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The Economic Impact of Canola on the Canadian Economy: 2024 Update

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Introduction

The Canola Council of Canada commissioned GlobalData (formerly LMC International) to undertake research to quantify the benefit of canola to the Canadian economy, in terms of:

1. ***Economic impact***
2. ***Number of people dependent on the sector***
3. ***Wages***

This study provides the results of that independent analysis.

We focus specifically on the production of canola and canola products across the value chain: from canola seed and trait development, through canola farming and processing, to the delivery of value added by-products to end users or ports of export. We also include the economic impact to the livestock sector of the benefits of using canola meal.

The results capture:

1. The ***direct*** benefit from these stages
2. The ***indirect*** benefit from the associated economic and market activities and industries
3. The ***induced*** benefit from household spending of the income earned from the canola sector.

The data are presented for ***Direct*** benefits and ***Total*** benefits (the sum of the direct, indirect and induced benefits above) for each stage, for each selected province in Canada and for Canada in aggregate.

The objective was to develop an up-to-date assessment, using:

- Official data as far as possible
- The latest data for 2022/23 and previous years (which are officially revised over time)
- Interviews with industry participants
- Best practice in estimating economic benefits.

This study

The analysis aims to update and enhance LMC/GlobalData's previous estimates on the same subject to provide the most accurate and independent assessment possible. To this end, we took guidance on past and current trends from industry participants and applied *Statistics Canada* multipliers to arrive at our totals in each category.

We have incorporated the results of previous studies to illustrate the long-term trends of the sector. Our direct results for the earlier years are comparable to those in previous studies, with small changes reflecting revisions to official data. The total results reflect the government's most recent multipliers for each sector.

*Note: Value throughout the study is presented in **Canadian dollars**, whether noted as dollars, or with the symbols $ or C$, unless otherwise specified.*

Summary of Results

For the average of the three years, ***2020/21-2022/23***:

- The total ***economic impact*** on the Canadian economy from the canola sector averaged C$43.7 billion per year (Table 5).
- 206,000 ***full time equivalent jobs*** are supported by the canola sector, comprising almost 142,000 paid jobs (Table 6) and an additional 65,000 family members (beyond the growers themselves) who support and are supported by canola farming operations.
- The total ***wage impact*** of the sector averaged C$16.3 billion (Table 7).

The economic benefits from canola are higher when prices and volumes produced are higher. Over the last three years, historically high prices have driven the very impressive economic value-added in the canola sector, peaking in the most recent year, 2022/23.

In the decade ***since 2012/13***:

- The 2022/23 peak for total economic impact has ***more than doubled***, ***increasing by C$30.5 billion.*** The most recent three-year average is over 70% higher than 2012/13, a C$18.4 billion rise.
- The total employment impact of the sector has ***increased by over 1,000 full-time equivalent employees to 2022/23.*** For the most recent three-year average, employment levels are almost the same as 2012/13.
- The total wage impact of the sector has ***increased more than 80% to its 2022/23 peak***, ***adding over C$8 billion*** in wages to the Canadian economy. The most recent three-year average is over 60% higher than 2012/13, a C$6.3 billion rise.

Part A. National Results – Overview

This study evaluates the impact along the value chain for canola via three different metrics:

- ***Economic impact:*** quantifies the value added to the Canadian economy by canola
- ***Employment impact:*** estimates the number of full-time equivalent (FTE) jobs contributed by the canola value chain in Canada
- ***Wage impact***: evaluates the total wages for individuals employed in the value chain

We evaluate the Canadian canola value chain at a number distinct steps, tracing the impact through the value-added products of crude oil, refined oil and meal.

- For ***refined canola oil***, our analysis ends at the point where this oil is either 1) processed into margarine, shortening and salad oil within Canada (our "end uses" sector); 2) loaded onto a ship for overseas export; or 3) crosses from Canada into the United States for overland export.
- Our approach for ***crude canola oil*** is similar; however, the vast majority of crude oil used in Canada is not delivered to end users — typically, it is refined first, whether into edible oil or biofuels. The refiner or biofuel producer is then treated as the *de facto* end user.
- ***Canola meal*** is treated largely in the same way as oil, but we extend our analysis one step further. For meal, we also 1) evaluate the cost savings for discrete livestock sectors vis-à-vis protein meal alternatives, and 2) estimate the value of additional milk yielded by Canadian cows fed a canola ration, given the unique benefits to dairy cattle.

The economic indicators for each step of the value chain are presented at two levels: ***Direct effects*** only, and ***Total effects*** (which is the sum of Direct, Indirect and Induced effects).

- ***Direct effects:*** the economic, employment and wage impacts that can be directly attributed to the canola value chain. These results are calculated by GlobalData based on models driven by publicly and privately available data, industry knowledge and interviews with industry stakeholders.
- ***Indirect effects:*** the economic, employment and wage impacts created by those industries that supply the canola value chain, or by individuals who work at the periphery of the sector.
- ***Induced effects:*** the economic, employment and wage impacts that stem from household spending of the income earned from the canola sector.

Note: The indirect and induced effects of the canola sector are estimated based on input-output tables developed by Statistics Canada (StatCan). The use of these multipliers is discussed in greater detail later in the study.

The Canada-level results represent an aggregate sum of the results from the provincial level analysis. In this section of the report, our focus is on the national-level results. The most recent three-year averages of provincial-level results are presented later in the report.

Table 1: Canola economic impact assessment by value chain component

Step number	Value chain component	Description	Economic impact	Employment	Wages	Multiplier used
1	Seed development	Breeding of canola varieties, enhancement of canola genetic materials as well as the manufacture, distribution and sale of canola seed in Canada	captured in canola farming	yes	yes	yes
2a	Canola farming	Production of canola seed by farmers using land and agricultural inputs like seed, fertilizers and crop protection	yes	yes	yes	yes
2b	Farm family members	Unpaid family members who may indirectly support farm operation. Paid family members would be captured under step 2a	captured in canola farming	yes	captured in canola farming	no
3	Elevation	Primary elevation of canola seed	yes	yes	yes	yes
4	Seed delivery	Delivery of seed to crushing facility or point of export via truck, rail and barge	yes	yes	yes	yes
5	Crushing	Crushing canola seed for the manufacture of crude canola oil and canola meal	yes	yes	yes	yes
6	Refining	Refining crude canola oil for use in edible applications	yes	yes	yes	yes
7	Bottling and packing	Bottling and packing refined oil into any container for use as salad and cooking oil	yes	yes	yes	yes
8	Biofuel production	Production of biofuel using canola oil feedstock	yes	yes	yes	yes
9	By-product delivery	Delivery of crude oil, refined oil or meal to end user or point of export	yes	yes	yes	yes
10	Impact at ports	Loading ocean-going vessels for overseas export as well as laker vessels for shipments between Ontario and Quebec	yes	yes	yes	yes
11	Benefit to livestock sector	Cost savings associated with using canola meal relative to alternatives and the value of the dairy yield boost associated with canola meal	yes	no	no	yes
12	End users	Impact on major end use- products such as margarine, shortening and salad oil	yes	yes	yes	yes

