Food Flows in Metro Vancouver

Final Report

April 30, 2020

Davies Transportation Consulting Inc.

Food Flows in Metro Vancouver

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1 Executive Summary

Davies Transportation Consulting Inc. was engaged by Metro Vancouver to conduct a "Food Flow" study that describes the movements of food commodities to and from within and through Metro Vancouver. Consulting team members included Philip Davies, Abra Brynne and Darryl Anderson. For purposes of this study, food flows include:

- Food products imported from offshore (via the Port of Vancouver or Vancouver International Airport) or the U.S. (via the Metro Vancouver land border crossings) for consumption in Metro Vancouver and the rest of B.C.;
- Food products imported from other provinces for consumption in Metro Vancouver, and food products imported from other provinces which are distributed to the rest of B.C. through Metro Vancouver;
- Food products imported from the rest of B.C. for consumption in Metro Vancouver;
- Food products which are produced in Metro Vancouver which are exported to the rest of B.C.;
- Food products produced and consumed within Metro Vancouver (intra-regional shipments);
- Food products which are exported to offshore destinations through the Port of Vancouver or Vancouver International Airport;
- Food products which are exported to the U.S. through the Lower Mainland border crossings;
- Food products which are either produced in Metro Vancouver or imported from offshore or the U.S. which are exported to other provinces.

A summary of estimated Metro Vancouver food flows by origin in 2018 is shown below. Total food flows are estimated at 33.7 million tonnes.

Figure 1-1 Metro Vancouver Food Flows Summary 2018

Metro Vancouver Food Flows Summary 2018			
Flows	**Tonnes**	**Value CDN$ Millions**	**Avg Value $ per Tonne**
Offshore Imports	1,266,492	$3,424	$2,704
US Imports	1,218,653	$3,045	$2,499
Interprovincial Imports	977,421	$2,613	$2,673
MV Intraprovincial Imports	527,858	$855	$1,620
MV Intraprovincial Exports	101,105	$355	$3,511
MV Intra-Regional Shipments	365,863	$1,118	$3,056
Total BC Food Supply Flows	4,457,393	$11,411	$2,560
Offshore Exports	27,982,248	$15,743	$563
US Exports	685,227	$2,152	$3,141
Interprovincial Exports	569,612	$2,292	$4,023
Total Flows	**33,694,480**	**$31,598**	**$938**

The figures below illustrate these flows by cargo volume and value.[1]

Figure 1-2 Metro Vancouver Food Flows – Volumes

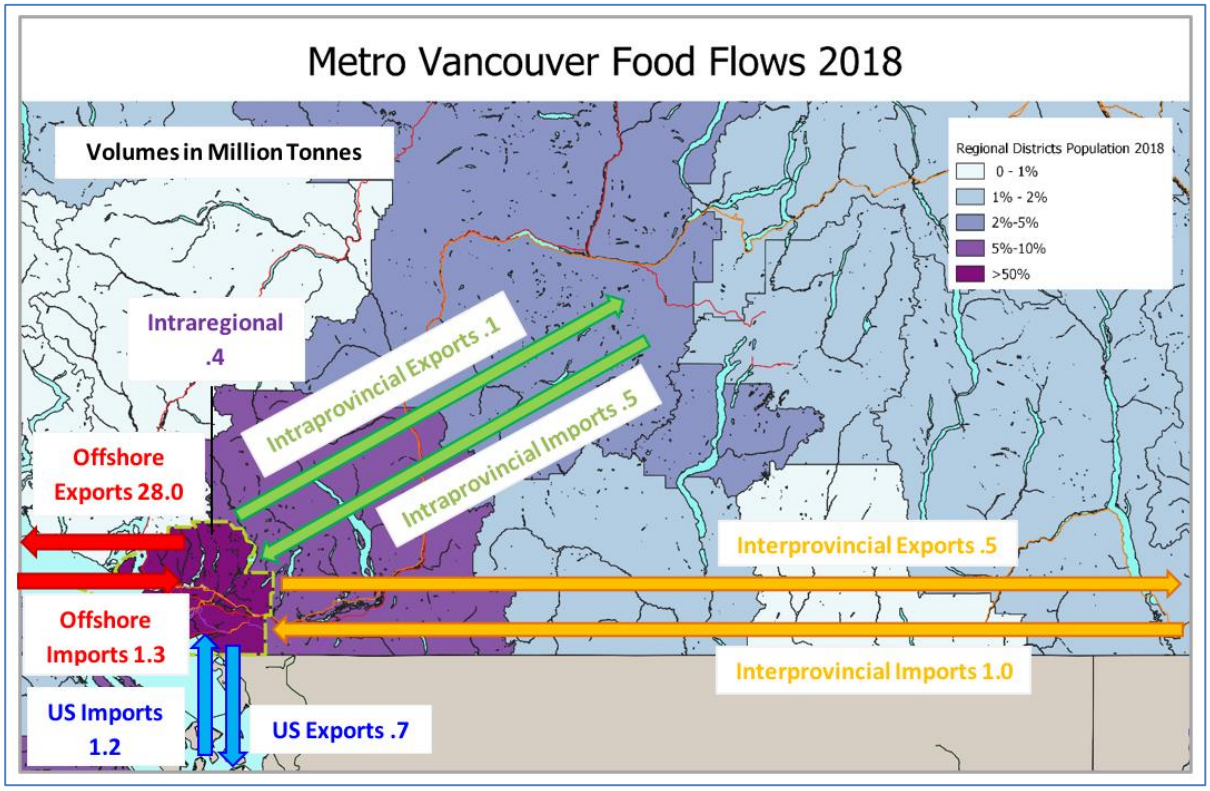
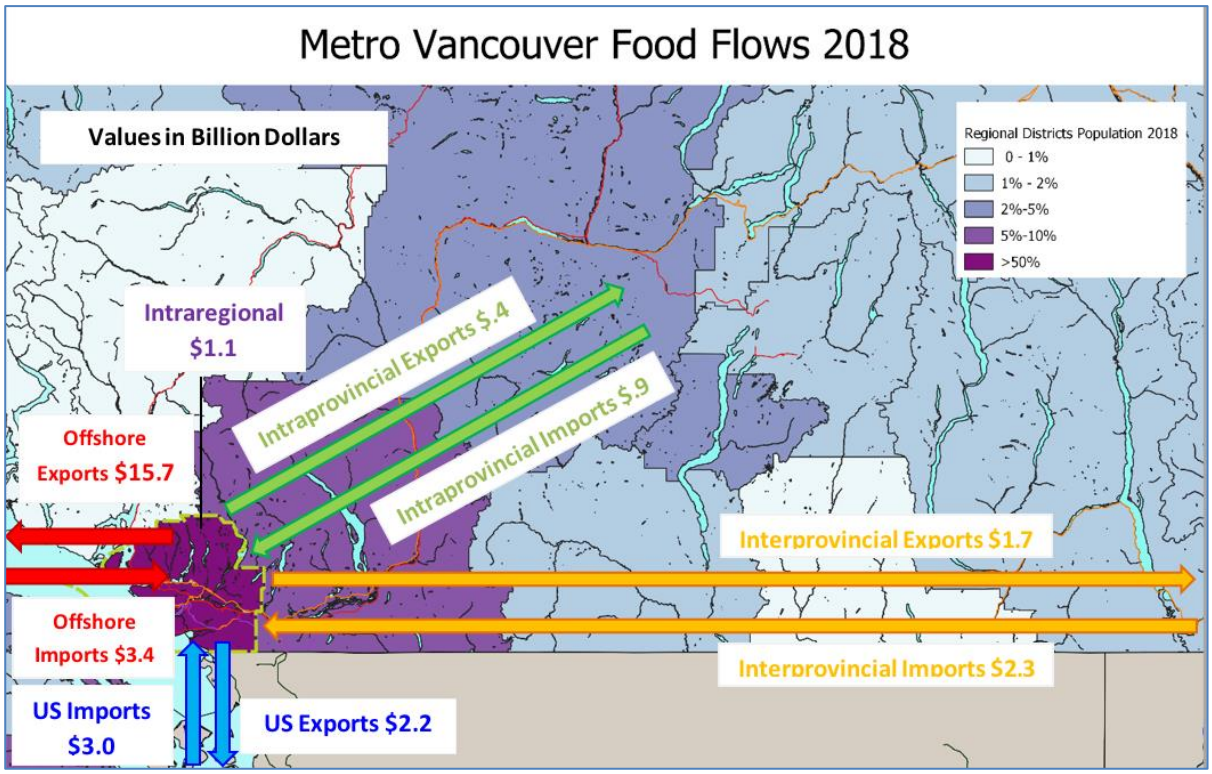


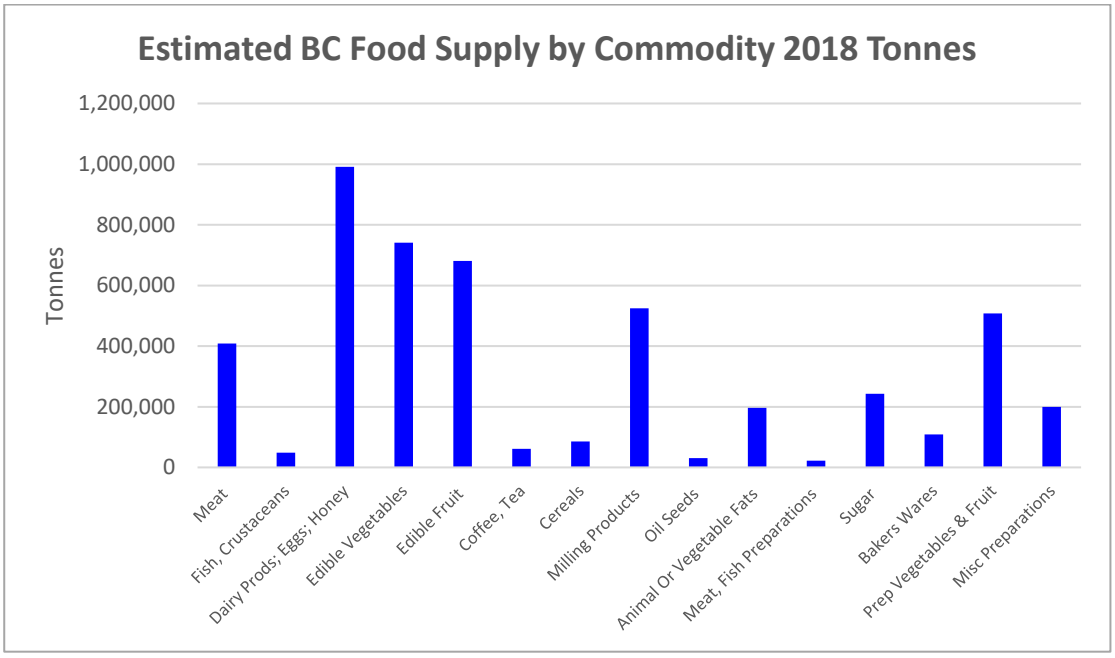
Figure 1-3 Metro Vancouver Food Flows – Values



B.C. Food Supply

The total annual food supply (consumption) for B.C. is estimated at 4.8 million tonnes, distributed among commodity groups as shown below.

Figure 1-4 B.C. Food Supply 2018 – Tonnes



Metro Vancouver Food Flows Related to B.C. Food Supply

Provincial food flows in Metro Vancouver include 100% of the food supply in Metro Vancouver, plus a share of the food flows related to the food supply for the rest of B.C., which flow through Metro Vancouver as a result of the region's role as the distribution hub for the province. The shares of ROBC food supply flowing through Metro Vancouver are estimated as follows:

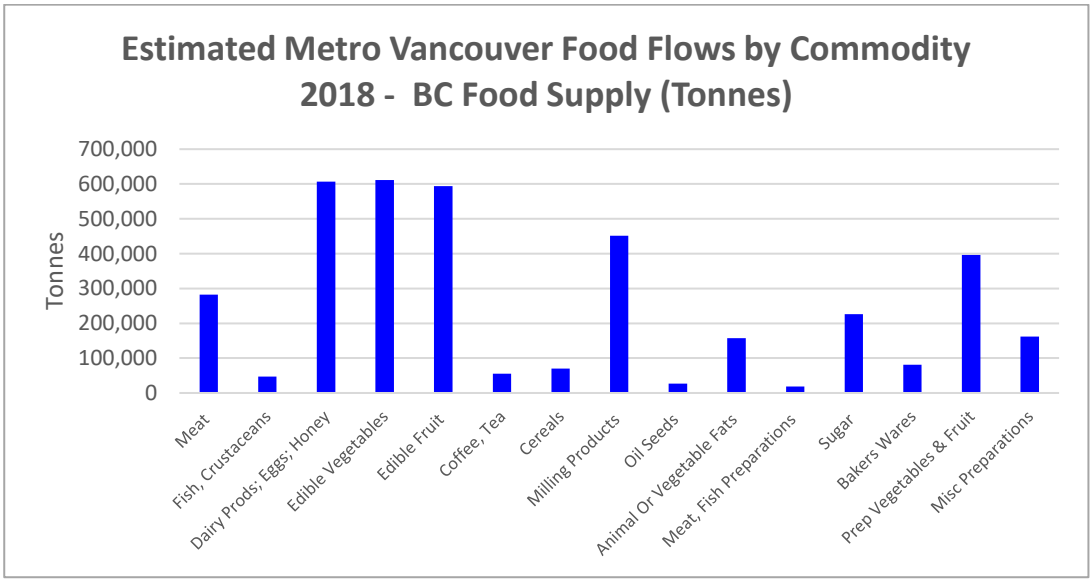
- 100% of offshore imports destined to Metro Vancouver and the rest of B.C. are assumed to flow through Metro Vancouver.

- The share of US imports destined to Metro Vancouver and the rest of B.C. which flows through Metro Vancouver is estimated based on the share of BC imports from the US entering through the two Metro Vancouver land border crossings (Pacific Highway and Lynden/Aldergove).

- 50% of imports from other provinces to the rest of B.C. are assumed to transit Metro Vancouver in its role as a distribution hub.

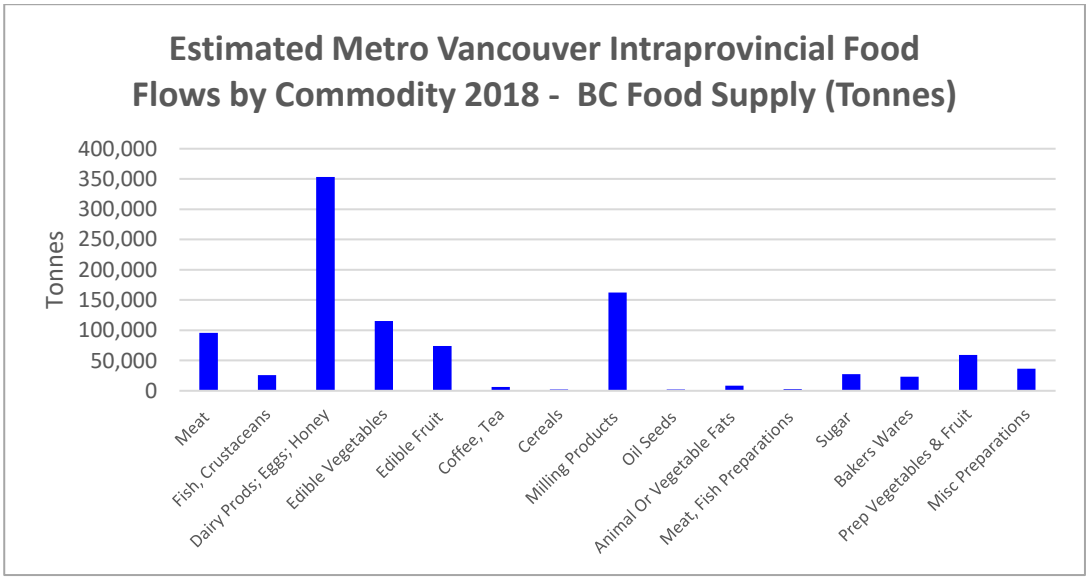
The resulting total Metro Vancouver food flows attributed to the provincial food supply (including both Metro Vancouver and the rest of B.C.) are depicted below. Metro Vancouver food flows related to the B.C. food supply total an estimated 3.8 million tonnes, approximately 78% of the total provincial food supply.

Figure 1-5 Estimated Metro Vancouver Food Flows by Commodity – B.C. Food Supply (Tonnes)



The intraprovincial volumes and shares of the B.C. food supply in 2018 are shown below. The intraprovincial flows are those which originate within B.C., and therefore represent domestic production.

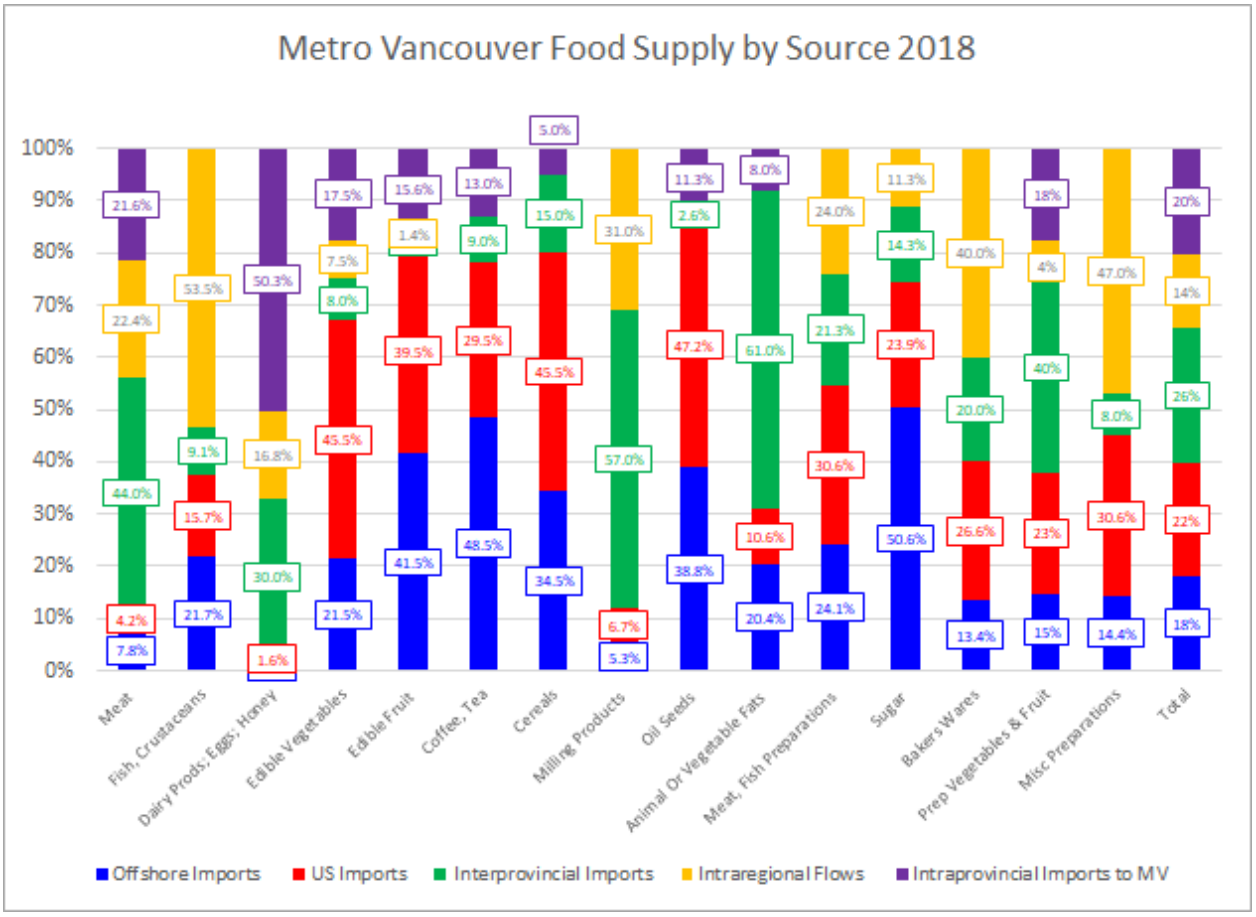
Figure 1-6 Estimated Metro Vancouver Intraprovincial Food Flows by Commodity – B.C. Food Supply (Tonnes) 2018



Supply managed commodities represent the largest portion of intraprovincial shipments. These are goods whose production is regulated by provincial marketing boards, including the BC Milk Marketing Board, BC Egg Marketing Board, BC Chicken Marketing Board, BC Turkey Marketing Board, and BC Vegetable Marketing Commission.

The assessment of Metro Vancouver's level of food self-sufficiency required disaggregating intraprovincial flows (within Metro Vancouver) and intraprovincial imports (products imported into Metro Vancouver from other parts of the province). The analysis used the best available data on agricultural and processed foods production by region. Intraregional flow estimates are based on the share of provincial commodities produced in Metro Vancouver. The estimated percentages of the Metro Vancouver food supply by source are indicated below.

