

Milk - Supply Chain Benchmarking Report

Report for the Department of Infrastructure, Transport, Regional Development and Communications

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
AUSTRALIAN SUPPLY CHAIN OVERVIEW	5
GENERIC MILK SUPPLY CHAIN OVERVIEW (ALL COUNTRIES)	5
MILK IN AUSTRALIA.....	5
KEY SUPPLY CHAIN FLOWS	6
BASIS FOR INTERNATIONAL COMPARISON	8
NEW ZEALAND.....	8
CANADA.....	8
NEW ZEALAND SUPPLY CHAIN	10
MILK IN NEW ZEALAND.....	10
KEY SUPPLY CHAIN FLOWS	10
MILK FREIGHT DATA IN NEW ZEALAND	11
MILK IN CANADA.....	13
KEY SUPPLY CHAIN FLOWS	13
MILK FREIGHT DATA IN CANADA	14
DATA COMPARISON.....	16



Executive Summary and Scope

EXECUTIVE SUMMARY

Milk is a household staple and is also used as an ingredient in other commonly consumed products such as baked goods and cheese. As such, the cost of milk, which is impacted by the efficiency of the milk supply chain, is an important component of everyday household spending.

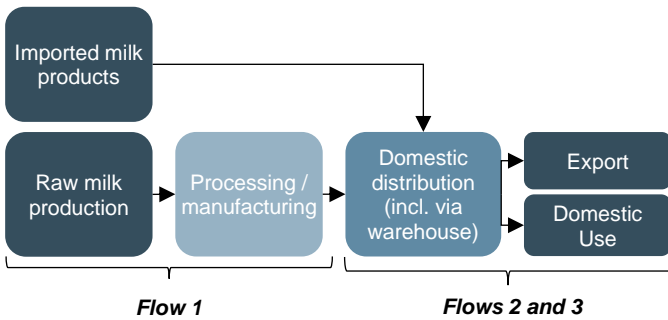


Figure 1: Simplified milk supply chain (country agnostic)

The milk supply chain can be segmented into three key movements (referred to as ‘flows’ in this report).

- The first flow (**flow 1**) is the movement of raw milk from farm to processing plant, where the milk is bottled or evaporated. Transport from farm to plant is typically undertaken using uninsulated bulk tankers.
- The second flow (**flow 2**) is the domestic distribution of fresh processed milk from the manufacturing plant, potentially via a warehouse or distribution centre, typically using refrigerated trucks.
- The third flow (**flow 3**) is the movement of milk powder from processing plant to port for export, potentially via a warehouse or distribution centre, which can be undertaken by non-refrigerated road or rail transport.

Australia produced 9.4 million tonnes (mt) of raw milk in 2019/20, the majority of which was pasteurised for domestic consumption. Additionally, a large portion (c.43%) was processed into milk powder for export.

Australia’s milk supply chain involves some longer distance travel (around c.500km on average) for the distribution of milk and milk powder, as milk production is largely concentrated in Victoria and New South Wales and distributed to the other states. The cost of transport is AUD c.\$0.15 per tonne-kilometre (tkm).

For benchmarking purposes, New Zealand and Canada have been selected as comparative countries for Australia’s milk supply chain as they are also self-sufficient in terms of dairy production. While Canada and Australia export milk in limited

quantities, New Zealand is a significant exporter and world leader in the sector, exporting 95% of total production.

New Zealand represents the “gold standard” in export of milk products globally. It produces c.22.8mt of raw milk annually and has one of the highest milk production surpluses in the world. Due to its small geographical size, milk tends to travel shorter distances than in Australia, though milk powder can travel up to c.400km in the journey to export. The cost of freight is lower than Australia, at AUD c.\$0.12 per tkm for all product types. New Zealand also has a greater reliance on rail, particularly in moving products to port for export, reducing the overall cost of its freight task.

Canada produces c.10.3mt of raw milk annually and is a largely self-sufficient market. Most of Canada’s production is located in Ontario and Quebec, where a majority of the population lives, meaning that average journey lengths are typically shorter (<250km). However, milk powder can travel extremely long distances (up to 2,500km) as it is stored in central Canada (e.g., Manitoba) prior to export. Overall, Canada’s cost of milk freight is slightly higher than Australia and New Zealand, at AUD c.\$0.16 per tkm.

Scope

This paper covers the production of raw milk, fresh processed milk and milk powder/UHT for domestic consumption and export. This paper deals with milk from cattle only, excluding milk from other sources such as goat, sheep and plant-based milks.

KEY FINDINGS & AREAS FOR FURTHER INVESTIGATION

- Freight rates for dairy are similar between Australia, New Zealand and Canada, with some countries using rail in order to minimise freight cost over longer distances.
- The difference in cost of moving milk products in different formats (e.g., bulk milk in a tanker or refrigerated truck versus milk powder) is much less pronounced than other commodity supply chains such as seafood.
- Further investigation could include collecting freight data for other dairy products such as cheese or cream, potentially gathered through engagement with industry.



