, 2012, April. Brazil: competitive factors in Brazil affecting US and Brazilian agricultural sales in selected third country markets. In Investigation Nr (pp. 332-524). Available at: <https://www.usitc.gov/publications/industry_econ_analysis_332/2012/brazil_competitive_factors_brazil_affecting_us_and.htm>
[19] Saitone, T., Forero, L. and Nader, G., 2016. Calf and yearling prices in California and the western United States. California Agriculture, 70(4), pp.179-186. Available at: https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1000&context=wild_stures [20] Saitone, T., Forero, L. and Nader, G., 2016. Calf and yearling prices in California and the western United States. California Agriculture, 70(4), pp.179-186. Available at: https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1000&context=wild_stures [21] Bai, Y., Oslund, P.C., Mulinazzi, T.E., Tamara, S., Liu, C., Barnaby, M.M. and Atkins, C.E., 2007. Transportation Logistics and Economics of the Processed Meat and Related Industries in Southwest Kansas. University of Kansas Center for Research, Inc. available at https://kuscholarworks.ku.edu/bitstream/handle/1808/20078/KU_06_03_Report.pdf?sequence=1 [22] Schwartzkopf-Genswein, K., Ahola, J., Edwards-Callaway, L., Hale, D. and Paterson, J., 2016. Symposium Paper: Transportation issues affecting cattle well-being and considerations for the future1. The Professional Animal Scientist, 32(6), pp.707-716. Available at: https://www.sciencedirect.com/science/article/pii/S1080744616300791 [23] Kannan, N., Saleh, A. and Osei, E., 2016. Estimation of energy consumption and greenhouse gas emissions of transportation in beef cattle production. Energies, 9(11), p.960. available at https://www.mdpi.com/1996-1073/9/11/960htm [24] Marcelo. D, Beyoda. V, de Mello Campos. P, de Zen. Sergio, deblitz. C, 2011, Characterization of 'in natura' bovine meat transportation from Brazil to Europe: its carbon dioxide emissions and its alternatives reduction. Available at: https://www.cepea.esalq.usp.br/en/documentos/texto/cattle-caracterization-of-in-natura-bovine-meat-transportation-from-brazil-to-europe-its-carbon-dioxide-emission-and-its-alternatives-reduction-1.aspx [25] Blank, S.C., Saitone, T.L. and Sexton, R.J., 2016. Calf and Yearling Prices in the Western United States: Spatial, Quality, and Temporal Factors in Satellite Video Auctions. Journal of Agricultural & Resource Economics, 41(3). Available at http://www.waeaonline.org/UserFiles/file/JARESeptember20167Blank458-480.pdf [26] Saulwick, J. 2012 Livestock industry backs plan to load more cattle onto trucks, the Sydney morning herald, available at: https://www.smh.com.au/environment/conservation/livestock-industry-backs-plan-to-load-more-cattle-onto-trucks-20120316-1valn.html

4.1.3 Main issues and differences

Like Australia, beef production in the United States and Brazil is geographically dispersed. As such, supply chains in these countries are heavily reliant on long distance freight, with the primary mode being road transport.

Australian cattle typically moved along the supply chain more frequently during their lifetime than cattle in Brazil or the United States. This is because Australian cattle farms typically specialise in a single phase of the production system (e.g. breeding, backgrounding or finishing), with cattle requiring transport between each phase–on average 2.3 movements per animal.[27] In contrast, Brazilian cattle tend to spend their entire life cycle on a single property, traveling only to processing.[28] In the United States, cattle move properties one to two times on average throughout their life, although large volumes of grains are also transported to feedlots to support the United States' intensive feedlotting production system.[29]

Australia is more export orientated than Brazil or the United States, with beef shipped from most states. In contrast, international exports from the United States and Brazil are predominantly shipped through a single port, Los Angeles and Sao Paulo. Most Australian processing plants are also located in close proximity to ports, meaning beef is generally not transported a significant distance before being shipped overseas. In contrast, Brazilian and United States processing plants are typically located closer to the supply of cattle for slaughter, with beef transported by road to their large domestic markets.

[27] QTLC n.d. Supply chain perspective: Livestock/Meat, Queensland Transport and Logistics Council, available at: http://www.qtlc.com.au/wp-content/uploads/2013/01/QTLC-Supply-Chain-Perspective_Livestock.pdf [28] Paulino, P.V.R. and Duarte, M.S. 2014 Brazilian beef production, in Beef cattle production and trade, edited by Kahn, L., & Cottle, D. Csiro Publishing. [29] Thomson, D.U., Eisenbarth, J., Simroth, J., Frese, D., Lee, T., Stephens, M. and Spare, M., 2017. Beef cattle transportation issues in the United States. In Proceedings of the American Association of Bovine Practices 2015 Conference, available at: http://www.ruminantia.it/wp-content/uploads/2016/09/ANNUAL_CONVENTION_OF_AABP_2015.pdf

4.2 Milk powder (dairy)

Summary of findings

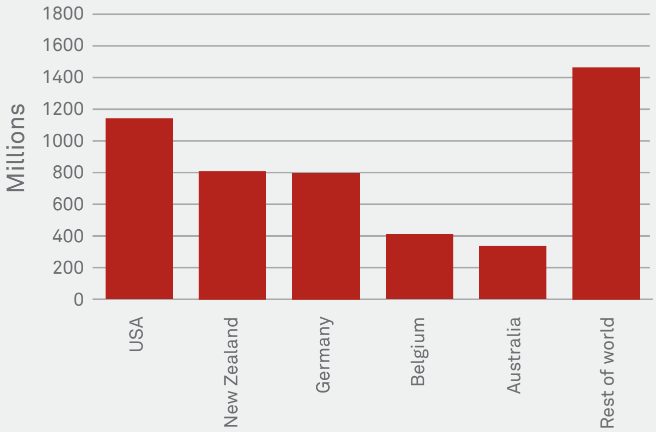
Although exact cost benchmarks are difficult to obtain, Australia has relatively higher dairy transport costs than its main competitor, New Zealand.

- **Largest global exporters:** United States, New Zealand and Germany
- **Australia's primary export markets:** China, Indonesia and Malaysia
- **Australia's main competitors:** New Zealand and the United States.

Key differences in Australia's market compared to New Zealand:

1. Higher labour cost in Australia contributing to a relatively higher transport cost
2. Australia has advantageous other factors affecting transport such as a lower fuel cost, and better quality road, rail and maritime infrastructure
3. Fonterra owns and operates the majority of New Zealand's dairy manufacturing supply chain. This enables greater economies of scale and lower costs, compared to dairy manufacturers in Australia.

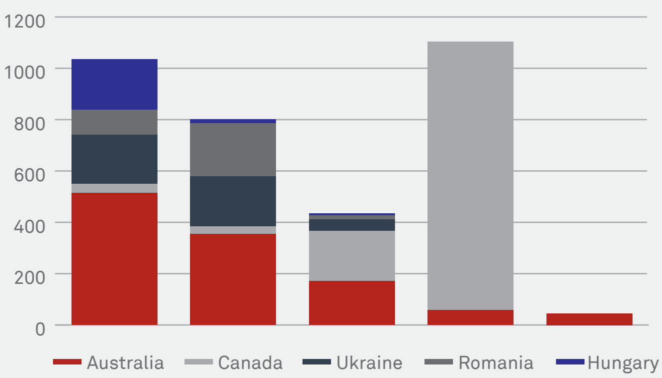
Chart 4.3: World milk powder exports, 2017 (US$)



Source: UN Comtrade Database (includes skim milk and whole milk powder)

Australia exports nearly 50% of its milk powder to China and Indonesia. Australia predominantly competes with New Zealand in the Chinese market, while in Indonesia, competition is more evenly split between the countries outlined in Chart 4.3. Australia holds a relatively small market share in Malaysia, Singapore and Japan, despite these countries all being Australia's top milk powder export destinations located in Asia.

Chart 4.4: Milk powder imports by Australia's main export markets, 2017 (US$)



Source: UN Comtrade Database (includes skim milk and whole milk powder)

4.2.1 Australia's competitors

The United States of America is the major exporter of milk powder, followed by New Zealand, Germany, Belgium and Australia. New Zealand is Australia's main competitor in Australia's top export markets for milk powder. As such, New Zealand is the comparison market used for this case study.

4.2.2 Comparative freight rates between Australia and New Zealand

Both New Zealand and Australia use a combination of road and rail transport in their supply chains. In Australia, the predominant mode of transport is by road and it is comparatively more expensive than New Zealand.[30] Fonterra reported in 2012-13 that its total cost of collecting raw milk from farms in New Zealand was approximately NZ$0.02 per litre (A$0.016 per litre).[31] By comparison, in Australia, the Australian Dairy Industry Council suggested that farm collection charges average 2.5-3 cents per litre in Australia.[32]

In general, there are a number of drivers of freight costs in both countries. These include:

- Labour
- Fuel
- Technology
- Distance travelled by dairy tankers.

Table 4.2 summarises the transport input costs and transport infrastructure indicators across countries. Australia appears to have significantly higher wage costs than New Zealand. This is likely to be a primary driver of the more labour-intensive parts of the supply chain. According to the ABS input–output tables, labour costs represent 26% of road transport output in 2015-16. Australia has significantly lower petroleum prices than New Zealand, although the difference in diesel price is negligible. Australia has slightly higher road quality than New Zealand, but poorer port infrastructure, according to the Global Competitiveness Report 2017-2018.

Table 4.2 Transport input costs for Australia and New Zealand, various years

	Australia	New Zealand
Labour costs (US$/hour - 2016)	38.19	23.67
Fuel prices - unleaded petrol (US$ - August 2018)	1.05	1.57
Fuel prices - diesel (US$ - August 2018)	1.10	1.08
Overall infrastructure (1-lowest to 7-highest rating)	4.7	4.8
– Roads quality (1-lowest to 7-highest rating)	4.8	4.7
– Ports quality (1-lowest to 7-highest rating)	4.9	5.5

Source: The Global Competitiveness Report 2017-2018, www.globalpetrolprices.com, www.conference-board.org. Notes: (1) Road / Rail / Maritime transport index provide useful across country comparisons with a higher index interpreted as being comparatively worse. (2) Specifically, labour costs refer to the 2016 hourly compensation costs in manufacturing (USD - 2016).

The other major driver of freight costs is the distance travelled by dairy tankers. Distance is influenced by a number of factors, which can vary across dairy regions:

- The size of dairy farms – larger farms can fill up more space in a tanker, meaning there is less distance to be covered, on average
- The distribution of dairy farms
- The number of dairy manufacturers collecting milk in a specific region.

In general, the distance travelled can vary depending on the product mix. For example, while it is the case that drinking milk manufacturers are generally located close to the domestic markets, manufacturers of less perishable dairy products (e.g. milk powder) often transport their products to interstate customers or ports for export.[33]

4.2.3 Key points of difference between countries

One fundamental difference between the Australian and New Zealand markets, which is likely to drive a number of the differences in freight cost, is the difference in competition for land, labour and expertise. Australia's Productivity Commission suggested that the competition for land, labour and expertise amongst domestic industry was likely less intense in New Zealand than in Australia over the last few years.[34] The mining investment boom in Australia pulled resources away from dairy and into higher-returning (non-agricultural) industries. In contrast, at the same time relatively low returns in competing industries in New Zealand has seen in land, labour and capital towards dairy production in New Zealand over the same period. More recently, however, the New Zealand Dairy Industry is facing threats to production levels from government policy on a range of environmental grounds, especially water quality and livestock emissions.

Another major difference between the two countries is the competition within the sector. In New Zealand, Fonterra processes the vast majority of the country's raw milk, meaning it can achieve greater economies of scale compared to Australia, where dairy processing market share is less concentrated. As a result, Australian processors may have to travel further to collect milk from farms (since farms within a given region may provide farms to competing processors) while achieving less scale benefit than Fonterra would enjoy in New Zealand.

[30] https://www.pc.gov.au/inquiries/completed/dairy-manufacturing/report/dairy-manufacturing.pdf [31] The Fonterra Farmgate Milk Price Statement 2013: For the Season Ended on 31 May 2013, September. [32] 2012, Food Processing Sector Inquiry - Questions on Notice: Australian Dairy Industry Council - Answers, April, Senate Select Committee on Australia's Food Processing Sector, Canberra. [33] Productivity Commission 2014, Relative Costs of Doing Business in Australia: Dairy Product Manufacturing, Research Report, Canberra, available at https://www.pc.gov.au/inquiries/completed/dairy-manufacturing/report/dairy-manufacturing.pdf [34] Ibid.

4.3 Canola (grain)

Summary of findings

Australia has comparatively lower freight costs for grain (A$60-87 per tonne) compared to another major exporter, Canada (A$107 per tonne), on average.

- **Largest global exporters:** Canada, Australia and Ukraine
- **Australia's primary export markets:** Germany, Belgium and France
- **Australia's main competitors:** Canada, Ukraine and Romania.