Figure 1-7 Metro Vancouver Food Supply by Source

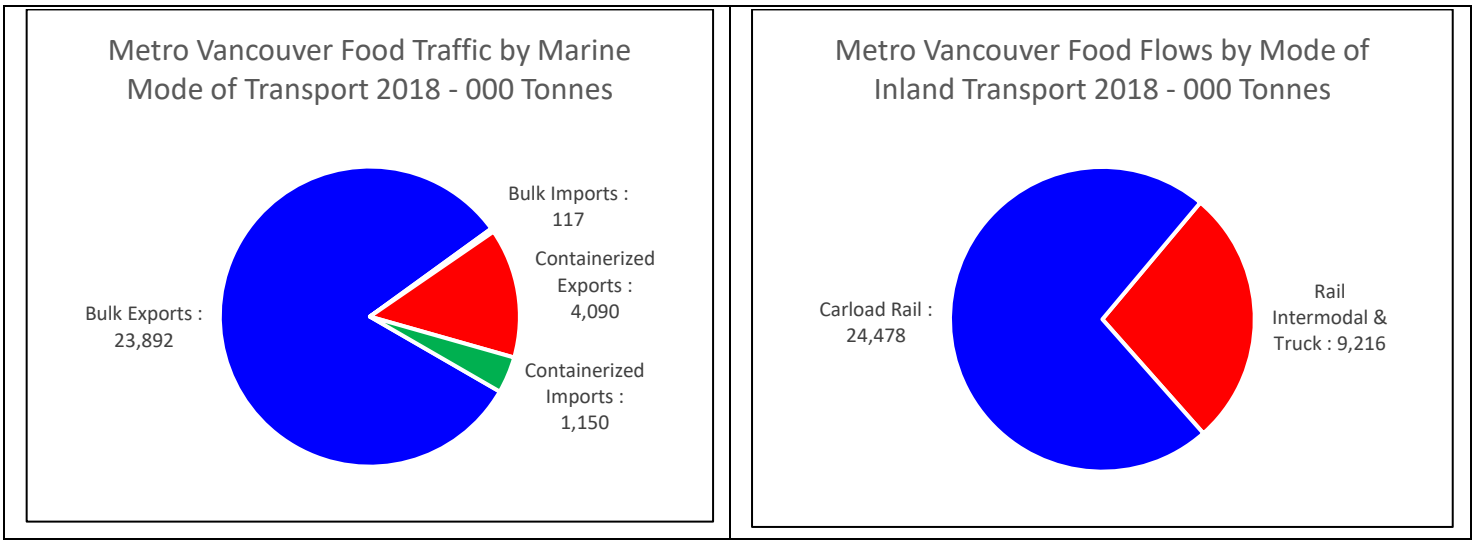


Transportation by Mode

Estimated Metro Vancouver food flows by mode of marine and inland mode of transport are shown below. It is not possible to disaggregate inland flows between rail and truck due to a lack of

available data on Canadian rail intermodal traffic. Air cargo accounts for less than 0.1% of total flows.

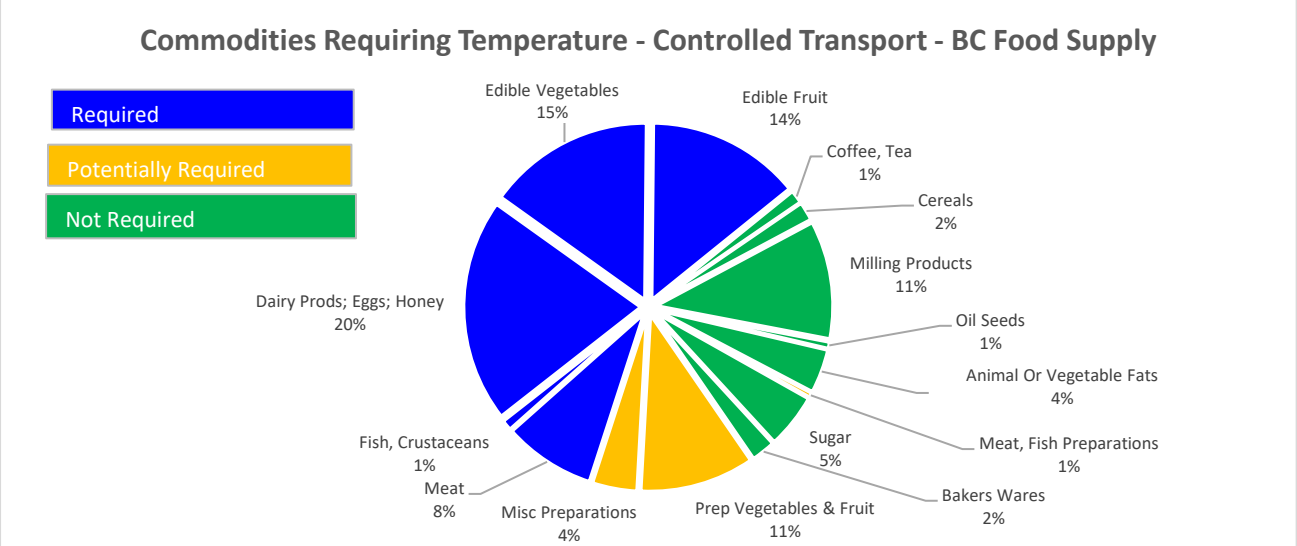
Figure 1-8 Metro Vancouver Food Flows by Mode of Transport 2018



Perishable Food

Perishable food is defined as food products such as meat, poultry, fish, dairy products, unprocessed raw fruits and vegetables that require temperature-controlled transportation and storage. The shares of commodities in the B.C. food supply requiring temperature-controlled transport are shown below. Almost 60% of the total requires temperature-controlled distribution, and an additional 15% may require temperature-controlled transportation if needed to protect from freezing.

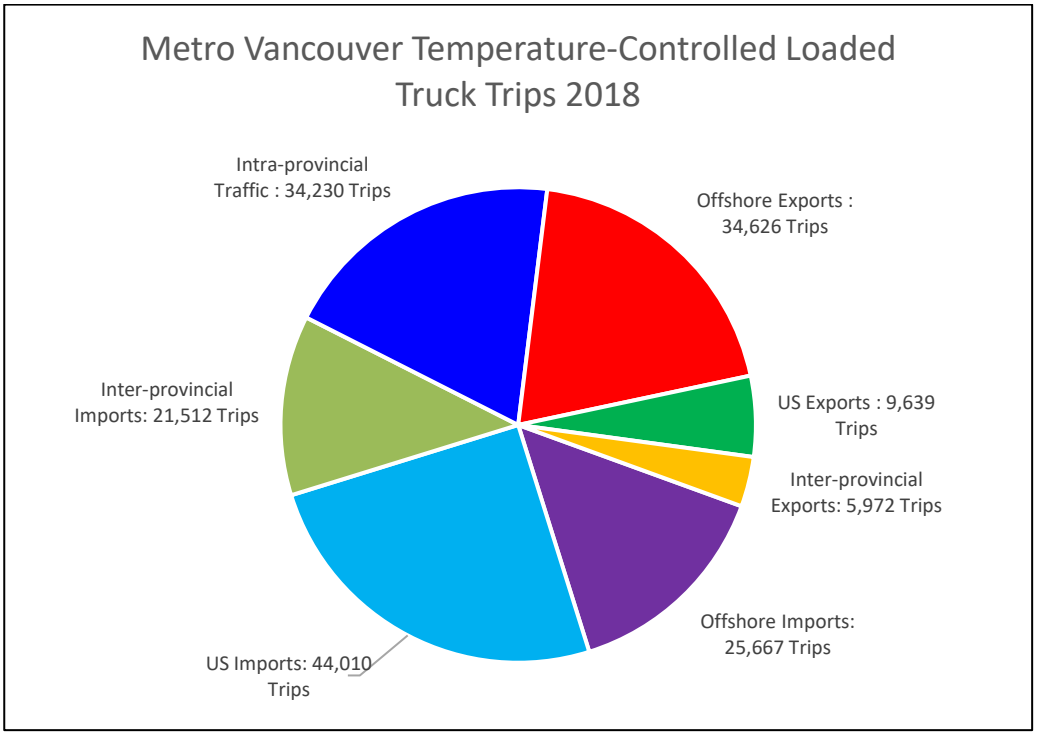
Figure 1-9 Food Commodities Requiring Temperature-Controlled Transport – BC Food Supply



Temperature-Controlled Truck Trips

Temperature-controlled loaded truck trips of food commodities in Metro Vancouver have been estimated based on the volumes of products that require temperature-controlled transport for each origin-destination food flow. The resulting estimates by origin-destination flows are shown below. The estimated annual total is 153,466 temperature-controlled loaded trips (i.e. trips with a truck hauling a loaded refrigerated trailer or intermodal container); this is approximately one-third of the total estimated rail intermodal and trucking volume.

Figure 1-10 Metro Vancouver Temperature-Controlled Loaded Truck Trips by Origin-Destination Flow 2018



2 Introduction

Davies Transportation Consulting Inc. was engaged by Metro Vancouver to conduct a "Food Flow" study that describes how perishable agricultural products move across regional borders. Consulting team members included Philip Davies, Abra Brynne and Darryl Anderson. The research entailed compiling information on the volume of perishable food from agricultural or aquaculture operations imported to and exported from Metro Vancouver, the methods used to transport this food and the entry/exit locations for the food products.

For this study, perishable food is defined as food products that have specific storage requirements such as meat, poultry, fish, dairy products, unprocessed raw fruits and vegetables that require cold storage, as well as bulk grains and pulses. Imports and exports refer to the shipping of commodities to and from the interprovincial, American and global markets.

The table below summarizes the Harmonized System 2-digit (HS2) categories of food products included in the project scope.

Figure 2-1 Commodities Included in Project Scope

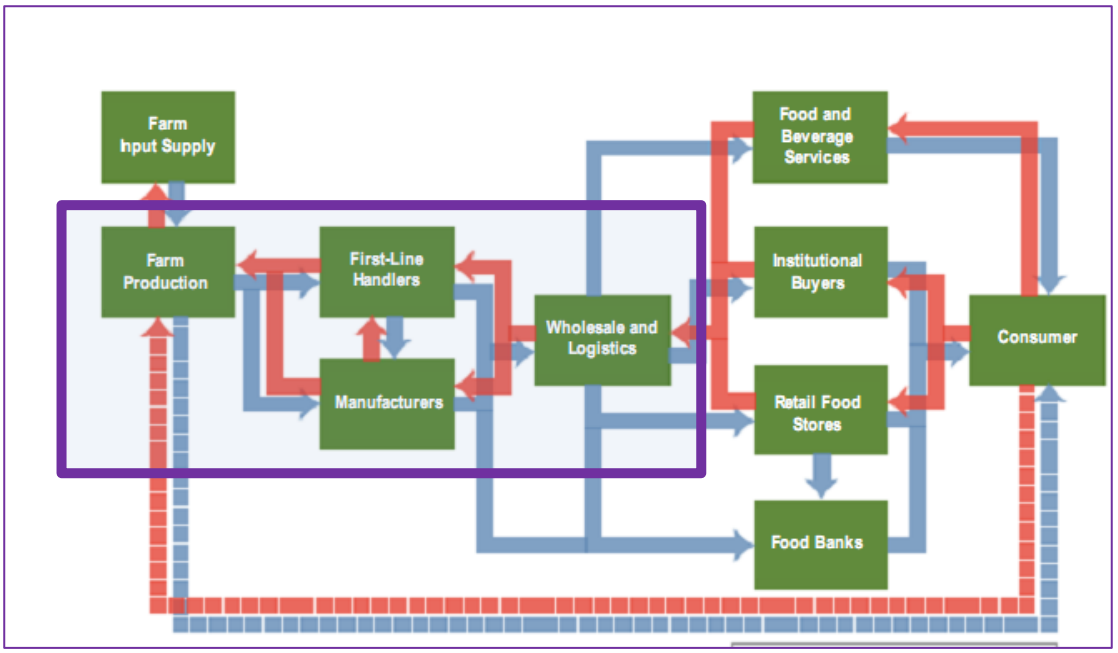
HS2 Code	HS2 Description	HS2 Code	HS2 Description
02	Meat	12	Oil Seeds
03	Fish, Crustaceans	15	Animal Or Vegetable Fats
04	Dairy Prods; Eggs; Honey	16	Meat, Fish Preparations
07	Edible Vegetables	17	Sugar
08	Edible Fruit	19	Bakers Wares
09	Coffee, Tea	20	Prep Vegetables & Fruit
10	Cereals	21	Misc Preparations
11	Milling Products		

Within these categories, the analysis focuses primarily on commodities with the following characteristics:

- Perishable products produced for human consumption.
- Commodities making up a significant share of overall food flows.

The analysis of flows concentrates on the stages of the food supply chain from farm production to wholesale and logistics facilities rather than last-mile deliveries to the point of consumption, as highlighted in the diagram below.

Figure 2-2 Food Flows Study Primary Scope[1]



[1] Adapted from A Framework for Assessing Effects of the Food System Malden C. Nesheim, Maria Oria, and Peggy Tsai Yih, Editors; Committee on a Framework for Assessing the Health, Environmental, and Social Effects of the Food System; Food and Nutrition Board; Board on Agriculture and Natural Resources; Institute of Medicine; National Research Council Copyright 2015 by the National Academy of Sciences.

3 Food Flows

3.1 Food Flow Origins and Destinations

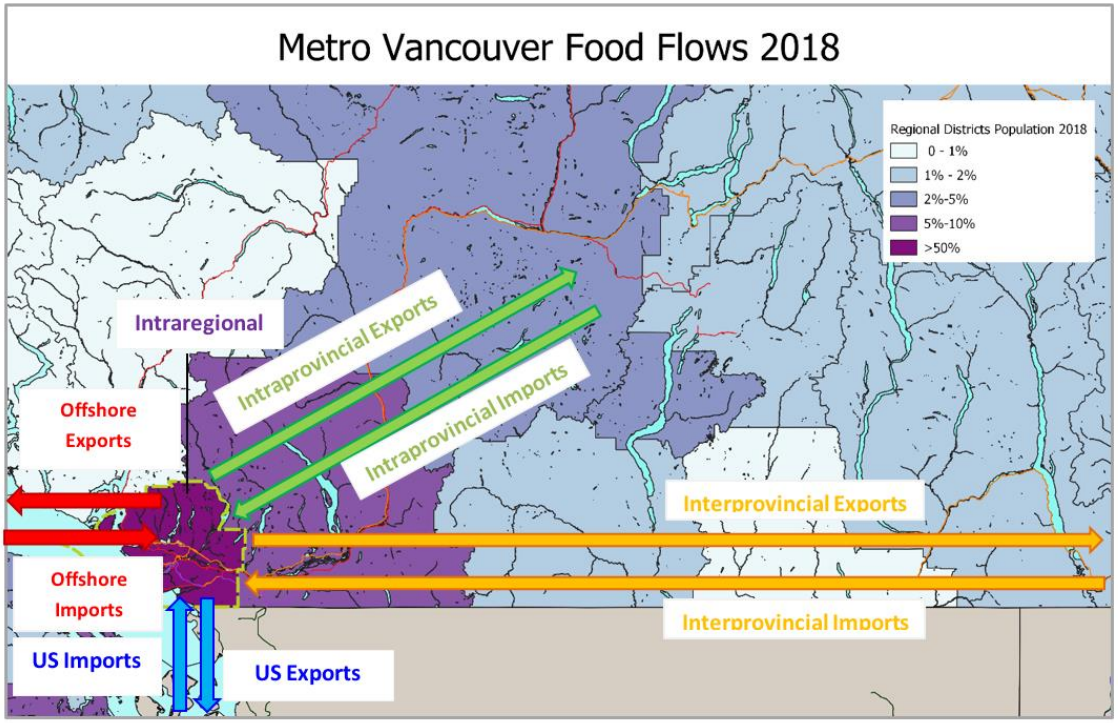
Metro Vancouver cargo flows related to food consumption can be divided into two categories:

- Food consumed in Metro Vancouver;

- Food consumed elsewhere which travels through Vancouver en route to the point of consumption.

Metro Vancouver food flows can be further categorized by origins and destination as illustrated and defined below.

Figure 3-1 Metro Vancouver Food Flows



- **Intraregional Flows:** food which is produced and consumed in Metro Vancouver.

- **Intraprovincial Imports**: food which is produced in B.C. outside of Metro Vancouver and transported to Metro Vancouver for consumption.

- **Intraprovincial Exports**: food which is produced in Metro Vancouver and transported to other regions of B.C. for consumption.

- **Interprovincial Imports**: food which is produced in the other provinces of Canada and transported to Metro Vancouver for consumption.

- **Interprovincial Exports**: food which is produced in Metro Vancouver and transported to other provinces for consumption.

- **U.S. Imports**: food produced in the U.S. and transported to Metro Vancouver or through Metro Vancouver to other Canadian locations for consumption.

- **U.S. Exports**: food produced in Metro Vancouver or other locations in Canada and transported through Metro Vancouver for consumption in the U.S.

- **Offshore Imports**: food produced in overseas countries and transported to Metro Vancouver or through Metro Vancouver to other Canadian locations for consumption.

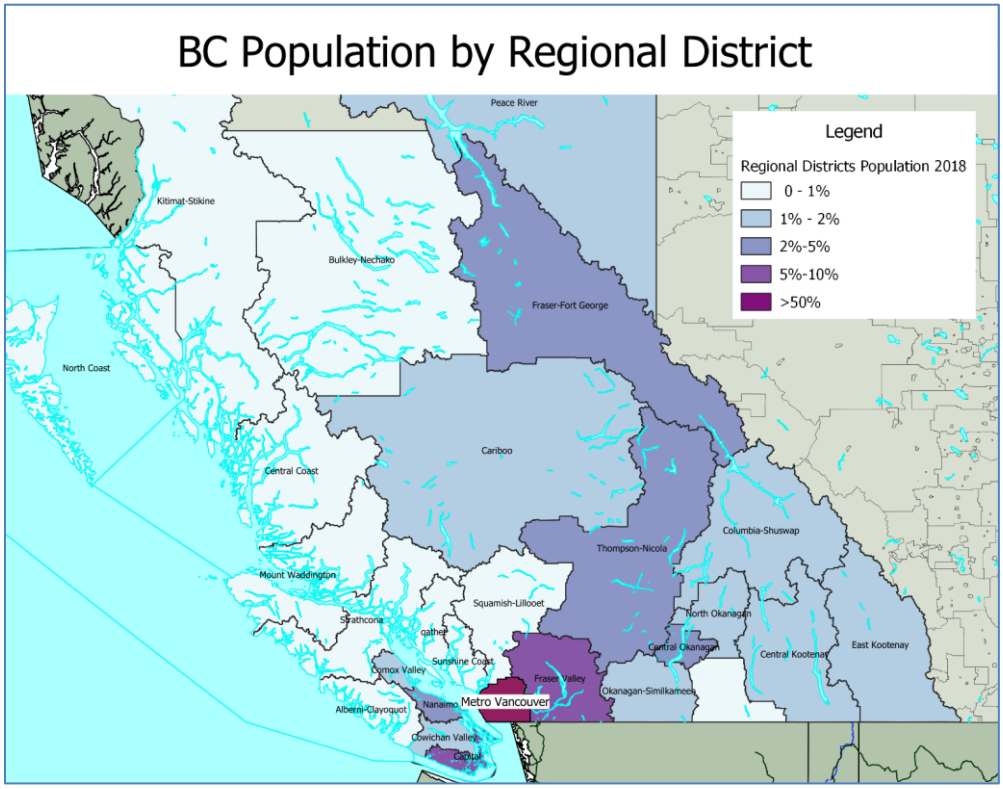
- **Offshore Exports**: food produced in Metro Vancouver or other locations in Canada and transported through Metro Vancouver for consumption in overseas countries.

3.2 Factors Influencing Food Flows

3.2.1 Population

Population determines the relative magnitude of food consumption in each region. In 2018 Metro Vancouver accounted for 53% of the population of British Columbia, and consequently the largest share of consumption in the province.

Figure 3-2 B.C. Population by Regional District



The Regional Districts with the next largest share include the Capital Region with 8%; Fraser Valley with 6%; and Central Okanagan with 4%.

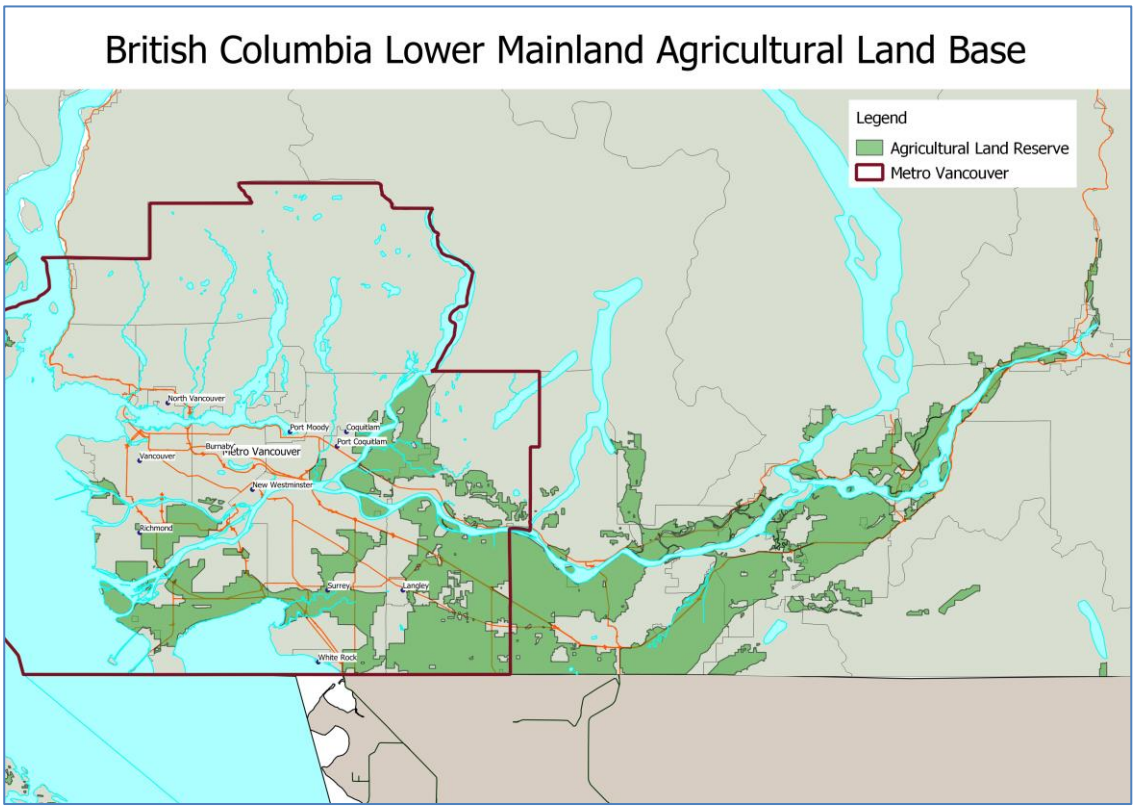
3.2.2 Agricultural Land Base

The agricultural land base determines the production potential of each region and is a major influence on food flows. Due to the mountainous topography of the province, B.C. has a limited agricultural land base. Through the provincial *Agricultural Land Commission Amendment Act*, agricultural land is designated for agriculture as the priority use, and non-agricultural uses are restricted. The figure below shows lands in the Agricultural Land Reserve in B.C.