Australian Supply Chain Overview

AUSTRALIAN SUPPLY CHAIN OVERVIEW

Generic milk supply chain overview (all countries)

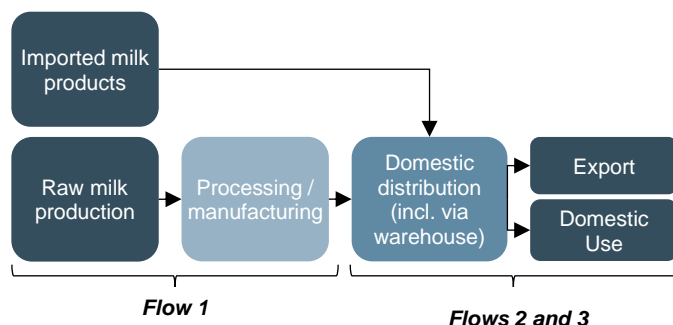


Figure 1: Generic milk supply chain (country agnostic)

The milk supply chain includes raw milk, fresh processed milk, ultra-high temperature processed (UHT) milk and milk powder. Raw milk is milk that has not been altered or pasteurised since its collection. Fresh processed milk refers to milk that has been pasteurised, bottled and is ready to drink. UHT milk refers to milk that has been sterilised with significant heat and does not require refrigeration. Milk powder is a manufactured dairy product created by dehydrating milk to powder form. Milk products in this paper refers to processed milk, UHT and milk powder.

The total consumption of milk products within western countries is largely tied to population. Some countries, such as Canada, are self-sufficient with domestic consumption mostly serviced by local production with few imports. Self-sufficient countries generally consume fresh (processed) milk as it tastes better than its non-perishable counterparts - UHT milk and milk powder.

Countries that export milk products tend to produce more raw milk than local demand requires. Scale exporters, such as New Zealand, produce proportionately larger volumes of non-perishable milk products due their extended shelf life which enables more flexible storage and transit times.

Different forms of milk require different transport conditions. Raw milk is generally stored chilled on the farm prior to being picked up by an insulated milk tanker. The milk-tanker transports the raw milk to processing plants without active refrigeration.

Once processed, fresh milk requires chilled freight. Finally, milk powder can be transported in non-refrigerated conditions, as its water content has been removed.

An optimised milk supply chain includes capacity to transport all milk production to its end destination on time with limited spoilage and in the most efficient and cost-effective way.

Milk in Australia

Australia's milk supply chain is self-sufficient with excess supply being exported. The top importers of Australian milk products are China, (c.32% of total volume), Japan (11%) and Singapore (10%). Meanwhile, only 10% of Australia's dairy supply is made up of imported products (refer figure 2).¹

Volume of Australia's imported, locally produced and exported dairy products (2019/20)
Thousand tonnes

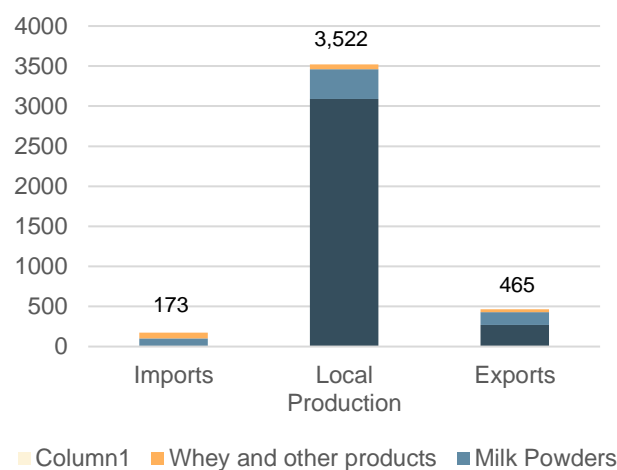


Figure 2: Volume of Australia's imported, locally produced, and exported dairy products 2019/20 (Source: Dairy Australia). Liquid milk assumes 909 litres per tonne and uses raw milk utilisation at 32% to estimate production

In 2019, Australia's largest milk products by total tonnage were fresh processed milk and UHT milk. Approximately 90% of these products were consumed domestically, with the remainder exported to Asia (c.92%) and island countries in the Pacific (c.8%) largely as UHT milk. Comparatively, c.34% of milk powder supply was destined for export, with c.90% exported to Asia.²

Milk and milk products are predominantly transported by road in Australia, due to the high number of farms

¹ Dairy Australia, Infocus 2020

² Dairy Australia, Infocus 2020

that milk is collected from. Rail is used in some instances to transport milk product exports in freight containers from processing plants to ports.³

Raw milk production takes place in temperate and subtropical regions of Australia due to favourable climactic conditions, improved water availability and limited constraints on the supply of cattle feed.

In 2019/20, Australian dairy farmers produced 8,776 million litres (ML) of raw milk. The majority of raw milk production (c.60%) occurred in south-eastern Australian dairying regions: Gippsland, The Murray Region (Northern VIC/Southern NSW) and Western Victoria (refer figure 3 and 4).⁴

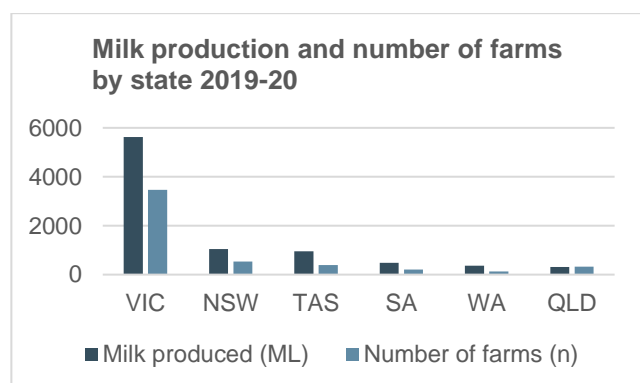


Figure 3: Milk production and number of farms by state 2019-20 Australia (Source: Dairy Australia)

Key supply chain flows

Key flow #1 Farm to processing plant

Raw milk is stored in temperature-controlled vats at farms. It is then transferred to a road milk tanker capable of holding c.37,000 litres.⁵ Raw milk is perishable and therefore time-sensitive and must be transported to a processor within 24-48 hours. Milk tankers are not refrigerated but have a stainless-steel body which is heavily insulated to keep the raw milk cold during transportation to the processing plant.