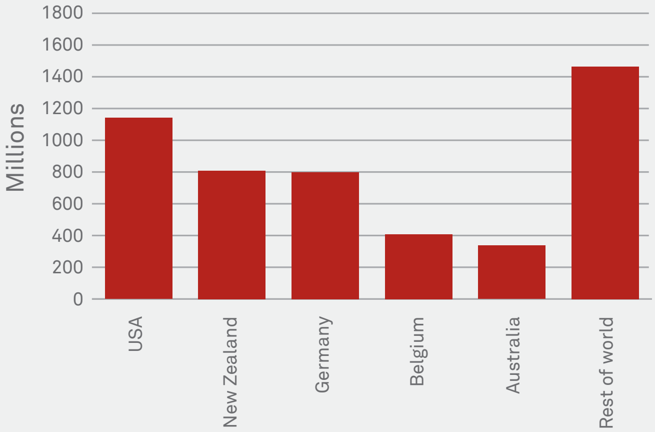
Key differences in Australia's market compared to Canada:

1. Australia has multiple grain supply chains often operating within each state, whereas in Canada, grains are transported over larger distances to reach coastal ports
2. As Canada has longer distances required to move grain to port (1610 km compared to an average of 250 km in Australia), their grain supply chain is more reliant on rail transport
3. Australian supply chains often aim to transport the grain as soon as it is harvested to centralised warehouse storage units. In comparison, supply chains in Canada mainly operate a delivery system whereby harvested grain is stored on farms and is only transported to port when required for shipment.

4.3.1 Australia's competitors

Canada is the world's major exporter of canola, followed by Australia, Ukraine, Romania and Hungary. Canada exports over half of the world's canola seed and therefore competes with Australia in many of Australia's export markets.

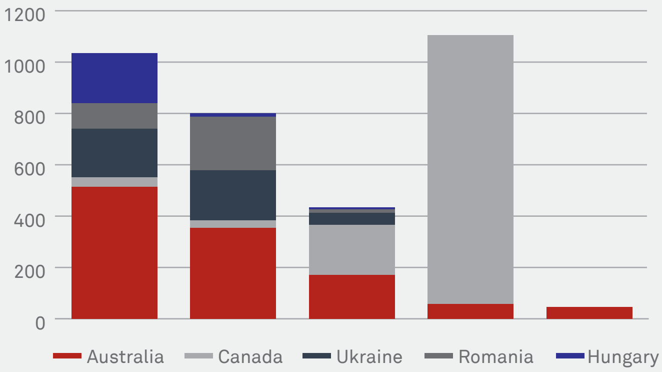
Chart 4.5: World canola exports, 2017 (US$)



Source: UN Comtrade Database (Canola)

Australia exports nearly 40% of canola production to Germany, with Hungary the second major market. Australia also maintains a dominant market share of canola exports to Belgium, competing predominantly with Ukraine and Romania. Of Australia's other top markets, Canada maintains the dominant market share in Japan.

Chart 4.6: Value of canola imports into Australia's main markets, 2017 (US$)



Source: UN Comtrade Database (Canola)

As Canada is the major exporter of canola and of other grain types, analysing Canada's freight costs provides a useful basis for comparison for Australian freight costs, noting the different geographies and distances to export ports.

4.3.2 Comparative freight rates, cost components

There are a number of different studies that examine the freight costs throughout the supply chain of grains. Notably, the Australian Export Grains Innovation Centre (AEGIC) has a series of papers that focus on the freight costs across Australia, Canada and Russia. The table below summarises the grain freight costs for these countries following a consistent methodological approach. Although Russia is not a major exporter of canola, their grain freight costs are also included as a point of comparison (Russia exports a significant volume of wheat).

Table 4.3 Comparison of component costs across Australia, Canada, Russia, 2016

Cost component (A$/tonne)	Australia	Canada	Russia
Farm storage	5	18	5
Cartage - farm to site	9	11	
Land transport	28	47	15.5
Port costs	21	14	22
Total supply chain	**87***	**107**	**56**

Source: Australian Export Grains Innovation Centre (AEGIC). *Other studies that examine specific supply chains in Australia, such as transporting wheat 200km from farm to port, suggest the cost is closer to $60-75 AUD/tonne

This research indicates that Australia has lower land transport and farm storage costs than Canada. These figures represent a weighted average cost of a number of different grain supply chains and therefore are not representative of any given supply chain in general.[35] In addition, a number of structural differences in the supply chain operation in each country has a significant effect on the cost of freight. For example, Australia has multiple grain supply chains often operating within each state. Whereas in Canada, grains are often transported over larger distances to reach coastal ports.

Although these structural differences drive much of the difference in costs between countries, other input prices and variable qualities in transport infrastructure also contribute to differences in freight costs. Table 4.4 summarises the transport input costs and transport infrastructure indicators across countries. On average, Australia has higher wage costs than Canada and is comparable in the cost of fuel and quality of road and rail transport.

Table 4.4 Transport input costs for Australia, Canada and Russia, various years

	Australia	New Zealand	Russia
Labour costs (US$/hour - 2016)	38.19	30.08	-
Fuel prices - unleaded petrol (US$ - August 2018)	1.05	1.14	0.70
Fuel prices - diesel (US$ - August 2018)	1.10	0.98	0.65
Transport infrastructure (1-lowest to 7-highest rating)	4.7	5.2	4.0
– Roads quality (1-lowest to 7-highest rating)	4.8	5.4	2.9
– Ports quality (1-lowest to 7-highest rating)	4.9	5.4	2.9
– Ports quality (1-lowest to 7-highest rating)	4.9	5.4	4.2
– Railroads quality (1-lowest to 7-highest rating)	4.1	4.9	4.5

Source: The Global Competitiveness Report 2017-2018, www.globalpetrolprices.com, www.conference-board.org.

Notes: (1) Road / Rail / Maritime transport index provide useful across country comparisons with a higher index interpreted as being comparatively worse. (2) Specifically, labour costs refer to the 2016 hourly compensation costs in manufacturing (USD - 2016)

[35] Australian Export Grains Innovation Centre (AEGIC), 2017, The puck stops here - Canada challenges Australia's grain supply chains, available at: <https://aegic.org.au/wp-content/uploads/2016/04/Canadian-Supply-Chain-Full-Report.pdf>

4.3.3 Key points of difference between countries

Although distance and transport cost do not share a one-for-one relationship, it is to be expected that Canadian grain producers face higher transport costs since the rail freight journey required to move grain to ports is significantly longer. Russian wheat is cheaper to move to port for export largely due to the ruble being weaker relative to the A$.[36] In addition, the better quality of storage and handling infrastructure in Australia adds to the overall cost, but provides greater control over the specifications and quality of grain received and stored.

Despite Australia's size, the average transport distance for grain, from farm to port, is one-sixth that of export competitor Canada.[37] However, given the fixed cost associated with loading and unloading transport vehicles, the cost of land transport is only half of the cost in Canada (Table 4.3). An additional element of this cost differential is that rail transport costs, on a per kilometre basis, is up to five times lower in Canada, due to the more efficient rail network and train operating standards.

In general, Australia's export supply chain is more flexible due to the availability of multiple ports and the opportunity to mix between road and rail transport. Canada's grain supply chain is much more reliant on rail transport[38], leaving farms exposed to the pricing and efficiency of rail freight provided by two dominant rail companies. The longer distances required for transport to a few main ports require infrastructure to exist across provincial boundaries, whereas in Australia, export grain supply chains tend to lie within state boundaries.

Russia provides another useful comparison to Australia given its comparatively low land transport costs (Table 4.3). Russia utilises its extensive rail network for longer journeys, and relies on its more efficient road network for shorter journeys of less than 500km.

In terms of farm storage, Australia has comparatively higher on-farm storage costs than its competitor Canada. This is because, in Australia, most grain is stored in centralised bulk storage units as soon as it is harvested. In contrast, nearly all of Canadian export grain is stored on farm and transported to port only when required for shipping[39].

A possible reason for Russia's low storage costs is the relative weakness of the ruble against the A$ and the limited need for airtight storage to facilitate fumigation, as the winter in most grain-producing regions is cold enough to kill most grain insect pests[40].

[36] Australian Export Grains Innovation Centre (AEGIC), 2016, Russia's wheat industry: Implications for Australia, available at: https://aegic.org.au/wp-content/uploads/2016/09/Russia-wheat-industry-Implications-for-Australia.pdf [37] Australian Export Grains Innovation Centre (AEGIC), 2017, The puck stops here – Canada challenges Australia's grain supply chains, available at: https://aegic.org.au/wp-content/uploads/2016/04/Canadian-Supply-Chain-Full-Report.pdf [38] Australian Export Grains Innovation Centre (AEGIC), 2017, The puck stops here – Canada challenges Australia's grain supply chains, available at: https://aegic.org.au/wp-content/uploads/2016/04/Canadian-Supply-Chain-Full-Report.pdf [39] Ibid [40] Australian Export Grains Innovation Centre (AEGIC), 2016, Russia's wheat industry: Implications for Australia, available at: https://aegic.org.au/wp-content/uploads/2016/09/Russia-wheat-industry-Implications-for-Australia.pdf

4.4 Horticulture (cherries)

Summary of findings

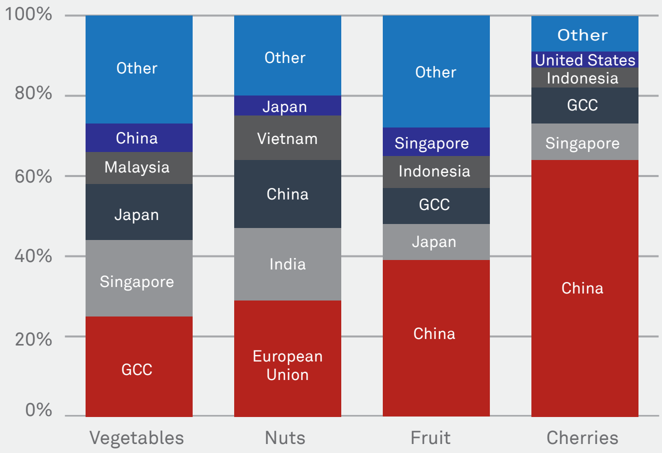
Chile is the southern hemisphere's largest cherry exporter. Chile faces higher airfreight transport costs than Australia when exporting into major Asian markets.

- **Largest Southern Hemisphere cherry exporters:** Chile, Australia and New Zealand
- **Australia's primary export markets:** China, Malaysia and Singapore
- **Australia's main competitors:** Chile and New Zealand.

Key observations in Australia's market compared to Chile:

1. Australia's closer proximity to major importing markets — resulting in lower airfreight costs and reduced loss in quality.

Chart 4.7: Major markets for Australian horticulture exports, 2016–17 (A$)



Source: ABARES (2017) Agricultural Commodity Statistics, 2017

4.4.1 Australia's competitors

In 2016–17, Australia exported 650,000 tonnes of horticultural produce valued at $2.0 billion[41]. Most of this (350,000 tonnes) was fruit destined for China. Around 200,000 tonnes of vegetables was exported mostly to the Gulf Co-operation Council and developing Asia. Australia also exported 100,000 tonnes of nuts, with the European Union, India and China the principal markets.

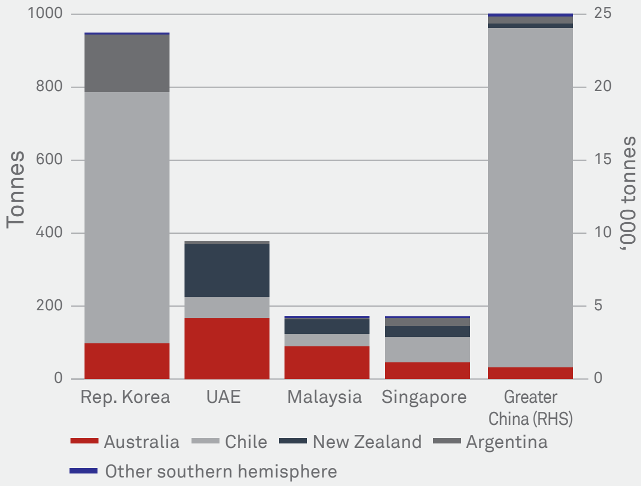
China is the primary market for Australian cherry exports, accounting for roughly half of all exports. The rest of Australian cherry exports are shipped to higher-income markets (such as Korea and the United Arab Emirates) or close neighbours in South-East Asia (Malaysia and Singapore).

Australia is a relatively small exporter of cherries on the global market. However Australian cherries really only compete with other producers in the Southern Hemisphere, who have comparable harvest windows (November to January). The main exporters in the southern hemisphere are Chile and New Zealand, with production in Argentina and South Africa expanding in recent years.

Chile dominates the supply of southern hemisphere cherry exports. In 2017, Chile accounted for 93% of Greater China (includes Hong Kong, Macau and Taiwan) imports from southern hemisphere suppliers, 73% of Korean imports and 42% of Singapore imports.

[41] ABARES, 2018, Agricultural commodities March Quarter 2018

Chart 4.8: Major southern hemisphere suppliers in Australian cherry export markets, 2016 (tonnes)



Source: UN FAOSTAT database (accessed August 2018)

Table 4.5 Transport input costs for Australia and Chile, various years

	Australia	Chile
Fuel prices - Diesel (US$/L)	1.11	0.93
Road transport quality (1-lowest to 7-highest rating)	4.8	5.2
Air transport quality (1-lowest to 7-highest rating)	5.2	4.5
Ports quality (1-lowest to 7-highest rating)	4.9	4.9

Sources: The Global Competitiveness Report 2017-2018, www.globalpetrolprices.com, www.conference-board.org.

Notes: (1) Road / Rail / Maritime transport index provide useful across country comparisons with a higher index interpreted as being comparatively worse. (2) Specifically, labour costs refer to the 2016 hourly compensation costs in manufacturing (USD - 2016)

4.4.2 Comparative freight rates

Because Chile dominates the southern hemisphere supply of cherry exports, it provides a useful comparison for analysing differences in freight costs. Shipping costs tend to account for a significant portion of total production costs in Chile, on par with those incurred during production. [42]However in general Chilean logistics costs are considered to be relatively low due to comparatively good infrastructure. This is reflected in the WEF's Global Competitiveness Index (2017), which ranks Chile as having better infrastructure than many of its neighbours, and comparable to that for Australia.