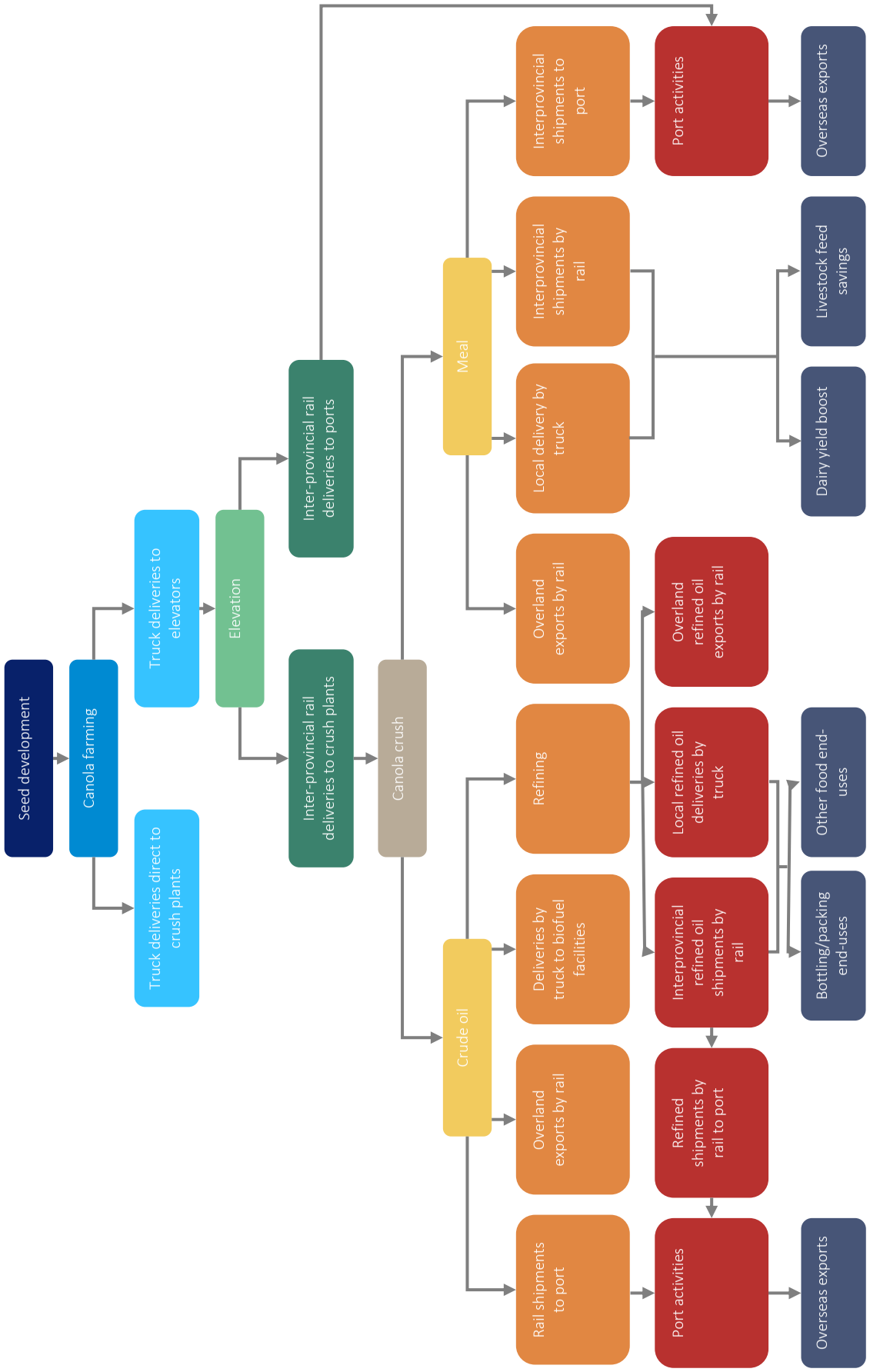


Figure 1: Flow chart of the Canadian canola value chain assessed in this study

The direct effect of canola on the Canadian economy

The ***direct*** impact of canola on the Canadian economy over the last 15 years is illustrated in Diagram 1. This presents the aggregate results for the entire value chain according to our three separate measures: *economic impact*, *employment* and *wage impact.* The data for each measure, broken down by each stage in the value chain, are presented in Tables 2, 3 and 4.

- Between 2020/21 and 2022/23, ***the direct economic impact of canola on the Canadian economy averaged C$18.7 billion*** (Table 2). This value peaked in 2022/23 with high prices and high output volumes. The average economic impact of canola is on an increasing trend, with the past three years representing the three highest years of direct economic impact of canola in our analysis thanks to high prices.

- The ***direct employment impact*** across the canola value chain is very stable as increased output tends to be offset by productivity improvements over time. Between 2020/21 and 2022/23, the canola sector was *directly accountable* for an average of almost 60,000 paying jobs (Table 3). When additional canola farm family members, who contribute to the overall success of the farming enterprise, are included, ***the number of people directly supported by the canola industry over the same period increases to almost 125,000***.

- Between 2020/21 and 2022/23, ***the direct wage impact of canola on the Canadian economy averaged C$5.2 billion*** (Table 4). This value has been increasing steadily over time, with stronger gains during the inflationary period of the last couple of years.

Diagram 1: Direct effects of canola on the Canadian economy

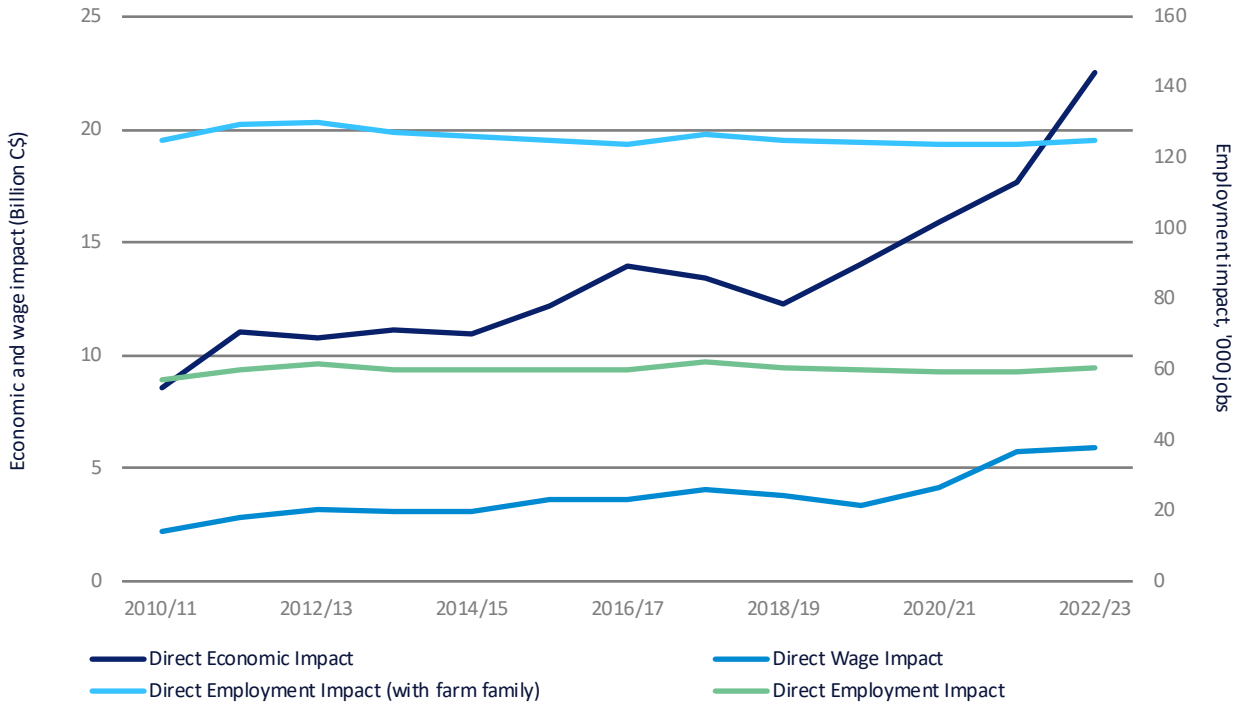


Table 2: Direct economic impact of canola on the Canadian economy (C$ billion)

	2012/13	2015/16	2020/21	2021/22	2022/23	Average 2020/21-22/23
Seed development	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Canola farming	8.15	8.66	11.70	11.95	15.26	12.97
Elevation	0.20	0.27	0.28	0.18	0.25	0.23
Total seed delivery	0.58	0.81	1.04	0.67	0.95	0.89
Crushing	0.41	0.69	0.57	0.00	2.20	0.92
Refining	0.15	0.25	0.19	0.77	0.74	0.57
Bottling & packing	0.10	0.16	0.07	0.11	0.25	0.14
Biofuel production	0.02	0.09	0.24	0.31	0.20	0.25
By-product delivery	0.11	0.19	0.21	0.20	0.24	0.22
Impact at ports	0.13	0.20	0.23	0.14	0.21	0.19
Total benefit to livestock sector	0.18	0.15	0.19	0.24	0.24	0.22
End uses	0.75	0.73	1.17	3.13	2.01	2.10
Direct Economic Impact	**10.78**	**12.21**	**15.88**	**17.69**	**22.54**	**18.71**

Note: Economic impacts of seed development sector are captured under canola farming – see methodology.

Table 3: Direct employment impact of canola on the Canadian economy (thousand jobs)

	2012/13	2015/16	2020/21	2021/22	2022/23	Average 2020/21-22/23
Seed development	0.61	0.61	0.64	0.64	0.66	0.65
Canola farming	52.26	49.51	49.21	50.46	49.81	49.83
Elevation	1.02	1.28	1.38	1.35	1.33	1.35
Total seed delivery	1.70	2.30	2.32	1.44	2.00	1.92
Crushing	0.47	0.46	0.45	0.45	0.45	0.45
Refining	0.27	0.30	0.29	0.29	0.29	0.29
Bottling & packing	0.39	0.38	0.34	0.31	0.31	0.32
Biofuel production	0.01	0.05	0.05	0.06	0.05	0.05
By-product delivery	0.38	0.58	0.57	0.58	1.64	0.93
Impact at ports	0.66	0.91	1.06	0.63	0.88	0.86
Total benefit to livestock sector	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
End uses	3.49	3.46	3.06	2.75	2.78	2.86
Direct Employment	**61.25**	**59.85**	**59.38**	**58.95**	**60.19**	**59.51**
Additional canola farm family members	*68.59*	*65.33*	*64.68*	*64.78*	*64.89*	*64.78*
Direct Employment (with farm family)	**129.84**	**125.18**	**124.05**	**123.74**	**125.08**	**124.29**

Table 4: Direct wage impact of canola on the Canadian economy (billion C$)

	2012/13	2015/16	2020/21	2021/22	2022/23	Average 2020/21-22/23
Seed development	0.05	0.05	0.06	0.06	0.07	0.06
Canola farming	2.57	2.86	3.37	5.10	5.05	4.51
Elevation	0.06	0.10	0.08	0.04	0.10	0.07
Total seed delivery	0.12	0.17	0.19	0.12	0.17	0.16
Crushing	0.03	0.03	0.03	0.03	0.03	0.03
Refining	0.02	0.02	0.02	0.02	0.02	0.02
Bottling & packing	0.02	0.02	0.02	0.02	0.02	0.02
Biofuel production	0.00	0.00	0.00	0.00	0.00	0.00
By-product delivery	0.03	0.05	0.06	0.06	0.16	0.09
Impact at ports	0.04	0.06	0.09	0.05	0.08	0.07
Total benefit to livestock sector	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
End uses	0.18	0.19	0.19	0.18	0.19	0.19
Direct Wage Impact	**3.12**	**3.57**	**4.11**	**5.68**	**5.90**	**5.23**

The total impact of canola on the Canadian economy (direct + indirect + induced effects)

The total effect of canola on the Canadian economy is not limited to the people working directly in the industry. The full impact also accounts for the indirect and induced effects that occur. The results of the total impact (direct + indirect + induced effects) are illustrated in Diagram 2 and in Tables 5-7.