Processing plants are typically located a short distance from farms in the heart of dairying regions. For example, Australia's second largest dairy processor Fonterra has manufacturing sites located in the heart of Western Victoria, The Murray Region, Gippsland and Tasmania.⁶

Key flow #2 Domestic distribution of fresh milk

Fresh milk travels a short distance from processing plant to distribution centres before being delivered to key end customers: grocery stores and food service outlets.⁷ However, as raw milk production is concentrated in Victoria and New South Wales, milk may have to travel interstate in order to reach the broader population, vastly increasing the average trip distance. The average trip distance is therefore estimated to be c.500km. However, trip distances vary widely; for example, Fonterra's fresh milk factory in Cobden is only c.200km from Melbourne CBD, while trips to regional or remote areas can be substantially higher.

In Australia, fresh milk is moved via road in refrigerated B-doubles holding up to 50 tonnes (including the weight of the vehicle).

Key flow #3 Exports of milk powder/UHT milk

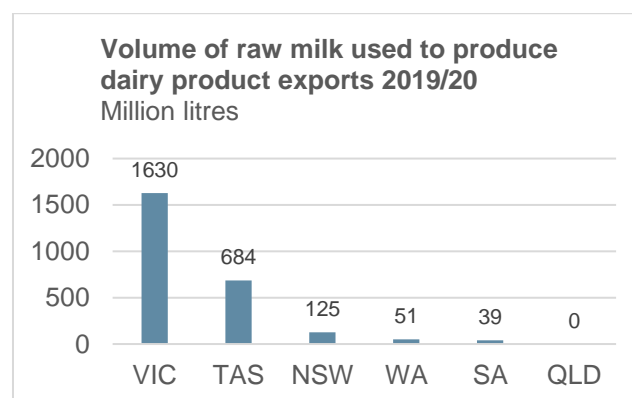


Figure 4: Volume of raw milk used to produce dairy product exports (Source: Dairy Australia)

Victoria is the largest exporter of dairy products in Australia, accounting for 79% of national dairy exports in 2019-20 by weight and c.42% of Australia's milk powder manufacturing locations. The vast majority of milk products exported are UHT milk and milk powder which can be transported without refrigeration. The largest export market for milk powder is China largely due to its high demand for infant powder.⁸

Exports produced at milk powder and UHT milk processing plants move direct to port, airports or distribution centres via road or rail.⁹ For example, milk powder from Fonterra's specialist processing plant in Darnum travels c.115km to Port Melbourne.

³ [AgriFutures Australia, The Impact of Freight Costs on Australian Farms, May 2019](#)

⁴ [Dairy Australia, Infocus 2020](#)

⁵ [Fonterra Australia, Press Release 2018](#)

⁶ [Dairy Australia, Infocus 2020; Fonterra Australia](#)

⁷ [AgriFutures Australia, The Impact of Freight Costs on Australian Farms, May 2019](#)

⁸ [Dairy Australia, Infocus 2020](#)

⁹ [AgriFutures Australia, The Impact of Freight Costs on Australian Farms, May 2019](#)

¹⁰ [United States Department of Agriculture, Dairy and Products Semi Annual, April 2021](#); Expert Interviews



Basis for International Comparison

BASIS FOR INTERNATIONAL COMPARISON

New Zealand and Canada have been chosen as suitable comparative countries for Australia's milk supply chain, as they produce most of the milk they consume. In addition, both countries have some geographical similarities to Australia, such as a low population density in Canada and the geographically isolated nature of New Zealand.

New Zealand

The New Zealand and Australian dairy supply chains have the following similar features:

- Both markets are largely “self-sufficient”, producing sufficient milk to cover the population's consumption.
- Like Australia, New Zealand is an isolated island. Due to the perishable nature of milk, it is difficult for either country to export fresh milk. While it can be airfreighted, this is typically not viable for significant volumes, with both countries largely exporting dry milk powder or UHT instead.

While the New Zealand and Australian supply chains are similar, there are notable distinctions between the domestic supply chains that need to be considered when interpreting the data in this report:

- New Zealand exports c.90-95% of its milk production, typically in a powdered form to Asia. While its domestic consumption per capita is roughly similar to Australia, its overall volume of milk produced is significantly higher and may benefit from economies of scale.
- Due to its large amount of dry, bulk exports, New Zealand is able to utilise rail in its export supply chain, leading to a difference in modal mix.

Canada

The Canadian and Australian milk supply chains have the following similar features:

- Both markets are largely “self-sufficient”, producing sufficient milk to cover the population's consumption.
- Both countries have a large landmass, with low population density and significant distances between population centres. This increases the distance travelled within the

supply chain and the overall scale of the freight task, particularly in getting milk to remote areas.

While the Canadian and Australian milk supply chains are similar, there are notable distinctions between the domestic supply chains that need to be considered when interpreting the data in this report:

- Canada has a number of domestic policies in place that may alter the economics and market forces of its milk production. The most prominent is Canada's supply management system, whereby production quotas are set to ensure a balance between supply and demand with tariffs on many imports. While Canada's milk supply is not subsidised, this may have some limited impact on the overall supply chain and the competitiveness of exports.