Figure 3-3 B.C. Agricultural Land Base

The following figure shows the extent of the Agricultural Land Reserve in the Lower Mainland, including Metro Vancouver.

Figure 3-4 B.C. Lower Mainland Agricultural Base



The types of commodities which can be economically produced within BC are limited by the climate. For example, BC's temperate climate makes it unsuitable for commercial production of tropical fruit so the province is dependent on supplies from the U.S. or offshore countries.

3.2.3 Location and Transportation Infrastructure

The magnitude of Metro Vancouver food flows is influenced by the region's location and transportation infrastructure. In general, transportation costs increase with distance so closer sources of supply are preferred.

The routing of food flows is also dependent on the efficiency and capacity of transportation infrastructure. Metro Vancouver is the primary entry point in B.C. for U.S. and offshore trade flows. The Metro Vancouver border crossings (Pacific Highway and Aldergrove) accounted for 84% of B.C.'s imports from the U.S. and 70% of B.C.'s exports to the U.S. by value at the land border crossings in 2018.

Food-related offshore ocean freight in B.C. moves through the Ports of Vancouver or Prince Rupert. Port of Prince Rupert food-related ocean freight flows consist primarily of bulk or containerized grain exports, and imports are generally destined outside of B.C., so the Port of Vancouver has the dominant role in offshore food flows related to the food supply in B.C.

Virtually all international air cargo in B.C. passes through Vancouver International Airport.

4 International Trade

4.1 Port of Vancouver Imports and Exports

Statistics on Port of Vancouver food imports and exports in 2018 by commodity group are shown below.[2] Food traffic totalled 29.2 million tonnes in 2018. Exports accounted for 96% of total traffic.

Figure 4-1 Port of Vancouver Food Imports and Exports 2018

Port of Vancouver Food Imports and Exports 2018 (Tonnes)				
	Imports		Exports	
HS2 Description	000 Tonnes	Share of Imports	000 Tonnes	Share of Exports
Meat	34,843	2.8%	592,196	2.1%
Fish, Crustaceans	149,806	11.8%	110,535	0.4%
Dairy Prods; Eggs; Honey	9,831	0.8%	23,084	0.1%
Edible Vegetables	107,555	8.5%	3,662,830	13.1%
Edible Fruit	154,221	12.2%	21,221	0.1%
Coffee, Tea, Spices	37,547	3.0%	3,342	0.0%
Cereals	103,138	8.1%	11,883,470	42.5%
Milling Products	56,127	4.4%	165,855	0.6%
Oil Seeds	15,771	1.2%	9,647,473	34.5%
Animal Or Vegetable Fats	33,604	2.7%	1,647,964	5.9%
Meat, Fish Preparations	4,030	0.3%	1,238	0.0%
Sugar	143,163	11.3%	40,420	0.1%
Bakers Wares	52,574	4.2%	2,377	0.0%
Prep Vegetables & Fruit	157,572	12.4%	61,929	0.2%
Misc Preparations	206,711	16.3%	118,316	0.4%
Total	1,266,492	100.0%	27,982,248	100.0%

[2] Source: Port of Vancouver.

Exports by commodity are shown in the figure and table below.

Figure 4-2 Port of Vancouver Food Exports 2018

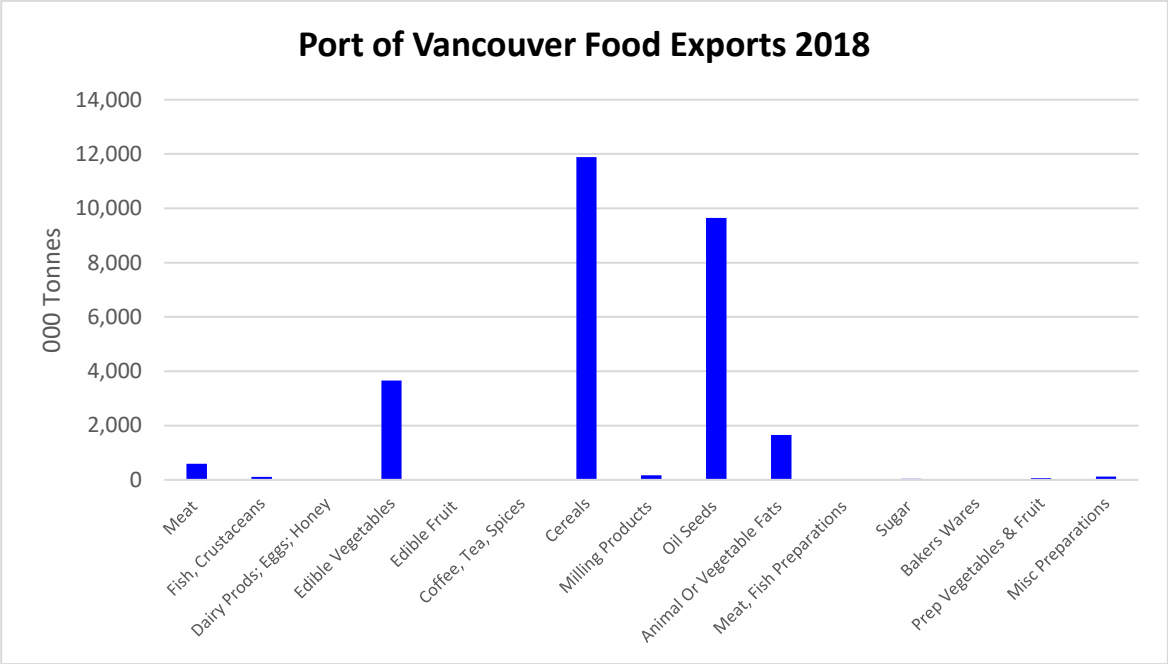


Figure 4-3 Port of Vancouver Food Exports – Major Commodities 2018

Port of Vancouver Food Exports - Major Commodities 2018				
HS2 Code	**HS2 Description**	**Commodity Name**	**2018 Tonnes**	**Share**
10	Cereals	Wheat	8,653,270	31%
12	Oil Seeds	Canola	7,493,479	27%
7	Edible Vegetables	Dried Pea	2,561,155	9%
12	Oil Seeds	Soybean	1,917,768	7%
10	Cereals	Malt Barley	1,823,744	7%
15	Animal or Vegetable Fats	Canola Oil	1,551,853	6%
10	Cereals	Durum Wheat	993,802	4%
7	Edible Vegetables	Dried Lentil	943,042	3%
2	Meat	Frozen Pork	304,104	1%
		Others	1,740,222	6%
		Total	27,982,438	100%

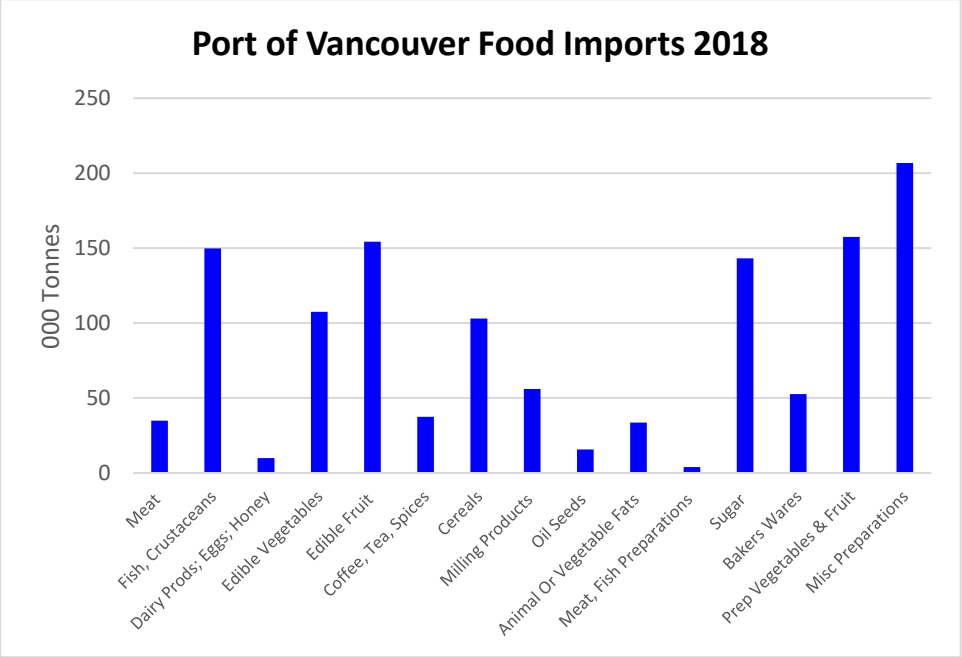
Export traffic consists primarily of grains, oilseeds and specialty crops[3] produced in the Prairie provinces and shipped directly by rail to terminal elevators at the Port.

Figure 4-4 Origins of Grains, Oilseeds and Specialty Crops Exports Through Vancouver Crop Year 2017/2018[4]

Origins of Grains, Oilseeds and Specialty Crops Shipped to the Port of Vancouver		
Crop Year 2017/2018		
Province	**000 Tonnes**	**Share**
Saskatchewan	13,471	51%
Alberta	11,378	43%
Manitoba	1,326	5%
British Columbia	213	1%
Grand Total	26,388	100%

Imports consist of consumer products and commodities used as inputs in local production of food products, such as raw cane sugar.

Figure 4-5 Port of Vancouver Food Imports 2018



[3] Specialty crops include peas, lentils, mustard seed, canary seed, beans, sunflower seed, and buckwheat.

[4] Source: Grain Monitor Program Open Data Center Quorum Corporation http://grainmonitor.ca/GMODS/

The table below shows the estimated value of food imports and exports through the Port of Vancouver in 2018, based on average export prices of major commodities.[5] Total value is estimated at $19.2 billion, $3.4 billion for imports and $15.7 billion for exports.

Figure 4-6 Port of Vancouver Import and Export Values 2018

Port of Vancouver Food Imports and Exports 2018 (Cdn $ Millions)				
	Imports		Exports	
HS2 Description	CDN $ Millions	Share of Imports	Cdn$ Millions	Share of Exports
Meat	$218	6%	$2,454	16%
Fish, Crustaceans	$179	5%	$266	2%
Dairy Prods; Eggs; Honey	$55	2%	$79	1%
Edible Vegetables	$180	5%	$1,558	10%
Edible Fruit	$450	13%	$67	0%
Coffee, Tea, Spices	$200	6%	$14	0%
Cereals	$112	3%	$3,808	24%
Milling Products	$70	2%	$131	1%
Oil Seeds	$8	0%	$5,358	34%
Animal or Vegetable Fats	$79	2%	$1,601	10%
Meat, Fish Preparations	$255	7%	$7	0%
Sugar	$222	6%	$33	0%
Bakers Wares	$110	3%	$9	0%
Prep Vegetables & Fruit	$620	18%	$80	1%
Misc Preparations	$666	19%	$279	2%
Total	$3,424	100%	$15,743	100%

[5] Source: Canadian International Merchandise Trade Database https://www5.statcan.gc.ca/cimt-cicm/home-accueil?lang=eng

4.2 YVR Air Cargo

According to Statistics Canada, enplaned/deplaned (E/D) air cargo at Vancouver International Airport (YVR) totalled 321,318 tonnes in 2018, as detailed below.[6] Details on commodities shipped and direction of traffic (inbound or outbound) are not available.

Figure 4-7 Vancouver International Airport Total Air Cargo 2018

Vancouver International Airport Air Cargo 2018		
	2018 Tonnes	Share
Domestic sector	114,795	36%
Transborder sector	42,267	13%
Other International sector	164,256	51%
Total cargo loaded and unloaded	321,318	100%

Air cargo is carried domestically within Canada as well as internationally to the U.S., the Asia-Pacific Region, Europe, and Mexico and the Caribbean. Estimates of the value of YVR air cargo by cargo type are shown below. [7]

Figure 4-8 Value of YVR Air Cargo 2018

Estimated Value of YVR Enplaned/Deplaned Air Cargo 2018			
Cargo Type	**Value (CDN $ Millions)**	**Tonnes**	**Average Value CDN$/Tonne**
International Exports	$3,393	76,470	$44,370
International Imports	$6,099	73,324	$83,179
Domestic Outbound	$4,600	103,217	$44,566
Domestic Inbound	$4,408	98,898	$44,571
Total	$18,500	351,909	$52,570

Data on the commodity composition of domestic cargo is not available. The table below shows the value of international exports by commodity for 2018. An analysis of air cargo by value done for the Vancouver International Airport Authority (YVR) indicates that the value of food imports and exports totalled $603 million in 2018, approximately 6% of the total.[8] Under the assumption

[6] Source: Statistics Canada Air Cargo Traffic at Canadian Airports Table: 23-10-0254-01. Note that Statistics Canada statistics do not include cargo shipments by regional airlines.
[7] Source: Vancouver International Airport Cargo Valuation Study 2019 Update Intervistas for Vaoncouver International Airport August 2019 p. ii.
[8] Ibid., p. 16.

that the share of cargo by weight is the same as for value, international food shipments would amount to approximately 9,000 tonnes, less than 0.1% of total food flows.

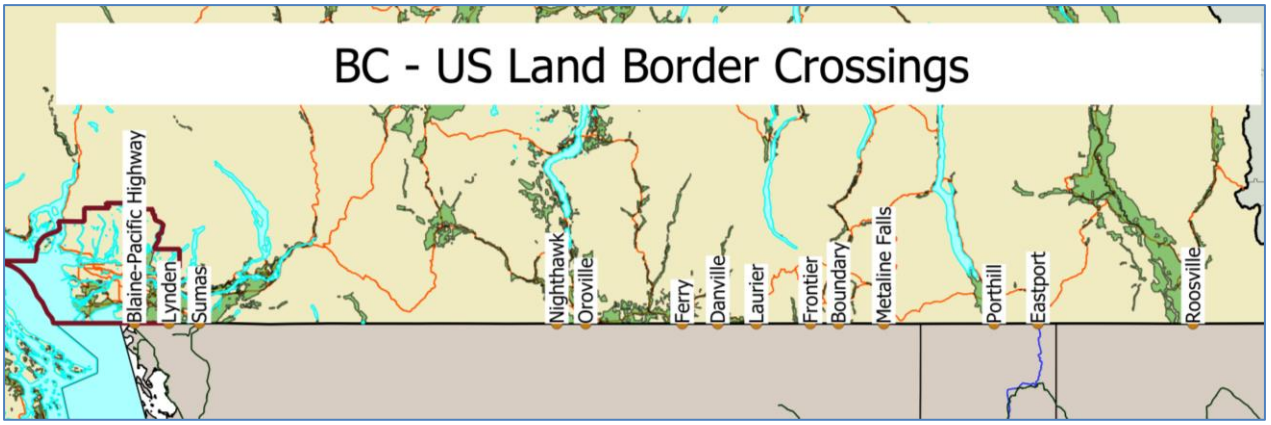
Figure 4-9 Vancouver International Airport International Air Cargo Value 2018

YVR International Air Cargo Value 2018 (CDN$ Millions)		
Commodity	**Imports**	**Exports**
Seafood & Meat	$121	$398
Vegetables	$15	$17
Fruits	$13	$39
Food Total	$149	$454
Other Perishables	$27	$32
Other Commodities	$5,923	$2,907
Total	$6,099	$3,393

4.3 US Imports and Exports

The locations of B.C. – U.S. land border crossings are shown below.[9]

Figure 4-10 BC – US Land Border Crossings

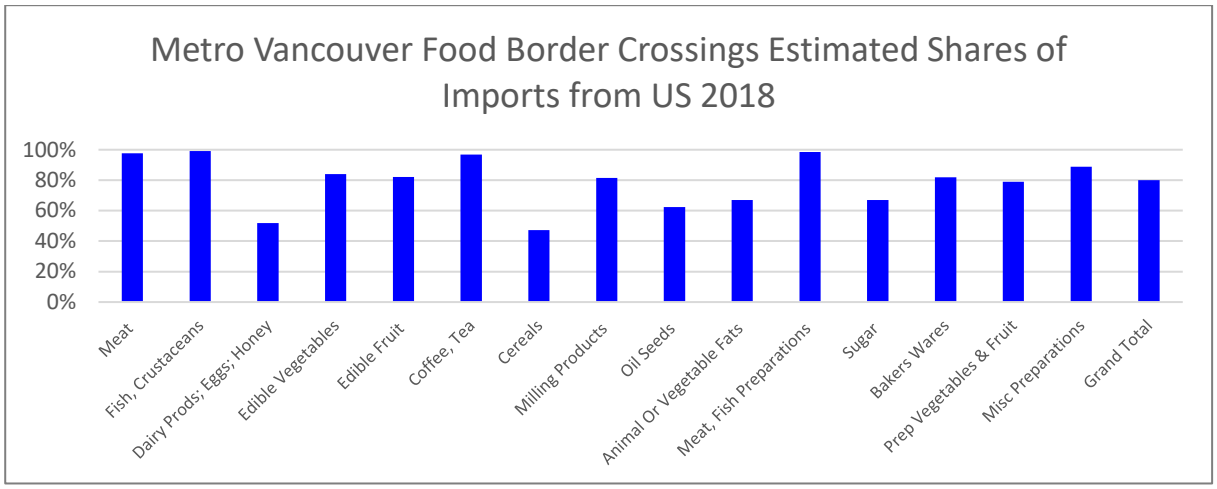


There are two commercial crossings within Metro Vancouver: Blaine (Pacific Highway) and Lynden (Aldergrove). Pacific Highway is by far the busiest commercial crossing in BC, accounting for 81% of food imports and 68% of food exports. The second largest commercial crossing is Eastport (Kingsgate) with 10% of food imports, followed by Sumas (Abbotsford) with 5% in 2018.

[9] Excluding Blaine – Peace Arch (passenger only crossing) and Point Roberts. The names are the U.S. designations for the crossings.

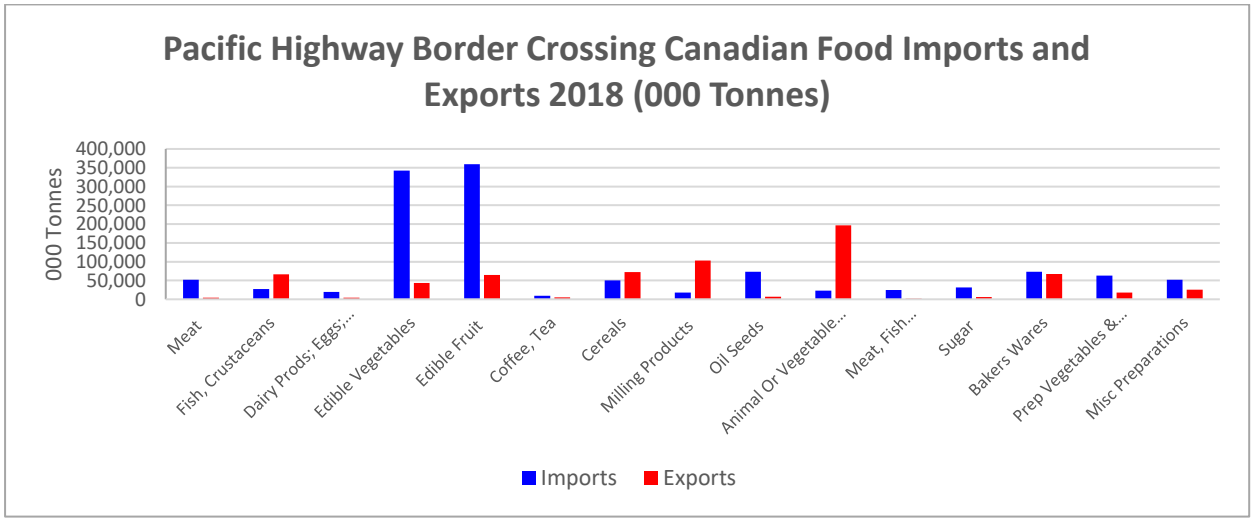
Estimated shares of B.C. import traffic at the land border crossings through the two Metro Vancouver border crossings are shown below, based on product values. [10]

Figure 4-11 Metro Vancouver Border Crossings Import Shares



Total tonnage of imports and exports at the Metro Vancouver border crossings by commodity group has been estimated based on product values for the Pacific Highway border crossing and average values per tonne calculated from Canadian customs data retrieved from the Canadian International Merchandise Trade Database.[11] Details of food import and export estimates by category are shown below.

Figure 4-12 Pacific Highway Border Crossing Imports and Exports Tonnage by Commodity Group



[10] Source: USA Trade Online https://usatrade.census.gov/
[11] Canadian International Merchandise Trade Database https://www5.statcan.gc.ca/cimt-cicm/home-accueil?lang=eng

B.C. imports from the U.S. totalled 1.2 million tonnes, compared to 685,000 tonnes of exports. Fruits and vegetables account for 58% of imports. The category with the largest share of exports is animal or vegetable fats (primarily tallow and rapeseed (canola) oil).