- In 2022/23, the total ***economic impact***, which includes direct, indirect and induced effects, peaked at a whopping $55.8 billion. The average economic impact of canola on the Canadian economy over the past three years of full data, 2020/21 to 2022/23, was ***$43.7 billion,*** thanks to the high prices of recent years***.***
- The total ***employment effect*** of canola between 2020/21 and 2022/23 averaged ***204,000***. This includes canola farm family members.
- Over the same period, the ***wage effect*** of canola on the Canadian economy averaged ***$16.2 billion***. When divided by the jobs created, excluding those jobs to canola farm family members, the implied average per-capita supported wage was $110,000, which compares favorably with an average Canadian salary of nearer $70,000.

Diagram 2: Total effect of canola on the Canadian economy

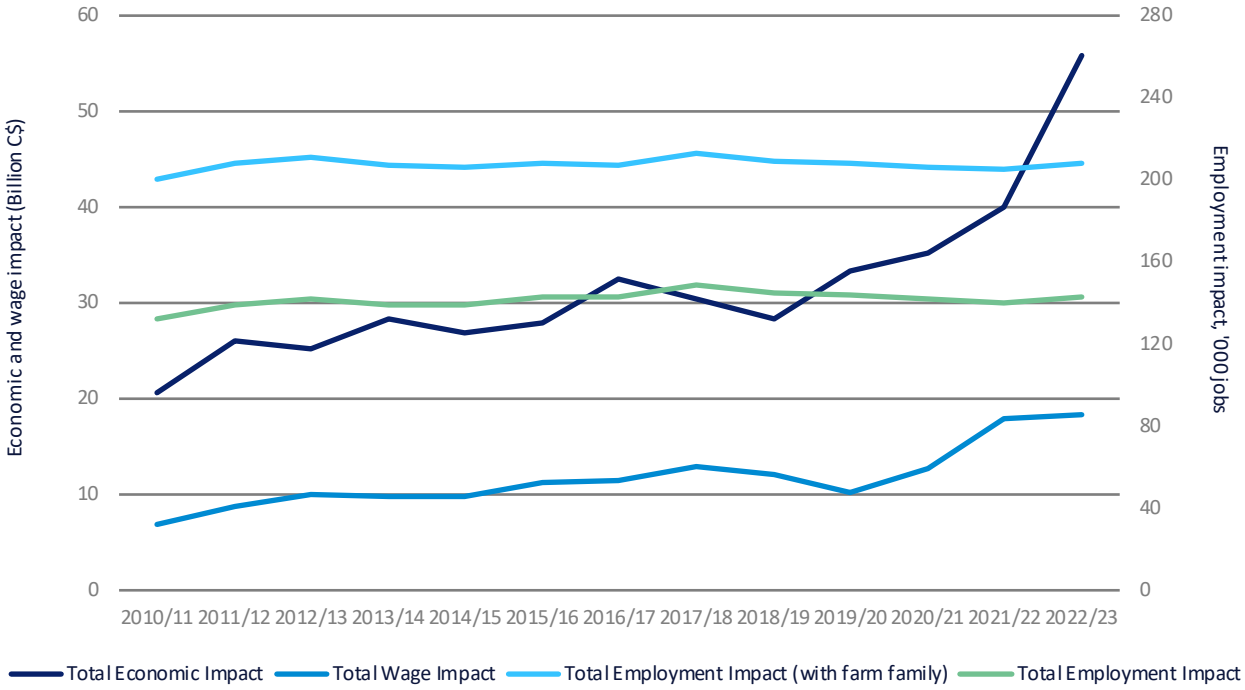


Table 5: Total economic impact of canola on the Canadian economy (C$ billion)

	2012/13	2015/16	2020/21	2021/22	2022/23	Average 2020/21-22/23
Seed development	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Canola farming	17.62	16.75	22.53	23.00	29.37	24.96
Elevation	0.38	0.41	0.41	0.26	0.37	0.35
Total seed delivery	1.29	1.74	2.26	1.55	2.11	1.97
Crushing	1.93	3.93	3.11	0.00	12.04	5.05
Refining	0.72	1.41	1.05	4.24	4.03	3.11
Bottling & packing	0.25	0.39	0.16	0.26	0.60	0.34
Biofuel production	0.07	0.54	1.32	1.68	1.09	1.36
By-product delivery	0.21	0.32	0.35	0.35	0.42	0.37
Impact at ports	0.24	0.29	0.34	0.21	0.31	0.29
Total benefit to livestock sector	0.97	0.81	1.02	1.26	1.30	1.20
End uses	1.59	1.35	2.63	7.18	4.18	4.66
Total Economic Impact	**25.27**	**27.96**	**35.18**	**39.99**	**55.82**	**43.67**

Table 6: Total employment impact of canola on the Canadian economy (thousand jobs)

	2012/13	2015/16	2020/21	2021/22	2022/23	Average 2020/21-22/23
Seed development	2.52	2.84	2.61	2.61	2.72	2.65
Canola farming	115.35	110.76	108.91	111.66	110.24	110.27
Elevation	1.61	2.20	2.37	2.32	2.28	2.33
Total seed delivery	3.66	5.79	5.85	3.61	4.99	4.82
Crushing	4.24	4.58	5.29	5.26	5.24	5.26
Refining	2.40	2.95	3.41	3.39	3.38	3.39
Bottling & packing	1.05	1.04	0.92	0.83	0.83	0.86
Biofuel production	0.11	0.47	0.54	0.65	0.53	0.57
By-product delivery	0.82	1.46	1.40	1.42	4.01	2.28
Impact at ports	1.03	1.57	1.82	1.08	1.52	1.47
Total benefit to livestock sector	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
End uses	9.41	9.36	8.28	7.43	7.51	7.74
Total Employment	**142.19**	**143.01**	**141.40**	**140.27**	**143.24**	**141.64**
Additional canola farm family members	*68.59*	*65.33*	*64.68*	*64.78*	*64.89*	*64.78*
Total Employment (with farm family)	**210.78**	**208.34**	**206.08**	**205.06**	**208.13**	**206.42**

Table 7: Total wage impact of canola on the Canadian economy (C$ billion)

	2012/13	2015/16	2020/21	2021/22	2022/23	Average 2020/21-22/23
Seed development	0.16	0.17	0.19	0.19	0.21	0.20
Canola farming	8.47	9.53	10.80	16.35	16.19	14.45
Elevation	0.09	0.15	0.13	0.06	0.15	0.11
Total seed delivery	0.24	0.36	0.41	0.25	0.36	0.34
Crushing	0.20	0.21	0.18	0.20	0.22	0.20
Refining	0.11	0.13	0.12	0.13	0.14	0.13
Bottling & packing	0.06	0.06	0.06	0.05	0.06	0.06
Biofuel production	0.01	0.02	0.02	0.02	0.02	0.02
By-product delivery	0.06	0.10	0.10	0.11	0.30	0.17
Impact at ports	0.07	0.10	0.14	0.08	0.12	0.11
Total benefit to livestock sector	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
End uses	0.47	0.47	0.46	0.43	0.47	0.45
Total Wage Impact	**9.94**	**11.29**	**12.59**	**17.89**	**18.25**	**16.25**

Methodology: Use of multipliers to evaluate indirect and induced impacts

The direct effects of canola on the Canadian economy are significant. Nonetheless, they ignore the important economic effect that a core industry generates via a ripple effect on supporting industries. This is known as the indirect effect. For some steps in the canola value chain, the indirect effect can be significant. This is especially true for capital-intensive aspects of the sector, such as crushing. To illustrate this point, consider that a typical canola crushing facility in Canada, with average capacity of over 500,000 tonnes annually, directly employs between 40 and 60 people (excluding the refining side of operations). However, many jobs associated with keeping that facility operational, from white collar jobs in engineering to trade professions like electricians, plumbers and pipefitters, are done on a contractual basis with outside firms, making the true impact of the crush facility much higher.

Similarly, direct effects fail to capture the economic activity stemming from expenditures of households drawing a salary from a given sector. While these "induced" effects are typically smaller than indirect effects, they can still constitute a sizeable economic force, particularly when the sector being evaluated is large, as is the case for canola.

These economic and employment spin-offs are known as the ***multiplier effect*** in established economic literature. Multipliers measure the impact on the broader economy from some kind of exogenous shock to a specific sector of the economy.

In this report, we employ different multipliers for the economic, employment, and wage effects, and the size of the multiplier effect also varies geographically and across different subsectors of the canola value chain. Fortunately, ***Canada maintains industry multipliers at a detailed sectoral level.***

How StatCan multipliers have been used in this study

Statistics Canada's Industry Accounts Division has estimated over 250 economic multipliers for all Canadian provinces, with all categories available at the national level. Initially, it would seem reasonable to assume that *provincial*-level data would provide more detail, and hence accuracy, for the estimates of indirect and induced effects. However, after calculating estimates using provincial-level multipliers and after conversations with StatCan economists who developed the multipliers, we learned the following:

- For some industries, the number of data points at the provincial level can be insufficient to make an accurate assessment of the multiplier effect.
- Some sector designations can mean very different things when applied to different provinces. For example, the category "Crop Production" in the Prairies represents broad acre agriculture, like that of canola production. However, in Ontario or Quebec, "Crop Production" is skewed toward the smaller fruit farms more commonly found in these provinces, whereas this study is strictly focused on canola.
- Finally, induced effects are not estimated at the provincial level, but are available only at the national level.

For these reasons, we adopt national-level multipliers when estimating the total impact of canola on the Canadian economy, including at the provincial level. This ensures a level playing-field for each of the provinces.

Canadian multipliers are available for each of our impact measures, i.e. 1) economic impact, 2) employment impact, and 3) wage impact, at the direct, the direct+indirect, and the direct+indirect+induced levels.