New Zealand Comparison

NEW ZEALAND SUPPLY CHAIN

Milk in New Zealand

New Zealand's milk market is heavily weighted toward exports with c.90-95% of production being exported.¹⁰ In 2019, New Zealand's largest dairy export was milk powder at c.70% of total dairy product exports. China is the largest importer of New Zealand dairy (c.41%) followed by Algeria (c.6%) and Sri Lanka (c.5%).¹¹

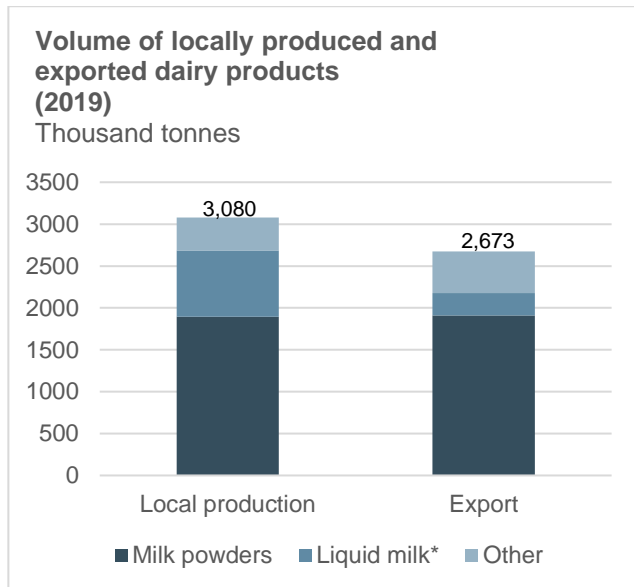


Figure 5: Volume of New Zealand's locally produced and exported dairy products 2019 (Source: USDA). Note: excludes raw milk (21bn litres, 22.8m tonnes). Weight reduces significantly as water is removed in the process of creating milk powder for export.

In 2017, New Zealand dairy farmers produced 21 billion litres of raw milk (c.22.8m tonnes). Raw milk production was approximately even between the North and South Island with c.56% of total raw milk volume originating from the North Island and c.44% from the South. Waikato (in the North Island) is New Zealand's largest dairy producing region followed by Canterbury (in the South Island). In 2017, these provinces produced c.46% of New Zealand's total raw milk.¹²

In New Zealand, Fonterra Co-operative Group processes c.85% of raw milk produced by independent and member dairy farmers. Key flows

will therefore focus on Fonterra's supply chain operations.

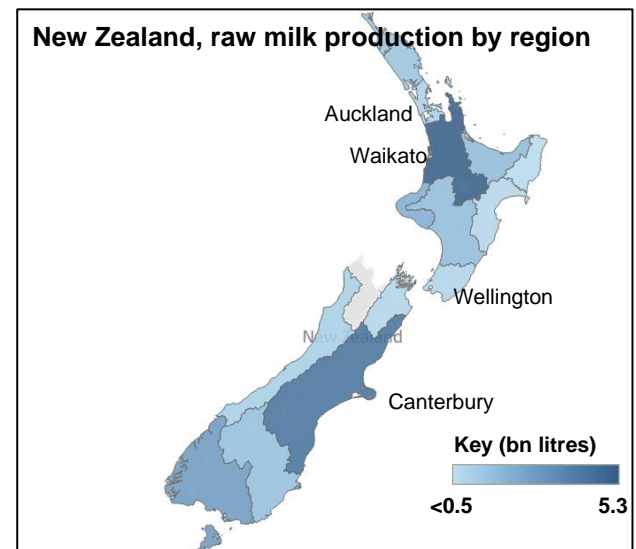


Figure 6: Heatmap of New Zealand's milk production 2017 (source: New Zealand Ministry of Transport)

The dominant mode of raw milk transport in New Zealand is road due to the large number of dairy farms. For milk products, rail constitutes a relatively higher proportion of movements at 40-50% mode share.¹³

Key supply chain flows

Key flow #1 Farm to processing plant

Raw milk is stored in temperature-controlled vats at farms. The raw milk is then transferred to an insulated milk tanker able to hold approximately 27,000 litres (10,000 litres less than Australian milk-tankers). Most of the raw milk is then transported via road to specialised processing plants. Some rail is used for the movements of product between collection points. Raw milk transport costs AUD c.\$0.016 per litre.¹⁴

Fonterra's consumer brand processing plants produce milk products for domestic consumption. Processing plants that produce fresh milk include Auckland, and Palmerston North. Processing plants that produce milk powder for export significantly outnumber fresh milk plants.¹⁵

The average distance milk tankers travel from the farm to the processing plant is c.100km. The

¹⁰ [United States Department of Agriculture, Dairy and Products Semi Annual, April 2021](#); Expert Interviews

¹¹ [United States Department of Agriculture, Dairy and Products Semi Annual, April 2021](#)

¹² [New Zealand Ministry of Transport, National Freight Demand Study, 2019](#)

¹³ New Zealand Ministry of Transport, National Freight Demand Study, 2012

¹⁴ [The Impact of Freight Costs on Australian Farms \(AgriFutures, 2019\)](#)

¹⁵ [Fonterra, Decarbonisation Roadmap Presentation, 2019](#)

maximum distance travelled is around c.150-200km.¹⁶

Key flow #2 Domestic distribution of fresh milk

Fresh processed milk is produced at specialised processing plants where filling and bottling of fresh milk occurs on-site. From the processing plant, c.60% of fresh processed milk is transported direct to grocery stores in urban locations and the remaining c.40% is transported to distribution centres in urban and regional locations.¹⁷

Two of Fonterra's distribution centres are concentrated near Auckland airport. There is also a consumer distribution centre located in Christchurch that supplies the South Island.¹⁸ Transport routes from Fonterra's fresh milk processors in the North Island are as follows:

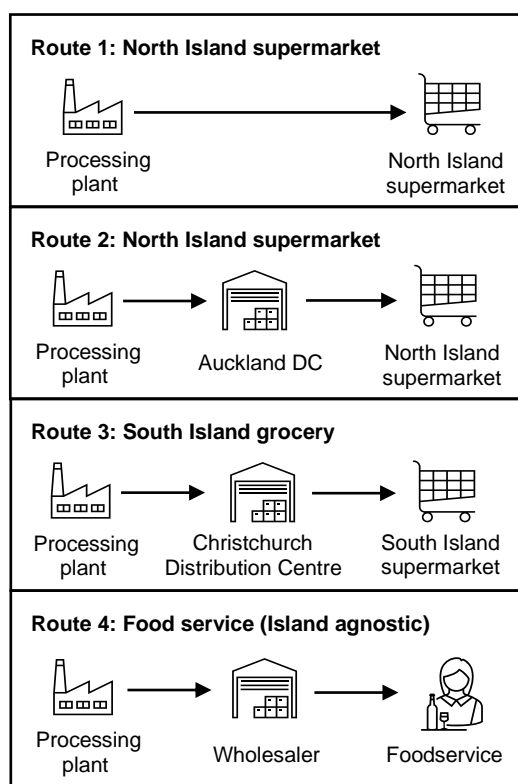


Figure 7: Potential routes from Fonterra's fresh milk processing facilities (Source: Expert Interviews; Fonterra)

The fresh processed milk is transported via road on board refrigerated trucks capable of holding 1,100 H-crates. Each H-crate can hold c.16 litres of fresh processed milk (e.g., 8 two litre bottles) equating to a total transport capacity of c.17,600 litres per truck (c.19t).¹⁹ This is lower than the capacity of Australian

¹⁶ Aggregate of views given by industry participants

¹⁷ Expert Interview

¹⁸ Fonterra, Decarbonisation Roadmap Presentation, 2019

¹⁹ Former National Supply Chain Development Manager, New Zealand dairy provider

trucks which hold c.21t of fresh processed milk per trailer.

Key flow #3 Exports of milk powder

Milk powder is produced at specialised processing plants with some plants providing on-site storage. Milk powders are then transferred to distribution centres via road and rail an average distance of 50-100km away.²⁰

The largest distribution centre is Crawford Street located north of Hamilton in the North Island. Crawford street is located near Fonterra Canpac – Fonterra's second largest packager of milk powders. Crawford street distribution centre is serviced by road and rail providing direct routes to Tauranga Port, the main North Island port of export. The approximate mode share is 60% road and 40% rail. The average distance to Tauranga port is about 120km and 1.5-2 hours from Crawford Street.²¹

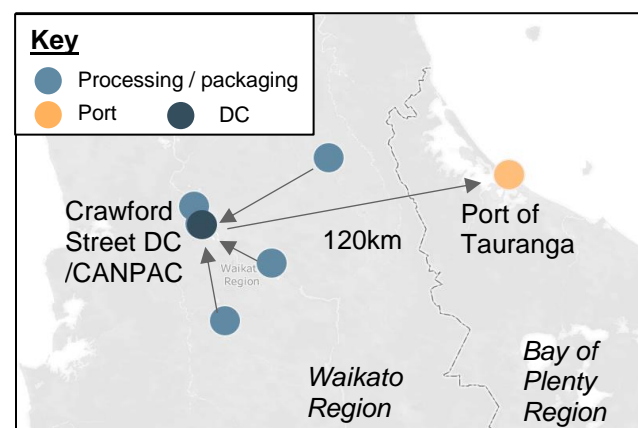


Figure 8: Example of Fonterra's milk powder operations from processing plants to port

In 2017, Tauranga port exported 51.4% of total dairy exports. Exports through South Island ports are more evenly distributed than the North Island. In 2017, Lyttelton Port (Christchurch) processed 14.8% of total dairy exports followed by Port Chalmers (Dunedin) (14.5%) and Timaru (11.8%).²²