Reflecting Australia's proximity to the Chinese market, Australian airfreight costs at $1.50/kilogram are estimated to be significantly lower than those of Chile. Importantly, the price of airfreight in Chile reportedly rises steadily in the period approaching Christmas, in some cases doubling from $3/kilogram to $7/kilogram. [43]Because of this, only early season Chilean cherries are shipped by airfreight, with later volumes shipped by sea.

4.4.3 Characteristics of Chilean cherry exports

After harvesting Chilean cherries are packaged into bags and placed into five kilogram cardboard boxes before being loaded into refrigerated containers or trucks for transport to port. Road transport is typically used to transport cherries from the packing plants to port.

There are around eight to 10 ports (including airfreight) in Chile designed to handle exports of perishable goods such as cherries. As a result, fruit destined for export generally does not have to travel more than 250 kilometres by road before being shipped internationally.

Most cherry exports are shipped by airfreight due to the high risk of quality loss during long sea voyages, which also results in heavy price discounts. By sea, Chilean cherry exports can take up to four weeks to reach China, significantly longer than airfreight. Chilean airfreight to China is estimated to take comparatively longer than from Australia, mostly due to geographic locations. Chilean exports also first stop in Middle Eastern trade hubs en route to market.[44]

[42]Bamber. P and Fernandez-Stark. K, 2015, Fresh Cherry Industry in Chile available at: https://www.apec.org/-/media/APEC/Publications/2015/11/Services-in-Global-Value-Chains-Manufacturing-Related-Services/TOC/Chapter-21-Fresh-Cherry-Industry-in-Chile.pdf [43]Rouget, M (2017) Australian Cherry Export, available at: https://www.cherrygrowers.org.au/assets/Michael_Rouget_Australian_Cherry_Export.pdf [44]AJOT, 2018, Qatar Airways Cargo concludes Chilean cherry charter season, available at https://www.ajot.com/news/qatar-airways-cargo-concludes-chilean-cherry-charter-season

Section 5

Factors influencing the future of agricultural freight

Factors influencing the future of agricultural freight

Previous chapters have explored the size of Australia's existing freight task, including case studies of existing supply chains and issues.

The purpose of this chapter is to focus on the future. More specifically, this chapter explores:

- How agricultural production trends will influence the size of the freight task
- The factors that will shape the future of farm freight
- Some of the key infrastructure and policy issues affecting the transport of farm products
- Highlight how some of Australia's major infrastructure projects (proposed, funded or underway) will address these emerging issues and the increased agricultural freight task.

5.1 The size of the future freight task

As outlined in previous chapters, Australia has a significant agricultural freight task. CSIRO (2017) estimated Australia's total agricultural freight task comprises 3.3 million vehicle movements[45] and 387,000 rail wagons per year. To put this figure in perspective – Australia had 600,000 registered trucks at the time of the 2016 ABS Motor Vehicle Census.

Australia's agricultural output is growing, and the view of agricultural forecasting agencies indicates that this trend will continue over the next five to 10 years. For example:

- The OECD[46] has forecast Australian production to be higher in 2026 for all major agricultural commodities (beef, sheep meat, milk, poultry, grains, sugar, cotton), relative to the 2014-16 average
- ABARES[47] has forecast all major commodities to have higher levels of production in the future. Some commodities such as cotton and sheep meat demonstrate some variability in year-to-year projections but are still expected to increase production over time.

To highlight how such growth would influence the freight task, Table 5.1 provides hypothetical estimates of agricultural production in 2028, and the number of vehicle/wagon loads that would be required to transport this level of production.

The estimates are based on ABARES projections out to 2022-23, with the average annual implied growth rate for the decade to 2022-23 applied for the subsequent 5 years to 2027-28. In other words, the growth rates in the final five years of the project period are estimated by calculating average growth rate for the last five years of observed production combined with ABARES 5-year forecasts.

Under these assumptions, the volume of agricultural freight will increase for all major agricultural commodities in 2027-28, relative to the average of 2014-15 to 2016-17 (Table 5.1).

Table 5.1 Projections of major commodities

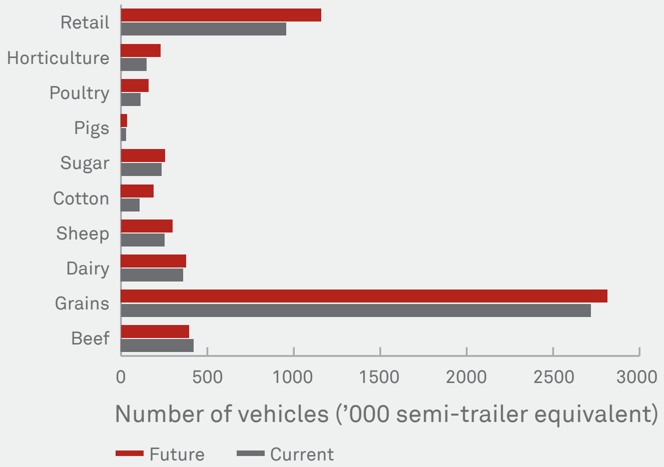
	Unit	2014-15 to 2016-17 (ave)	2027-28	Change
Beef	'000 head (slaughtered)	8,774	8,213	-6%
Grains	'000 tonnes	25,837	26,754	4%
Dairy	'000,000 litres	9,475	9,909	5%
Sheep	'000 head (slaughtered)	30,681	36,308	18%
Cotton	'000 tonnes (cotton lint)	683	1,191	75%
Sugar	'000 tonnes, raw equiv.	4,765	5,176	9%
Pigs	'000 head (slaughtered)	5,179	6,670	29%
Poultry	'000 head (slaughtered)	637,978	899,182	41%
Horticulture	Value (2017 AUD)	8,011	12,257	53%

Source: Deloitte Access Economics (2018) analysis of ABARES

Using these hypothetical estimates above, and CSIRO (2017) estimates of Australia's existing freight task, Australia's agricultural road freight task will increase by 10% from 5.5 million semitrailer equivalent movements to 6 million by 2027-28.

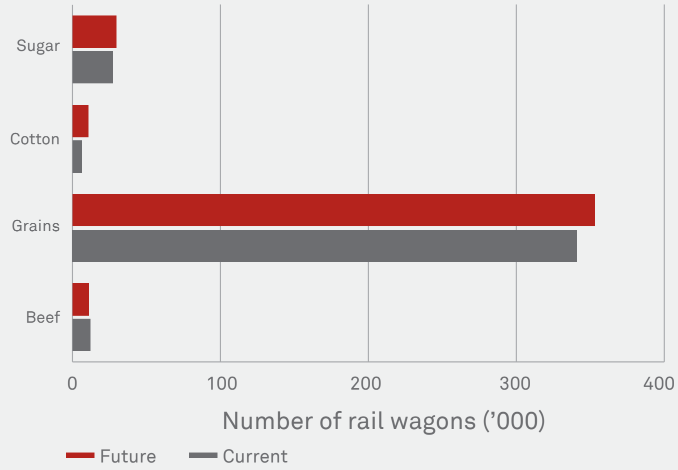
[45] Semi-trailer equivalents. Includes the movement of goods post-processing to distribution centres and supermarkets) [46] OECD (2017), Medium-term prospects for major agricultural commodities 2017-2026: Australia, available at https://www.oecd.org/australia/Australia-AGR-Outlook-country-note.pdf [47] http://data.daff.gov.au/data/warehouse/agcomd9abcc004/agcomd9abcc20180306_6R2bY/AgCommodities201803_Tables_v1.0.0.xlsx

Chart 5.1: Australia's current (2015-2017) and future (2028) agricultural road freight task



Source: CSIRO (2017) and Deloitte Access Economics

Chart 5.2: Australia's current (2015-2017) and future (2028) agricultural rail freight task



Source: CSIRO (2017) and Deloitte Access Economics

Assuming that the ratio of road freight to rail freight remains constant, then these hypothetical estimates indicate that Australia's agricultural rail freight task to grow by 5% over the same period, from 387,000 to 405,000 wagon movements.

5.2 Other factors that may influence the future of farm freight

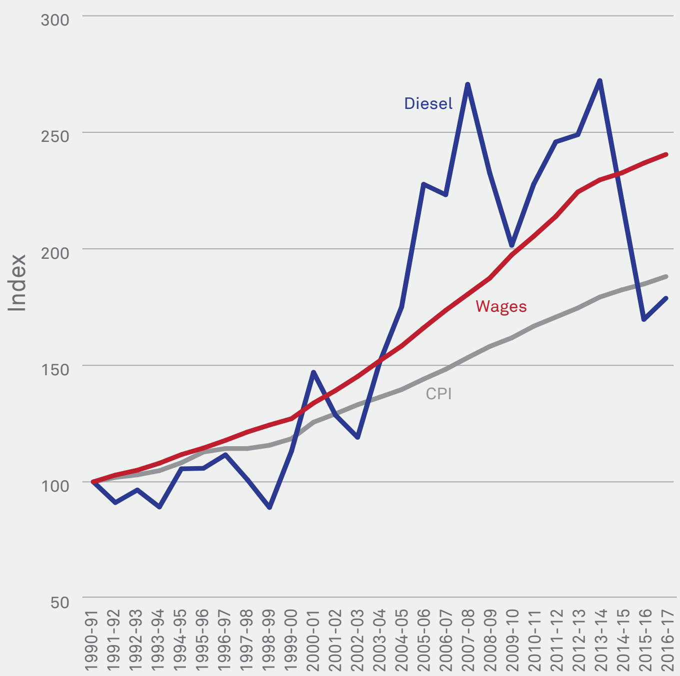
The size of the freight task itself is only one facet that will influence the cost of agricultural farm freight. Other factors, such as technological enhancements, input costs and the climate change effects will also shape changes in the cost of moving agricultural goods in future.

5.2.1 Rising input costs

Input costs to the transport sector, particularly wages and fuel costs, are major drivers of road transport costs faced by Australia's agricultural industries.

In Australia, growth in average wages and fuel costs have both outstripped Consumer Price Index (CPI over the past 20 years. Labour and fuel account for the majority of marginal road transport costs, per kilometre travelled. The chart below tracks Australia's wages and diesel costs with in index of prices received by Australian farmers. It shows that, but for a significant fall in diesel prices between 2013 and 2016, both wages and fuel prices grew at a faster rate than CPI.

Chart 5.3: Index of Australian diesel prices and average weekly earnings, compared with Consumer Price Index (CPI)



Source: ABARES Agricultural commodity Statistics, December 2017

5.2.2 Technology and the future of freight

Technology advancements may indeed prove to be one of the most significant drivers of agricultural freight costs over the next 10 to 100 years. Rising inputs costs are almost a given in Australia's freight sector, as is the growing overall freight task. However, significant productivity improvements have worked to offset rising input costs.

In particular, growth in the size of articulated trucks and increased uptake of larger truck combinations has enabled more freight by proportionately fewer trucks. Between 1971 and 2007, the average load carried by articulated vehicles more than doubled from 9.7 tonnes/vehicle km to over 20.7 tonnes/vehicle km. Furthermore, the share of freight carried by higher-capacity articulated trucks grew relative to rigid trucks and light commercial vehicles.[48] These two points highlight the importance of investment in productivity-enhancing infrastructure upgrades and technology improvements – not just for the competitiveness of the agricultural sector, but all sectors that rely heavily on road freight.

In March 2018, the Commonwealth Department of Infrastructure, Regional Development and Cities released the findings of its Inquiry into National Freight and Supply Chain Authorities[49]. One of the key themes to emerge from that report was the importance for Australia's transport sector to embrace and enable new technologies, particularly the 'twin engines of automation and data'.

The Inquiry also noted that there is a significant risk that transport automation will be unable to deliver expected rural and regional supply chain cost savings, as in other parts of the economy. This is because, despite the potential to enhance productivity and safety by navigating unsealed roads, there are doubts that the technology (as it is currently used) would work there, given limitations with lane markings.

As a follow up to the Inquiry, the Australian Government and COAG Transport and Infrastructure Council is developing a long term *National Freight and Supply Chain Strategy* to identify ways to lift productivity and efficiency in the sector.

[48]Mitchell, David 2010, Heavy vehicle productivity trends and road freight regulation in Australia, Australasian Transport Research Forum 2010, Bureau of Infrastructure, Transport and Regional Economics. Available at: http://atrf.info/papers/2010/2010_Mitchell_C.pdf [49]Commonwealth of Australia 2018, Inquiry into National Freight and Supply Chain Priorities, Report, Available at: https://infrastructure.gov.au/transport/freight/freight-supply-chain-priorities/files/Inquiry_Report.pdf

5.2 Other factors that may influence the future of farm freight

5.2.3 Climate change

In Australia, climate change could have a profound effect on the agricultural sector. Changing climatic conditions will influence the volume, variability and location of crop and livestock production thereby influencing the nature and distance of transportation. These changing conditions, driven by increased carbon dioxide (CO_2) concentration, will include higher temperatures, changes in the pattern and reliability of rainfall.

The effect of these factors are likely to depend specifically on the type of commodity and the associated supply chain. Wheat, for example, is a major crop in many Australian states, with Western Australia the largest grain-producing state overall. However, these states, notably Western Australia, are forecast to become drier in the future with elevated CO_2 levels.[50] As a result, future transport requirements may vary based on the impact that climate change has on production levels and areas of production. As this happens, parts of the existing bulk storage and transport network could become underutilised or stranded if marginal wheat growing areas become inviable.

Another example of the potential impact of climate change is sugarcane, which is predominantly grown in high rainfall areas of Queensland and accounts for approximately 94% of Australia's raw sugar production. This production relies on a steady supply of rain, which under CSIRO modelling is also expected to decrease.[51] Varied production levels and locations are likely to require the transport system to adapt to these future changes, and might threaten the commercial viability of bulk sugar handling operators.