Multipliers change over time

One challenge associated with using multipliers for sophisticated economies, like Canada, is that multipliers can change over time to reflect not only new economic realities, but also methodological developments. Also, constructing multiplier tables is both data and labour-intensive, resulting in a significant time lag in reporting. As of the writing of this study, the most recent multipliers available were from 2020 (Table 8).

For this study:

- Total economic and employment impact calculated in the previous study, conducted in 2020, were calculated using StatCan's 2016 multipliers (Table 8).
- Total impact from 2019/20-2022/23 has been calculated using StatCan's latest 2020 multipliers.

Table 8: National-level multipliers derived from StatCan input-output tables

Value-added activity	StatCan Industry Designation	2016 Multipliers			2020 Multipliers		
		Economic Impact	Employment Impact	Wages Impact	Economic Impact	Employment Impact	Wages Impact
Seed Development	Pesticides, Fertilizer Ag Chem Manu	2.5	4.7	3.5	2.5	4.1	3.2
Farming	Crop Production	1.9	2.2	3.3	1.9	2.2	3.2
Rail Transport	Rail Transportation	1.7	2.5	1.9	1.6	2.3	1.8
Truck Transport	Truck Transportation	2.8	2.4	2.4	2.9	2.3	2.6
Barge Transport	Water Transportation	3.2	3.4	2.7	3.0	2.9	2.4
Crushing	Grain and Oilseed Milling	5.7	9.9	6.0	5.5	11.7	6.7
Refining	Grain and Oilseed Milling	5.7	9.9	6.0	5.5	11.7	6.7
Biofuels	Grain and Oilseed Milling	5.7	9.9	6.0	5.5	11.7	6.7
Elevation	Warehousing and Storage	1.5	1.7	1.5	1.9	1.6	1.6
Port Activities	Warehousing and Storage	1.5	1.7	1.5	1.9	1.6	1.6
Livestock	Animal Production	4.7	n.a.	n.a.	5.1	n.a.	n.a.
End uses & bottling	Other Food Manufacturing	2.4	2.7	2.4	2.5	2.7	2.6

Part B. Provincial Results – Overview

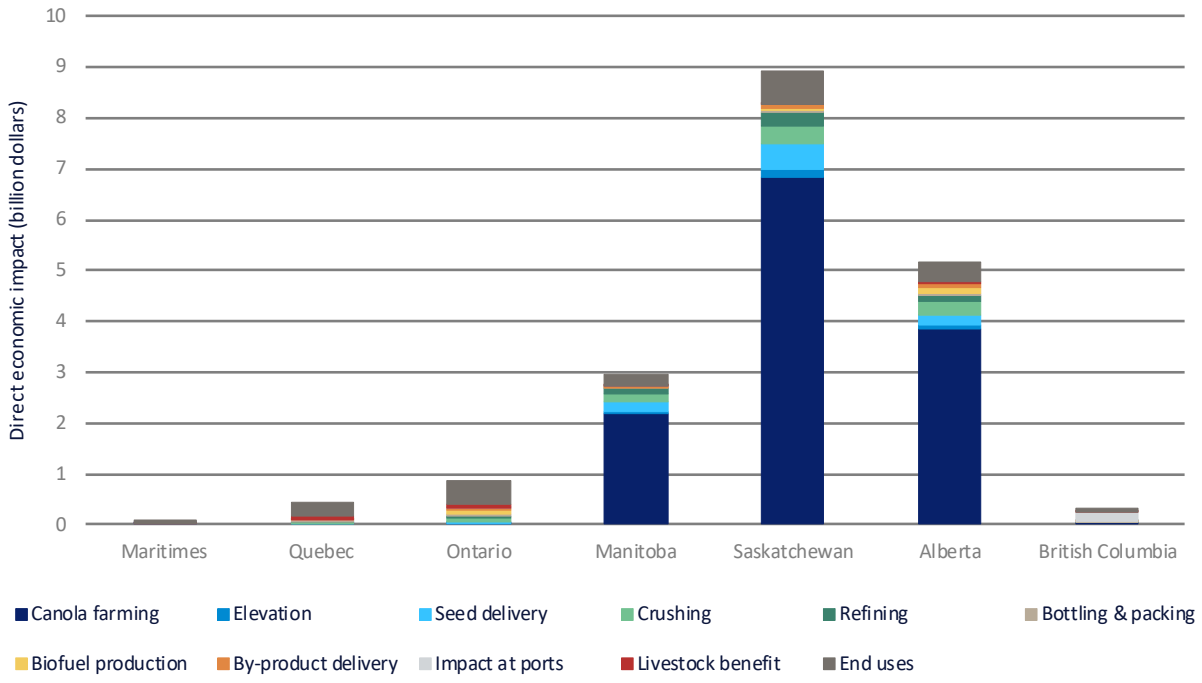
The direct effect of canola on Canadian provincial economies

Saskatchewan enjoys the largest ***direct economic impact*** from Canadian-grown canola. It is both the leading producer of canola seed and home to the largest share of the country's processing capacity. Saskatchewan accounts for almost half of the total Canadian direct economic impact. With Alberta and Manitoba included, Canada's Prairie provinces account for 90% of the economic impact from canola.

Table 9: Direct economic impact by province (C$ million), average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Seed development	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Canola farming	0.6	17.8	29.9	2,189.4	6,839.9	3,858.1	33.1	12,968.8
Elevation	0.0	0.0	0.0	39.3	133.1	80.3	2.1	254.9
Seed delivery	0.0	0.8	1.2	202.4	506.4	171.8	3.9	886.6
Crushing	0.0	29.8	86.6	147.2	363.6	294.3	0.0	921.4
Refining	0.0	20.3	53.0	90.2	283.6	119.5	0.0	566.6
Bottling & packing	0.0	6.5	17.9	30.3	47.4	40.9	0.0	143.0
Biofuel production	0.0	25.6	113.2	0.0	8.0	97.6	4.2	248.6
By-product delivery	0.0	3.1	16.3	16.6	97.3	85.0	0.0	218.4
Impact at ports	0.0	2.1	7.2	0.0	0.0	0.0	181.9	191.2
Livestock benefit	10.4	75.4	80.9	10.5	6.5	21.7	17.9	223.3
End uses	62.2	244.0	442.1	245.4	656.8	386.8	67.4	2,104.7
Direct Economic Impact	**73.2**	**425.5**	**848.4**	**2,971.3**	**8,942.5**	**5,156.1**	**310.5**	**18,727.5**

Diagram 3: Direct economic impact by province, average 2020/21–2022/23

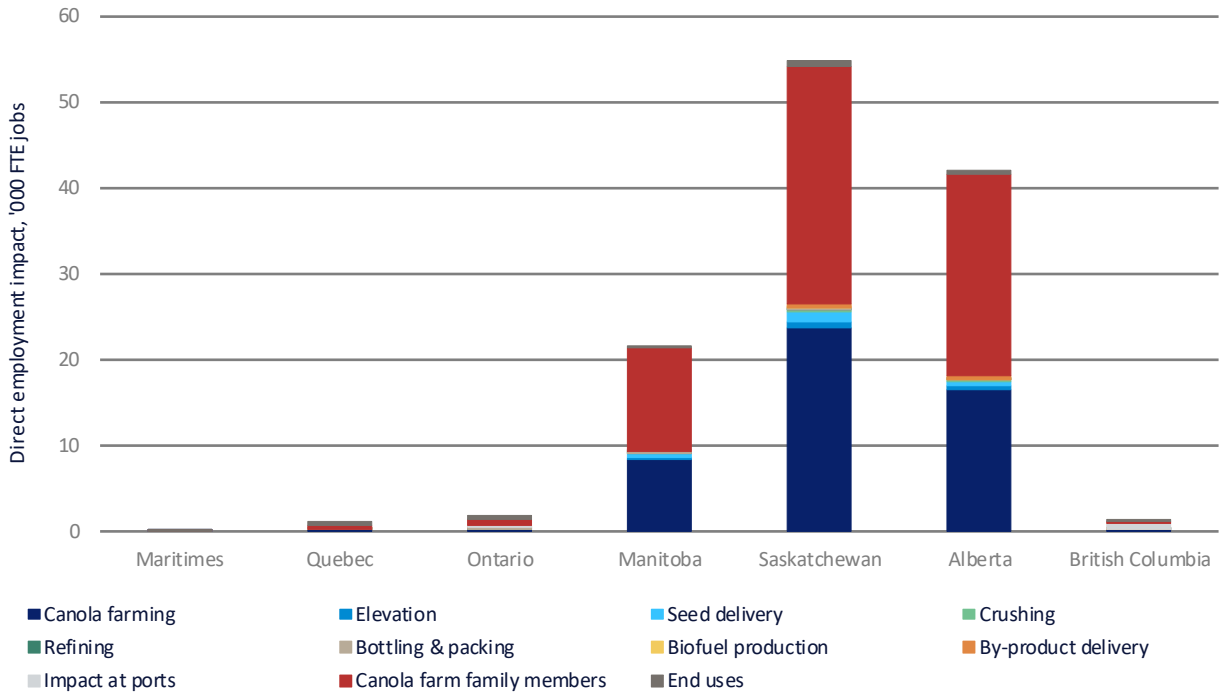


The Prairies also dominate in terms of the ***employment impact*** of canola. In Saskatchewan, over 55,000 people are directly employed in the canola sector when canola farm family members are included. An additional 64,000 work in Alberta and Manitoba, meaning that over 90% of canola's employment impact is generated in the Canadian Prairies.