Milk freight data in New Zealand

New Zealand estimated costs	Road	Rail
Cost per tkm (AUD)	c.\$0.12	c.\$0.11

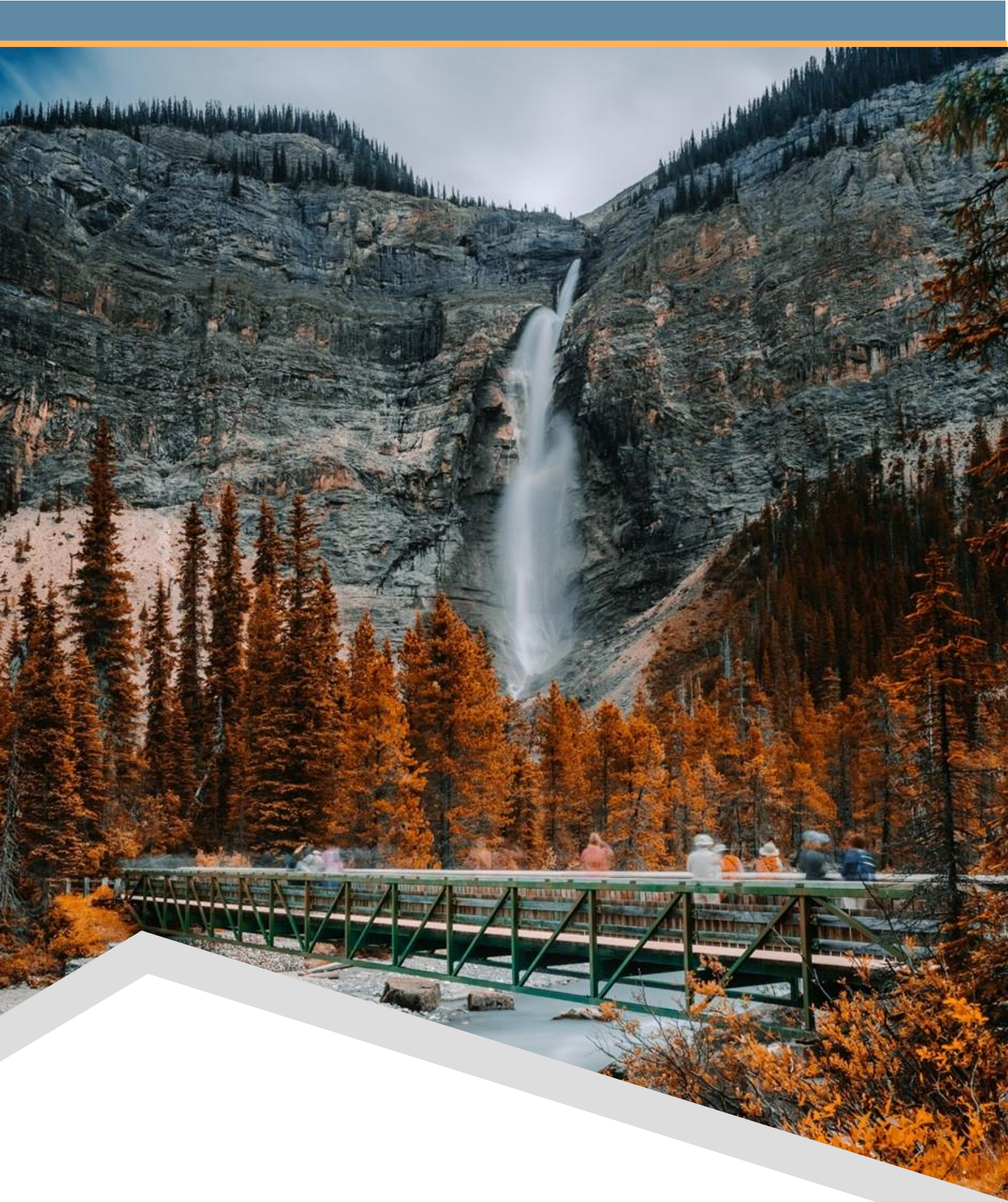
Table 1: Milk freight cost estimates (Source: Industry participants)

New Zealand freight costs for road and rail are similar (road rates: c.\$0.12, rail rates: c.\$0.11).

²⁰ Fonterra, Decarbonisation Roadmap Presentation, 2019; Google maps

²¹ Former National Supply Chain Development Manager, New Zealand dairy provider; Google Maps

²² New Zealand Ministry of Transport, National Freight Demand Study, 2019



Canada Comparison

CANADA SUPPLY CHAIN

Milk in Canada

Canada's milk market is largely self-sufficient with minimal imports supplementing local supply. Canada exports only a fraction (c.5%) of its domestic production. In 2020, Canada's largest products by weight were fresh processed milk and UHT making up approximately 70% of total dairy products. Milk powder production was limited; however, a large proportion of local milk powder production was exported.²³

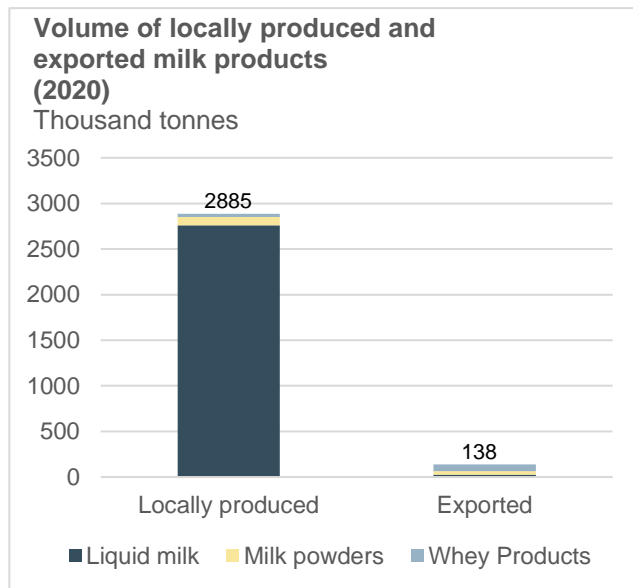


Figure 9: Volume of Canada's locally produced and exported milk products 2020 (Source: Agriculture and Agri-food Canada)

In 2020, Canadian dairy farmers produced 9.4 billion litres (10.3mt) of raw milk. The bulk of raw milk production was in Ontario and Quebec which collectively produced c.70% of Canada's raw milk.²⁴

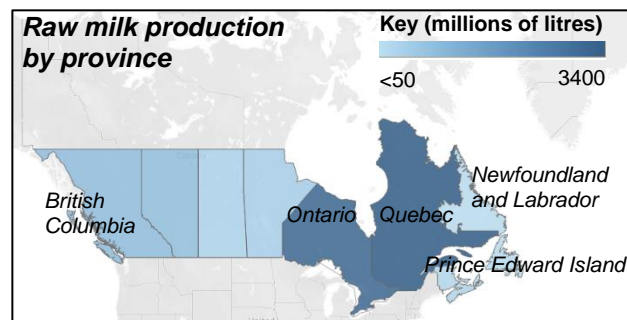


Figure 10: Volume of raw milk production by province 2020 (source: Statistics Canada)