Figure 4-13 Pacific Highway Food Imports and Exports 2018 – Volume

Pacific Highway Food Imports and Exports 2018 (Tonnes)				
	CDN Imports		CDN Exports	
HS2 Description	Tonnes	Share of Imports	Tonnes	Share of Exports
Meat	52,189	4.3%	4,579	1%
Fish, Crustaceans	27,167	2.2%	66,014	10%
Dairy Prods; Eggs; Honey	19,500	1.6%	4,451	1%
Edible Vegetables	342,605	28.1%	43,151	6%
Edible Fruit	359,507	29.5%	65,030	9%
Coffee, Tea, Spices	9,426	0.8%	4,850	1%
Cereals	50,539	4.1%	72,095	11%
Milling Products	17,851	1.5%	102,710	15%
Oil Seeds	72,853	6.0%	7,220	1%
Animal Or Vegetable Fats	23,368	1.9%	196,489	29%
Meat, Fish Preparations	24,406	2.0%	1,730	0%
Sugar	31,193	2.6%	5,979	1%
Bakers Wares	72,933	6.0%	67,461	10%
Prep Vegetables & Fruit	62,925	5.2%	17,595	3%
Misc Preparations	52,189	4.3%	25,873	4%
Total	1,218,653	100.0%	685,227	100%

The value of food imports and exports at the Metro Vancouver border crossings by commodity group in 2018 is shown below. The value of imports totalled $3.0 billion, compared to $2.1 billion for exports.

Figure 4-14 Pacific Highway Border Crossing Imports and Exports Value by Commodity Group

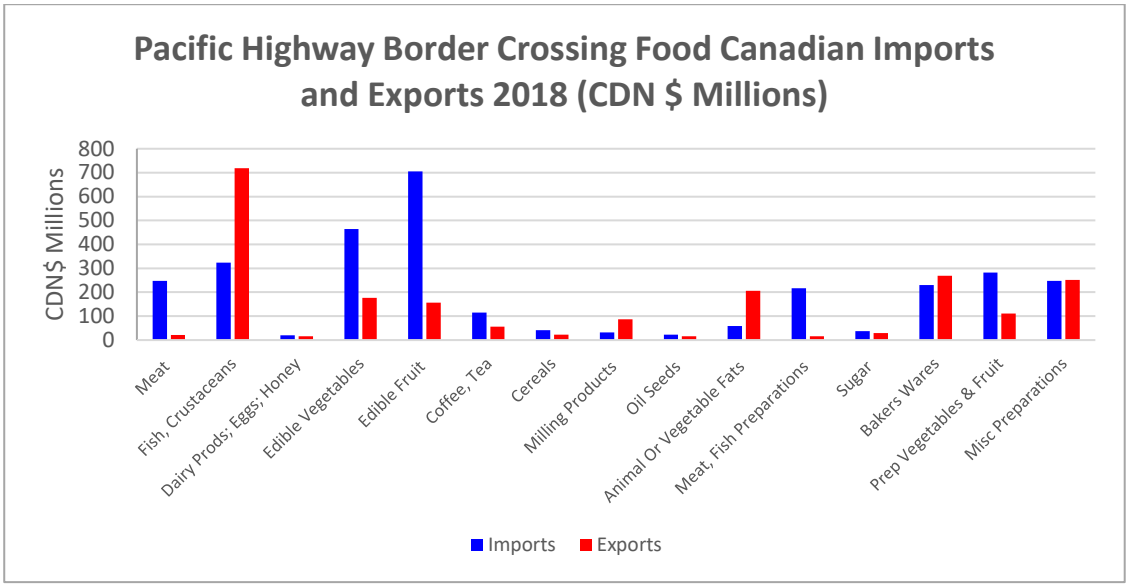


Figure 4-15 Pacific Highway Food Imports and Exports 2018 – Value

Pacific Highway Food Imports and Exports 2018 (Cdn $ Millions)				
	CDN Imports		CDN Exports	
HS2 Description	CDN$ Millions	Share of Imports	CDN$ Millions	Share of Exports
Meat	$248	8%	$22	1%
Fish, Crustaceans	$323	11%	$718	33%
Dairy Prods; Eggs; Honey	$20	1%	$16	1%
Edible Vegetables	$464	15%	$177	8%
Edible Fruit	$706	23%	$157	7%
Coffee, Tea, Spices	$115	4%	$56	3%
Cereals	$41	1%	$23	1%
Milling Products	$33	1%	$87	4%
Oil Seeds	$23	1%	$16	1%
Animal Or Vegetable Fats	$59	2%	$206	10%
Meat, Fish Preparations	$217	7%	$16	1%
Sugar	$37	1%	$29	1%
Bakers Wares	$231	8%	$269	12%
Prep Vegetables & Fruit	$282	9%	$111	5%
Misc Preparations	$248	8%	$251	12%
Total	$3,045	100%	$2,152	100%

5 Food Supply in BC and Metro Vancouver

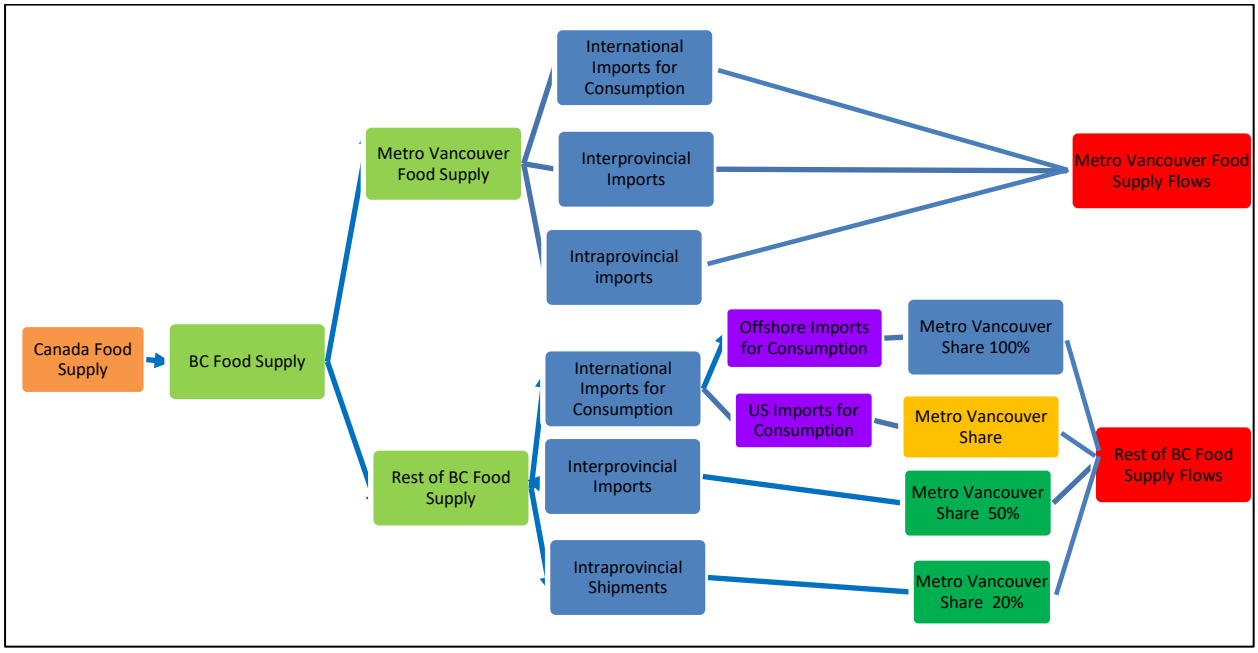
5.1 Methodology

Food flows in Metro Vancouver related to the food supply for the province include:

- 100% of the food supply in Metro Vancouver;
- A share of the food flows related to the remaining provincial food supply which flow through Metro Vancouver by virtue of the regional role as the distribution hub for the province.

The diagram below depicts the methodology used to estimate Metro Vancouver food flows related to the food supply for the region and for the rest of B.C.

Figure 5-1 Estimation of Food Flows for Metro Vancouver and BC Food Supply



Variable	Source	Units
Canada Food Supply	Statistics Canada Food Availability	kg/person
Metro Vancouver Food Supply	Shares based on BC Stats regional population estimates	tonnes
Rest of BC Food Supply		
Food Supply by Source	Shares based on Statistics Canada Interprovincial Trade Tables	value (CDN$)
International Imports Offshore	Shares based on Statistics Canada International Trade Data	value (CDN$)
International Imports US		
Metro Vancouver Share of US Imports	US Customs Data	value (US$)

5.2 Statistics Canada Food Availability Statistics

The starting point for estimating Metro Vancouver food flows related to regional and provincial consumption is the estimates of food supply developed by Statistics Canada through their food statistics program. The food statistics tables are designed to provide annual measures of food availability per person along with supply and disposition of selected food products. A wide range of food products consumed by Canadians is covered by this program. These include dairy products, beverages, eggs, pulses and nuts, sugars and syrups, cereal products, meats and poultry, citrus fruits, fresh fruits, processed fruits, fresh vegetables, processed vegetables, juices, oils and fats, and fish.[14]

Food products used as inputs for food production but not typically consumed directly are not included in the food supply statistics. For Metro Vancouver, these consist primarily of:

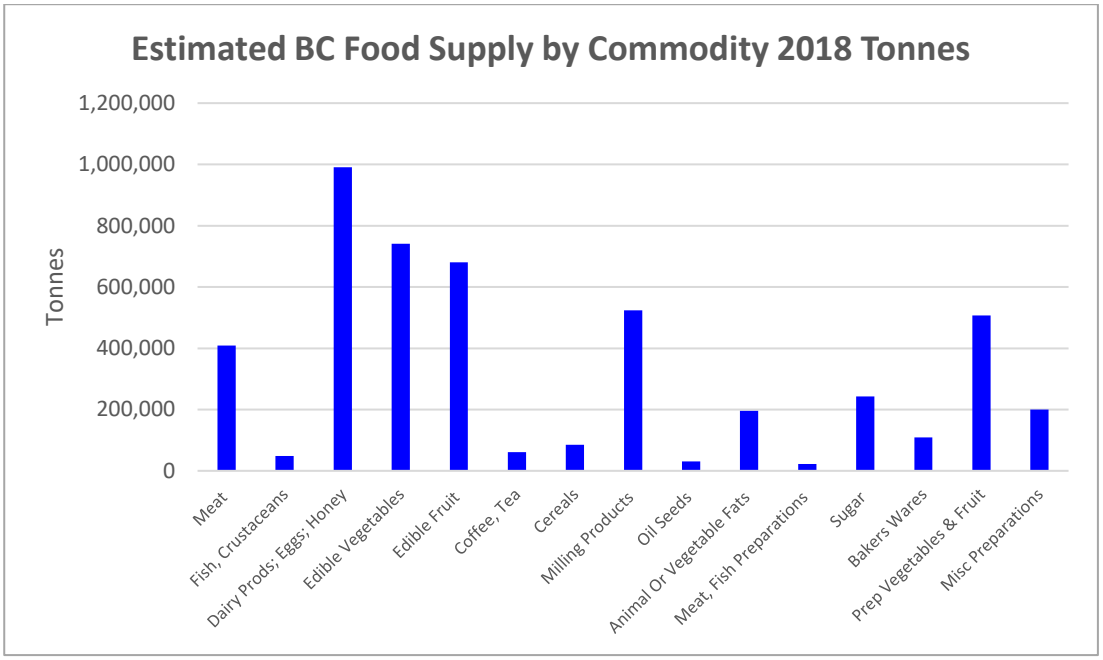
- Cereal grains (wheat, rye, oats, etc.) which are typically used as inputs in the production of milling products such as flour. The only major cereal which is consumed directly in significant quantities is rice.
- Raw sugar which is imported through the Port of Vancouver and used in the production of refined sugar products.

Based on the volume of trade reflected in trade statistics, the Food Supply statistics underestimate food supply in Bakers Wares and Miscellaneous Preparations, particularly for highly processed foods. Food supply estimates for these commodities in this study were increased to reflect more realistic values.

5.3 BC and Metro Vancouver Food Supply

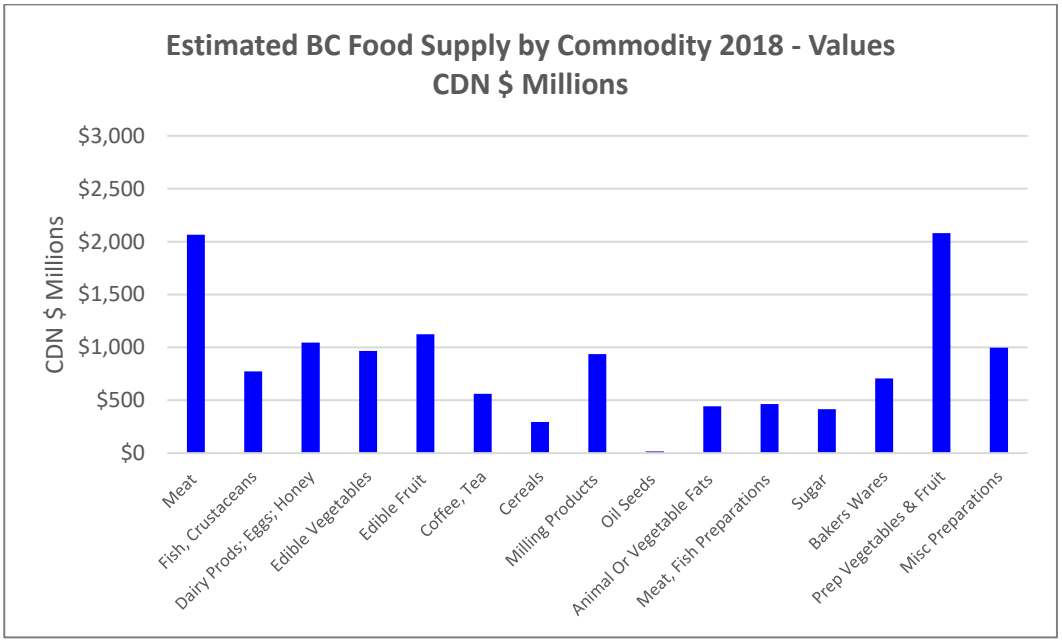
The food supply estimates are calculated on a national basis; for purposes of this study, estimates for B.C. and Metro Vancouver are calculated based on provincial and regional population totals. Total food supply for B.C. is estimated at 4.8 million tonnes, distributed among commodity groups as shown below.

Figure 5-2 B.C. Food Supply 2018 – Tonnes



The values of these commodity flows has been estimated based on customs values for offshore and U.S. imports; domestic values are based on US import values. Estimated values are shown below. The total value of the total B.C. food supply is estimated at CDN$12.9 billion.

Figure 5-3 B.C. Food Supply 2018 – Values

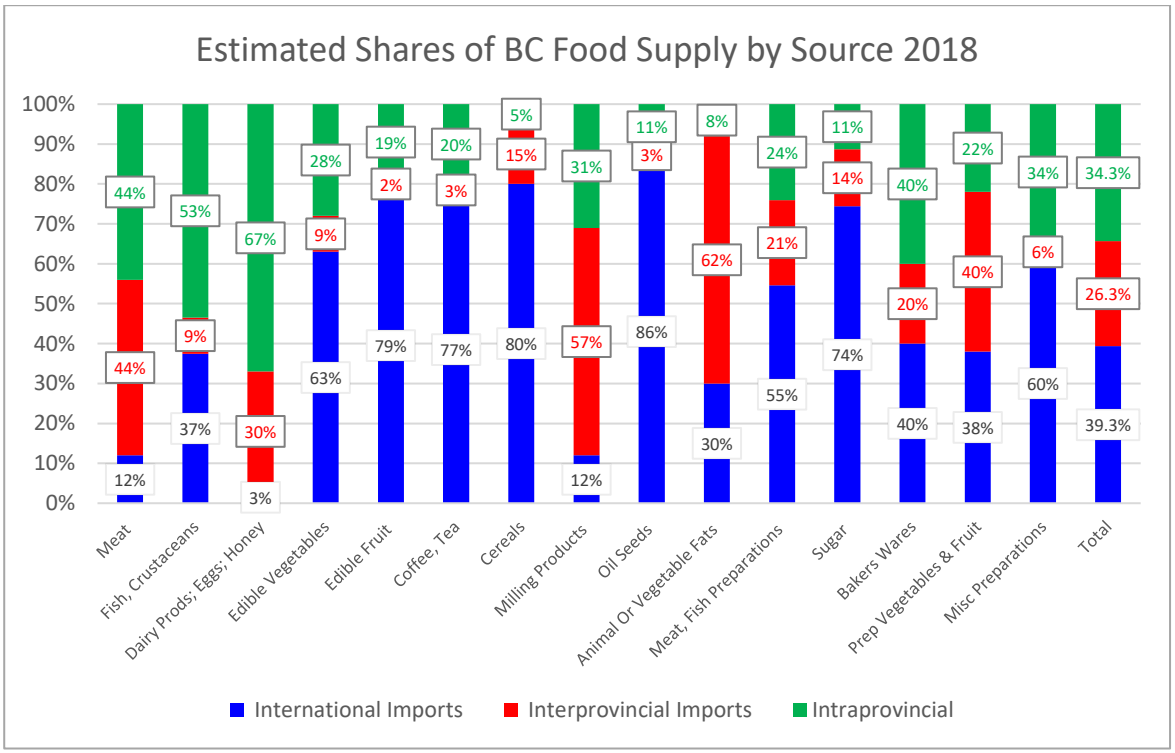


5.4 BC Food Supply by Source

The source of food consumed in B.C. has been estimated from data on international and interprovincial trade compiled by Statistics Canada from the supply and use tables in the input-output tables. The supply and use tables trace the production of commodities by domestic industries, combined with imports, through their uses by industries or as final consumption, investment or exports.[12] The most recent data available is for 2016.

The figure below shows estimates of food supply by source for major commodity groups generated by applying the 2016 trade shares to the 2018 data. In total, international imports account for 39.6%; interprovincial imports for 27.1%; and intraprovincial shipments for 34.9%.

Figure 5-4 BC Food Supply by Source 2018



5.5 Metro Vancouver Share of Provincial Food Supply

Food flows in Metro Vancouver related to the food supply for the province include 100% of the food supply in Metro Vancouver, plus a share of the food flows related to the food supply for the rest of B.C. (ROBC) which flow through Metro Vancouver by virtue of the regional role as the

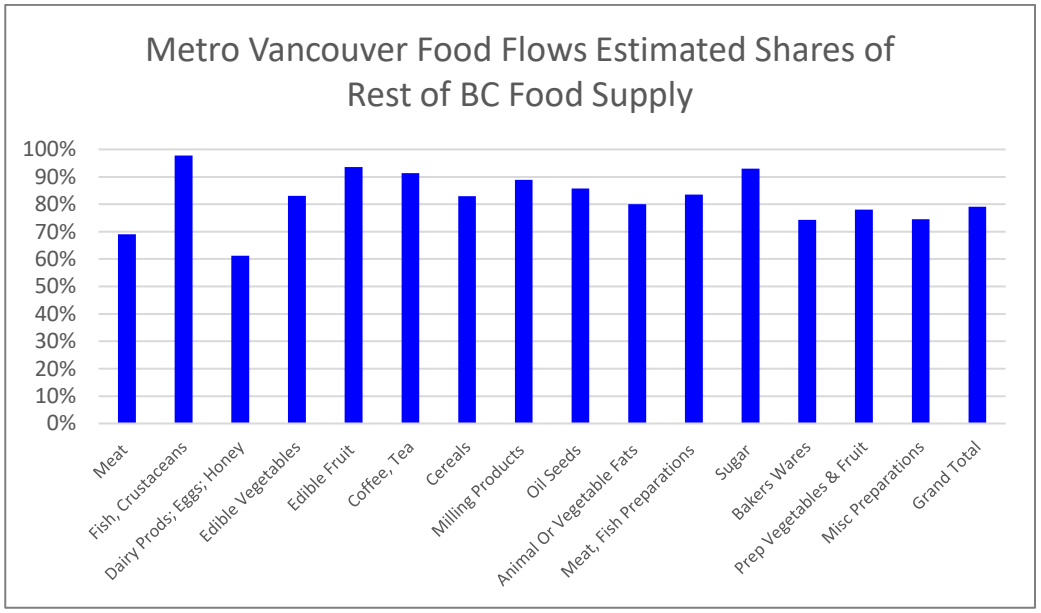
[12] Statistics Canada. Table 12-10-0101-01 Interprovincial and international trade flows, basic prices, detail level (x 1,000) https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=1401

distribution hub for the province. The shares of ROBC food supply flowing through Metro Vancouver are estimated as follows:

- 100% of offshore imports are assumed to flow through Metro Vancouver.
- The share of US imports flowing through Metro Vancouver is estimated based on the share of BC imports from the US entering through the two Metro Vancouver border crossings (Pacific Highway and Lynden/Aldergove).
- 50% of ROBC imports from other provinces are assumed to transit Metro Vancouver in its role as a distribution hub.

The resulting shares of ROBC food supply by commodity group which flow through Metro Vancouver are shown in the figure below.

Figure 5-5 Metro Vancouver Food Flows Estimated Shares of Rest of B.C. Food Supply



The resulting total Metro Vancouver food flows related to the provincial food supply (including both Metro Vancouver and the rest of B.C.) are depicted below. The total volume is estimated to be approximately 3.8 million tonnes, with a value of $10.4 billion.