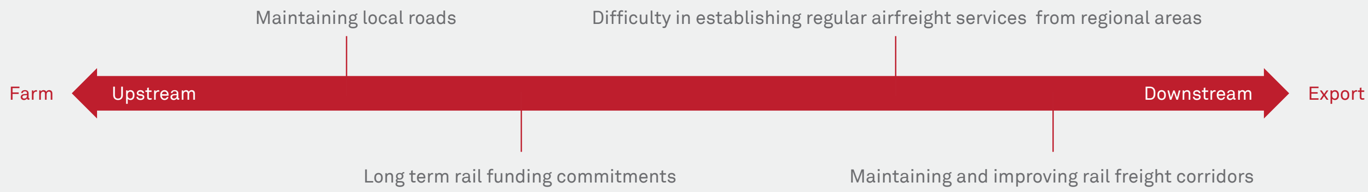
As well as the physical effects of climate change, government policies to mitigate climate change could also significantly impact both the agriculture and transport industries. As two of the largest greenhouse gas emitting sectors in Australia, these sectors could face higher costs if an emissions price were to be introduced. As such, the cost of agricultural freight could increase as a result if such a policy were introduced.

[50] http://www.canegrowers.com.au/ [51] Inman-Bamber, NG (2007). Economic impact of water stress on sugar production in Australia. Proceedings of the Australian Society of Sugar Cane Technologists 29, 167-175.

5.3 Current and emerging infrastructure issues

Infrastructure issues that restrict the productivity of transport in the agricultural freight industry exist both upstream and downstream in agricultural supply chains. The diagram below, and subsequent sub-sections, outline some of these issues.

Figure 5.1: Summary – infrastructure issues



5.3.1 Local councils have insufficient funding for upgrading and maintaining local roads (first mile for farmers)

With most of Australia's agricultural production occurring in regional settings, the path-to-market inevitably commences on regional, local roads. These roads feed into the broader regional, state and federally funded road network, but are generally maintained by local councils who struggle to find sufficient funds to maintain these roads, let alone upgrade their standard.

Regional roads not only service agriculture, but also mining interests, the requirements for each sector being very different. Agriculture comprises multiple farm units operating across broad districts, while mining tends to be more centralised at fewer, individual mine locations. Mining therefore consolidates its transport operations onto key routes, making it easier for road providers to service their requirements. Agriculture, being more widely spread, has more first mile entry points onto the regional road network, with transport operators having to travel further on local roads before consolidating onto key regional roads, making it more difficult for road providers to service their collective needs.

In addressing regional road network issues, there is a risk that agriculture's first mile requirements are overlooked due to their complexity while mining's requirements can be more specifically addressed.

Work conducted for Infrastructure Australia[52] noted that there is a maintenance deficit for most regional roads in all states, with local rural roads particularly vulnerable, where insufficient maintenance on could affect future freight productivity and economic growth.

According to NRMA[53], 80% of NSW's roads are maintained by local councils, and in 2015/16 there was a $1.96 billion shortfall in spending on basic road maintenance. Other states have a similar story, with local councils looking to support local industry development, but faced with competing funding demands.

Under the Federal Government's 'Roads to Recovery Program', direct funding to local councils is distributed according to a formula based on population and road length set by the Local Government Grants Commissions in each state and the Northern Territory. Each council's Roads to Recovery allocation is fixed for the life of the Program. Money provided under the Roads to Recovery Program is not intended to replace council spending on roads or state and territory government assistance to councils for local road construction or maintenance.

As farmers and road freight operators seek to capture cost savings and road transport efficiencies through the greater use of higher productivity freight vehicles (HPFV), they find that many local roads are not able to accommodate these vehicles, even though they may have a lower impact in terms of road damage than conventional trucks. Local councils often find the cost to upgrade local roads (including bridges) to a Higher Mass Limit (HML) standard to accommodate HPFV prohibitive, meaning that vehicles either have to travel further distances along approved HPFV routes or in some instances cannot access sites at all.

The difficulty for local councils in funding upgrades to key local roads is being recognised by some State Governments through the introduction of programs like the 'Fixing Country Roads' program in NSW. Fixing Country Roads is a $543 million NSW Government program providing targeted infrastructure funding for regional freight projects. A key element of the program is the requirement for projects to enhance access for High Productivity Vehicles to access key freight hubs and State Roads.

[52]GHD (2015), Infrastructure maintenance – A report for Infrastructure Australia [53]http://www.abc.net.au/news/2017-08-24/nrma-finds-1.96b-shortfall-regional-road-funding/8840274

5.3.2 Heavy vehicle regulation harmonisation - (first mile for farmers)

The other area where there is often difficulty for local producers moving product to market regionally or interstate is in the area of road regulation. Putting aside the issues of HPFV access, which is discussed in section 5.3.1, there are other issues with harmonisation of road regulations across state borders.

The National Heavy Vehicle Regulator (NHVR) administers the Heavy Vehicle National Law (HVNL) for heavy vehicles over 4.5 tonnes gross vehicle mass. The HVNL commenced in February 2014 in the Australian Capital Territory, New South Wales, Queensland, South Australia, Tasmania and Victoria. At that time, each passed a law that either adopts or duplicates the HVNL (with some modifications) as a law of that State or Territory. While the HVNL has not commenced in Western Australia or the Northern Territory, the HVNL applies equally to vehicles from those jurisdictions when they cross into one of the states or territories where the HVNL applies.

The objective of the HVNL is to provide a seamless, national, uniform and coordinated system of heavy vehicle regulation. However in recognition that there are issues with the HVNL in not meeting all these objectives, Australia's Transport Ministers have asked the National Transport Commission (NTC) to bring forward a HVNL Review. In developing the terms of reference for this review, NTC has identified that the HVNL[54]:

- Has more than 800 sections and 5 sets of regulations
- Is inconsistent in its approach and difficult to read and interpret
- Not yet national
- Not fully uniform
- Has inconsistent regulatory approaches.

These observations would support industry's view that inconsistencies in transport regulations between states, makes it difficult to operate the most efficient vehicles across state lines.

Interestingly, despite the difficulties with harmonising some road regulations across state borders, the recent drought saw a relaxation of rules around the cartage of baled commodities like fodder. The change saw new load dimension rules for transporting hay and fodder, resulting in a removal for the need for permits on the state-controlled road network.

5.3.3 Rail networks require long-term commitment

Australia's rail freight network comprises a standard gauge interstate network stretching from Brisbane around the coast linking Sydney, Melbourne and Adelaide to Perth; a standard gauge rail line travelling between Port Augusta in South Australia through to Darwin; regional state-based rail networks each with different gauges; and discrete privately-owned rail lines, mostly in northern Australia linking regional mines with ports.

Australia's east coast rail network is about to undergo major enhancement, with the development of the Inland Rail Network, linking Melbourne with Brisbane via an inland route, providing a 24 hour freight link between these two centres – see ARTC Inland Rail Network box below.

Most agricultural produce that moves by rail is moved in the bulk form to domestic mills or to bulk port terminals for export, with some produce being containerised and moved to container port terminals, also for export. The major agricultural product by volume currently moved by rail is grain, which moves on a regional rail network that in many states is almost 100 years old. This network faces declining freight volumes as more freight is being moved by road transport. The seasonal nature of the grain harvest means that volumes are inconsistent from year to year, and as a result, many regional lines only move little or no grain for a number of years. However, continual maintenance is required during these times, irrespective of usage.

A key reason that this is an ongoing issue in all states is the low level of cost recovery obtained from users of branch lines. In many instances the rail access fees paid by rolling stock operators to use the rail network can cover as little as 1% of the total maintenance costs for such rail lines. There is evidence of a maintenance deficit for Australia's regional rail freight network, just as there is for rural roads[55].

In all states, rail network user charges are the subject of review by the respective State Regulator, however, in some states, these rates are then set by Government in light of market circumstances, Government policy and capacity to pay. As a result, State Governments may provide additional rail funding to help maintain the network in the face of declining rail freight volumes.

[54] NTC (2018), NTC CEO presentation to NatRoad conference, Aug 2018 <https://www.ntc.gov.au/Media/Reports/(F20086A6-A87D-EA92-5A9E-EA6B68DB37B9).pdf>
[55] GHD (2015), Infrastructure maintenance – A report for Infrastructure Australia

New South Wales

The NSW State Government is required to fund the majority of the maintenance costs for low-volume lines (Transport for New South Wales, 2013). In 2010-11 (a good harvest year), the average level of recovery in New South Wales was estimated to be around 3% – meaning that the NSW Government subsidised 97% of the cost of providing and maintaining grain line infrastructure (Independent Pricing and Regulatory Tribunal, 2012).

GrainCorp in its submission to the Senate Committee Inquiry into Grain Export Networks noted the impact that the deteriorating rail network was having on transport costs when it stated "rail transport costs in eastern Australia is estimated to be $10 per tonne above best practice, due to the lack of investment in rail loading and track infrastructure" (GrainCorp, 2014). GrainCorp noted the decline in export grain movements from 90% to around 50% - with 2 million additional tonnes of export grain moving by road – as being largely attributable to the deteriorating rail network and the uncertainty surrounding its performance and future.

The NSW Government has since introduced its 'Fixing Country Rail' initiative, which provides $400 million for regional rail projects which improve freight connectivity on the regional rail network. The program aims to fund projects such as new or extended rail sidings, the opening of non-operational rail lines and network enhancements which allow the use of faster, longer and heavier trains.

Victoria

In 2012-13, V/Line identified that a minimum annual maintenance budget of $30 million (V/Line, 2012) would be required to keep the regional rail freight network operating at a steady state, highlighting that investment short of this would deteriorate the condition of the network. A review of the maintenance and renewal funding being provided over the 30-year period (1984 to 2014) on Victoria's freight network shows on average only $10.9 million/annum has been invested over the past twenty years. This expenditure was boosted by a one-off injection in the mid-2000s, following the Fischer review (Victoria Department of Infrastructure, 2006). On average, maintenance expenditure on Victoria's regional rail network, which largely services the grain sector, has been less than 40% of requirements over this period (DEDJTR, 2015).

However, it should be noted however, that following approval of the Murray Basin Rail Project Business Case in 2015, there is now an injection of new funding to upgrade and standardise this part of the regional rail network, which represents around 80% of the share of grain exports from the State.

Western Australia

In Western Australia, failure to reach agreement by the rail network operator, the State Government and the major bulk handler, CBH over the issue of rail maintenance funding for part of the regional rail network resulted in the closure of over 500 kilometres of rail lines used exclusively for grain (known as Tier 3 lines) in 2014.

ARTC Inland Rail Network

In 2014, the Federal and Queensland Governments agreed to investigate expanding the Australia Rail Track Corporation's (ARTC) 8,500km national rail network by establishing an inland rail link between Melbourne and Brisbane.

By bypassing the Sydney rail network, the inland rail link would shorten travel times between the two cities considerably. A map showing the proposed alignment for the inland rail link is shown below.

Apart from reducing the rail travel times for freight between Brisbane and Melbourne, the proposed new alignment and upgraded rail track will provide quicker rail access for southern Queensland and northern New South Wales regional areas into the Port of Brisbane, and southern Riverina regions into the Port of Melbourne. The Inland Rail route may also shorten rail times to port for parts of central New South Wales by directing rail traffic away from the more congested Sydney rail network towards Brisbane and Melbourne.

The Inland Rail Route should deliver benefits for grain growers located in these regional areas by providing another rail option to port for the export of bulk and containerised grain. It is too early to determine whether this initiative will open up new domestic market options for growers since few domestic users have ready access to rail receival facilities.

With construction commencing in 2018, inland rail is forecast for completion in 2024-25.

Regardless of these initiatives, there remains uncertainty surrounding the future of regional rail lines in most states and their funding to at least maintain standard and performance. This remains one of the most significant of the issues facing the grains industry in being able to access competitive supply chains.

5.3.4 Airports – support the establishment of international services at regional airports

Airfreight services are an important element of time-sensitive and valuable product supply chains such as computer equipment, pharmaceuticals and perishable foods. Most air freight is transported in passenger aircraft holds, although major airlines and specialised carriers operate freighter aircraft on high volume routes.

Over recent years, growth in international tourism has led to an increase in the number of international and domestic passenger flights, providing greater freight capacity and put downward pressure on rates to many destinations.[56] Agricultural producers have been able to take advantage of these enhanced services and lower freight rates, especially given the depreciating Australian dollar.

Presently, most airfreight is shipped through capital city airports, as few regional airports have international passenger services being operated with the wide-bodied aircraft and the frequency required to offer significant regular freight capacity. Shipping perishable food products through regional airports would offer the advantage of valuable time savings in being located closer to agricultural production areas, thereby helping to prolong the shelf life of perishable products and making them more attractive to buyers. However, while the regional location of these airports being closer to food production areas is attractive, these airports need to be able to offer the infrastructure required to accommodate the preferred, large wide body aircraft used on international routes, along with cold chain storage for the handling of perishable food products.

The importance of this issue was recognised in the findings of the recent Inquiry into National Freight and Supply Chain Priorities,[57] where a priority action was identified as follows:

- *Priority action 2.6 - Develop a better understanding of regional air freight requirements to enhance regional export opportunities, for example through airport upgrades and/or improved road, or domestic air, connections to international airport gateways.*

A number of regional airports have looked at the potential to grow their regional air freight business, and realise that until the export market for these products grows sufficient to support regular, dedicated air freighter services, the air freight business relies on the tourism trade, and the growth of international passenger services. One example where there has recently been new regional air freight services developed is Toowoomba Wellcamp Airport. This airport, servicing the Surat Basin, supports a weekly international freighter service taking fresh produce into Hong Kong.[58]

5.3.5 Ports – improve freight connections into major ports

Seaports are the major conduit for most agricultural export supply chains. Their importance in being able to efficiently receive, handle and load export produce is key to helping maintain Australia's competitiveness as a reliable supplier of agricultural goods to world markets.