Ontario and Quebec are the most highly populated provinces, home to c.60% of Canada's total population. Further, the population in Quebec and Ontario is concentrated in major cities. As such, most milk products travel less than c.100km (c.2 hours) from farm to end consumer.²⁵

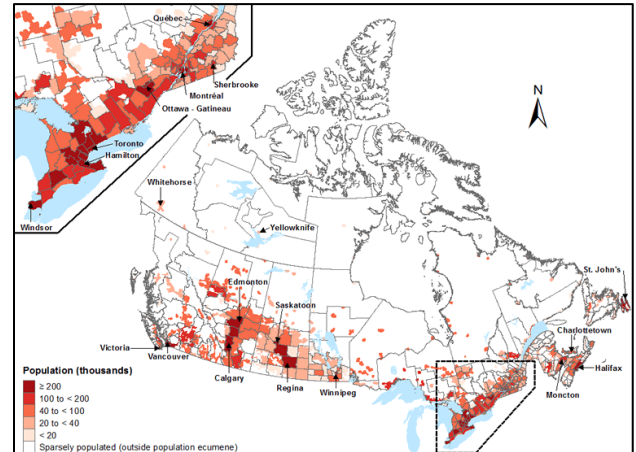


Figure 11: Canadian population density heatmap (source: Canadian government)

The vast majority of milk products in Canada (>90%) are moved by road. The remaining transport modalities include rail for long distances as well as ship and air freight to reach communities separated from the mainland.²⁶

Key supply chain flows

Key flow #1 Farm to processing plant

Raw milk is collected from farms and transported to processing plants via road milk-tankers which hold an average of 40,000 litres. The road milk tankers travel an average distance of 150-250 km from farm to processing plant at a cost of AUD \$0.02-0.03 per litre.²⁷

Farms and processing plants are more concentrated in Quebec and Ontario compared to other provinces, leading to a lower average trip time (refer figure 4). The average distance from farm to processing plant in Quebec and Ontario takes just below the average distance while a trip in Newfoundland can be up to 800km and take up to 8 hours.

²³ Agriculture and Agri-food Canada

²⁴ Statistics Canada

²⁵ Expert Interview

²⁶ Director, North American logistics company

²⁷ Director, North American logistics company, Supply Chain Consultant, Canada. National Director of Transportation, Canadian dairy company.

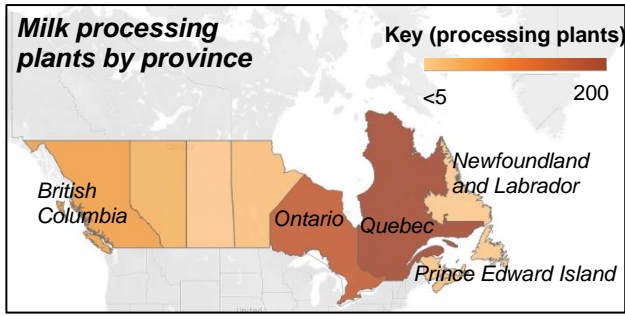


Figure 12: Number of processing plants by province 2020 (Source: Statistics Canada)

Key flow #2 Domestic distribution of fresh milk

Fresh processed milk is manufactured and bottled at processing plants and then stored on-site in refrigerated storage facilities. Fresh processed milk is then transported via road in refrigerated trucks held in crates direct-to-supermarkets or to distribution centres. The average distance travelled to distribution centres and grocery stores is approximately c.50km.

Approximately 80% of fresh processed milk is delivered direct to grocery stores and the remaining c.20% is delivered to warehousing facilities for distribution alongside other tailored products to non-grocery customers such as food service providers.

The variety of routes to end-destinations are as follows:

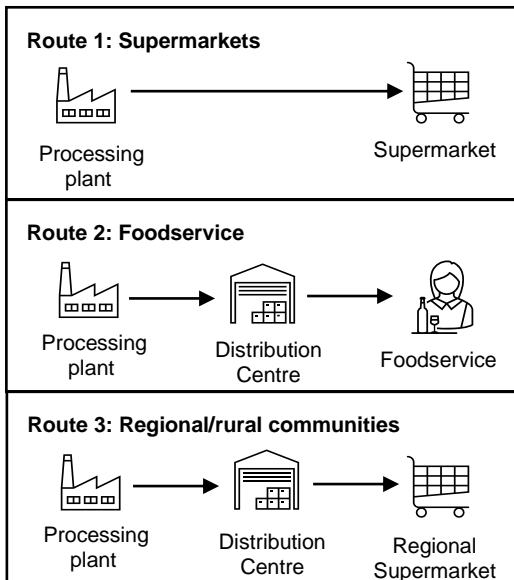


Figure 13: Key routes of fresh-milk to end-destinations (Source: industry participants)

Road is the key mode used for transporting fresh processed milk; however, rail can be used for long

distance trips with air freight and ships used to freight fresh milk to limited offshore locations.

Key flow #3 Exports of milk powder

Milk powder is transported from processing plants via road and rail up to thousands of kilometres to be stored in warehousing in central Canada (e.g., in Manitoba, up to c.2,500km away). Milk powder is held with other products to be exported, generally until market price favours Canadian milk powder exports. Transport to the central warehousing is often slow given the non-perishability of milk powder. Further, the small volumes to be exported prevent the need for product turnover.