Figure 5-6 Estimated Metro Vancouver Food Flows by Commodity – B.C. Food Supply (Tonnes)

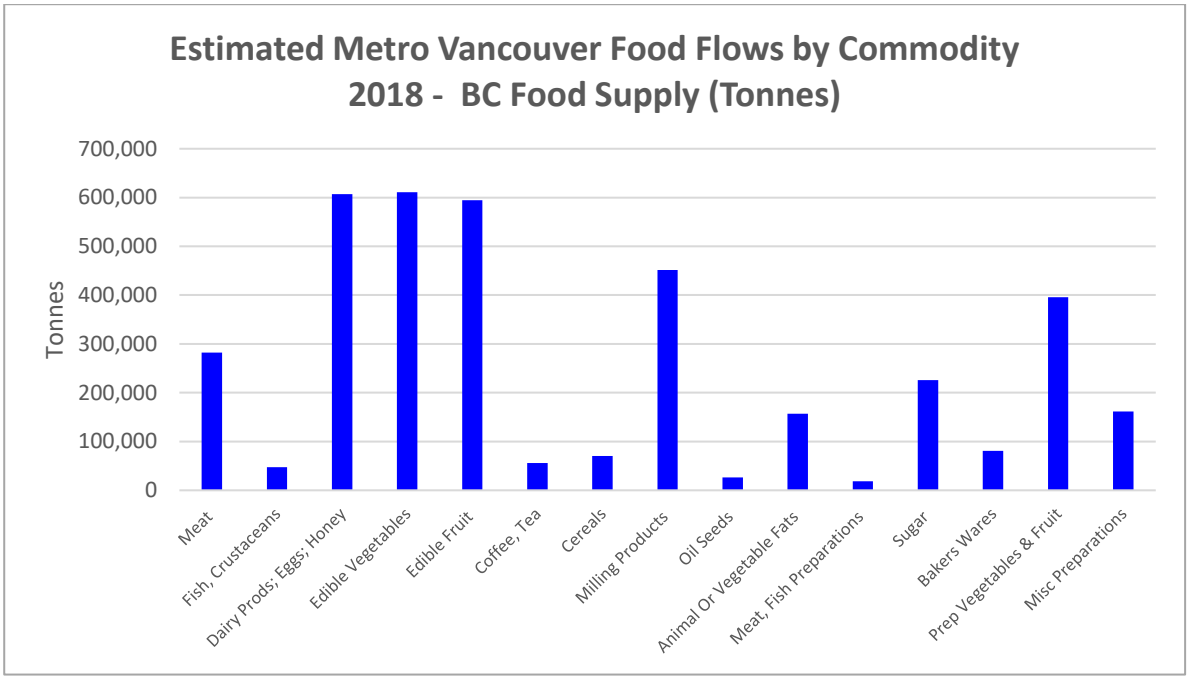
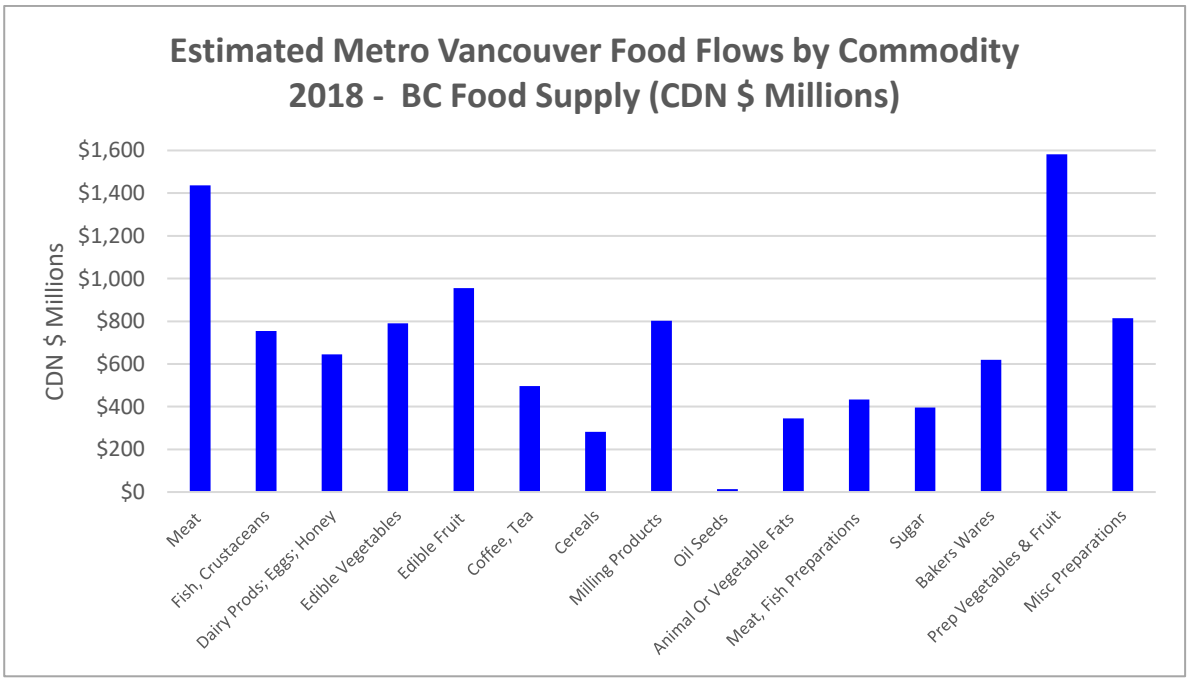


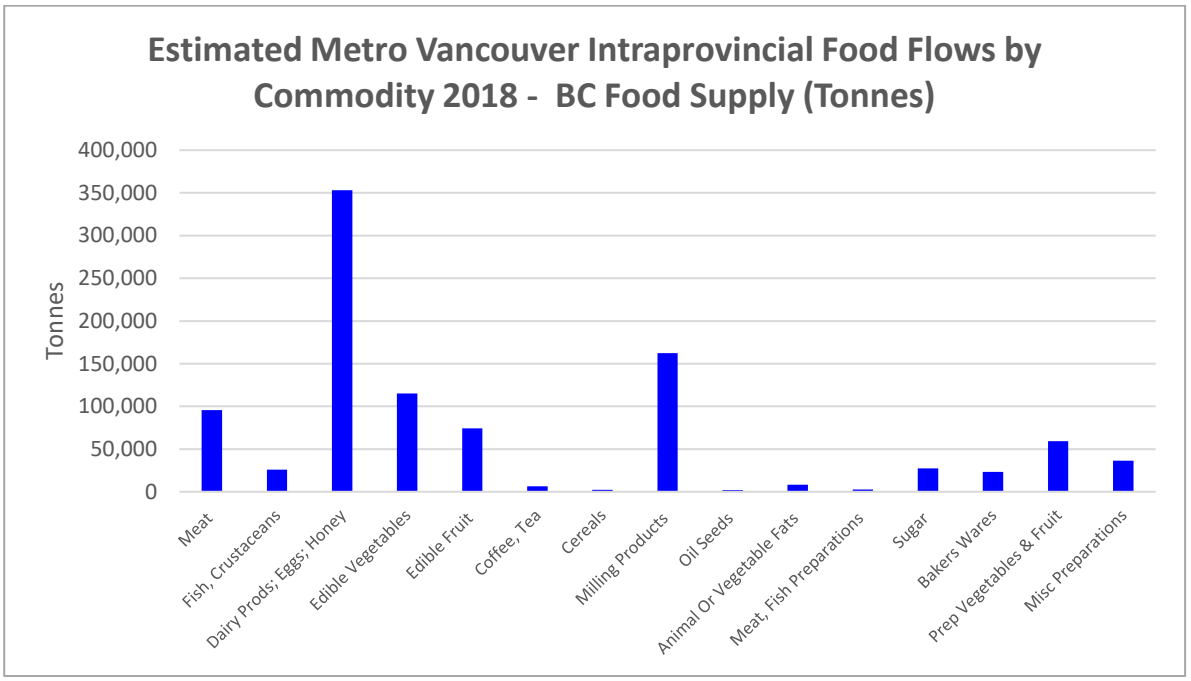
Figure 5-7 Estimated Metro Vancouver Food Flows by Commodity – B.C. Food Supply (Value)



6 Intraprovincial and Intraregional Food Flows

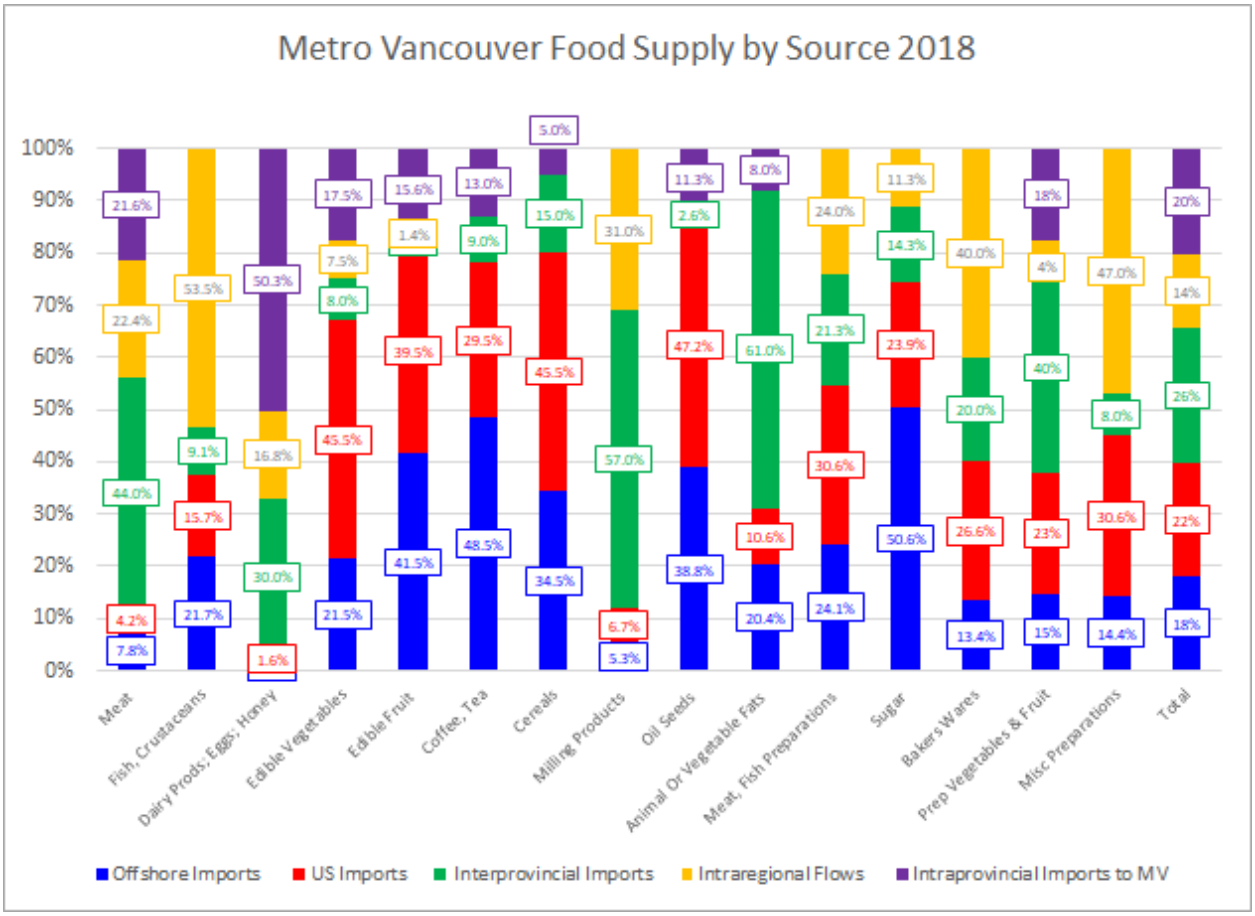
The intraprovincial volumes and shares of the B.C. food supply in 2018 are shown below. The intraprovincial flows are those which originate within B.C., and therefore represent domestic production.

Figure 6-1 Metro Vancouver Intraprovincial Tonnes 2018



The assessment of Metro Vancouver's level of food self-sufficiency required disaggregating intraprovincial flows (within Metro Vancouver) and intraprovincial imports (products imported into Metro Vancouver from other parts of the province). The analysis used the best available data on agricultural and processed foods production by region. Intraregional flow estimates are based on the share of provincial commodities produced in Metro Vancouver. The estimated percentages of the Metro Vancouver food supply by source are indicated below.

Figure 6-2 Metro Vancouver Food Supply by Source



In total approximately 14% of the Metro Vancouver food supply is sourced within the region, and 20% is sourced from the rest of B.C..

Supply managed commodities represent the largest portion of intraprovincial shipments. These are commodities whose production is regulated by provincial marketing boards, including the BC Milk Marketing Board, BC Egg Marketing Board, BC Chicken Marketing Board, BC Turkey Marketing Board, and BC Vegetable Marketing Commission.

Metro Vancouver accounts for the largest share of consumption for all food commodities within the province, and the Fraser Valley Regional District accounts for the largest share of production for all of these commodities. This highlights the importance of the Fraser Valley to the local food supply for Metro Vancouver and the Lower Mainland as a whole.

7 Food Supply by Commodity Group

Additional details on major commodity groups in the food supply are provided below.

7.1 HS 02 Meat

Meat accounted for an estimated 14.2% of intraprovincial shipments in 2018. B.C. production consists primarily of poultry products (chicken and turkey). Based on BC Chicken Marketing Board statistics, B.C. farmers produced 186,061 tonnes of chicken[13] and 21,119 tonnes of turkey[14] in 2018. On a net basis, B.C. is essentially self-sufficient in poultry products. The primary source of beef is interprovincial imports (over 80%). Pork is supplied primarily through interprovincial imports (54%) and intraprovincial shipments (37%).

Based on data from the 2016 Census of Agriculture, in 2016 Metro Vancouver accounted for 24% and FVRD for 56% of provincial poultry production.[15]

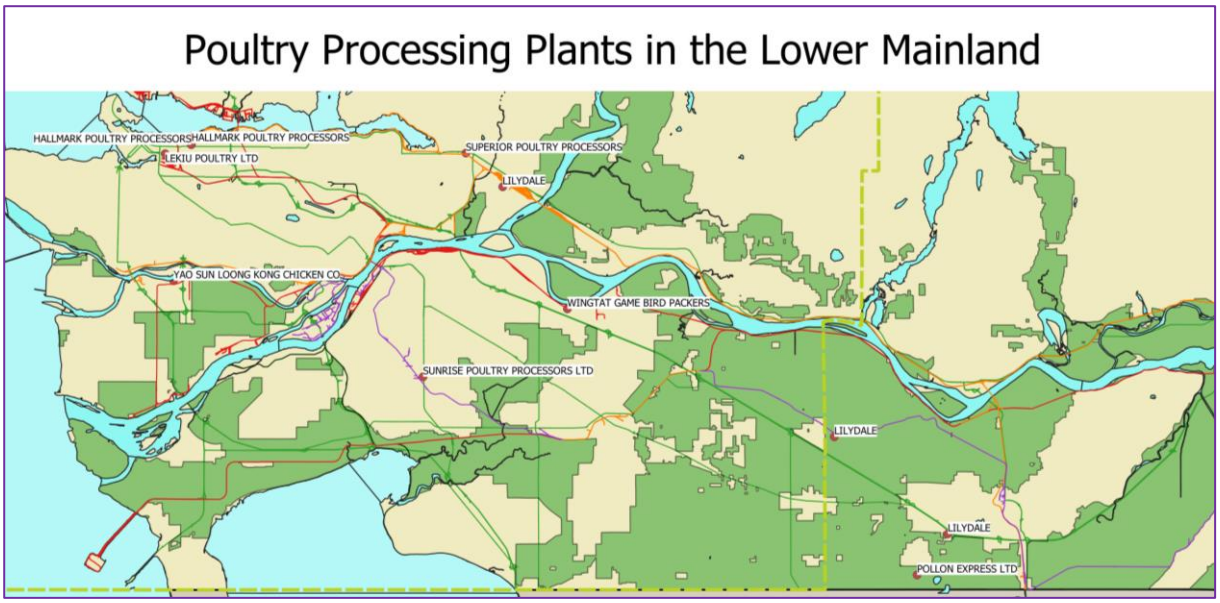
Figure 7-1 BC and Lower Mainland Chicken Production 2011 and 2016

BC and Lower Mainland Broilers, Roasters and Cornish Production				
	2011		2016	
Region	Tonnes	Share	Tonnes	Share
British Columbia	201,244	100%	212,372	100%
Fraser Valley	119,487	59%	134,625	63%
Greater Vancouver	56,654	28%	55,601	26%
Lower Mainland Total	176,141	88%	190,226	90%

Metro Vancouver production accounts for approximately 41% of Metro Vancouver consumption; the balance is supplied primarily from the Fraser Valley Regional District. The locations of poultry processing plants in Metro Vancouver and FVRD are depicted in the figure below.

[13] Eviscerated weight. Source: B.C. Chicken Industry 2019 BC Chicken Marketing Board p. 1.
[14] Eviscerated weight. Source: B.C. Turkey Industry 2019 BC Chicken Marketing Board p. 1.
[15] Statistics Canada Table Poultry Production Table 32100429.

Figure 7-2 Poultry Processing Plants in the Lower Mainland



7.2 HS 03 Seafood

Metro Vancouver generates a surplus of seafood products, substantially exceeding regional consumption. The commercial harvest totalled 196,300 tonnes in 2018.[16] Aquaculture production totalled 98,000 tonnes, for total of 294,300 tonnes

The largest share of provincial seafood is processed in the Lower Mainland (Metro Vancouver). According to a 2017 study conducted for Canada Fisheries and Oceans, the Lower Mainland accounted for 43% of commercial seafood landings and 81% of seafood processing in 2016.[17]

Figure 7-3 Metro Vancouver Seafood Landings and Processing 2016

Metro Vancouver Seafood Landings and Processing 2016									
		Metro Vancouver Landings - Commercial				Metro Vancouver Processing			
Source	Tonnes	%	Round Tonnes	Yield Edible vs Round wt	Edible Tonnes	%	Round Tonnes	Yield Edible vs Round wt	Edible Tonnes
Commercial Harvest Landings	186,302	46%	85,699	50%	42,849	81%	150,905	50%	75,452
Aquaculture Production	79,204			50%		81%	64,155	50%	32,078

[16] Round weight (whole fish ungutted). Source: Sector Snapshot 2018: BC Seafood BC Department of Agriculture https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/statistics/industry-and-sector-profiles

[17] Linkages Between Seafood Harvesting and Processing GSGislason & Associates For Canada Fisheries and Oceans August 2017 p.3.

B.C. consumption is estimated at approximately 48,000 tonnes (edible basis) in 2018.

7.3 HS 04 Dairy Products, Eggs and Honey

7.3.1 Dairy Products

Dairy products represent the largest share of intraprovincial shipments, accounting for over 30% of the total. The table below shows B.C. production and consumption of dairy products from 2014 through 2018. Quantities are based on the conversion of fluid milk to milk solids to account for the amount of milk required in the production of each category of processed (industrial) milk products.

Figure 7-4 B.C. Production and Consumption of Dairy Products 2014 - 2018

BC Production and Consumption of Dairy Products					
	2014	**2015**	**2016**	**2017**	**2018**
BC Production Fluid Milk 000 litres	690,522	722,150	734,877	793,820	812,901
Kg/L	1.03	1.03	1.03	1.03	1.03
BC Production Fluid Milk Tonnes	711,237	743,815	756,923	817,635	837,288
BC Production Milk Solids Tonnes	63,300	66,200	67,366	72,770	74,519
Fluid Milk Products (MS Tonnes)	46,718	47,000	47,385	46,177	46,305
Industrial Milk Products (MS Tonnes)	53,096	55,072	60,789	62,954	65,691
	99,814	102,072	108,174	109,131	111,995
Fluid Milk Products Share	47%	46%	44%	42%	41%
Industrial Milk Products Share	53%	54%	56%	58%	59%
BC Production % of Consumption	63.4%	64.9%	62.3%	66.7%	66.5%

On a net basis, B.C. production accounts for approximately two thirds of provincial consumption. According to interprovincial trade data, B.C. produces over 80% of fluid milk requirements but imports over 70% of cheese and other processed milk products from other provinces.

According to the BC Milk Marketing Board, the Fraser Valley (including Metro Vancouver and the Fraser Valley Regional District) accounted for 76% of milk production in 2018.[18] Extrapolating from data on dairy cattle populations from the 2016 Census of Agriculture, Metro Vancouver accounts for 14% and FVRD for 62% of the provincial total. On a net basis, Lower Mainland milk

[18] B.C. Milk Industry 2019 BC Milk Marketing Board p.1.