Table 10: Direct employment impact by province (full time equivalent jobs), average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Seed development	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	646
Canola farming	7	268	337	8,461	23,835	16,704	216	49,828
Elevation	0	0	0	225	679	440	11	1,354
Seed delivery	0	5	7	381	1,143	379	6	1,921
Crushing	0	17	41	107	156	129	0	450
Refining	0	10	27	46	145	62	0	290
Bottling & packing	0	14	40	68	105	91	0	318
Biofuel production	0	5	22	0	2	19	1	49
By-product delivery	0	12	67	80	441	329	1	930
Impact at ports	0	9	123	0	0	0	725	856
Livestock benefit	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
End uses	101	373	655	279	871	475	111	2,863
Direct Employment Impact	**108**	**712**	**1,319**	**9,646**	**27,377**	**18,628**	**1,070**	**59,507**
Canola farm family members	11	531	685	12,036	27,691	23,532	297	64,784
Direct Employment (with farm family)	**119**	**1,244**	**2,005**	**21,682**	**55,068**	**42,160**	**1,367**	**124,291**

Diagram 4: Direct employment impact by province, average 2020/21–2022/23

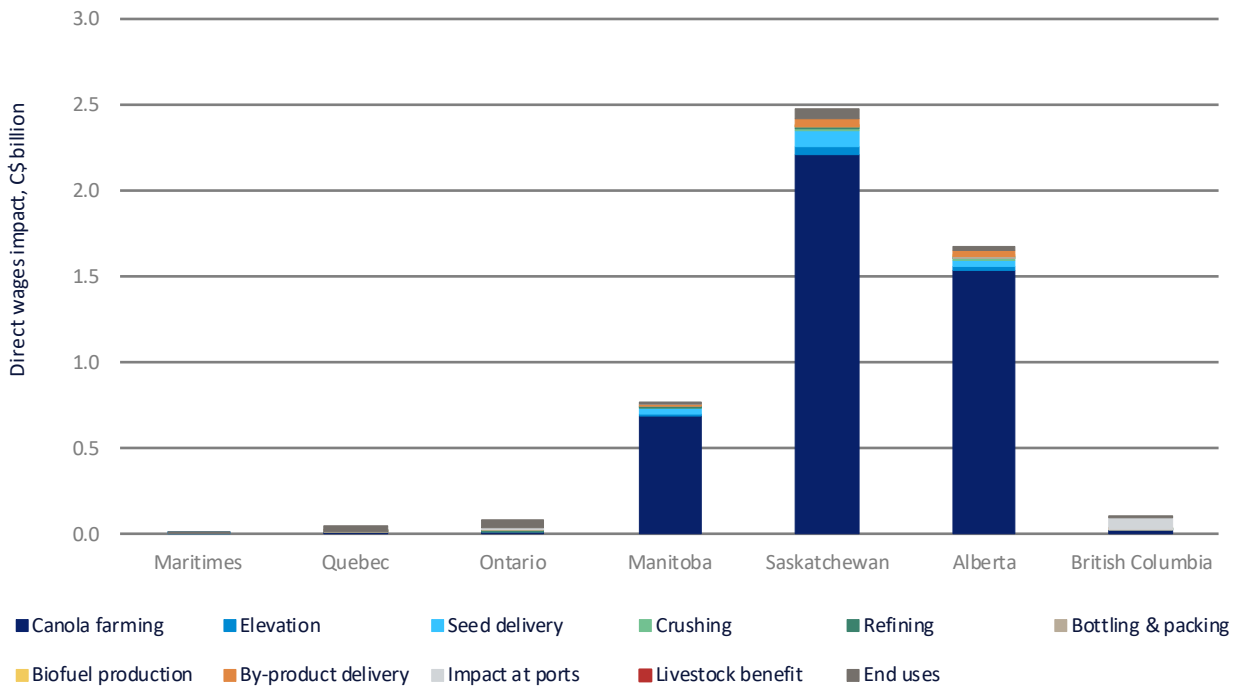


Finally, of the $5.2 billion in ***direct wages*** derived from canola, $4.9 billion are paid into the Prairie provinces.

Table 11: Direct wage impact by province (C$ million), average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Seed development	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	60.7
Canola farming	0.6	14.2	15.9	687.1	2,217.2	1,543.8	27.4	4,506.3
Elevation	0.0	0.0	0.0	12.1	38.4	23.4	0.5	74.5
Seed delivery	0.0	0.3	0.5	33.5	97.0	29.8	0.6	161.7
Crushing	0.0	1.2	2.8	7.1	10.4	8.6	0.0	30.1
Refining	0.0	0.7	1.8	3.1	9.7	4.2	0.0	19.4
Bottling & packing	0.0	1.1	2.9	5.0	7.7	6.7	0.0	23.3
Biofuel production	0.0	0.3	1.5	0.0	0.1	1.3	0.1	3.3
By-product delivery	0.0	0.9	5.4	7.9	44.8	33.1	0.0	92.2
Impact at ports	0.0	0.8	10.7	0.0	0.0	0.0	63.2	74.6
Livestock benefit	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
End uses	7.4	26.3	45.2	15.4	56.2	28.1	8.1	186.7
Direct Wage Impact	**8.1**	**45.7**	**86.6**	**771.3**	**2,481.5**	**1,678.9**	**99.9**	**5,232.8**

Diagram 5: Direct wage impact by province, average 2020/21–2022/23



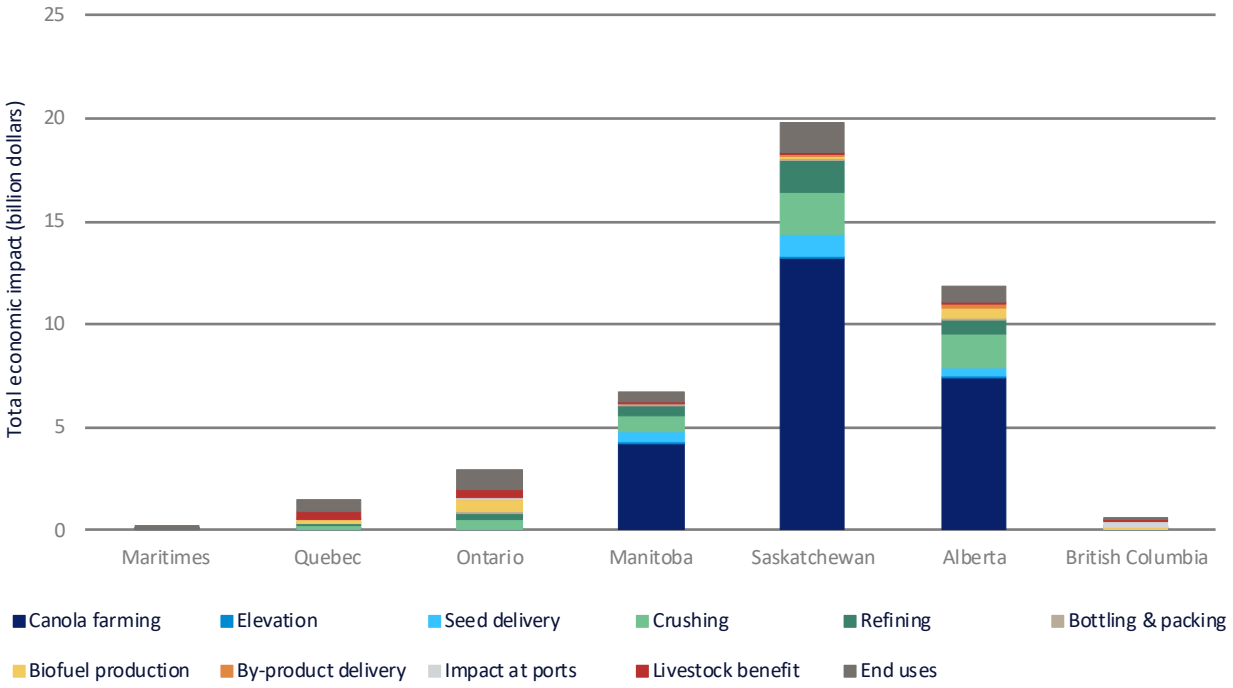
The total effect of canola on Canadian provincial economies

Applying the indirect and induced multiplier effects does little to change the relative effects of canola on Canada's provinces. Of the C$43.7 billion total economic impact of canola on the Canadian economy, almost half stems from Saskatchewan, with another C$18.5 billion coming out of Alberta and Manitoba combined (Table 12 and Diagram 6).