Central warehousing allows for the directional uncertainty of international buyers from the east or west. Exports going east will be transported via road or rail to the Port of Montreal while western exports will be transported via road or rail to Vancouver port.²⁸

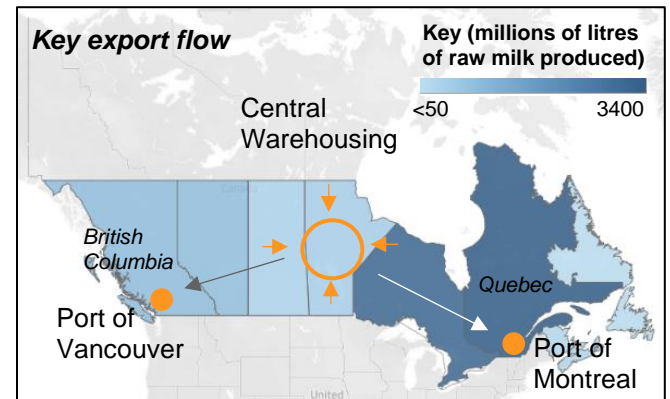


Figure 14: Key flow of dairy exports, including milk powder, in Canada (Source: Industry participants)

Milk freight data in Canada

Canada estimated costs per tkm	Road	Rail
Cost (AUD)	c.\$0.16	c.\$0.05

Table 2: Milk freight cost estimates (Source: Industry participants)

Canada freight costs for road and rail differ significantly per tkm with road freight costing AUD c.\$0.16 and rail costing c.\$0.05.

²⁸ Director, North American logistics company



Data comparison

DATA COMPARISON

A high-level summary of the key freight metrics for each country is shown in the table below.

Estimates	Australia (CSIRO)	New Zealand (Source/method in italics)	Canada (Source/method in italics)
Annual tonnes moved (c. millions)	12.0	c.23.6 ²⁹	c.13.4 ³⁰
Annual net tkm (c. millions)	3,133	c.2,368 ³¹	c.2,360 ³²
Annual trailers / shipments (c. thousands)	506	c.1,177 ³³	c..560 ³⁴
Cost of movement (AUD c.\$ per tkm)	Total, all types – weighted average of road and rail (majority road): Total: \$0.15	Road: \$0.12 Rail (predominantly milk powder): \$0.11 ³⁵ Total, all types – weighted average of road and rail (majority road): \$0.12	Road: ³⁶ \$0.16 Rail: \$0.05 Total, all types – weighted average of road and rail (majority road): \$0.16
Total transport costs (AUD c.\$m)	456	c.283 ³⁷	c.370 ³⁸
Average trip distance (km) ³⁹	Raw milk: 191 Milk: 504 Milk powder: 517	Raw milk: c.70-110 from farm to plant Bottled milk, c.120 from plant to DC Milk powder, depending on region of origin, but up to c.400km (including c.100km from key aggregation DC to port)	Raw milk: c.150-250km from farm to plant Bottled milk: 50km Milk powder: extremely long distances, up to 2500km
Average trip duration (c. hours) ⁴⁰	Raw milk: 2.4 Milk: 6.5 Milk powder: 6.4	Raw milk: 1-2 hours Bottled milk: 1-2 hours Milk powder: up to 6 hours	Raw milk: 2.5-3.5 hours Bottled Milk: 1 hour Milk powder: Over 24 hours

²⁹ [New Zealand National Freight Demand Study \(2017/18\)](#)

³⁰ Canadian Government (converted at a rate of 909L per t)

³¹ New Zealand National Freight Demand Study 2012, grown by c.8% to represent milk growth since 2012.

³² Multiplying tonnes times average distance of c.150km for raw milk and c.50kms for milk and milk powder

³³ Total tonnes divided by c.19 tonnes per trailer (17,600L)

³⁴ Total tonnes divided by c.24 tonnes per trailer

³⁵ [Agrifutures Australia: The Impact of Freight Costs on Australian Farms](#) (AUD \$0.016) per litre.

³⁶ Road and rail estimates taken from an average of interviews with industry participants

³⁷ tkm * Average weighted cost per tkm

³⁸ tkm * Average weighted cost per tkm, assuming a 95% road share (5% rail) from expert interviews

³⁹ Aggregate of interviews with industry participants

⁴⁰ Aggregate of interviews with industry participants

FREIGHT DATA COMPARISON SUMMARY

Milk is an important consumer staple and therefore has a direct impact on household spending. Australia exports a reasonable component of its milk production, and the efficiency of the milk supply chain is an important factor in the competitiveness of these exports. Australia transports 12Mt of milk products each year, moving processed products a significant distance (c.500km) from processing plant to distribution centres. Comparatively, New Zealand transports more than c.24mt of milk products in its supply chain, though the freight tasks are relatively comparable due to the substantially shorter milk transport distances in New Zealand. Canada produces a relatively similar volume of milk products to New Zealand, moving 13.4mt in total, generally travelling shorter distances than Australia.

The cost of transport varies between regions, with Australia's weighted cost of transport being AUD c.\$0.15 per tkm, compared to AUD \$0.12 in New Zealand (AUD \$0.12 per tkm for road and AUD c.\$0.11 per tkm for rail). Industry reports have suggested that this difference is due to a difference in labour costs between the two countries.⁴¹ Canada's road freight rates are estimated to be slightly higher at AUD c.\$0.16 (AUD \$0.16 per tkm, for road and AUD c.\$0.05 per tkm for rail).

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⁴¹ [The Impact of Freight Costs on Australian Farms \(AgriFutures, 2019\)](#)