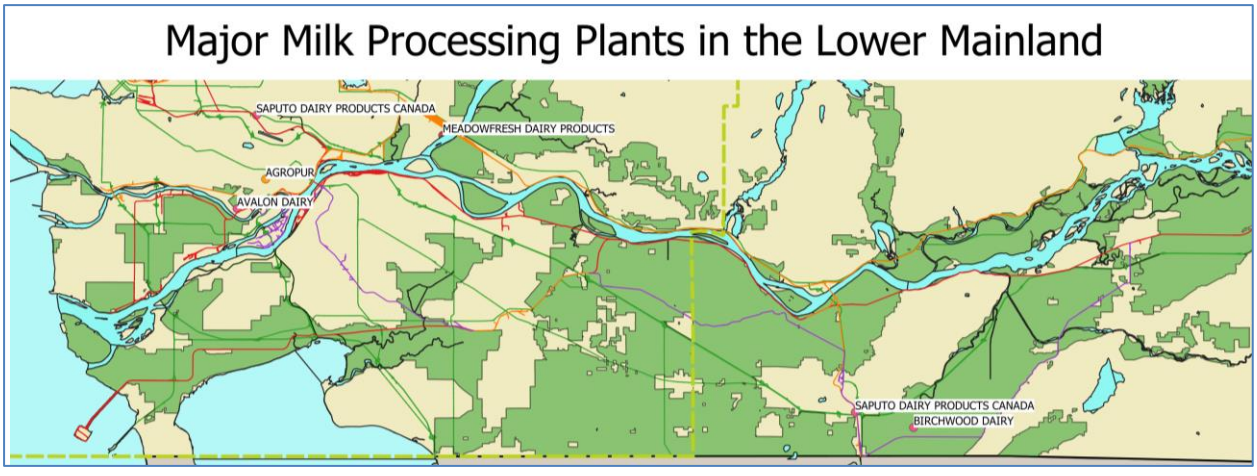
production is sufficient to provide approximately 90% of total Metro Vancouver demand for dairy products. If FVRD consumption is included, Lower Mainland production is sufficient to provide approximately 80% of total regional demand. Metro Vancouver production accounts for approximately 17% of regional consumption.

Figure 7-5 Metro Vancouver and Fraser Valley Regional District Production of Dairy Products

Metro Vancouver and Fraser Valley Regional District Production of Dairy Products					
	2014	2015	2016	2017	2018
Lower Mainland Production Share	76%	76%	76%	76%	76%
Metro Vancouver Production Share	14%	14%	14%	14%	14%
FVRD Production Share	62%	62%	62%	62%	62%
MV Production Tonnes Fluid	96,673	101,101	102,883	111,135	113,806
FVRD Production Tonnes Fluid	428,123	447,733	455,624	492,169	503,999
MV Production Tonnes Milk Solids	8,604	8,998	9,157	9,891	10,129
FVRD Production Tonnes Milk Solids	38,103	39,848	40,551	43,803	44,856
					54,985
Fluid Milk Products (MS Tonnes)	24,771	24,903	25,147	24,530	24,622
Industrial Milk Products (MS Tonnes)	28,153	29,179	32,261	33,443	34,930
	52,923	54,082	57,408	57,973	59,551
Fluid Milk Products	47%	46%	44%	42%	41%
Industrial Milk Products	53%	54%	56%	58%	59%
MV Production % of MV Consumption	16%	17%	16%	17%	17%
FVRD % of MV Consumption	72%	74%	71%	76%	75%
MV + FVRD % of MV Consumption	88%	90%	87%	93%	92%

The figure below shows major fluid milk processing plants in the Lower Mainland.

Figure 7-6 Major Milk Processing Plants in the Lower Mainland



7.3.2 Eggs and Honey

According to the BC Egg Marketing Board, egg production in the province totalled 84 million dozen eggs in 2018, or an estimated 50,400 tonnes.[19] The Lower Mainland accounted for 77% of total production in 2018. Based on data from the 2016 Census of Agriculture, Greater Vancouver accounted for 9% of provincial production in 2016.[20]

Figure 7-7 BC and Lower Mainland Egg Production 2011 and 2016

BC and Lower Mainland Egg Production (Dozens)				
	2011		2016	
Region	**Dozens**	**Share**	**Dozens**	**Share**
British Columbia	74,505,550	100%	80,447,599	100%
Fraser Valley	55,022,149	74%	58,859,463	73%
Greater Vancouver	6,851,210	9%	7,066,681	9%
Lower Mainland Total	61,873,359	83%	65,926,144	82%

Based on the production shares the 2016 Census of Agriculture, Metro Vancouver accounted for 8% and FVRD for 68% of total provincial production in 2018. On a net basis, Lower Mainland production is sufficient to fulfill 60% of Metro Vancouver demand. Metro Vancouver production accounts for approximately 6% of Metro Vancouver demand; the balance is primarily sourced from FVRD. B.C. imports more eggs from other Canadian provinces and countries than it exports.

BC honey production is estimated at 1,544 tonnes[21] and consumption at 7,288 tonnes in 2018. Metro Vancouver accounts for an estimated 40% of BC honey production.[22]

7.4 HS 07 Vegetables

Vegetables accounted for an estimated 18.5% of intraprovincial food shipments in 2018. On a net basis B.C. production accounted for almost 50% of potato consumption and 34% of other vegetables. Excluding potatoes, B.C. is heavily dependent on international imports of vegetables which account for approximately 63% of total consumption of vegetables.

[19] Assuming a conversion factor of .6 kg per dozen.
[20] Statistics Canada Table 32100430.
[21] Statistics Canada Production and value of honey Table 32100353.
[22] Estimated based on Statistics Canada 2016 Agricultural Census data.

Based on acres planted data from the 2016 Census of Agriculture, the Lower Mainland accounted for 68% of B.C. vegetable production in 2016. Metro Vancouver accounted for approximately 30% and FVRD for 38%.

Figure 7-8 BC and Lower Mainland Vegetables Hectares Planted 2016

BC and Lower Mainland Vegetables Ha Planted				
	2011		2016	
Region	Ha Planted	Share	Ha Planted	Share
British Columbia	6,591	100%	6,478	100%
Fraser Valley	2,199	33%	1,927	30%
Greater Vancouver	2,451	37%	2,463	38%
Lower Mainland Total	4,650	71%	4,390	68%

The Lower Mainland accounted for 60% of provincial consumption in 2018. Metro Vancouver production accounts for approximately 23% of Metro Vancouver demand.

7.5 HS 08 Fruit

B.C. is highly dependent on international imports for fruit. International imports account for an estimated 81% of total consumption. B.C. produces significant exportable surpluses of cranberries, blueberries, and cherries. Export tonnage and values for selected products are shown below.[23] Metro Vancouver accounted for 54% of blueberry acreage in 2016.[24]

Figure 7-9 BC Fruit Exports 2018

BC Fruit Exports Selected Fruit Products 2018		
Product	Tonnes	Value (CDN$ Millions)
Cranberries	104,286	$232.2
Other Frozen Fruit (includes Blueberries)	82,545	$194.1
Other Cherries - fresh	10,844	$90.5
Frozen Raspberries, mulberries, blackberries	2,438	$8.0
Sour Cherries - Fresh	2,157	$16.4
Frozen Strawberries	549	$2.0

[23] Source: Canadian International Merchandise Trade Database https://www5.statcan.gc.ca/cimt-cicm/home-accueil?lang=eng

[24] Statistics Canada Marketable Fruit Table 32100417.

7.6 HS 10 Cereals

Cereals include a variety of grains including wheat, durum, barley, oats, corn, rye and rice. Except for rice, these products are not generally consumed directly but are used as inputs in the production of other products. With the exception of some wild rice, rice is not produced in Canada. Greater Vancouver is a major import gateway for rice shipments; 2018 import volumes are shown below.

Figure 7-10 Greater Vancouver Rice Imports 2018

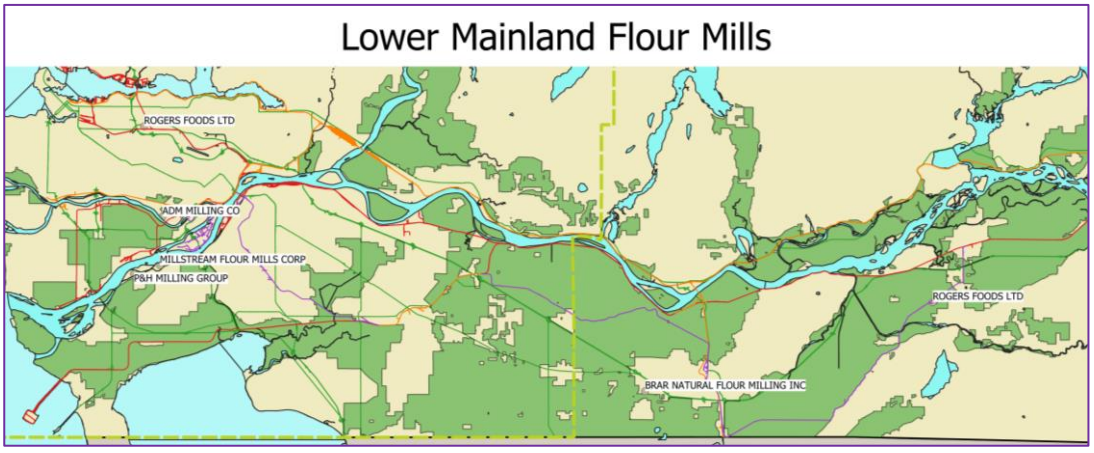
Greater Vancouver Rice Imports 2018		
Source	**Port of Entry**	**2018 Tonnes**
Offshore countries	Port of Vancouver	92,927
US	Pacific Highway Border Crossing	31,436
Total		124,363

Rice is one of the commodities included in the Statistics Canada food supply data, but there is no data in the database (i.e. all observations are 0). Provincial and regional consumption figures have been adjusted to compensate, based on an average per capita consumption of 12.8 kg per year.[25]

7.7 HS 11 Milling Products

Milling products accounted for an estimated 179,229 tonnes in 2018. The major product in this category is wheat flour, which accounts for over 90% of consumption. Major B.C. flour mills are clustered in Metro Vancouver and FVRD; the locations are depicted below.

Figure 7-11 Flour Mills in the Lower Mainland



[25] Source: https://www.helgilibrary.com/indicators/rice-consumption-per-capita/canada/

The only large facility in B.C. outside the Lower Mainland is the Rogers Foods flour mill at Armstrong. Given the concentration of production facilities in Greater Vancouver, it is assumed that Greater Vancouver is self-sufficient on a net basis in milling products.

7.8 HS 16 Meat and Fish Preparations

These products include sausages, hams, livers, and prepared or preserved seafood (including canned seafood). The volumes of major imported commodities are shown below.

Figure 7-12 Greater Vancouver Meat and Fish Preparations Imports 2018

Greater Vancouver Meat and Fish Preparations Imports 2018 - Selected Products			
Source	**Port of Entry**	**Product**	**2018 Tonnes**
Offshore	Port of Vancouver	Canned Tuna	27,030
US	Pacific Highway Border Crossing	Fish Preserved or Prepared (incl canned)	19,957
US	Pacific Highway Border Crossing	Salmon Preserved or Prepared (incl canned)	8,482
US	Pacific Highway Border Crossing	Sausages	4,045
Total			59,514

The only product included in the Statistics Canada food supply data is “processed seafood”; consumption is estimated at 22,213 tonnes for B.C. and 11,811 tonnes for Greater Vancouver. The gap between import supplies and consumption suggests that substantial quantities of canned fish are exported from B.C. to other provinces.

7.9 HS17 Sugar

Products in this category include raw and refined sugar, refined industrial sweeteners (lactose, glucose and fructose), and sugar confectionery (including white chocolate).

The only sugar refinery in B.C. is the Rogers Sugar plant which is located on the south shore of Burrard inlet at the Port of Vancouver. Raw cane sugar is received from vessels at the plant docks and refined into a variety of consumer products. Sugar is also produced from sugar beets received by rail from Alberta. Capacity of the Vancouver plant is approximately 240,000 tonnes per year[26]; on a net basis this is sufficient to fulfill B.C. requirements, estimated at approximately 240,000 tonnes for B.C. and 128,000 tonnes for Metro Vancouver. Actual production depends on the balance between production at the Vancouver plant and the Rogers plant in Taber, Alberta.

[26] LanticRogers https://www.lanticrogers.com/en/about-us/locations/

7.10 HS 19 Bakers Wares

Bakers wares include a wide variety of baked goods including noodles, bread, cereals, mixes and doughs. Estimated 2018 import quantities for major products are shown below.

Figure 7-13 Greater Vancouver Bakers Wares Imports 2018

Greater Vancouver Bakers Wares Imports 2018 - Selected Products			
Source	**Port of Entry**	**Product**	**2018 Tonnes**
Offshore	Port of Vancouver	Noodles	30,746
US	Pacific Highway Border Crossing	Bread, Cakes, Pastry	28,647
US	Pacific Highway Border Crossing	Mixes & Doughs for Prep of Bakers Wares	11,401
US	Pacific Highway Border Crossing	Prep Food, Swelling/roasting Cereal	7,491
US	Pacific Highway Border Crossing	Pasta, Prepared	7,335
US	Pacific Highway Border Crossing	Malt Extract; Flour, Meal, Milk Prod	6,500
US	Pacific Highway Border Crossing	Pasta, Stuffed, Whether or Not Cooked, Etc.	3,787
Total			95,907

7.11 HS20 Vegetable Preparations

This category includes fruit juices and a wide variety of canned and dried fruits and vegetables and similar products. Major commodities imported are shown below.

Figure 7-14 Metro Vancouver Vegetable Preparations Imports 2018

Greater Vancouver Vegetable Preparations Imports 2018 - Selected Products			
Source	**Port of Entry**	**Product**	**2018 Tonnes**
Offshore	Port of Vancouver	Canned Fruit	41,271
Offshore	Port of Vancouver	Juice Concentrate	18,520
Offshore	Port of Vancouver	Fruit Pulp	14,389
Offshore	Port of Vancouver	Canned Vegetable	12,372
Offshore	Port of Vancouver	Canned Mushroom	10,142
Offshore	Port of Vancouver	Fruit Juice Nc	9,482
Offshore	Port of Vancouver	Canned Pineapple	8,921
Offshore	Port of Vancouver	Frozen Vegetable	8,342
US	Pacific Highway Border Crossing	Nuts (exc Peanuts) And Seeds, Prepared	7,676
US	Pacific Highway Border Crossing	Potatoes, Prepared Not Frozen	5,655
US	Pacific Highway Border Crossing	Potatoes, Prepared Frozen	8,755
US	Pacific Highway Border Crossing	Fruit & Edible Plant Parts Prep	7,593
US	Pacific Highway Border Crossing	Peanuts, Prepared or Preserved	6,231
Total			159,349

Offshore imports of these products through the Port of Vancouver totalled almost 160,000 tonnes in 2018; imports from the U.S. through the Greater Vancouver border crossings totalled an estimated 63,000 tonnes. Imports accounted for an estimated 38% of Metro Vancouver consumption in 2018.

8 Transportation by Mode

8.1 Marine Transportation

Port of Vancouver import and export food flows through Metro Vancouver include bulk commodities and non-bulk commodities handled in international containers.

8.1.1 Bulk Commodities

Bulk commodities like wheat, canola, etc. are carried in dry bulk vessels which are loaded or unloaded at specialized bulk terminals (primarily grain terminals) located on the North Shore or South Shore of Burrard Inlet. Annual shipment volumes from 2014 to 2018 are shown below.

Figure 8-1 Port of Vancouver Bulk Food Traffic 2014 – 2018

Port of Vancouver Bulk Food Traffic 2014 - 2018 000 Tonnes						
Exports						
Mode	**Commodity Name**	**2014**	**2015**	**2016**	**2017**	**2018**
Bulk Dry	Wheat	7,571	9,478	6,891	7,686	8,435
Bulk Dry	Canola	6,464	5,992	7,125	7,317	7,457
Bulk Dry	Dried Pea	2,080	2,157	2,729	2,410	1,854
Bulk Dry	Malt Barley	695	586	728	1,148	1,761
Bulk Liquid	Canola Oil	749	905	1,032	1,116	1,529
Bulk Dry	Soybean	415	899	1,013	1,255	1,267
Bulk Dry	Durum Wheat	1,361	1,239	2,073	1,985	993
Bulk Dry	Oat	0	18	57	29	171
Bulk Dry	Dried Lentil	409	471	430	347	167
Bulk Dry	Flaxseed	157	212	206	231	118
Bulk Liquid	Tallow	101	104	125	118	81
Bulk Dry	Barley Seed	2	0	0	29	56
Bulk Dry	Corn	0	1	2	1	2
Bulk Dry	Malt	50	20	8	2	0
Bulk Liquid	Linseed Oil	5	7	5	2	0
Bulk Liquid	Sunflower Oil	1	2	0	0	0
Grand Total Exports		20,060	22,091	22,424	23,678	23,892
Imports						
Bulk Dry	Raw Sugar	96	113	112	77	116

8.1.2 Containerized Commodities

Other food commodities are shipped in international (ISO) containers on container vessels. These are handled at port of Vancouver container terminals including Global Container Terminals (GCT) Deltaport Terminal at Roberts Bank, the GCT Vanterm and DP World Centerm terminals on the south shore of Burrard Inlet, and Fraser Surrey Docks on the Fraser River.

8.1.3 Summary

Figure 8-2 Port of Vancouver Bulk and Containerized Food Traffic 2014 - 2018

Port of Vancouver Bulk and Containerized Food Traffic 2014 - 2018 000 Tonnes					
	2014	2015	2016	2017	2018
Bulk Exports	20,060	22,091	22,424	23,678	23,892
Bulk Imports	96	113	112	77	117
Containerized Exports	3,924	3,991	3,797	3,628	4,090
Containerized Imports	1,113	1,165	1,166	1,154	1,150
Total	25,193	27,359	27,500	28,537	29,249

8.2 Carload Rail Transportation

Rail traffic is disaggregated between carload (traffic moving in traditional freight cars such as box cars, tank cars and hoppers) and intermodal traffic (containers and piggyback service). Carload traffic includes all types of traffic except intermodal.

Large volumes of wheat, canola and other cereal grains for export are shipped to the Port of Vancouver in large trains similar to unit trains. A unit train is a train in which all cars carry the same commodity and are shipped from the same origin to the same destination. In the Lower Mainland, unit trains are used for coal, potash and sulphur shipments. Grain trains are similar to unit trains in that they are typically tendered to the railways in large car blocks, but they are not necessarily handled as a single train. CN and CP provide rate incentives for car blocks of 100 cars or more for grain shipments. From August to November 2017, over 80% of grain cars were supplied in lots of 100 or more by both CN and CP.[27] These large car blocks can only be handled at the major port terminals on the South Shore and North Shore of Burrard Inlet.

Other carload food commodities are shipped in manifest trains. A manifest train is comprised of small blocks of mixed car types and multiple commodities, origins and destinations. These car blocks must be marshalled from multiple origins into trains for transit, and the trains split into car blocks for delivery to specific terminals at destination. In the Lower Mainland manifest train operations are typically used for breakbulk cargo (lumber, pulp, etc.) and all dry and liquid bulk commodities except coal, grain, potash and sulphur handled as unit trains. Significant quantities

[27] Rail Activity and Capacity Issues in the Lower Mainland Area Davies Transportation Consulting Inc. for Transport Canada Economic Analysis March 31, 2018 p. 10.

of specialty crops[28] are shipped in hopper cars and then transloaded to marine containers in Metro Vancouver for export through the Port of Vancouver. The table below shows grain shipments to the Port of Vancouver by rail for the 2017/2018 crop year.[29] All of these shipments are exported; domestic shipments of specialty crops within Western Canada totalled only 7,000 tonnes in the 2017/2018 crop year.[30]

Figure 8-3 Rail Carload Shipments of Grain and Specialty Crops to the Port of Vancouver Crop Year 2017/2018

Grain Shipments to the Port of Vancouver by Rail Crop Year 2017/2018		
Commodity	**000 Tonnes**	**Estimated Carloads**
Wheat	7,978	88,641
Durum	1,408	15,645
Barley	1,738	19,316
Canola	7,319	81,319
Canola Meal	994	11,043
Oats	173	1,920
Peas	2,621	29,122
Lentils	956	10,619
Soybeans	1,228	13,642
Flaxseed	271	3,013
Others	969	10,767
Total	25,654	285,046

8.2.1 Rail Infrastructure

The Lower Mainland rail network can be divided into three primary corridors accessing the three major terminal clusters at the Port of Vancouver: (1) the Roberts Bank Rail Corridor accessing Deltaport and the Westshore Terminals on Roberts Bank; (2) the South Shore Rail Corridor accessing terminals on the South Shore of Burrard Inlet; and (3) the North Shore Rail Corridor accessing terminals on the North Shore of Burrard Inlet. The network also includes: (4) a North-South rail corridor between Vancouver and the Canada-US border, known as the Burlington Northern Santa Fe (BNSF) mainline, which provides railway access to the Greater Vancouver industrial network from the south; and (5) the Fraser River Trade Area Corridor, which provides

[28] Specialty crops include peas, lentils, mustard seed, canary seed, beans, sunflower seed, and buckwheat.

[29] Source: Grain Monitoring Program (2017-18 Crop Year) Annual Report Data Tables Quorum Corporation http://grainmonitor.ca/reports.html

[30] Grain Monitoring Program (2017-18 Crop Year) Annual Report Table 2-2 M.

access to the marine terminals on the Fraser River, including Fraser Surrey Docks and Annacis Auto Terminal.

The primary routes for food shipments include the South Shore and North Shore Rail Corridors accessing the grain terminals on the Inner Harbor (North Shore and South Shore of Burrard Inlet), Burrard Inlet, and the Roberts Bank and South Shore Rail Corridors accessing the Deltaport and South Shore container terminals respectively.

8.3 Rail Intermodal and Trucking

All food commodities except for those shipped by carload rail rely on intermodal rail or trucking services for inland transport.

Rail intermodal traffic consists of cargo carried in shipping containers or truck trailers on railcars. Intermodal service in Metro Vancouver is limited to transportation of shipping containers and can be divided into international and domestic services. International traffic consists of standard international marine containers (typically 20 ft. and 40 ft. containers) which carry import and export cargo; and domestic traffic consists of shipments between points in North America in larger domestic containers (typically 53 ft.). Intermodal trains serve a limited number of facilities in the Lower Mainland; specifically, the three major port terminals (GCT Deltaport at Roberts Banks, and GCT Vanterm and DPW Centerm on Vancouver's South Shore) for international traffic and the CN and CP Intermodal facilities (primarily for domestic traffic).