Table 12: Total economic impact by province (C$ million), average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Seed development	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Canola farming	1.2	34.3	57.6	4,214.6	13,166.8	7,426.8	63.6	24,964.9
Elevation	0.0	0.0	0.0	57.8	178.3	111.0	2.6	349.7
Seed delivery	0.0	2.3	3.4	503.7	1,075.8	379.7	7.5	1,972.5
Crushing	0.0	163.5	474.6	806.9	1,993.4	1,613.7	0.0	5,052.2
Refining	0.0	111.3	290.8	494.4	1,555.2	655.2	0.0	3,106.9
Bottling & packing	0.0	15.5	42.4	72.1	112.6	97.2	0.0	339.8
Biofuel production	0.0	140.4	620.9	0.0	43.6	535.1	23.2	1,363.3
By-product delivery	0.0	7.2	37.8	28.8	158.3	140.3	0.1	372.6
Impact at ports	0.0	3.2	10.8	0.0	0.0	0.0	273.3	287.3
Livestock benefit	55.7	403.5	433.1	55.7	34.6	116.3	96.1	1,195.0
End uses	147.7	564.3	1,008.1	510.9	1,448.0	821.9	160.0	4,660.9
Total Economic Impact	**204.7**	**1,445.4**	**2,979.6**	**6,744.9**	**19,766.6**	**11,897.2**	**626.6**	**43,665.1**

Diagram 6: Total economic impact by province, average 2020/21–2022/23

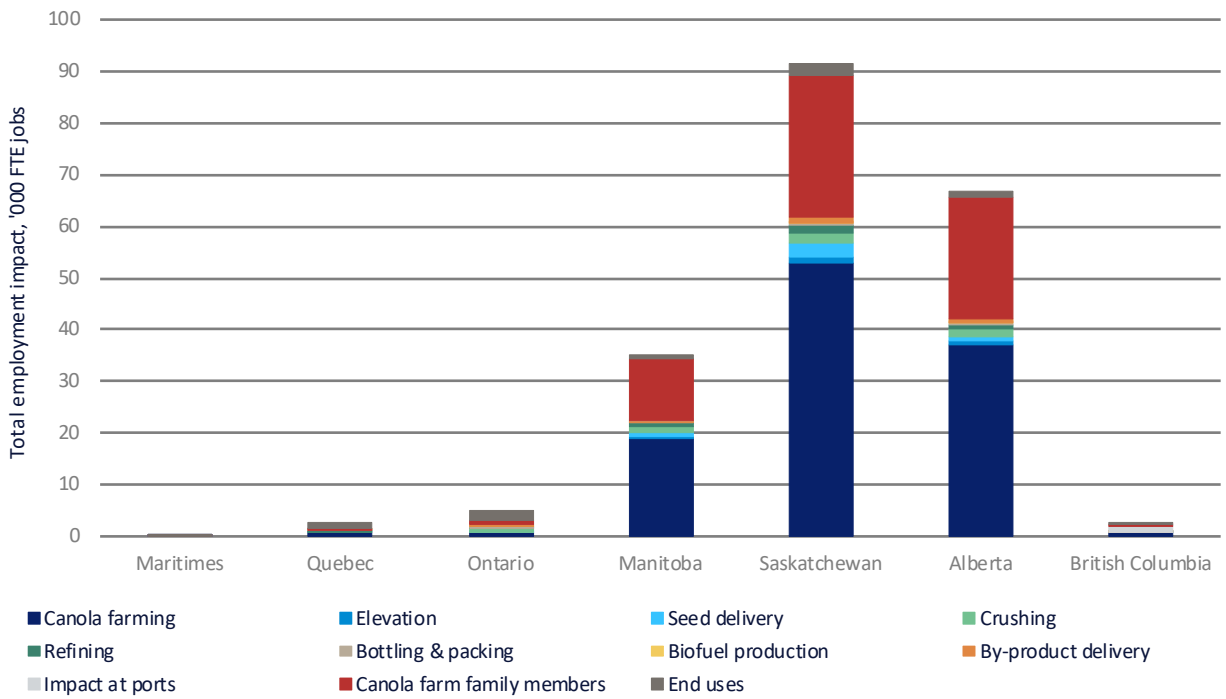


Of the 206,000 Canadian people supported by the canola sector (a figure including farm family members), roughly 194,000 are in the Canadian Prairies, with 92,000 people dependent on the canola sector in Saskatchewan alone (Table 13 and Diagram 7).

Table 13: Total employment impact by province (full time equivalent jobs), average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Seed development	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2,646
Canola farming	15	593	746	18,725	52,747	36,966	478	110,268
Elevation	0	0	0	386	1,166	755	18	2,326
Seed delivery	0	12	18	997	2,847	929	16	4,819
Crushing	0	201	481	1,247	1,828	1,506	0	5,264
Refining	0	116	318	541	1,692	728	0	3,395
Bottling & packing	0	39	107	183	285	246	0	860
Biofuel production	0	59	260	0	18	227	10	574
By-product delivery	0	28	163	199	1,077	809	1	2,278
Impact at ports	0	15	211	0	0	0	1,246	1,471
Livestock benefit	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
End uses	273	1,007	1,769	753	2,354	1,282	299	7,737
Total Employment Impact	**287**	**2,069**	**4,073**	**23,031**	**64,014**	**43,448**	**2,068**	**141,637**
Canola farm family members	11	531	685	12,036	27,691	23,532	297	64,784
Total Employment (with farm family)	**299**	**2,601**	**4,759**	**35,067**	**91,705**	**66,980**	**2,365**	**206,421**

Diagram 7: Total employment impact by province, average 2020/21–2022/23

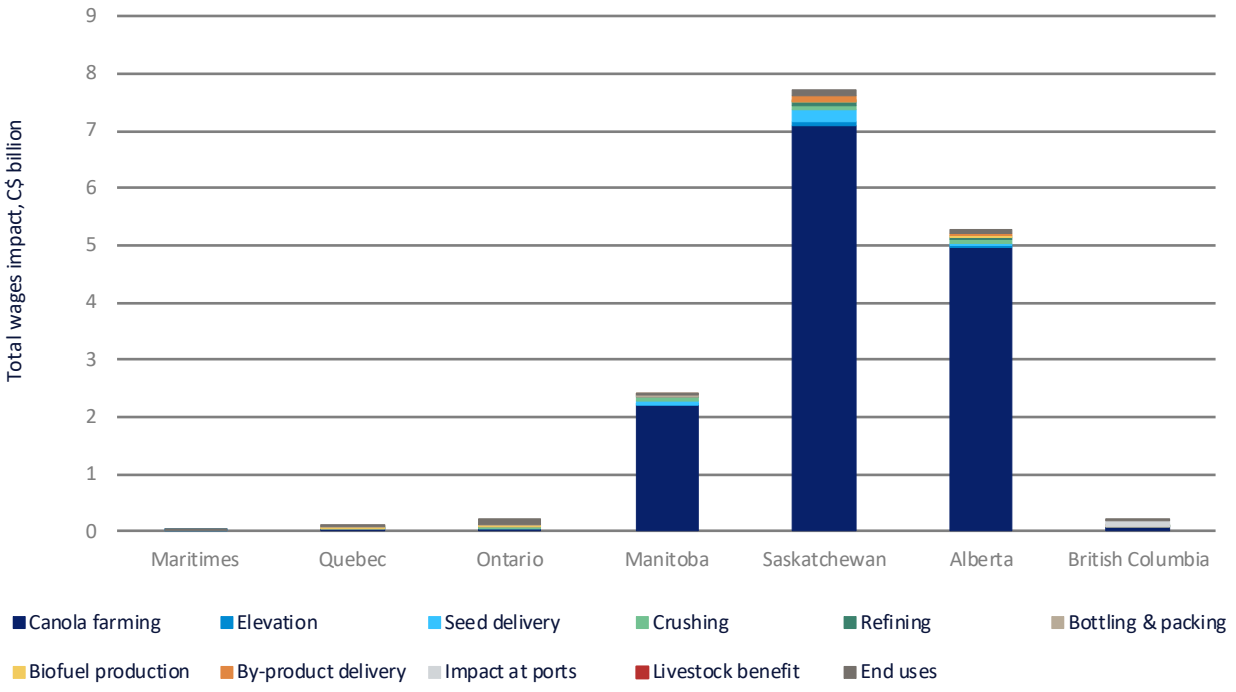


Lastly, of the $16.2 billion in total wages attributable to canola, on average between 2020/21 and 2022/23, $15.5 billion stems from the canola industries of the Canadian Prairies (Table 14 and Diagram 8).

Table 14: Total wage impact by province (C$ million C$), average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Seed development	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	196.8
Canola farming	2.1	45.6	51.1	2,202.9	7,108.3	4,949.3	87.8	14,447.1
Elevation	0.0	0.0	0.0	18.6	58.8	35.9	0.8	114.1
Seed delivery	0.0	0.7	1.1	73.9	201.3	63.2	1.2	341.4
Crushing	0.0	7.7	18.4	47.7	70.0	57.6	0.0	201.5
Refining	0.0	4.4	12.2	20.7	64.8	27.8	0.0	129.9
Bottling & packing	0.0	2.6	7.1	12.0	18.8	16.2	0.0	56.6
Biofuel production	0.0	2.2	9.9	0.0	0.7	8.7	0.4	22.0
By-product delivery	0.0	2.0	11.4	14.7	81.5	60.6	0.1	170.4
Impact at ports	0.0	1.1	16.4	0.0	0.0	0.0	96.6	114.2
Livestock benefit	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
End uses	18.0	63.8	109.5	37.4	136.1	68.1	19.7	452.7
Total Wage Impact	**20.1**	**130.2**	**237.1**	**2,427.9**	**7,740.3**	**5,287.5**	**206.6**	**16,246.5**

Diagram 8: Total wage impact by province (C$ billion), average 2016/17-2018/19



Part C. Detailed Results – by Step in the Canola Value Chain

Below we present our provincial-level results in further detail and discuss the methodology employed in accounting for direct economic, employment and wage impacts across the distinct steps in the canola value chain.

Seed development

Canola seed development is a significant industry within Canada. It produces perhaps 70% of the seed used within Canada, with the remainder grown in the Pacific Northwest of the United States (approximately 25%) and Chile (5%). Canola breeding efforts are also concentrated in Canada, and the country exports some seed for planting as well — mostly to the United States.

Impact and methodology

Estimates of the economic, employment and wage impact of the canola seed sector have been based on first-hand discussions with industry stakeholders.

- ***We do not provide a specific estimate of the economic impact of canola seed development in our analysis***. However, although the economic impact of the canola seed sector is not listed explicitly, the impact of the sector is captured under the canola farming category in the form of improved yields and higher quality seed. If we were to address seed development as a separate item, we would have to lower the canola farming value added by the same amount (or we would be double-counting this value). We would also have to do the same for other inputs such as fertilizers, agricultural chemicals and farm machinery. Including each of these would reduce the farm value added. Instead, the canola farming sector captures the value of seed development and all other farm inputs at this key stage in the value chain.