The issue of freight connections with ports has been on the national agenda for some years, having being raised in the 2012 National Ports Strategy and again in the 2013 National Land Freight Strategy. It is recognised that effective road and rail connections need to be protected from encroachment and unreasonable operational constraints, so there are port and corridor planning issues to be managed.

The Department of Infrastructure, Regional Development and Cities is working with the states, territories and industry to assist with master planning of ports. Port master plans help clarify and communicate a port's vision. They also provide a strategic framework for port authorities to consider a range of internal and external factors that may impact on current and/or future operations. In addition, the Inquiry into National Freight and Supply Chain Priorities,[59] identified two action priorities in this area as follows:

- *Priority action 4.2 - Provide additional funding to ensure efficient rail freight connections to major ports and rail freight paths through metropolitan networks, including port rail projects, such as completing the duplication of the Port Botany freight rail line*

- *Priority action 4.3 - Investigate high reliability high capacity rail links to other key ports not included under priority 4.3, such as Fremantle, Brisbane and regional ports.*

[56]IBISWorld, 2018, Air Freight Services in Australia, IBISWorld Industry Report OD5177 [57]Department of Infrastructure, Regional Development and Cities, 2018, Inquiry into National Freight and Supply Chain Priorities, Report [58]Toowoomba Wellcamp Airport Cargo Service, found at https://www.wellcamp.com.au/corporate/cargo/cargo-services/ [59]Department of Infrastructure, Regional Development and Cities, 2018, Inquiry into National Freight and Supply Chain Priorities, Report

5.4 Summary of current and upcoming infrastructure projects

While the previous section identified current and emerging issues with agricultural freight, it is recognised that agricultural freight moves across the key regional roads, highways and rail networks. There are a number of current infrastructure projects that are significant to the development of regional in Australia. A selection of these are summarised in Table 5.2.

Table 5.2 Summary of current relevant infrastructure projects

Project	Description
Inland rail, NSW[60]	• New 1,700km line between Melbourne and Brisbane via regional Victoria, New South Wales and Queensland • Completed by 2024/25 • Expected to bring lower costs, greater efficiencies to freight customers and deliver more produce and goods to consumers along Eastern Australia.
Tamworth intermodal terminal, NSW[61]	• Multi-user Rail Freight Intermodal Terminal • $7.5 million government funding committed • Benefit the meat, grains and processed foods industries by enabling more efficient transport.
Parkes National logistics hub, NSW[62]	• 600ha site set is set to be Australia's largest intermodal site • The site will have readily accessible rail connections to all major seaports.
Great Northern Highway, WA[63]	• This upgrade will improve safety and amenity for all road users and facilitate the future movement of 53.5m road trains along a 218km section of highway • The highway is currently a major road freight corridor for the mining and agricultural (livestock and grains) industries.
Bruce Highway upgrade, QLD[64]	• 10-year program (2013-14 to 2022-23) aimed at improving safety, flood resilience and capacity along the length and breadth of the Bruce Highway between Brisbane and Cairns • The highway is a vital part of the National Land Transport Network providing linkages for west-east freight networks connecting a significant resource sector, and inland agriculture production areas to 11 coastal ports, and is a major tourism route.
Pacific Highway upgrade, NSW[65]	• The Pacific Highway connects Sydney and Brisbane, and is a tourism and agricultural freight route • Upgrades, which primarily involve dividing the road, started in 1996, with 2020 identified as the targeted completion date • About 81% of the 657km Pacific Highway between Hexham and the Queensland border are now four lane divided road.

[60] <https://www.artc.com.au/projects/inland-rail/> [61] <http://www.railpage.com.au/news/s/tamworth-rail-freight-intermodal-hub-development-delayed-until-2019> [62] <https://www.parkes.nsw.gov.au/business-investment/national-logistics-hub/> [63] <https://www.mainroads.wa.gov.au/Documents/Great%20Northern%20Highway%20Newsletter%20June%202016.RCN-D16%5E23391979.PDF> [64] <https://www.tmr.qld.gov.au/Projects/Featured-projects/About-the-Bruce-Highway-Upgrade-Program> [65] <http://www.rms.nsw.gov.au/projects/pacific-highway/index.html>

Project	Description
Princes Highway East[66] and West duplication[67]	• The Princes Highway is an important route for Victoria's Gippsland and South West agricultural industries • Duplication of the Princes Highway between Traralgon and Sale in the Gippsland region • Duplication of the Princes Highway in Victoria's west, between Winchelsea and Colac • Both due for completion in 2019.
Midland Highway upgrade, Tas[68]	• The Midland Highway connects Launceston and Hobart, and importantly connects Tasmania's southern agricultural areas with its northern seaports • Upgrades include lane duplication, overpasses and new carriageways.
New England Highway upgrade, NSW[69]	• The New England Highway connects the Hunter region to the Queensland border, and is an important corridor for agricultural freight movements between NSW and Queensland • Improvements include a number of underpasses, bypasses and lane duplications, with works commencing in 2018.
Murray Basin rail project, Vic	• Large scale rail infrastructure project that will standardise the axle loading of rail lines (primarily used for grain) in the Murray Basin region of Victoria. Construction is currently underway.
Fixing Country Rail, NSW[70]	• $400m funding program aiming to relieve bottlenecks by upgrading parts of the NSW regional railt network (across the whole state) that are constraining efficient freight movement.

These projects when completed will help address some of the current and emerging issues facing agricultural freight, and introduce efficiencies that should put downward pressure on transport costs.

[66] 70 [66] <https://bigbuild.vic.gov.au/projects/princess-highway-east-duplication> [67] <https://bigbuild.vic.gov.au/projects/princess-highway-west-duplication>; [68] <http://minister.infrastructure.gov.au/chester/releases/2017/november/dc351_2017.aspx> [69] <http://www.rms.nsw.gov.au/projects/hunter/new-england-highway/index.html>
[70] <https://www.transport.nsw.gov.au/projects/programs/fixing-country-rail>

Section 6

Policy and funding solutions

In this chapter, we will revisit the issues identified in Chapter 5 and identify potential policy and funding options that can help address these issues and improve transport infrastructure and regulation within the agricultural sector.

The key infrastructure and policy issues for agricultural freight identified in the previous chapter may be summarised as follows:

A. First mile access issues – these include:

a. Maintenance of rural roads

b. Access for High Productivity Vehicles

c. Harmonisation of heavy vehicle regulation.

B. Infrastructure investment issues – these include:

a. Maintenance of regional rail freight networks

b. Support for new rail investment

c. Support for regional air freight hubs

d. Improved freight connections into major ports.

Many of these issues have already been recognised on national and state agendas (e.g. National Freight and Supply Chain Priorities, Fixing Country Roads (New South Wales), Fixing Country Rail (New South Wales). However, there is a need to maintain focus on their particular impact on the efficiency of specific supply chains. The case studies presented in Chapter 3 identified that first and last mile issues in particular can have a major bearing on transport efficiency outcomes.

As discussed previously, potential solutions to address these issues include changes to policy/regulation (e.g. harmonisation of heavy vehicle regulation), use of appropriate funding solutions (e.g. maintenance programs for rural roads and regional rail freight), or in most cases both (e.g. access for High Productivity Vehicles).

There are a range of financing mechanisms available for infrastructure investment. Each has its own benefits and costs, including risk appetite, cost and availability. When selecting the preferred financing option, the finance needs to be matched to the business model to achieve the optimum outcome. Examples of funding options for reform include:

- Government grants (full and partial) – Direct Government contribution to the project in order to pay for the construction and lifecycle costs
- Government funding programs - Funding available through Federal and State funding programs
- ‘City Deals’ - City deals are an agreement between Federal, State and Local governments and the business community around investment in key infrastructure to enhance development in a region
- User pays (direct agreements) – Infrastructure users pay for their use. Under this option, the infrastructure owner sets the charges directly, or negotiates with users to set charges
- User pays (regulated) – Infrastructure users pay for their use. Under this option, a regulator sets the prices that the owner can charge. This would occur where the infrastructure is in a monopoly position
- Third party income - Where other parties can make use of the infrastructure, fees can assist in generating revenue for the project
- Value capture - Where other parties benefit from the project, some of the value can be shared with the project to assist in generating revenue.

Further details about each funding option, including an assessment of each option’s relative advantages is discussed in Appendix B.

6.1 Relevance of funding options for agricultural supply chains

In considering future freight needs, it is recognised that agricultural supply chains largely utilise the national road freight and port network, and the air freight network that non-agricultural products use. To the extent that these networks meets the broader community freight needs, then there is generally no additional requirement to service particular agricultural supply chains, especially for containerised or non-bulk freight. It is the regional and local road network, and the regional rail networks that agricultural supply chains need which are often poorly serviced.

Major regional roads are generally of a standard that provides for Higher Mass Limit (HML) vehicle access, and where there are constraints on these networks, local and state governments are seeking to address these limitations. This issue of HML access is generally more problematic with local roads. Funding to upgrade such roads to HML standard is being provided in some states through Government funding programs such as Bridges to the Bush and Fixing Country Roads, where there is often a joint funding approach involving Local and State Government, even attracting private funding in some instances where there is a direct business benefit. Opportunities for private investment in the regional road network is therefore limited.

Similarly, the regional rail freight network, where there are limited freight volumes, agricultural or otherwise, also presents limited commercial incentive for private investment. Aside from some high volume rail lines where mining developers, sometimes with government support, have invested in heavy rail to haul coal or ore for processing, or to port for export, the regional rail network across Australia is largely left to service agriculture supply chains, mainly grain, limited regional intermodal traffic, and some mining and industrial bulk products. These regional rail lines remain in government ownership, despite some being leased to private operators, with most struggling to earn sufficient revenue through access charges to maintain their operational rating. As a result, many of these rail lines are falling into disrepair, thereby becoming an inefficient transport option due to speed restrictions. While a number of state governments have begun addressing these issues by investing in rail maintenance and upgrades through programs such as Fixing Country Rail and the Murray Basin Rail Project, we still see rail closures occurring in other regions due to the low freight volumes and lack of funding e.g. Tier 3 rail lines in Western Australia.

Aside from full government grants, few of the funding reform options identified above have ready application for many regional agricultural supply chains. Only specific high volume supply chains, or sections of supply chains where there is a clear financial return are likely to attract private funding. The challenge for industry is to create higher volume supply chains through product consolidation or chain rationalisation to make them economic for investment and operation.

One example where there has been private investment in a supply chain that helps service agriculture is the Toowoomba Wellcamp Airport. This airport, servicing the Surat Basin, and largely developed with private funding provides an alternate air cargo option out of northern Australia to Asia.

The recent Inquiry into National Freight and Supply Chain Priorities[71] recognised that existing infrastructure investment programs may not necessarily support regional freight priorities, such as first and last mile issues, which may be too small to be considered for Commonwealth funding. Accordingly, the Panel developed a priority action to recognise this potential gap:

> *Priority action 3.11 - Undertake a review to identify any potential gaps in existing infrastructure investment programs to allow funding for smaller, collective packages of investment in freight projects that could lift regional productivity, which may not otherwise be considered for Commonwealth funding.*

While we have identified the key infrastructure and policy issues that face agricultural freight and will continue to do so if Agriculture is to become a $100 billion industry by 2030, further gap analysis at a supply chain level is required to ensure transport inefficiencies are identified, especially as they relate to first mile access. CSIRO's TraNSIT modelling tool continues to be useful in this regard, by using data outcomes to help identify supply chain inefficiencies, and infrastructure funding priorities.

Changes to policy/regulation will also continue to play an important role, as will access to government funding to maintain existing infrastructure, and support new infrastructure investment priorities like the Inland Rail.

[71] Department of Infrastructure, Regional Development and Cities, 2018, Inquiry into National Freight and Supply Chain Priorities, Report

Appendix A

Costs for other commodities

A.1. Cotton

A.1.1. The Australian cotton industry

Cotton is grown predominantly in Queensland and New South Wales and has been produced in Australia since the 1960s. Australia is the fourth largest exporter of cotton, and Australian cotton attracts a price premium on the world market due to its quality. There were an estimated 684 cotton producers in Australia in 2015-16, generating a gross value of farm production of $1.53 billion. In the same year, the production volume of lint was approximately 629 kilotonnes, with 536 kilotonnes of raw cotton exported to international markets.