The most common truck trailer for food transportation (except bulk commodities) is a 53-foot dry van or reefer trailer. The capacity of the trailer is determined by the nature of the commodity carried and by provincial commercial vehicle weights and dimensions. Low density products such as potato chips will "cube out' i.e. the maximum load is limited by the cubic capacity of the trailer. Denser commodities will "weigh out" i.e. the maximum load is limited by the maximum allowable gross vehicle weight; in BC the standard limit is 46,500 kg for a single trailer truck.

Key road infrastructure for food-related truck infrastructure includes Highway 1 as the major east-west route for interprovincial and interprovincial flows, and Highway 15/Highway 99 accessing the Pacific Highway border crossing for Canada-U.S. trade.

Total food flows in Metro Vancouver are estimated at 33.7 million tonnes. Subtracting the carload rail volumes identified in section 8.2, intermodal rail and trucking accounted for food flows of 9.2

million tonnes in 2018. It is not possible to disaggregate inland flows between rail and truck due to a lack of available data on Canadian rail intermodal traffic. At an average cargo weight of 20 tonnes per load, this would amount to approximately 460,000 loads (containers or trailers).

9 Safety Requirements for Transportation of Perishable Commodities

Transportation of perishable commodities is subject to food safety regulations designed to ensure that the safety of food products is not compromised during the transportation process. Regulations cover all aspects of transportation, including equipment requirements ("conveyances"), operating procedures, and record-keeping. In Canada, interprovincial and international shipments are regulated by the *Safe Food for Canadians Regulations* implemented in 2019.[31] In B.C., intraprovincial shipments are regulated under regulations specific to each commodity (Milk Industry Standards Regulation, Fish and Seafood Licensing Regulation, etc.).[32] Food shipments in the United States are regulated under the *Food Safety Modernization Act*.[33]

The Safe Food for Canadians Regulations require that conveyances:

- be appropriate for the food … and for the activity being conducted;
- be designed, constructed and maintained to prevent contamination of the food;
- be constructed of, and maintained using, materials that are suitable for their intended use (corrosion-resistant, durable, capable of withstanding repeated cleaning and sanitizing, free of any noxious constituent);
- be equipped with instruments to control, indicate and record any parameters that are necessary to prevent contamination of the food.

"Parameters necessary to prevent contamination of the food" consist primarily of temperature and humidity conditions. Optimal transportation temperature and humidity conditions to maintain the safety and freshness of perishable food shipments have been developed for specific commodities. Examples are given below.

9.1 HS 2 Meat and Poultry

It is recommended that chilled meat shipments in B.C. be held at 4°C or lower, and frozen meat shipments at -18°C or lower.[34]

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[31] https://laws-lois.justice.gc.ca/eng/regulations/SOR-2018-108/index.html
[32] https://www2.gov.bc.ca/gov/content/health/keeping-bc-healthy-safe/food-safety/food-safety-legislation
[33] https://www.fda.gov/food/guidance-regulation-food-and-dietary-supplements/food-safety-modernization-act-fsma
[34] Guidelines for the Safe Transportation of Carcasses, Poultry and Meat Products Prepared by: Food Protection BC Centre for Disease Control p. 2.

9.2 HS 3 Seafood

Seafood shipments must be maintained at a temperature of no less than 0°C and no more than 4°C for fresh fish and -18°C or less for frozen fish. In the case of live fish, shipments must be maintained at a temperature and in other conditions suitable to the species of fish.[35]

9.3 HS 4 Dairy and Eggs

In B.C., raw milk must be stored at a temperature between 0°C and 4°C and must not be allowed to exceed 6°C in a tank truck.[36] Optimal shipment conditions for other dairy products vary. For example, the desired transit temperature is 4°C for fresh butter and -23°C for frozen butter, with a desired relative humidity of 75 to 85 percent.[37] Recommended transport conditions for eggs include a desired transit temperature of 1.7° to 4.4°C with a relative humidity of 70 to 80 percent.[38]

9.4 HS 7 Edible Vegetables and HS8 Edible fruit

Fresh fruit and vegetables are transported at varying temperatures and humidity levels depending on individual product requirements. For example, for most varieties of apples a transit temperature of -1°C to 0°C is recommended at a desired relative humidity of 90 to 95 percent. Optimal conditions for avocados range from a desired temperature of 4°C to 13°C depending on the variety and season, with a desired relative humidity of 85 to 90 percent.[39]

9.5 HS 16 Meat and Seafood Preparations; HS 19 Prepared Vegetables and Fruit, and HS 21 Miscellaneous Preparations.

Foods that can be safely stored at room temperature, or “on the shelf,” are called ‘shelf stable.’ These non-perishable products include jerky, country hams, canned and bottled foods, rice, pasta, flour, sugar, spices, oils, and foods processed in aseptic or retort packages and other products that do not require refrigeration until after opening. Not all canned goods are shelf stable. Some canned food, such as some canned ham and seafood, are not safe at room temperature. These products are labeled, “Keep Refrigerated.”

[35] BC Fish and Seafood Licensing Regulation section 40.
[36] BC Milk Industry Standards Regulation section 59.1.
[37] Protecting Perishable Foods During Transport by Truck and Rail Jeffrey K. Brecht et al University of Florida 2019 p. 154.
[38] Protecting Perishable Foods During Transport by Truck and Rail p. 168.
[39] Protecting Perishable Foods During Transport by Truck and Rail p. 83.

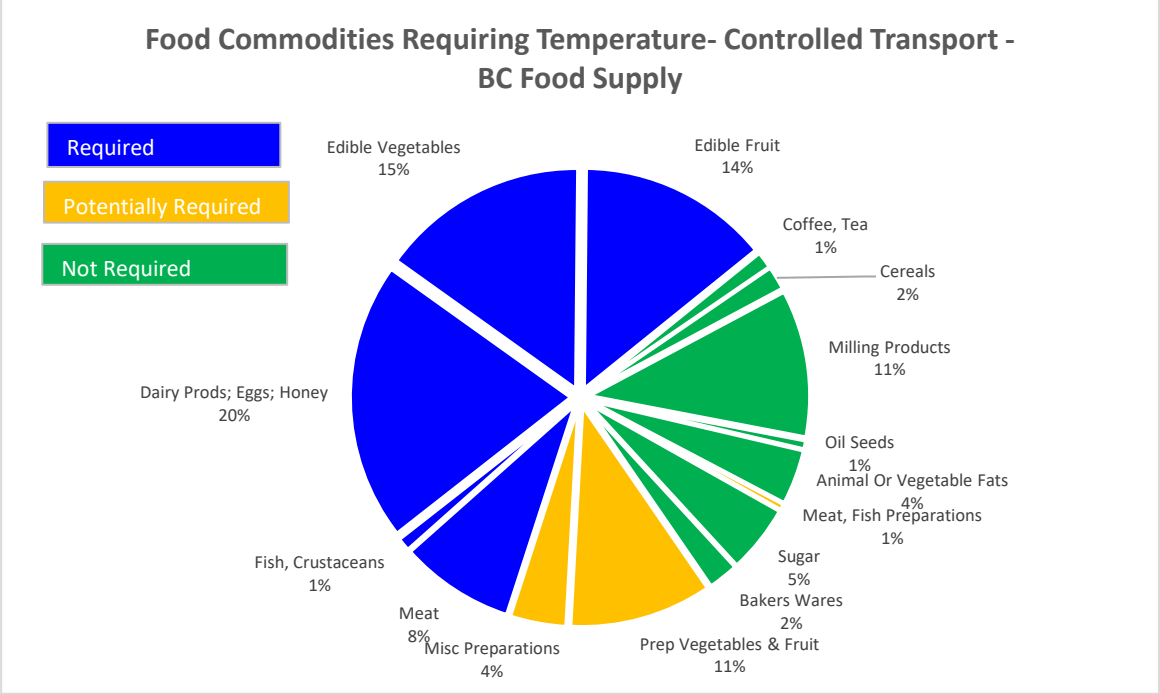
The most frequent type of temperature damage to canned foods is rusting of tin cans. Rusting is caused by condensation on cans removed from a low temperature environment to one with a higher temperature. This can be avoided by proper handling procedures i.e. canned foods should not be unloaded in warm warehouse areas which have previously been subjected to low temperatures until they have had time to warm up to 10°C or above.[40]

Freezing is not likely to damage the canned food product itself. However, freezing a canned product may endanger the package integrity or break a glass package. To protect canned food against freezing damage during transit through areas of intense cold, conveyances may need to be heated rather than cooled. Freezing temperatures vary by product; for example, canned applesauce will freeze at -2.4°C, grapefruit juice at -1°C, and canned tuna at -3.2°C.[41]

9.6 Summary

The shares of commodities in the B.C. food supply requiring temperature-controlled transport are shown below. Almost 60% of the total requires temperature-controlled transport, and an additional 16% may require temperature-controlled transport if required to protect from freezing.

Figure 9-1 Food Commodities Requiring Temperature-Controlled Transport – BC Food Supply



[40] Protecting Perishable Foods During Transport by Truck and Rail p. 151.
[41] Protecting Perishable Foods During Transport by Truck and Rail pp. 153-154.

10 Transportation of Perishable Commodities by Mode of Transport

10.1 Marine Transportation

Perishable commodities are shipped in refrigerated containers ("reefers"). These containers are insulated and specially designed to allow temperature-controlled air circulation maintained by an attached and independent refrigeration power plant. The term reefer increasingly applies to refrigerated forty-foot ISO containers with the dominant size being 40-foot high-cube containers. While a regular 40-foot container costs around $5,000, a reefer of the same size costs in the range of $30,000. This cost differential is attributed to insulation and the refrigeration unit that keeps the temperature constant. A reefer has less volume than a regular container of the same size. A regular 40-foot high cube container can accommodate a volume of 76 cubic meters, while a reefer of the same size handles 67 cubic meters (12% less). This shortcoming is compensated by the heavier loads that are usually carried in reefers. According to a local industry source, typical cargo weight for a floor-loaded 40-foot reefer container averages approximately 24 tonnes.

The refrigeration unit of a reefer requires an electric power source during transportation, at a container yard, or anywhere a reefer is parked for any length of time. While on the vessel, power is directly provided by the ship's generator. Regular containerships have 10 to 20% of their slots adapted to carry reefers.[42]

In North America reefer containers typically comprise a small portion of total container traffic. Electrical power for the refrigeration units is provided through reefer plugs at the container terminals. The number of reefer plugs at major North American ports averages only 1 to 1.5 reefer slots per 1,000 TEUs of port traffic.[43] The number of reefer plugs available at Port of Vancouver container terminals is shown below.

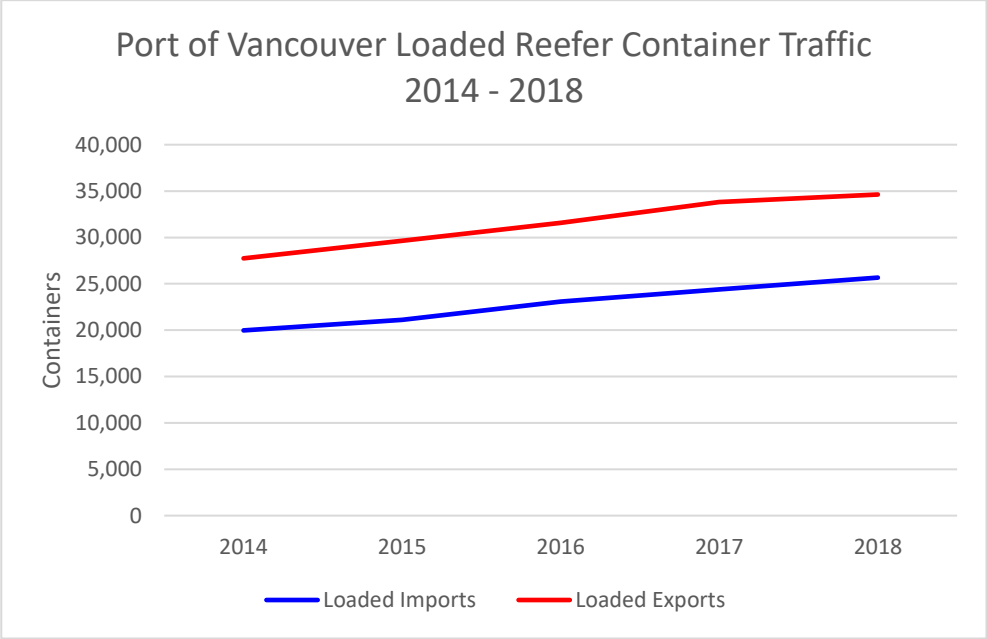
[42] Reefers in North American Cold Chain Logistics: Evidence from Western Canadian Supply Chains J.P. Rodrigue for the Van Horne Institute December 2014 pp. 21-22.
[43] J.P. Rodrigue p. 28. A TEU is a Twenty Foot Equivalent Unit based on the capacity of a standard 20 foot ISO international container.

Figure 10-1 Port of Vancouver Container Terminals Capacity and Reefer Plugs[44]

Port of Vancouver Major Container Terminals Capacity and Reefer Plugs				
	Total Capacity		Reefer Plugs	
Terminal	TEUs	Share	Plugs	Share
GCT Deltaport	2,200,000	56%	1020	53%
GCT Vanterm	850,000	22%	360	19%
DP World Centerm	900,000	23%	550	28%
Total	3,950,000	100%	1930	100%

Port of Vancouver loaded import and export reefer container traffic from 2014 to 2018 is depicted below. In 2018 Port traffic totalled 25,666 loaded import reefer containers (2.7% of loaded imports) and 34,626 loaded export reefer containers (5.7% of loaded export containers).[44]

Figure 10-2 Port of Vancouver Loaded Reefer Container Traffic 2014 – 2018



The Port of Vancouver does not typically publish statistics on individual terminal throughput volumes. Assuming that the distribution of reefer traffic is proportional to overall total reefer capacity shares, approximately 55% of reefer traffic is handled at Deltaport at Roberts Bank and 45% at the Inner Harbour terminals.

[44] Source: Port of Vancouver.

10.2 Rail Intermodal Traffic

Perishable products are shipped in international or domestic "reefer" containers. For rail movements, a single diesel generator is used to provide power to about 16 reefer containers with 8 power plugs on each side. These genset units (often called power packs) have the same dimensions as a 40-foot container and can use the same handling equipment as intermodal containers. They are usually able to provide power for about 10 days without being refueled. A common loadout for unit trains is to have two stacked genset units to power a group of 16 reefers.[45]

Detailed data on the commodity composition, origins and destinations of the railways' intermodal reefer traffic is not available. According to a study done for Calgary's Van Horne Institute in 2014, Western Canadian reefer rail traffic to the Port of Vancouver in 2012 included chilled and frozen pork from Maple Leaf plants in Brandon, Manitoba and Lethbridge, Alberta and frozen vegetables from a Maple Leaf plant in Lethbridge.[46]

10.3 Truck Transportation

Trucking is the dominant mode of transport for perishable goods due to the on-demand availability of service, rapid transit times, and availability of active monitoring of perishable cargo.

Perishable cargo is carried in international or domestic reefer containers, or in specialized reefer truck trailers. For the road transport of a reefer container, either a clip-on generator (called genset; it attaches to the upper front end of a reefer) or an underslung generator (attaches under a container chassis) is used. Clip-ons are usually owned by maritime shipping companies and are offered as an additional fee to their reefer service. Underslung generators are preferred by trucking companies since they are linked with a chassis and require less handling than a clip-on generator.

"Reefer" trailers have lower capacity for both types of cargo. A reefer trailer has less cubic capacity due to the space required for insulation. Stowage patters for refrigerated freight further limit reefer trailer capacity, because loads must be stowed to ensure adequate air circulation within the trailer and to avoid heat transfer from the trailer walls. Multi-temperature reefer trailers can be divided into two or three compartments operating at different to allow transport of different types of cargo

[45] J.P. Rodrigue p. 22.
[46] J.P. Rodrigue pp 37-38.

Simultaneously. Three zone compartments are separately controlled at 0°F (-18°C) or below for frozen foods, around 35°F (1.7°C) for chilled foods, and around 55°F (12.8°C) for sensitive chill products. This further reduces the cubic capacity of the trailer.[47]

10.4 Temperature – Controlled Truck Traffic in Metro Vancouver

Temperature-controlled loaded truck trips of food commodities in Metro Vancouver are estimated below. These include trips with either a loaded reefer trailer, or a loaded international or domestic reefer container. For this purpose, the relative cargo shares of rail intermodal and trucking do not matter, because all rail intermodal movements also generate a loaded truck trip:

- All international reefer containers are trucked between the port terminals and CN and CP domestic intermodal terminals to ensure expedited service for perishable cargoes. This differs from operating procedures for non-reefer international containers, which are loaded to rail and unloaded from rail at the port terminals.

- Domestic reefer containers are delivered or received from the CN and CP domestic intermodal terminals by truck.

The volume of loaded reefer truck trips has been estimated based on:

- The volumes of commodities which require temperature-controlled transport for each origin-destination food flow. For commodities which may require temperature-controlled transport (Meat & Fish Preparations, Prepared Vegetables & Fruit, and Miscellaneous Preparations) it is assumed that 20% of cargo is shipped in a reefer container or trailer.

- Estimates of market shares for carload rail, intermodal rail, and truck for each of the origin-destination flows. For example, virtually all cross border food imports and exports are shipped by truck, because BNSF Railway carload traffic for food commodities is negligible and BNSF does not provide intermodal service to Metro Vancouver.

- An average loading for refrigerated trailers of 19 tonnes.[48]

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[47] Protecting Perishable Foods During Transport by Truck and Rail p. 15.

[48] Based on U.S. Department of Agriculture “usual loads” for temperature-controlled truck transportation of fresh produce (see Agricultural Refrigerated Truck Quarterly USDA Agricultural Marketing Service).

- For international reefer containers, the traffic volume of import and export reefer containers reported by the Port of Vancouver.

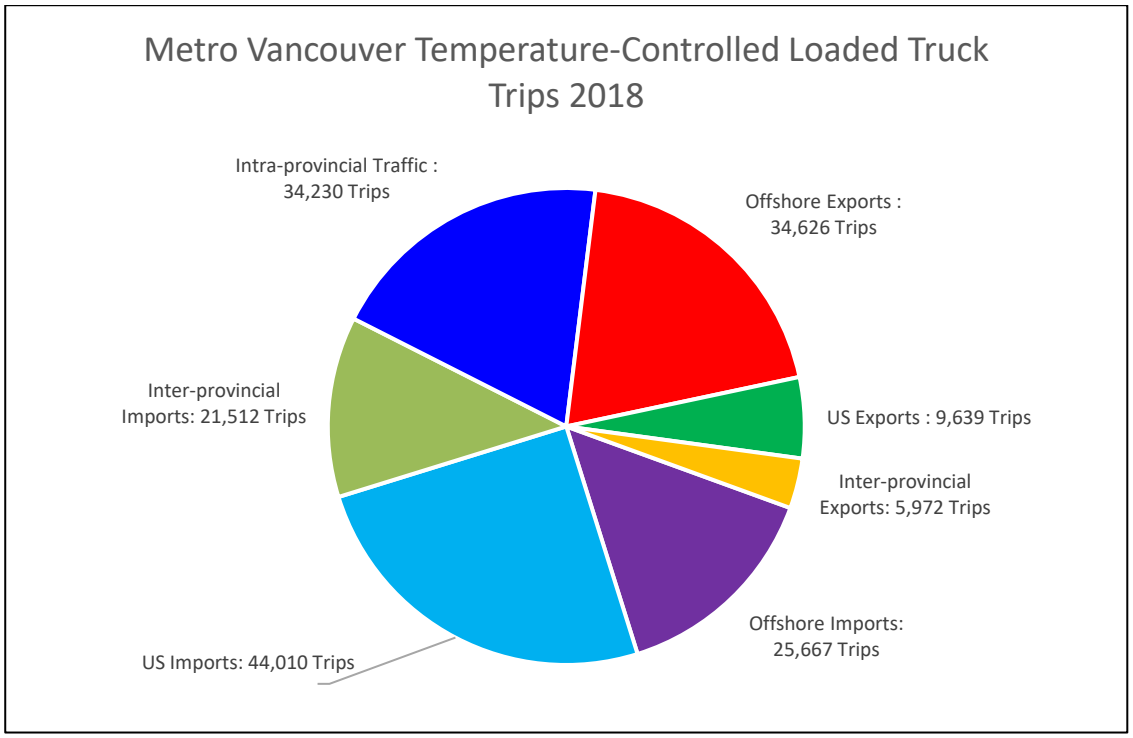
The resulting detailed estimates by commodity groups and origin-destination flows are shown below. The estimated total is 153,466 temperature-controlled loaded trips; this is approximately one-third of the total rail intermodal and trucking volume estimated in section 8.4.