- Nonetheless, although we do not include the economic impact estimate of seed development in the earlier sections, we have included an estimate in the table below for indicative purposes only. *Note that, as explained above, the economic impact shown here cannot be added to the farm economic impact covered in the next section — in all other sections of this report, the economic impact of seed development is included within the farm economic impact figure.*

- From the tables below, for the direct economic impact, we estimate an indicative figure of $105 million might stem from the canola seed sector.[1] For the total economic impact, we estimate an indicative figure of perhaps $265 million attributable to the seed sector.

- The direct employment impact of the Canadian seed industry is estimated at almost 650 jobs, which include individuals involved in biotech, breeding, seed production and marketing. Roughly half of these individuals are involved in marketing or technical sales, with the remainder involved in R+D or seed manufacturing. When indirect and induced impacts are taken into account, the employment impact of the industry is estimated at over 2,600.

- Direct wages for the sector are estimated at $60 million, while the total wage impact is approaching $200 million.

[1] This accounts for seed company expenditures alone and does not attempt to quantify the share of canola's value (through improved yields, improved quality, etc.) attributable to the efforts of the canola sector.

Table 15: Impact of the Canadian canola seed industry, average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Direct economic impact (C$ million)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	105.4
Total economic impact (C$ million)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	265.0
Direct employment (FTE jobs)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	646
Total employment (FTE jobs)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2,646
Direct wages (C$ million)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	60.7
Total wages (C$ million)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	196.8

Note: We do not estimate seed development impacts at the provincial level in this report. Furthermore, although the other tables in this report include our estimates of seed development jobs and wages at the national level, they do not split out estimates for the seed development economic impact, even at the national level. In all other tables and diagrams in this report, the economic impact of seed development is incorporated within the Canola Farming category. However, the table above does provide an estimate of seed development economic impact, but this number should be considered for indicative purposes only.

Canola farming

Canola farming is the foundation of the canola value chain in Canada and accounts for the majority of the direct economic and employment impact of the canola value chain.

Impact

- The direct economic impact of canola farming averages $13.0 billion over the last three years, with the total economic impact estimated at $25 billion. This includes the economic impact of seed development, which is not specified separately in our analysis in Part A. The farm impact is naturally concentrated in the Prairie provinces.
- Canola farming directly employs almost 50,000 paid individuals. This figure does not include canola farm family members, who will be discussed in the next section, or seed development jobs, which are specified separately. When the indirect and induced multipliers are applied, the total employment impact of canola farming is estimated at 110,000.
- $4.5 billion in wages are directly attributable to canola farming. For growers, this includes profits from the canola share of their farm, while for hired labour it comprises wages paid out by growers. Including indirect and induced effects, the total wage impact of canola farming is over $14 billion.

Table 16: Impact of Canadian canola farming and production, average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Direct economic impact (C$ million)	0.6	17.8	29.9	2,189.4	6,839.9	3,858.1	33.1	12,968.8
Total economic impact (C$ million)	1.2	34.3	57.6	4,214.6	13,166.8	7,426.8	63.6	24,964.9
Direct employment (FTE jobs)	7	268	337	8,461	23,835	16,704	216	49,828
Total employment (FTE jobs)	15	593	746	18,725	52,747	36,966	478	110,268
Direct wages (C$ million)	0.6	14.2	15.9	687.1	2,217.2	1,543.8	27.4	4,506.3
Total wages (C$ million)	2.1	45.6	51.1	2,202.9	7,108.3	4,949.3	87.8	14,447.1

Methodology

We determine the economic impact of canola farming by considering the ***canola revenues*** earned by farmers; this serves as a proxy for volumes produced multiplied by prices received. Unlike the other sectors in our analysis, this calculation does not estimate the value added by the sector: to do this, we would have to subtract canola farming costs from canola farming revenues. However, if we did that, we would fail to capture the economic impact of the wide array of inputs used in canola farming, such as seed, fertilizers and crop protection. To include these would necessitate a multitude of value added calculations for each input into canola farming. The best way to view the canola farming impact in this report, therefore, is to view this as ***a summation of all the value added by all the sectors up to and including the canola farming stage***.

The value of canola farming is determined by two main factors:

- ***Canola prices:*** The trajectory of Canadian canola prices in the diagram below demonstrates the exceptional rises in price from 2021 to 2023.
- ***Canola output:*** Canadian canola seed production shows an upward trajectory to 2018, but a slight downturn thereafter, magnified by the very poor 2021/22 crop.

The effect of higher output is accelerated by the very high prices since 2021. The record prices particularly explain the large increase in canola revenues and the economic impact of canola farming in Canada since 2020.

Diagram 9: Canadian canola seed prices

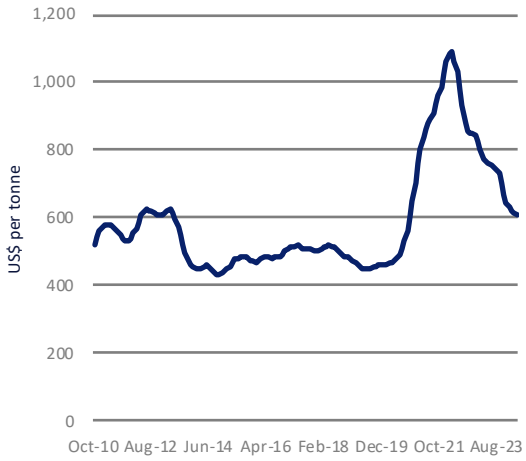
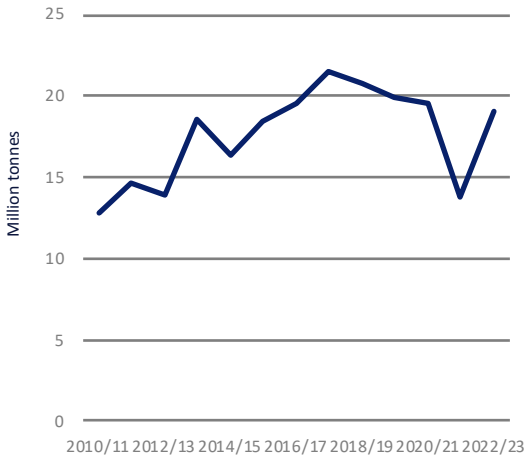


Diagram 10: Canadian canola seed output



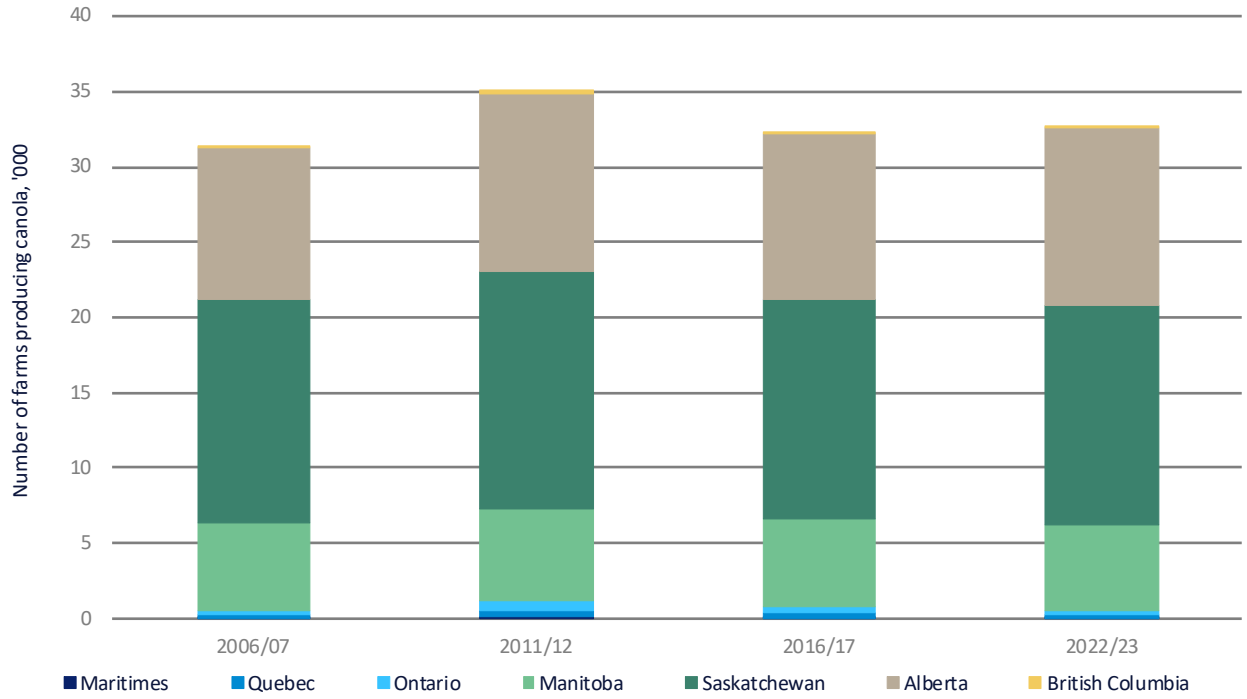
For this study, we took paid canola employment to be a combination of growers and paid labour. While many growers may hire an immediate family member (like a son or daughter) we assumed that hired labour was primarily found outside the immediate family. The employment effect on unpaid immediate family members is captured in the next section.

Estimating ***grower employment*** in canola farming was straightforward and made on the basis of the number of farms in Canada that grow canola.

Each canola farm was assumed to provide a ***canola job*** regardless of the fact that canola may make up only a portion of a farm's acreage (given that it is grown in rotation). Had we accounted for the fact that canola farming may make up 1/2 to 1/3 of a grain and oilseed grower's time, presenting the employment number in terms of "Full-time Equivalent," the number would have been lower.