Brisbane, Sydney and Melbourne are the main export ports for cotton, capturing 48%, 28 % and 23 % or exports, by weight, respectively in 2015-16.[72]

Table 6.1 Overview of the Australian cotton industry

Variable	Unit	Year	Value
Industry scale			
Businesses	No. of businesses	2015-16	684
Lint yield	No of tonnes/ha	2015-16	2.33 t/ha
Production			
Gross value of farm production	A$	2015-16	$1.53 billion
Production volume (cottonseed)	Kilotonnes	2015-16	890
Production volume (lint)	Kilotonnes	2015-16	629
Exports			
Volume	Kilotonnes	2015-17	536 kt
Price	A$	2015-17	$2.26/kg
Value	A$	2015-17	$1.27 billion

Source: ABS, Agricultural Commodities 2015-16; ABARES (2017) Agricultural commodity statistics

A.1.2. Overview of the cotton supply chain

After cotton is picked at the farm, it is pressed into large blocks or round bales and transported to a cotton gin for the first stage of processing. Cotton gins are factories where the cotton lint is separated from the cottonseed and trash. The lint is then pressed into cotton bales for sale and shipment. Cotton bales are generally containerised for movement and shipment. Cotton gins are located in regional areas where cotton is grown to reduce the costs of transportation.[73]

Figure 6.1 Overview of the Australian cotton industry supply chain

Source: Adapted from BITRE analysis, page 11

Movement of cotton from farms to gins is primarily done by road haulers using articulated semi-trailer, B-double or A-double road vehicles. A mix of road and rail is then used to transport cotton from the warehouse to port. Use of rail transportation is not as common, due to the limited access to rail by cotton gins and warehouses.[74]

A.1.3. Freight costs throughout the supply chain

CSIRO (2017) estimate the transport cost incurred moving cotton from farms to cotton gins is approximately $37 million a year, averaged across 2013-14 to 2015-16. The cost of transporting lint from the cotton gins to the port (often via the warehouse) varies based on the mode of transport. The aggregate cost of road transport is $39.8 million, significantly larger than the cost of rail transport, at $13.3 million. However, the transporting of cotton via road is relatively cheaper per unit transported, at $183.5 per tonne compared to $255.1 per tonne via rail - reflecting the longer average haulage distances for rail freight than road freight.

[72]https://bitre.gov.au/publications/2018/files/Freightline_05.pdf , page 1 [73]Ibid, page 4 [74]https://bitre.gov.au/publications/2018/files/Freightline_05.pdf , page 6

Table 6.2 Transport costs and other fees of cotton in Australia

From	To	Mode	Volume	Cost/unit	Total Cost
Cotton			**(tonnes)**	**(A$/tonne)**	**(A$)**
Paddock	Cotton gin	Road	620,000	60.03	$37 million
Cotton gin	Warehouse	Road	220,000*	-	-
Warehouse	Port	Road	-	183.5	$39.8 million
Warehouse	Port	Rail	-	255.1	$13.3 million
Total (road)					**$76.8 million***
Total (rail)					**$13.3 million**

Source: CSIRO (2017). Note: Volume moved from gin to warehouse is lower, since cotton lint is separated from the trash and cottonseed. No cost information is available for movements from gin to warehouse

Analysis of figures from CSIRO (2017) and the ABS indicates that the cost of freight represented approximately 2.4% of the average value of gross farm production across 2013-14 to 2015-16 (see Table 6.3). This estimate is likely to be slightly understated, given it does not include the costs associated with transportation for domestic consumption. However, this is likely to be insignificant given that approximately 99% of raw cotton is exported (Australia has no major domestic cotton spinning facilities).[75]

Table 6.3 Summary of farm freight costs as a share of farm production (2013-14 to 2015-16)

Category	Value
Transport costs to and from properties	$37.2 million
Average value of gross farm production	$1.57 billion
Freight as a share of gross farm production	**2.4%**

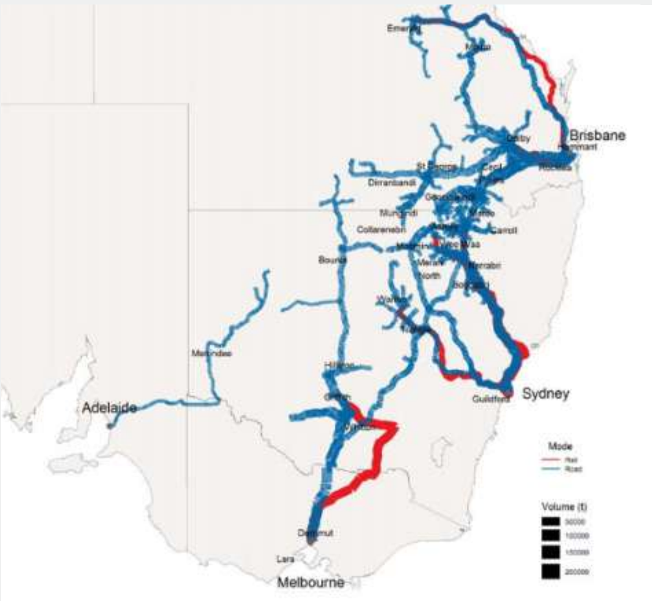
Source: Deloitte Access Economics analysis of CSIRO (2017)); ABARES Agricultural Commodities (March 2018)

[75]https://bitre.gov.au/publications/2018/files/Freightline_05.pdf , page 1

A.1.4. Spatial distribution

The production of cotton is predominantly located in New South Wales and Queensland, with some transport networks extending down to Melbourne and Adelaide. Road transport dominates the cotton distribution network, with some rail links existing between cotton gins and local ports.

Figure 6.2 Australian freight flows for cotton



Source: BITRE Freightline 5 – Australian Cotton freight Transport

A.2. Pigs

A.2.1. The Australian pig meat industry

Pig farming occurs in all Australian states, and is a largely domestic-focused industry. The gross value of Australian farm production of pigs was $1.3 billion in 2015-16, accounting for 2% of Australia's gross value of farm production. In that year, there were an estimated 2.3 million pigs located on 1,419 different properties.

The industry is characterised by a few large producers with high production efficiency, with other smaller producers more focused on addressing lifestyle and niche markets.[76]

Table 6.4 Summary of the Australian pig meat industry

Variable	Unit	Year	Value
Industry scale			
Number of properties	No. of properties	2015-16	1,419
Number of pigs	No of head	2015-16	2.3 million
Production			
Gross value of farm production	A$	2015-16	$1.3 billion
Value of pig meat produced	Tonnes	2015-16	378,000
Exports			
Value of exports	A$	2015-16	$128 million
Volume of exports	Tonnes	2015-16	27,900

Source: ABS, Agricultural Commodities 2015-16; ABARES (2017) Agricultural commodity statistics

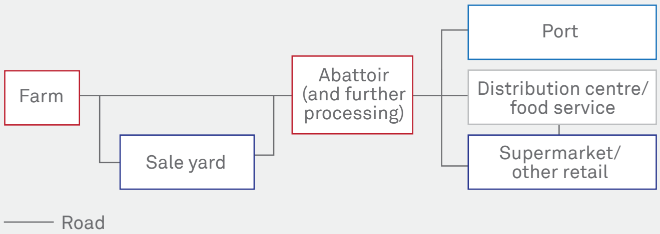
[76] <https://www.dpi.nsw.gov.au/data/assets/pdf_file/0011/578747/pork-industry-overview-2015.pdf> , page 5

A.2.2. Overview of the pig meat supply chain

With Australia being a net importer of pig meat, the domestic market accounts for the majority of Australian pig meat production. Pig farms are located in all states – there are clusters of pig producers located in certain areas within southern Queensland (Toowoomba area), Southern New South Wales (near Young and the Riverina district) and across Northern Victoria, with processing plants located close to each cluster. The pig meat industry lends itself to vertical integration – with pork production companies often sharing long-term agreements with abattoirs and piggeries. For this reason, saleyard auctions are a less common method of selling in the industry, relative to other livestock industries.

Pork products are largely distributed to their final point of sale through distribution centres. With production occurring in all states, pork products tend to be sold in nearby markets in the same (or neighbouring) state.

Figure 6.3 Modelled pig meat supply chain



Source: CSIRO (2017)

A.2.3. Freight costs throughout the supply chain

The pig meat industry primarily utilises road transport to move pigs and pig meat between properties, abattoirs, distribution centres and ports. CSIRO (2017), using 2014-15 data, estimates the cost of transporting pigs from the farm to an abattoir at $5.47/head. The cost to transport pigs directly from the farm to the saleyard is noticeably smaller at $3.12/head.

Once processed into pig meat products, the average cost of transporting each tonne of pig meat from abattoir to port is $51.09 per tonne, and $26.50 per tonne for domestic freight movements.

Table 6.5 Transport costs and other fees of pig meat in Australia

From	To	Volume	Cost/ unit	Total Cost
Cotton		**(Head)**	**(A$/ head)**	**(A$)**
Property	Property	0.6 million	$0.73	$0.4 million
Property	Abattoir	5.3 million	$5.47	$27.8 million
Property	Saleyeard	0.1 million	$3.12	$0.4 million
Pig meat		**(Tonnes)**	**($/tonne)**	**(A$)**
Abattoir	Port	40,000	n/a	0.04 million
Abattoir	DC / supermarket	300,000	$26.50	26 million
Total (road)				**$54.64 million**

Data source: CSIRO (2017)

Analysis of estimates from CSIRO (2017) and ABARES indicates that the cost of freight represented approximately 2.5% of the average value of gross farm production of pigs in 2014-15.

Table 6.6 Summary of farm freight costs as a share of farm production (2014-15)

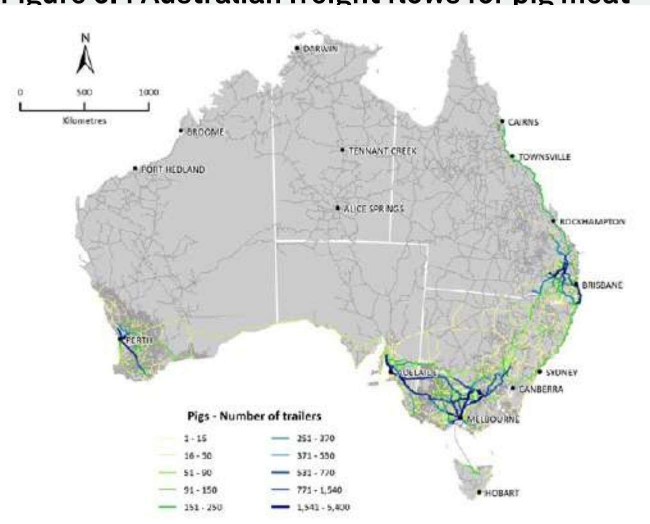
Category	Value
Transport costs to and from properties	$28.7 million
Average value of gross farm production	$1,1490 million
Freight as a share of gross farm production	**2.5%**

Source: Deloitte Access Economics analysis of CSIRO (2017); ABARES Agricultural Commodities (March 2018)

A.2.4. Spatial distribution

Compared with industries such as beef cattle and horticulture, pigs and pig meat are typically transported shorter distances. Producers tend to service local domestic markets, resulting in considerably more production intensive areas. The major areas of pig production are south-eastern Queensland, southern NSW, northern/western Victoria, south-eastern South Australia and south-western Western Australia. Traditionally, pig farms are located near major grain growing areas and are clustered near abattoirs.[77]

Figure 6.4 Australian freight flows for pig meat



Source: TraNSIT

A.3.1. The Australian sugar industry

The Australian sugarcane industry is primarily located in Queensland, which accounts for 95% of total Australian production. Overall, sugar is Australia's second largest export crop, behind wheat.[78] Sugarcane is an annual tropical crop that requires plenty of sunlight, fertile soil and water. A crop typically takes between 9-16 months to grow in Queensland and 18-24 months in northern New South Wales.[79]

There were 3,341 sugar-producing agricultural properties in 2015-16, generating a gross value of farm production of $1.3 billion. In the same year, the production volume was approximately 4,920 kilotonnes, with 4,140 kilotonnes exported to international markets (Table 6.7).

[77] https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/578747/pork-industry-overview-2015.pdf , page 5 [78]http://www.sugaraustralia.com.au/sugar-australia/about/industry-information/ [79]https://bitre.gov.au/publications/2015/files/Freightline_03.pdf , page 2

A.3. Sugar

Table 6.7 Overview of the Australian sugar industry

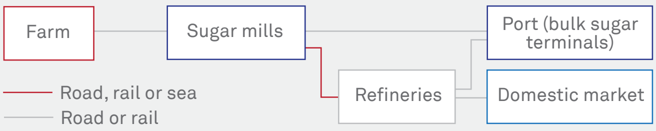
Variable	Unit	Year	Value
Industry scale			
Businesses	No. of businesses	2015-16	3,341
Yield	No of tonnes/ha	2015-16	91.4 t/ha
Production			
Gross value of farm production	A$	2015-16	$1.3 billion
Production volume	kt	2015-16	4,920
Exports			
Volume	kt	2015-16	4,140
Price	A$/tonne	2015-16	$498
Value	A$	2015-16	$1.82 billion

Data sources: ABS Agricultural Commodities; ABARES Agricultural Commodities (March 2018)

A.3.2. Overview of the sugar supply chain

Much of Australia's sugarcane is grown on family-owned and operated farms, with harvested sugarcane transported to a raw sugar mill. Sugarcane is often moved off-farm via cane railway networks and rolling stock to minimise the time from harvesting the sugarcane to the mill. The movement of sugarcane to mills is usually completed within 16 hours to preserve the sugarcane juice.[80] Australia has 24 sugar mills, 21 of these located in Queensland to ensure efficient movement between farms and mills.[81]

Figure 6.5 Australian sugar industry supply chain



Source: BITRE analysis, page 11

Sugarcane processing at sugar mills involves shredding to break apart the cane, before being rolled to separate the sugar juice from the excess material. A number of purification steps follow to crystallise the sugar before it is transferred to short-term storage in bulk bins at the mill. At the end of this process the raw sugar is transported from the mill to a bulk sugar terminal and then either exported or transferred to a sugar refiner. There are only four sugar refiners in Australia, two in Queensland, one in New South Wales, and one in Victoria.[82] The bulk sugar terminals can accommodate a combined 2.5 million tonnes of sugar at any one time.[83] The capacity varies according to the terminal that receives the sugar, with details provided in Table 6.8.