Figure 10-3 Estimated Metro Vancouver Temperature-Controlled Loaded Truck Trips 2018

Estimated Metro Vancouver Temperature-Controlled Loaded Truck Trips 2018									
HS Code	HS Description	Offshore Imports	US Imports	Inter-provincial Imports	Intra-provincial Traffic	Offshore Exports	US Exports	Inter-provincial Exports	Total Loaded Reefer Trips
02	Meat	1,742	2,747	5,511	4,783	26,293	229	1,526	42,830
03	Fish, Crustaceans	5,728	1,430	169	1,294	4,738	3,301	1,128	8,621
04	Dairy Prods; Eggs; Honey	491	1,026	11,388	17,658	1,025	223	158	30,564
07	Edible Vegetables	5,376	18,032	2,593	5,761	0	2,158	305	31,761
08	Edible Fruit	7,708	18,921	526	3,704	942	3,252	199	30,859
09	Coffee, Tea	0	0	0	0	0	0	0	0
10	Cereals	0	0	0	0	0	0	0	0
11	Milling Products	0	0	0	0	0	0	0	0
12	Oil Seeds	0	0	0	0	0	0	0	0
15	Animal Or Vegetable Fats	0	0	0	0	0	0	0	0
16	Meat, Fish Preparations	981	642	91	71	27	43	1,289	1,785
17	Sugar	0	0	0	0	0	0	0	0
19	Bakers Wares	0	0	0	0	0	0	0	0
20	Prep Vegetables & Fruit	1,575	662	1,166	594	550	176	294	3,997
21	Misc Preparations	2,066	549	69	365	1,051	259	1,073	3,050
	Grand Total	25,667	44,010	21,512	34,230	34,626	9,639	5,972	153,466

The distribution of temperature-controlled loaded truck trips by origin-destination flows in 2018 is summarized in the figure below.

Figure 10-4 Metro Vancouver Temperature-Controlled Loaded Truck Trips by Origin-Destination Flow 2018



11 Appendix A Background Information on Statistics Canada Estimates of Food Availability

Food supply and disposition

The food statistics program relies on supply-disposition analysis. The stocks at the beginning of a period are combined with the flows in during that period to estimate total supplies. Total disposition is computed as flows out during the period, while ending stocks represent the total supply minus the total disposition. Consequently, the total supply for a given commodity in a given time period must equal the total disposition plus ending stocks for the same period. And, the ending stocks of one period must equal the beginning stocks of the next period. In reality, it is unusual for all stocks and flows to be measured directly. However, using the basic principles, a missing component can be derived residually.

On the disposition side, exports, manufacturing and waste are displayed followed by ending stocks. Domestic disappearance or food available for consumption is derived by subtracting the flows out plus ending stocks from the total supply. The domestic disappearance is viewed as the total amount of food available at the retail level.

Domestic disappearance is divided by the Canadian population as of July 1st of the year depicted to calculate the food available per person, per year, at the retail level. It is normally expressed on a weight basis in kilograms unless that is inappropriate, as is the case with beverages.

The data are sometimes displayed on a different basis depending on the commodity. For example, processed fruits and vegetables are displayed on a retail basis and fresh equivalent basis. The different basis for the retail weight is displayed simply to provide additional information for analytical purposes.

The information required to produce the food statistics is extensive and varied. The sources of data often reach deeply into the agricultural statistics program relying on surveys conducted by the Agriculture Division (AD). A few other divisions in Statistics Canada such as the International Accounts and Trade Division (IATD) or the Public Sector Statistics Division (PSSD) contribute crucial components of the data set. Trade statistics used are those produced on a customs basis which is derived from the administrative records of the Canada Border Services Agency and the United States Customs Border Protection. These trade statistics cover the physical movement of goods. Considerable administrative data from organizations such as Agriculture and Agri-Food

Canada (AAFC), Canadian Egg Marketing Agency, Canadian Sugar Institute, provincial departments and industry groups are also invaluable.

Beginning stocks represent the physical inventory of fresh and frozen products held in storage of a particular commodity at the beginning of the year. They equal the previous year's ending stocks. This item has a fairly small impact on domestic disappearance because the magnitude of changes in inventories is typically small. There are numerous commodities for which inventory data are not available; however, given the small impact of these data, the effect of this type of data gap is considered minor. Due to confidentiality, some inventory data are not displayed but they are used in the calculation.

Production represents the amount of a particular commodity that is produced during the reference year. The data are often based on independent surveys of farms and food processors. Many of the surveys are conducted by AD.

Imports include all goods which have crossed Canada's territorial boundary, whether for immediate consumption in Canada or stored in bonded custom warehouses.

Total supply is the sum of beginning stocks plus production plus imports. This number represents the total supply of a particular commodity that is available for any use.

Exports include goods grown, extracted or manufactured in Canada, including goods of foreign origin which have been materially transformed in Canada. Re-exports are exports of goods of foreign origin which have not been materially transformed in Canada, including foreign goods withdrawn for export from bonded customs warehouses. Total exports are the sum of domestic exports and re-exports.

Manufacturing data include requirements for processing, seed, animal feed and industrial use. If data are available at a more detailed level, then an important component of manufacturing is the amount used for processing. At the same time, the processed commodities need to be accounted for. For instance, apples contain an amount for processing and processed apples, be they canned, dried, frozen, made into apple sauce or pie filling, are accounted for as individual commodities. If detailed data are not available for processed products, then the commodity is accounted for at a less processed level even though it might often be used as an input into further processing. For instance, wheat flour is accounted for but the wheat flour products from breads

to cookies are not accounted for. Consequently, there is no deduction from wheat flour to account for further processing.

Waste factors attempt to account for quantities removed during processing or that are lost in storage. They do not allow for losses at the retail level, in households, restaurants or institutions during storage and preparation, or for unconsumed food.

Ending stocks represent the physical inventory of fresh and frozen products held in storage of a particular commodity at the end of the year. They equal the following beginning stocks. This item has a fairly small impact on net supply because it is truly the change in inventories that has any impact. There are numerous commodities for which inventory data are not available; however, given the small impact of these data, the effect of this type of data gap is considered minor. Due to confidentiality, some inventory data are not displayed but they are used in the calculation.

Domestic disappearance is derived by subtracting other uses and ending stocks from the total supply. The other uses include exports, manufacturing and waste. Domestic disappearance represents the total food available for human consumption from the Canadian food supply chain.
Total Supply = Beginning stocks + Production + Imports
Total Disposition = Exports + Manufacturing + Waste + Domestic disappearance
Domestic Disappearance = Total supply – Exports – Manufacturing - Waste - Ending stocks

Food available per person is calculated by dividing the domestic disappearance by the Canadian population as of July 1st of the reference year.
The food available per person is presented in a number of ways.

Retail weight is the volume of food available per person, for consumption, at the retail level. It is viewed as the most important number as it displays levels and trends for individual foods. It allows for easy comparisons of one type of food to another and within or between food groups. Furthermore, it is the number on which all other calculations are based including different ways of displaying the data and estimates of loss-adjusted food available. Processed fruits and vegetables or selected beverages are displayed on a fresh equivalent basis. Dairy products are depicted on a milk solids basis. Estimates based on the sugar content are provided for sugar products such as refined sugar, honey or maple syrup, while estimates for oils and fats include those based on the fat content. Red meats are displayed on a boneless and carcass basis, while poultry is provided on an eviscerated and boneless basis. Fish data are provided on an edible

weight basis. In the case of alcoholic beverages, the data are estimated for two population groups. One estimate is based on the total Canadian population. The other represents the population of Canadians who are 15 years of age and older.

Adjusted for losses results occur because in the storage, preparation and cooking of the food, as well as the food that makes it to the plate al is not consumed, or becomes a plate loss. These losses can occur in the retail store, home, restaurants or institutions. The losses are deducted from the food available for consumption at retail weight to derive food available for consumption adjusted for losses. The objective is to provide a proxy of fork-level consumption based on food supply data. Factors used to adjust the food available data are estimates themselves and caution should be used when working with the data, as they are based on a static model. The factors are taken from the Economic Research Service of the United States Department of Agriculture.

The waste factors that account for quantities removed during processing or lost in storage at the industrial level are removed before domestic disappearance is calculated and therefore do not appear in the retail weight available per person.

Perspective by food group

Cereal products

The food available for consumption value on a per capita or per person basis for cereal products describes what is available after the products leave the mills and therefore, further processing is not included under the manufacturing category. For wheat flour, rye flour, oatmeal and rolled oats, production and stocks data are derived from a monthly survey of Canadian millers, conducted by the Crops Section of the Agriculture Division. Data for imports and exports of these products are obtained from IATD. Included in wheat production are Canadian western red spring, red winter wheat, soft white spring wheat, and amber durum wheat; and Ontario and Quebec winter and spring wheat.

Per capita food available figures are provided for pot and pearl barley, corn flour and meal; however, some calculation components are hidden because of confidentiality restrictions.Nearly all of the domestic supply of rice is imported. Production data represent Canadian wild rice production, as provided by the Manitoba, Saskatchewan and Ontario departments of agriculture. Import data includes that for wild rice. Stocks data are not available for rice. For breakfast foods, the data include prepared, ready-to-serve breakfast foods, unprepared oatmeal and rolled oats and other unprepared cereals. The volume of oatmeal and rolled oats is removed from the

production and trade data to avoid double counting. Historically, the production of breakfast foods was based on shipments data provided by the Manufacturing and Energy Division (MED).

Sugars and syrups

The per capita availability of refined sugar includes all sugar destined for domestic and commercial uses (baking, confectionery). It is provided in retail weight (the weight of the product itself) and on a sugar content (the quantity of sugar in a product) basis.

In the past, MED collected information on the production and stocks of refined sugar through surveys of all known Canadian refiners of raw sugar. Manufacturing inputs in refineries include cane or beet sugar, chemically pure sucrose in solid form and liquid sucrose. Imported sugar products include granulated, cubed, brown and confectioner's sugar. Exports consist of refined cane and beet sugar. Stocks and production data are now provided by the Canadian Sugar Institute.

In 2005, following consultations with the Canadian Sugar Institute, the food supply-disposition for refined sugar was modified to include imports and exports of sugar containing products. Canada increasingly exports more sugar containing products than it imports.

Production data of maple products for Ontario, Nova Scotia and New Brunswick are collected by AD through a producer survey while production and stocks data for the province of Quebec are provided by the Institut de la Statistique du Québec. Production is recorded in units of maple syrup, but all maple products (taffy, butter, syrup) are converted to a maple sugar equivalent. Artificially produced maple items are not counted, only farm produced maple sugar. All trade data are converted to a maple sugar equivalent in order to maintain consistent units throughout the supply-disposition tables. These tables are reported on a crop year basis (April-March). Estimates of honey production are derived from a survey of beekeepers. Beginning stocks (if there are any) and imports are added to production to obtain total supply. Ending stocks (where applicable) and exports are deducted to produce a domestic disappearance figure. The food available data for honey is reported in retail weight and on a sugar content basis.

Meats

The procedure used to calculate the food available for beef, veal, pork, mutton and lamb is basically the same. Animals slaughtered include federally inspected slaughtering provided by Agriculture and Agri-Food Canada (AAFC) and estimates for those slaughtered in commercial

establishments not under federal inspection as well as on-farm slaughtering. The total warm dressed carcass weight is obtained from information collected by AAFC on animals slaughtered under federal inspection by the Canadian Food Inspection Agency (CFIA).

To convert to a cold dressed basis, beef is reduced by 1.5% to allow for shrinkage and 2.04 kg per carcass are added to account for head meat recovery. Veal is reduced by 1.5% to allow for shrinkage and removal of the hide, 0.23 kg per carcass is subtracted to account for kidney which is weighted in the carcass and 0.36 kg per carcass is added to account for head meat recovery. Mutton and lamb are reduced by 3% for shrinkage, 0.09 kg per carcass is subtracted for kidney and 0.18 kg per carcass is added to account for head meat recovery.

In 1988, a new methodology was developed for estimating pork available on a carcass basis in order to reflect the trend towards leaner hogs. Warm carcass weight is reduced by 3% for shrinkage to arrive at a cold carcass weight. A further 0.68 kg per carcass is deducted for kidney and tongue which is left in the carcass. The result is pork carcass production. Previously, 17% of cold carcass weight had been subtracted to account for larding fat. This, however, is no longer done.
The retail conversion factor for pork is similar to that developed for beef. It is calculated on the portion of the carcass that is available for consumption after removing the skin, bone and trimmed fat. The average cold dressed carcass weight is obtained by dividing the cold dressed weight for federally inspected slaughter by the number of animals slaughtered under federal inspection. This average cold dressed carcass weight is then multiplied by the total number of animals slaughtered to obtain a total cold dressed carcass weight. From the total supply, exports and ending stocks are subtracted to arrive at the domestic disappearance. For pork, manufacturing and waste are removed from the supply to arrive at domestic disappearance.

Exports of meats are collected and published by IATD. Conversion factors are applied to these exports to bring them to a cold dressed carcass basis.

Offal includes variety meats such as liver, heart, kidney, tongue, sweetbreads, oxtail and edible tripe and is calculated on a specific weight per carcass basis. The procedure for calculating the per capita availability of offal is basically the same as described for other meats.

Poultry

Production and beginning stocks are added to imports to derive total supply. From total supply, exports and ending stocks are deducted to produce domestic disappearance. Live imports and exports are converted to an eviscerated basis (dressed, ready for sale). Since the supply-disposition is calculated on an eviscerated weight basis, no further manufacturing or waste factor calculation is applicable. The available data are expressed in terms of eviscerated weight.

Fish

Data are available for four categories: fresh and frozen seafish, processed seafish, total shellfish and freshwater fish. Production data are provided by Fisheries and Oceans Canada for the commercial fishery and aquaculture survey data are obtained from AD. Information on stocks is not available. Imports and exports data are obtained from IATD. Initially all the data are converted to an edible weight basis due to the variety of species, products, sources and conversion factors. Therefore, the food available information is provided only on an edible weight basis.

Eggs

Total egg production includes all eggs sold for consumption, consumed by producers, sold for hatching, and leakers and rejects. Production from registered, non-registered and hatchery supply flocks are included in these estimates. Egg production is derived using average layer numbers and their estimated rates of lay. Administrative data from AAFC and the Canadian Egg Marketing Agency and information from surveys conducted by AD are used when compiling these estimates. Data on beginning and ending stocks are obtained from a monthly survey conducted by AD in conjunction with AAFC, while information on imports and exports is provided by IATD. The manufacturing figure represents domestically produced eggs used for hatching and is therefore not included in the amount available for human consumption. Processed eggs are not included in manufacturing but are converted to shell egg equivalent and are incorporated into the supply-disposition. The waste figure contains the leakers and rejects, those eggs which did not meet quality control standards.

Pulses

Agriculture Division reports production on pulses such as peas, lentils, mustard seed, canary seed, sunflower seed and chickpeas on a field-run basis through a producer survey. The product is removed from the field and the total weight-harvested is reported as production with no allowances made for spoilage. Import and export data are provided by IATD. Imports are added to production to obtain total supply; stock data is only available for dry peas. All imports and exports are converted to a whole pea equivalent to allow trade data, which includes split peas, to

be incorporated. Data for dry peas and dry beans are presented on a crop year basis (August - July). The manufacturing figure includes seed requirements and quantity used by manufacturers. Approximately 2% of production is removed to account for waste. Dry peas used for manufacturing include feed and seed requirements as well as processing.

Nuts

The bulk of Canada's supply of nuts is imported. There is some limited production of filberts and hazelnuts in British Columbia. The British Columbia Department of Agriculture provides information on this production. Imports and exports are reported by IATD and most trade data are reported on a shelled weight basis. Where appropriate, commodities are converted to shelled weight. The supply of tree nuts is comprised of imports such as almonds, Brazil nuts, cashew nuts and walnuts, and does not include oil-producing nuts (such as beechnuts).

Dairy products

Information on dairy products is obtained from several sources. Fluid milk and cream production data are derived mainly from administrative data supplied by the milk marketing boards in each province, based on the sales by dairies. The waste figure, which accounts for milk lost in transfer and shrinkage, is incorporated into the sales data. Since there are no stocks, imports, exports or other waste deductions for fluid milk and cream, production constitutes the domestic disappearance for these items. Information for other dairy products and by-products such as cheddar, processed and variety cheese, condensed and powdered milk, ice cream, cottage cheese, sherbet, milkshake, ice milk, yogurt and sour cream, originates from provincial marketing boards and departments of agriculture and is compiled by AD. Production and stocks data are released on a monthly basis and import and export information is obtained from IATD. Most of these products are considered as final products not requiring further processing and therefore manufacturing data are not reported. A waste figure is incorporated into the production data. This value is also expressed in terms of milk solids (i.e., the portion of the product which comprises butterfat and non-fat solids such as protein and calcium, etc.). The milk solid values are calculated on a weight basis rather than a volume basis.

Oils and Fats

There are four categories of oils and fats. They include: butter, margarine, salad (or vegetable) oils, along with shortening and shortening oils. The data depicting the amounts available for consumption are presented on a retail weight and fat content basis. Butter is estimated

independently with information that originates from provincial marketing boards and departments of agriculture and is compiled by AD. Trade data for butter are obtained from the IATD.

To backtrack a little, prior to 1994, production data on margarine, salad oils, shortening and shortening oils were based on sales to retail and commercial outlets, therefore no stock information was required. Trade data for these products were obtained from the IATD. They were considered as final products not requiring further processing and therefore, manufacturing data were not reported. A waste figure had already been accounted for in the production data, so no additional waste factor was applied. In July 1995, the survey of oils and fats, conducted by MED, underwent some revisions in co-operation with the Canadian Oilseed Processors Association. In 1995, the degree of estimation for non-response was 1.8%. By 2001, the last year for this survey, estimation for non-response had grown to 37.3%. After 2001, manufacturing data no longer existed making it was necessary to find an alternative source and trend analysis was used as a substitute.

Fresh fruits

Production of fresh fruits is provided by AD. Information is gathered through producer surveys or directly from the representatives of various provincial departments of agriculture. Stocks data for apples are obtained from AFFC. The import and export data, based on a calendar year basis, originate from IATD. For several commodities the total supply is imported (avocados, bananas, coconuts, dates, figs, guavas and mangoes, muskmelons and cantaloupes, winter melons, papayas, prunes, plums and sloes, pineapples, quinces). The quantity of each commodity acquired by processors or used as manufacturing inputs is reported under manufacturing. This may be the amount reported by processors. Manufacturing inputs are removed from the domestic disappearance of fresh items to avoid double counting. The information is obtained from AD.

Citrus fruits

Information on citrus fruits is obtained from the import and export data available from IATD. Since there are no stocks or domestic production of these commodities, imports constitute domestic disappearance for these items. In 1988, the data for mandarins became available and have been added to this table. However, they continue to be included with fresh oranges in order to maintain a consistent historical time series.

Processed fruits

Because the processed fruit products are not available, the data related to the sales of processed fruits are used to estimate the per capita consumption data from the Canadian food supply. Import

and export data based on a calendar year basis originate from IATD. Processed products are considered as end products so there is no further manufacturing component.

Fresh vegetables

Production of fresh vegetables is reported by AD. Information is gathered through producer surveys or directly from the representatives of various provincial departments of agriculture. Stocks of fresh vegetables are reported by AAFC. These commodities include cabbage, carrots, onions and shallots, white potatoes, rutabagas and turnips. The import and export data originate from IATD. For several commodities the total supply is imported (artichokes, Chinese cabbage, other edible root vegetables, eggplant, kohlrabi, manioc, okra, olives, other leguminous vegetables and rapini).

Agriculture Division produces six estimates including: potatoes, white; potatoes, fresh; potatoes, processed; potatoes, frozen; potatoes, chips; and potatoes, processed, other. Potatoes, white are a sum of fresh and processed potatoes while potatoes, processed are a sum of the three categories of processed potatoes.

The calculation to estimate the volume of fresh potatoes available for consumption starts with the January 1 stocks of fresh potatoes provided by AAFC, plus that year's estimate of production from AD and the imports of fresh potatoes as reported by IATD, minus the volume of fresh potatoes that is diverted to processing, cattle feed, exported or used for seed. We also subtract the fresh stocks at the end of the year to estimate domestic disappearance.

Processed vegetables

The processed vegetables products are also not available and the data related to the sales of processed vegetables are used to estimate the per capita consumption data from the Canadian food supply. Import and export data on a calendar year basis originate from IATD. As processed products are considered as end products, there is no further manufacturing component.

Juices

The information on grapefruit, grape, lemon, orange and pineapple juices is obtained from the import and export data available from IATD. Since there are no stocks or data on domestic production of these commodities, imports and exports constitute domestic disappearance for these items. Fruit juices are measured in terms of weight not volume. Once converted to kilograms, frozen and unfrozen concentrates are converted to a single strength basis. Then all

juice products can be referenced as single strength juice which can be converted to a fresh equivalent weight. Two available figures are published - one in kilograms and one in litres.

Tea, coffee and cocoa

All components of the supply-disposition reported for tea are in tea leaf equivalent and litres. Coffee is reported in bean equivalent and litres. Cocoa is expressed in bean equivalent. There is no domestic production of these commodities; imports represent the total supply. The per capita disappearance of coffee is based on adjusted domestic retail sales data. These commodities are converted to weight for comparability purposes.

Soft drinks

Domestic disappearance was based on total domestic sales, as provided by the Canadian Soft Drink Association, but because the data is not available anymore, trend analysis was used as a substitute. Included in the imports and exports are data for mineral and aerated waters, which contain added sugars, other sweeteners, or flavours. The data on imports and exports are provided for information only and are not used in the calculation for domestic disappearance.

Bottled water

Bottled water data were calculated using the domestic sales information provided by the Canadian Bottled Water Association. These data represent sales of bottled water, which includes spring water, mineral water, well water, artesian water, purified water and carbonated bottled water. Bottled water cannot contain sweeteners or chemical additives and must be calorie free and sugar free. Soda water, seltzer water and tonic water are not considered bottled water. Currently, there is no source of data for this commodity.

Alcoholic beverages

Domestic disposition along with trade data are the only components of the supply-disposition tables that are provided. The data are based on the volume of sales of alcohol beverages from the provincial and territorial government liquor authorities and other retail outlets. However, these data do not contain information on sales generated by those establishments which offer either "brew on premises" services or sell products for "at home" production of beer and wine. These tables are reported for the April to March fiscal year. There are two estimates published for alcoholic beverage consumption. One estimate is based on the total Canadian population. The other represents the population of Canadians who are 15 years of age and older.