Table 6.8 Capacity of Australian bulk sugar terminals

Terminal	No. of Sheds	Capacity (tonnes)
Cairns	2	234.000
Mourilyan	1	175,000
Lucinda	3	231,000
Townsville	3	755,000
Mackay	4	737,000
Bundaberg	2	316,000
Total capacity	**15**	**2,448,000**

[80] https://bitre.gov.au/publications/2015/files/Freightline_03.pdf , page 2 [81] https://bitre.gov.au/publications/2015/files/Freightline_03.pdf , page 9 [82] https://bitre.gov.au/publications/2015/files/Freightline_03.pdf , page 9 [83] https://www.sugarterminals.com.au/locations/

Australia exports 80-85% of its raw sugar to buyers overseas, in the form of white refined, raw sugar and blends.[84] Exports of all three types are focused in the Asia-Pacific. The main port for Australian sugar export is Townsville, with the refined bulk sugar exports going through Mackay.[85] The other ports for sugar export are in Townsville, Lucinda, Mourilyan, Bundaberg and Cairns. An estimated 80% of the remaining volume of raw sugar and refined products is domestically used in food manufacturing.[86]

A.3.3. Freight costs throughout the supply chain

CSIRO (2017) provides the most in-depth analysis into the specific freight costs incurred throughout the sugar supply chain. They estimate, based on data from 2013-14 to 2015-16, that the total cost incurred in transporting sugarcane from farms to sugar mills is $26.8 million a year. This cost mirrors an amount of $25.4 million incurred to transport the raw sugar from mill to port by road, with a further $9.95 million incurred through rail transport.

CSIRO report only provides a partial picture, however, omitting key components such as the rail costs from paddock to mill and information on domestic consumption freight costs.

Table 6.9 Transport costs and other fees of sugar in Australia

From	To	Mode	Volume	Cost/unit	Total Cost
Sugarcane			**(Tonnes)**	**(A$/tonne)**	**(A$)**
Paddock	Sugar Mill	Road	3.0 million	$9.02	$26.8 million
Sugar Mill	Domestic market	Road	0.4 million	-	-
Sugar Mill	Storage at Port	Road	3.4 million	$10.62	$25.4 million
Sugar Mill	Storage at Port	Rail	-	$9.13	$9.95 million
Total (road)					**$52.2 million***
Total (rail)					**$9.95 million**

Data source: CSIRO (2017)

Note: *excludes domestic

Based on estimates from CSIRO (2017) report and ABARES, freight costs to and from properties represent **2.1%** of the average value of gross farm production between 2013-14 and 2015-16 (see Table 6.10). This is likely to slightly understate the actual cost given it does not appear to include the cost of rail transport.

[84] http://www.sugaraustralia.com.au/sugar-australia/about/industry-information/ [85] https://bitre.gov.au/publications/2015/files/Freightline_03.pdf , page 10 [86] Ibid, page 2

Table 6.10 Summary of farm freight costs as a share of farm production (2013-14 to 2015-16)

Category	Value
Sugar transport costs from properties	$26.8 million
Average value of gross farm production	$1.27 billion
Freight as a share of gross farm production	**2.1%**

Source: Deloitte Access Economics analysis of CSIRO (2017); ABARES Agricultural Commodities (March 2018)

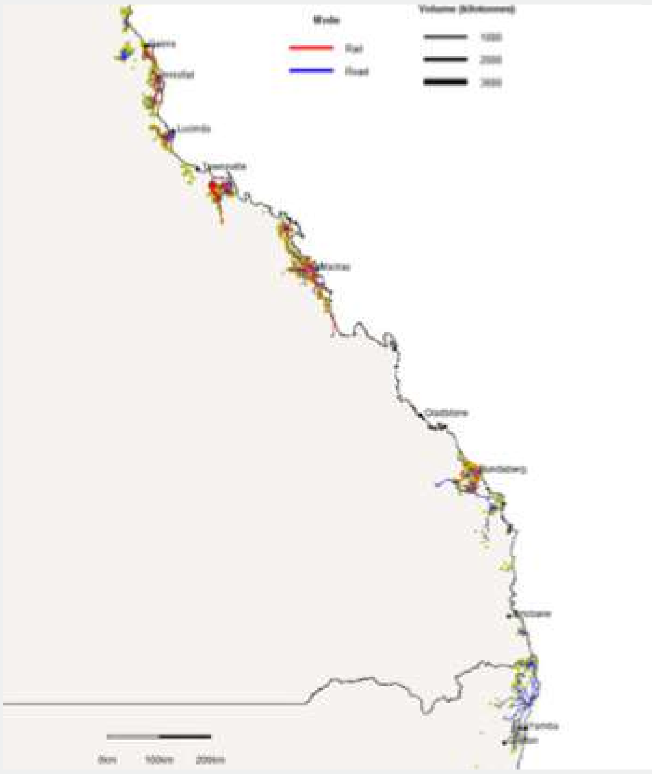
A.3.4. Spatial distribution

Sugarcane freight movements are largely concentrated in Northern NSW and Coastal areas across Queensland, since sugar mills and bulk export terminals are located close to the point of primary production.

Some mill regions (e.g. Maryborough, New South Wales, Atherton Tablelands, Queensland) rely completely on road transport for sugarcane while some utilise road transport to a rail load point. Raw sugar that is exported is transported to the nearest suitable port that contains the required storage shed (predominantly Queensland).

Sugar mills in New South Wales are mostly dedicated towards domestic use so raw sugar is transported directly to a sugar refiner. Figure 6.6 shows the spatial distribution of Australia's sugarcane freight movements.

Figure 6.6 Estimated Australian sugarcane freight movements (2011-12)



Source: BITRE analysis, page 15

A.4. Rice

A.4.1. The Australian rice industry

Australian rice growing is concentrated in the Murrumbidgee and Murray Valleys of south-western New South Wales, with a small amount grown in northern Victoria. These areas accommodate rice growing, with flat land, clay-based soils and availability of water. The industry is supported by storage and milling infrastructure in these areas, often in regional towns.[87] Australian rice is predominantly exported via the Port of Melbourne.[88]

The rice industry supports 335 businesses and had a gross value of farm production of over $115 million in 2015-16. In the same year, the production volume was approximately 274 kilotonnes, with 366 kilotonnes of processed rice exported to international markets[89], valued at $408 million (Table 6.11).

Table 6.11 Overview of the Australian rice industry

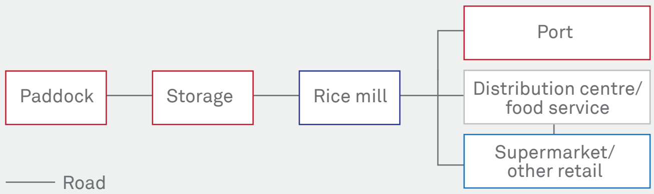
Variable	Unit	Year	Value
Industry scale			
Businesses	No. of businesses	2015-16	335
Yield	Tonnes/ha	2015-16	10.3
Production			
Gross value of farm production	A$	2015-16	$115 million
Production volume	kt	2015-16	274
Exports			
Volume	kt	2015-16	336
Price	A$/tonne	2015-16	$1,276
Value	A$	2015-16	$408 million

Data sources: ABS Agricultural Commodities, ABARES Agricultural Commodities (March 2018)

A.4.2. Overview of the rice supply chain

Following harvest, rice is usually transported to a storage facility by road, where it is stored at regulated temperatures until it is ready to be transported to a rice mill for processing. The milling process varies based on the type of rice produced. Brown rice involves the least milling, requiring that the rice be separated from the husk. White rice involves the additional step of bran and germ removal from the rice grain. The majority of rice is then exported via the Port of Melbourne, with approximately 20% of production being consumed in the Australian domestic market.[90]

Figure 6.7 Australian rice industry supply chain



Source: CSIRO (2017)

A.4.3. Freight costs throughout the supply chain

There is limited analysis and research on the cost of freight for rice in Australia. As with a number of other commodities included in this report, CSIRO (2017) provides the most in-depth analysis into the specific freight costs incurred throughout the supply chain. They estimate the total cost incurred to transport raw rice to storage facilities and then to rice mills as approximately $12.4 and $12.6 million a year respectively, based on data from 2013-14 to 2015-16.

[87] https://www.sunrice.com.au/media/6663/history_of_australian_rice.pdf , page 2 [88] https://www.sunrice.com.au/media/6663/history_of_australian_rice.pdf , page 2 [89] Storage allows exports to exceed production in any given year. [90] http://www.rga.org.au/the-rice-industry.aspx

The cost to transport milled rice to port and distribution centres is estimated at $59.53 and $154.45 per tonne respectively (Table 6.12). Costs for transporting processed rice to both port and domestic markets are significantly higher because rice is stored and milled relatively closer to the growing regions.

Table 6.12 Transport costs and other fees of rice in Australia (2013-14 to 2015-16)

From	To	Mode	Volume	$ per unit	Total Cost
Rice			**(Tonnes)**	**(A$/ tonne)**	
Paddock	Storage	Road	1,200,000	10.67	$12.4 million
Storage	Rice Mill	Road	1,200,000	10.84	$12.6 million
Rice Mill	Port	Road	600,000	59.53	$37.4 million
Rice Mill	DC/ super-market	Road	600,000	154.45	$71.8 million
Total (road)					**$134.2 million**

Data source: CSIRO (2017)

Analysis of freight estimates from CSIRO (2017) and production data from ABARES (2018) indicates that freight costs to and from properties and storages represent approximately 11.6% of the average gross value of farm production between 2013-14 and 2015-16 (see Table 6.13).

Table 6.13 Summary of farm freight costs as a share of farm production (2013-14 to 2015-16)

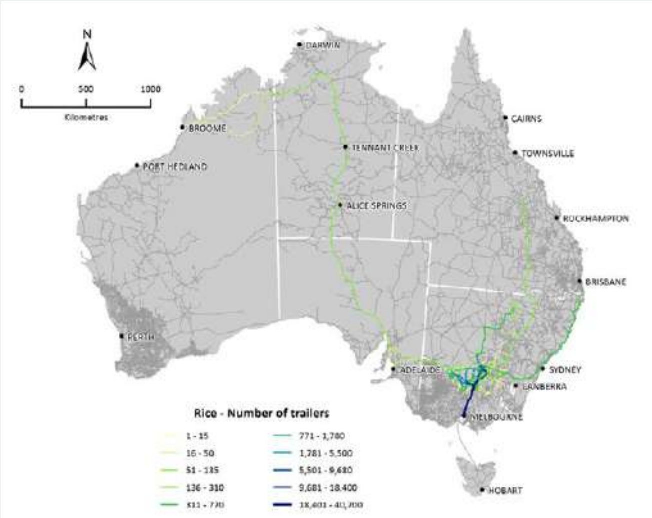
Category	Value
Transport costs to and from properties and storage	$25.8 million
Average value of gross farm production	$222 million
Freight as a share of gross farm production	**11.6%**

Source: Deloitte Access Economics analysis of CSIRO (2017); ABARES Agricultural Commodities (March 2018)

A.4.4. Spatial distribution

The production and initial transport from paddock to rice mill nearly all occurs in southern New South Wales. Domestic transportation routes of processed rice spread up towards Townsville and Darwin. The major route to market in Australia are those ending at the Port of Melbourne, where all international exports of rice are shipped (see Figure 6.8).

Figure 6.8 Australian freight flows for rice



Source: CSIRO (2017)

A.5. Sheep and goats

A.5.1. The Australian sheep and goat meat industries

Australia is one of the world's largest producers of sheep meat. Australia's lamb producing regions are concentrated in the southeast of Australia, although all states produce sheep meat. Australia is the largest exporter of sheep meat in the world and is the third largest live sheep exporter.[91] In 2015-16, this represented 56% of total Australian lamb production and 91% of total Australian mutton production.[92]

Goat meat production in Australia is a less common, but emerging industry, with a strong export focus that reflects low demand from Australian consumers. Goat meat exported from Australia is often as a whole carcass, with the remaining quantity being exported live. Globally, Australia is a minor producer of goat meat but one of the largest exporters.[93]

The gross value of Australian production of sheep and goats was $3.4 billion in 2015-16, accounting for approximately 6% of Australia's gross value of farm production (Table 6.14).

Table 6.14 Summary of Australian sheep meat and goat industries

Variable	Unit	Year	Value
Industry scale			
Properties with sheep	No. of properties	2015-16	13,136
Properties with goats	No. of properties	2015-16	1,133
Number of sheep	No. of head of sheep	2015-16	67.6 million
Number of goats	No. of head of goats	2015-16	424,900
Production			
Gross value of farm production	A$	2015-16	$3.4 billion
Sheep/goat meat processed in Australia	Tonnes	2015-16	746,000
Sheep and goat meat exports			
Volume	Tonnes	2015-16	446,800
Value	A$	2015-16	$2.7 billion
Live Exports			
Volume	Head	2015-16	1.9 million
Value	A$	2015-16	$238 million
Consumption			
Domestic expenditure	A$	2016-17	$2.4 billion*
Per person consumption	Kg/person	2016-17	9.5kg*

Data sources: ABS Agricultural Commodities; ABARES Agricultural Commodities (March 2018)
* Excludes goat meat, which is not widely consumed in Australia

[91] https://www.mla.com.au/globalassets/mla-corporate/prices--markets/documents/trends--analysis/fast-facts--maps/mla_sheep-fast-facts-2016.pdf [92] ABS [93] https://www.mla.com.au/globalassets/mla-corporate/prices--markets/documents/os-markets/red-meat-market-snapshots/2018-mla-ms_global-goatmeat.pdf , page 3

A.5.2. Overview of the sheep meat supply chain

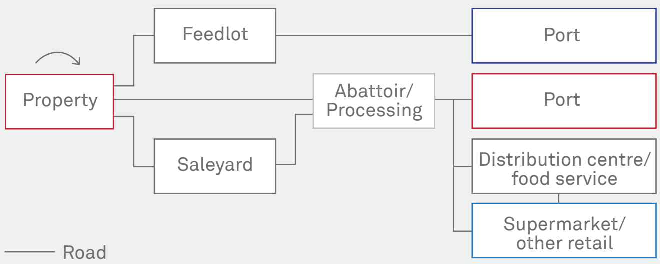
Sheep meat (and goat) supply chains, vary mostly based on the end-market. The market can be segmented into three distinct groups:

- Live sheep and goats for export: the majority of live sheep for export come from Western Australia and are exported to the Middle East by ship
- Sheep and goat meat exported overseas: Australia exports significant volumes of lamb and mutton to the Middle East, Asia and the US
- Domestic sheep meat: While sheep meat is not as widely consumed as beef in Australia, domestic consumers account for a significant market share of Australian sheep meat. Goat meat is not widely consumed in Australia, with over 90% of product destined for the export market.

Road freight is the dominant land transport mode for livestock and meat products in Australia. Sheep are transported throughout the supply chain in trucks, as are consignments of sheep meat.

According to CSIRO (2017), almost two-thirds of sheep that are sold for processing are transported directly from properties to abattoirs by road, while around one-third are sold and transported through saleyards.

Figure 6.9 General sheep, lamb and goat meat supply chain



Source: CSIRO (2017)

A.5.3. Freight costs throughout the supply chain

CSIRO (2017) estimates that total freight costs were $268 million, based on data from 2013 to 2016.

The modelling results indicate that majority of freight costs in the industry are incurred in the movement of livestock from agricultural properties, either to other properties ($22.8 million), saleyards ($66.7 million), abattoirs ($91.5 million) or export depots ($4.8 million). Transport costs for meat from abattoirs total $46 million, split relatively evenly between transport to ports ($25.2 million) and domestic distribution centres ($20.9 million).

Table 6.15 Summary of freight costs - sheep and goats

From	To	Volume	$ per unit	Total Cost
Sheep and goats		**(Head)**	**(A$/head)**	**(A$)**
Property	Property	4.7 million	$4.91	$22.8 million
Property	Saleyard	9.9 million	$4.38	$66.7 million
Property	Export Depot	2.0 million	$2.38	$4.8 million
Property	Abattoir	18.7 million	$4.92	$91.5 million
Saleyard	Abattoir	8.9 million	$3.31	$29.2 million
Export Depot	Port	2.0 million	$3.14	$6.7 million
Sheep and goat meat		**(Tonnes)**	**($/tonne)**	**(A$)**
Abattoir	Port	500,000	50.61	$25.2 million
Abattoir	DC/supermarket	270,000	77.69	$20.9 million
Total (road)				**$268 million***
Sheep and goats				**$222 million**
Meat				**$46 million**

Source: CSIRO

Analysis of CSIRO (2017) and ABS data indicates that freight costs of sheep and goats, both to and from agricultural properties, represent **5.8%** of the gross value of agricultural production.

Table 6.16 Summary of farm freight costs as a share of farm production (2013 to 2016)

Category	Value
Transport costs to and from properties	$185.8 million
Average value of gross farm production	$3.2 billion
Freight as a share of gross farm production	**5.8%**

Source: Deloitte Access Economics analysis of TraNSIT, ABS.

As a share of the combined final value of sheep and goat meat and live exports (estimated as the combined value of sheep and goat meat exports, live exports and retail value), total transport costs (for both livestock and meat) represented **5.4%** of total value over the same time period.

Table 6.17 Transport costs as a share of total final value (2013 to 2016)

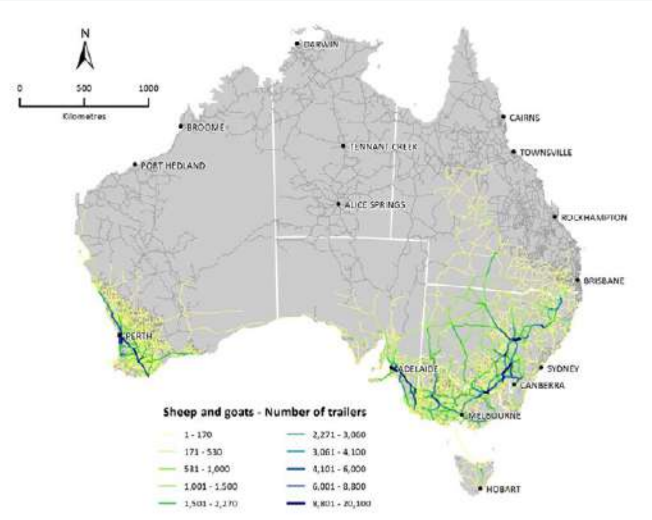
Category	Value
Value of sheep and goat meat exports	$2.7 billion
Value of live exports	$3.2 billion
Value of domestic production	$2.1 billion
Transport costs	$268 million
Transport costs as a share of final value	**5.4%**

Source: Deloitte Access Economics analysis of TraNSIT, ABS.

A.5.4. Spatial distribution

As the majority of Australia's sheep are located on properties in the southern half of the continent (South of Alice Springs), freight movements largely also occur across the south of the continent (see Figure 6.10).

Figure 6.10 Sheep and goat freight movements throughout Australia



Source: CSIRO (2017)

Appendix B

Examples of funding options

Examples of funding options

Table 7.1: Examples of funding options for reform

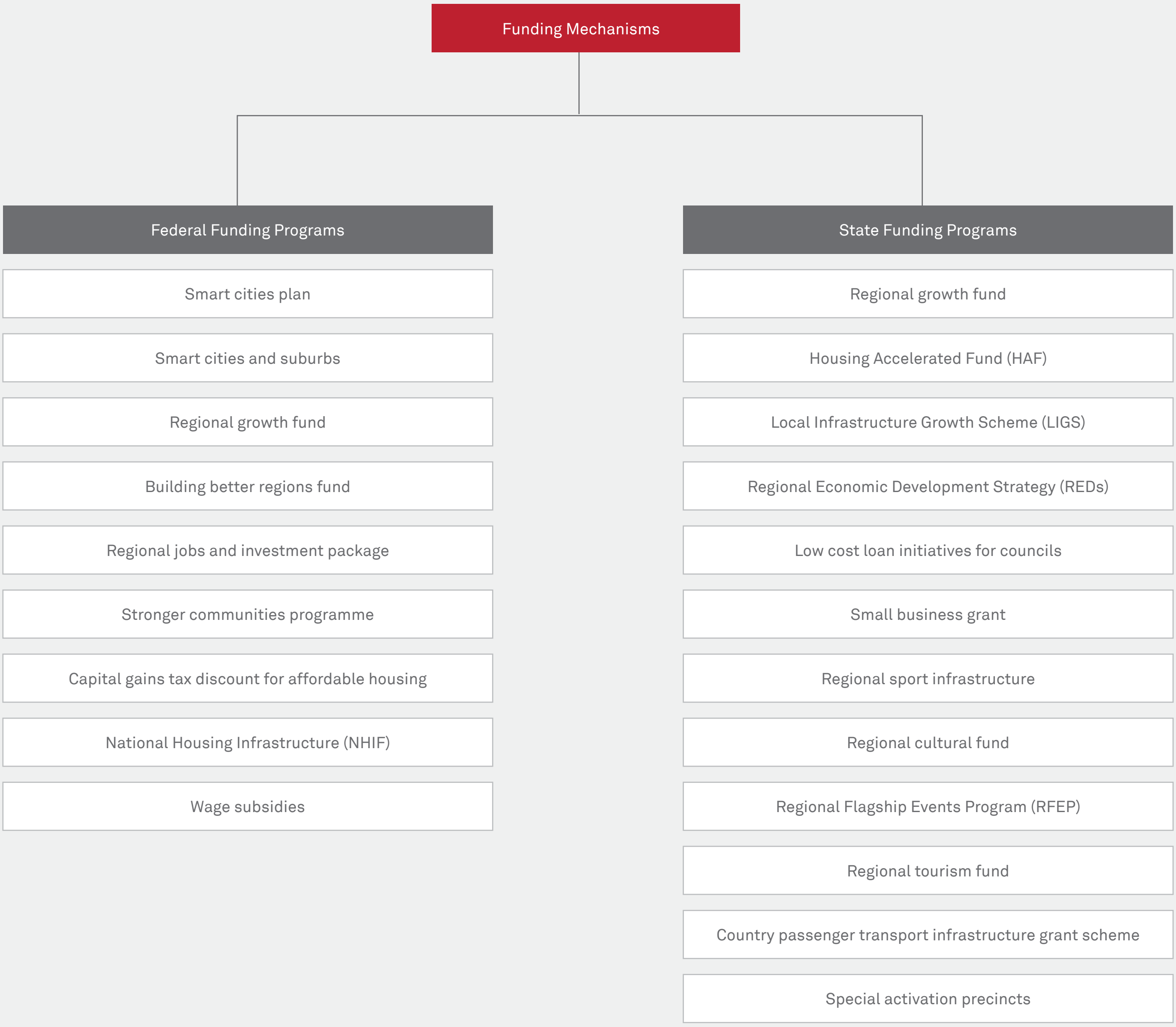
Funding Option	Description	Advantages/Disadvantages	Examples
Government grants - full	Government directly makes a contribution to the project in order to pay for the entirety of the construction and lifecycle costs. Grants can come from Federal, State and less frequently from local governments.	**Advantages** • Guarantees viability of a project • Straightforward process **Disadvantages** • Government has limited funds, no guarantee when budget will be available • Users get value for 'free'	• Pacific Highway upgrades.
Government grants - partial	Government directly makes a contribution to the project to pay for a portion of the construction and lifecycle costs. This is usually used where other sources of funding are available, but are not sufficient to fully fund the project. Grants can come from Federal, State and less frequently from local governments.	**Advantages** • Assists with viability of a project • Government not required to fund entire project. **Disadvantages** • Government has limited funds, no guarantee when budget will be available.	• M7 Motorway.
Government funding programs	Funding may also be available through Federal and State funding programs. These are funds that have been allocated for a specific purpose, and may be available on a competitive basis. A list of some relevant funding programs is included in the diagram below.	**Advantages** • Budget funding has already been allocated to programs • Assists with viability of a project. **Disadvantages** • Funding programs typically would not be large enough to fully fund projects • Requires project to be aligned to the funding program, which may not have the same objectives.	• Bridges to the Bush program.

Funding Option	Description	Advantages/Disadvantages	Examples
City deals	City deals are an agreement between Federal, State and Local governments and the business community around investment in key infrastructure to enhance development in a region. While not solely focused on transport infrastructure, this can play a significant role in the city deal.	**Advantages** • Allows a more coordinated approach across governments and industry, potentially creating better 'bang for bucks'. **Disadvantages** • Can be complex to negotiate • Project would need to be located within one of the cities identified for city deals.	• Western Sydney City Deal – includes the first stage of the North-South Rail Link.
User pays – Direct agreements	Users of the infrastructure can pay for their use. Under this option, the infrastructure owner sets the charges directly, or negotiates with users to set charges. The amount that can be charged will depend on the existence of alternatives to the new infrastructure (for example other roads or rail lines that may take longer, but are free to use). Payments could take a combination of the following: • Charge per use • Distance per weight based charges • Fixed charge per month for access to the infrastructure.	**Advantages** • Users make a contribution to the project in return for the value they derive • Additional funding that may allow project to be undertaken sooner. **Disadvantages** • Unlikely to provide full funding for an investment • Will reduce benefits for users • Opportunities for owners to charge based on demand to generate super profits.	• M7 Motorway, Lane Cove Tunnel, WestConnex.
User pays – Regulated	Users of the infrastructure can pay for their use. Under this option, a regulator (such as IPART) sets the prices that the owner can charge. This would occur where the infrastructure is in a monopoly position (that is, there is no competition with other roads / railways / ports) The regulator typically sets the prices based on the cost of delivering the infrastructure plus a cost of financing. Payments could take a combination of the following: • Charge per use • Distance/weight based charges • Fixed charge per month for access to the infrastructure.	**Advantages** • Users make a contribution to the project in return for the value they derive • Additional funding that may allow project to be undertaken sooner. **Disadvantages** • Unlikely to provide full funding for an investment • Will reduce benefits for users • Regulation may provide uncertainty for investors.	• Freight rail network • Regulated ports.

Funding Option	Description	Advantages/Disadvantages	Examples
Third party income	Where other parties can make use of the infrastructure, fees can assist in generating revenue for the project. Examples include: • Advertising along new roads • Telecommunications companies using land / corridors along road / railways • Service stations along new roads	**Advantages** • Additional funding that may allow project to be undertaken sooner **Disadvantages** • Usually a small component of total funding	• Pacific Highway
Value capture	Where other parties benefit from the project, some of the value can be shared with the project to assist in generating revenue. Examples include: • Where land for residential / commercial development increases in value due to the new infrastructure, part of the increase can be shared with the project. This can be through annual rates or taxes on the sale of the land • Businesses that benefit from increased patronage (while not directly using the road) can share the benefit with the project. This can be through annual rates.	**Advantages** • Additional funding that may allow project to be undertaken sooner • Non-user beneficiaries make a contribution to the project in return for the value they derive. **Disadvantages** • Can be difficult to implement (for example identifying beneficiaries and the level of benefit that they have received) • Not common in Australia and may have negative reaction.	• Sydney Metro Northwest / Metro City & Southwest – airspace above stations is being developed to provide revenue to assist in funding the project.

Figure 7.1 below shows some infrastructure related funding programs at the Federal and State level.

Figure 7.1: Infrastructure related funding programs at the Federal and State level



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