Canola's share of farm earnings was used to represent a grower's ***canola wage***. Canola earnings were based on the average farm earnings for grain and oilseed farmers, from a data series available from StatCan. To account for the canola share of those earnings, we divided average canola acreage per farm by the average farm size. We then multiplied this ratio by the StatCan series on profitability.

Diagram 11: Number of farms growing canola in Canada



Estimates for ***hired labour*** were based on crop budgets developed by agricultural ministry extension specialists from across the Prairie provinces. While there was some variability in these budgets in terms of labour requirements, the data were fairly tightly clustered at around 1.6 man-hours per acre of canola. By multiplying the number of canola acres by 1.6 and dividing by 2000 (50 weeks x 40 hours/week), we arrived at the number of hired hands working on canola farms on a full-time basis annually.

Wages for hired labour were also taken from StatCan with total wages paid being the product of the number of hired workers and the prevailing wage.

Table 17: Number of hired workers dedicated to canola acreage

	2010/11	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Maritimes	n.a.	n.a.	n.a.	n.a.	1	1	1	0	1
Quebec	25	24	27	30	29	24	22	25	33
Ontario	64	28	32	36	50	37	26	34	45
Manitoba	2,660	2,572	2,560	2,528	2,733	2,646	2,731	2,739	2,625
Saskatchewan	6,800	8,920	9,000	10,184	9,880	9,240	9,071	9,584	9,115
Alberta	4,440	5,012	4,933	5,544	5,448	4,747	4,701	5,349	5,217
British Columbia	80	72	76	90	110	69	74	83	80
Canada	**14,069**	**16,628**	**16,627**	**18,411**	**18,251**	**16,764**	**16,626**	**17,815**	**17,116**

Canola farm family members

Estimating the employment impact of an agricultural commodity presents the added challenge of how to account for farm family members other than the growers themselves. In some families, spouses and children may provide just a supporting role in farm operations, be it through keeping the books, buying supplies, or providing labour on an occasional basis. For other families, however, spouses and grown children may work on a nearly full-time basis, supported by farm revenues and, in the case of grown children, possibly working as a means ultimately to acquire the farm from their parents.

Impact and methodology

To account for this impact, we have included a sub-category in our employment estimates for ***canola farm family members***. As labour that is unpaid in the traditional sense, this category is differentiated from the rest of our employment estimates across the canola value chain, which represent workers who draw a cash wage from working in the canola sector. Consequently, the total employment effect given at the beginning of this study is presented with and without this number.

A number of data sets detail the average size of Canadian families over time, maintained by StatCan. One series suggests an average Canadian farm family size of 3.1 resident persons. Using this series would, therefore, imply that for every grower, there are just over two additional canola farm family members. Because these family members are assumed to be uncompensated through wages, ***no indirect or induced multiplier has been applied toward this group and totals are the same whether looking at direct or total impact***.

Lastly, we remind readers that the economic impact associated with these workers has been captured under the previous heading "canola farming."

Table 18: Impact of canola farm family members, average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Direct economic impact (C$ million)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Total economic impact (C$ million)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Direct employment (FTE jobs)	11	531	685	12,036	27,691	23,532	297	64,784
Total employment (FTE jobs)	11	531	685	12,036	27,691	23,532	297	64,784
Direct wages (C$ million)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Total wages (C$ million)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Primary elevation

Up to around 40% of the canola produced in Canada can be delivered directly from growers' farms to processing facilities, with the balance being delivered to primary elevation facilities. At these facilities, canola (and other grains) are stored until needed, 1) by domestic crushing facilities, 2) for overland export to the US or Mexico, or 3) for delivery to Canadian ports for overseas export.

Impact

- The direct economic impact of canola elevation in Canada averaged $255 million between 2020/21 and 2022/23. The total economic impact, meanwhile, is estimated at nearly $350 million.
- An estimated 1,350 people are directly employed in primary canola elevation. When indirect and induced effects are included, the total effect is estimated at over 2,300 jobs.
- Lastly, wages directly attributable to primary canola elevation are calculated at $75 million over the observed time frame, with the total wage effect estimated at $114 million.

Table 19: Impact of primary canola elevation, average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Direct economic impact (C$ million)	0.0	0.0	0.0	39.3	133.1	80.3	2.1	254.9
Total economic impact (C$ million)	0.0	0.0	0.0	57.8	178.3	111.0	2.6	349.7
Direct employment (FTE jobs)	0	0	0	225	679	440	11	1,354
Total employment (FTE jobs)	0	0	0	386	1,166	755	18	2,326
Direct wages (C$ million)	0.0	0.0	0.0	12.1	38.4	23.4	0.5	74.5
Total wages (C$ million)	0.0	0.0	0.0	18.6	58.8	35.9	0.8	114.1

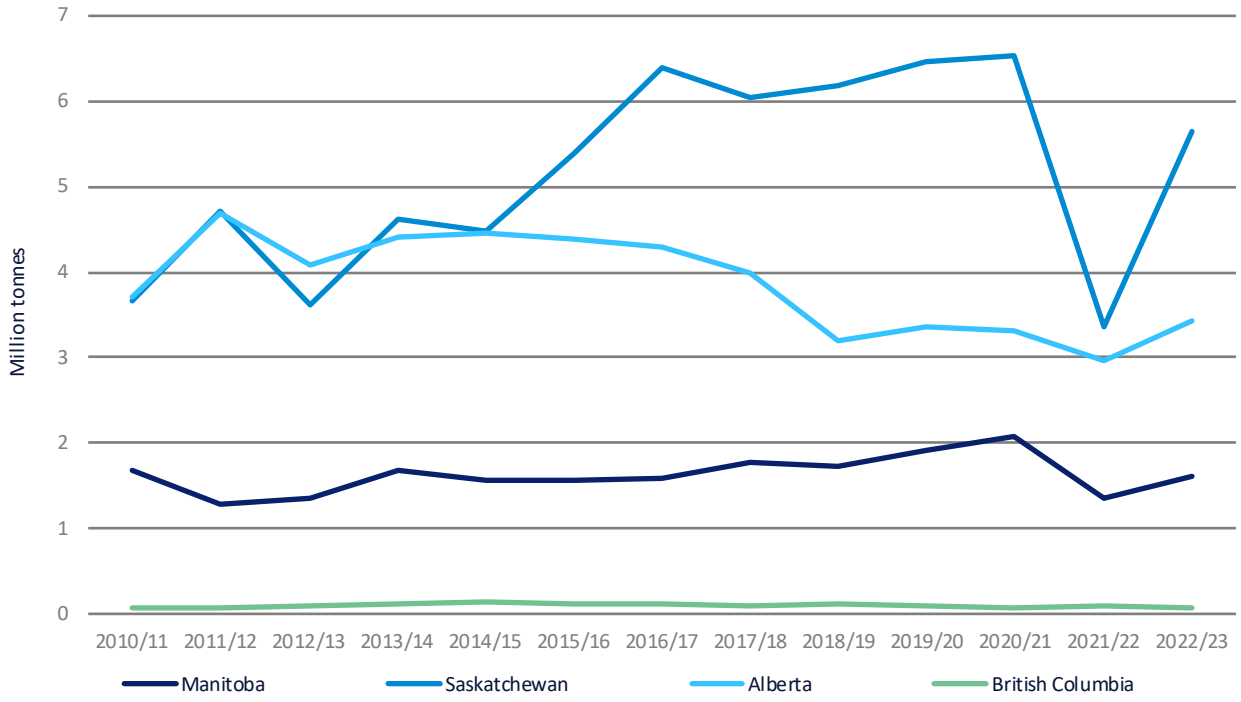
Methodology

The economic impact of canola elevation was determined by the product of volumes of canola being elevated and fees incurred for primary elevation. For the Prairie provinces, elevated canola volumes were determined by data available through the *Canadian Grain Commission*, with the numbers modified slightly to reconcile with information on internal canola trade flows within the country. Elsewhere, the volumes of canola passing through elevators (versus being delivered directly to processing facilities) were derived based on conversations with industry stakeholders. We estimate negligible volumes of elevation outside of the Prairies.

- We estimate up to twelve million tonnes of canola can pass through primary elevation facilities in Canada, a reflection of increased processing capacity in the country. The 2021/22 figure was reduced considerably because of the very poor crop.

- Primary elevation fees were also obtained from the *Canadian Grain Commission* based on annual surveys conducted on the costs of moving grain to point of export. Total fees, for receiving, removal of dockage and storage, typically range from $20-$25 per tonne over the period.

Diagram 12: Volumes of canola elevated



To understand the employment impact of primary canola elevation, we began with a *"Working in Canada"* report first developed by the Canadian government in 2010. This identifies over 6,000 individuals employed in the elevation of all agricultural commodities in Canada. The canola share of this total was calculated by multiplying the total jobs figure by the ratio of canola in commercial positions over all grains in commercial positions. Salaries for these positions were based on a *StatCan* series for jobs in grain processing and handling.

Seed delivery

Seed delivery comprises delivery of seed from the farm to its point of processing within Canada or departure from Canada. The majority of canola seed is delivered to elevators for rail shipment to 1) Canadian ports, 2) the US border, or 3) processing facilities within Canada, while an increasing share is delivered by farmers directly to processing facilities within Canada. Within Canada:

- Seed is transported across provinces predominantly by rail.
- Seed delivered directly to processing facilities is transported by truck.
- A small share is also delivered by barge/laker vessels to the processing facilities in Ontario and Quebec.

Impact

The economic impact of seed deliveries is presented separately for rail, truck, and barge. Because transport networks are nationwide rather than being fixed at a single point (unlike crushing, for example), ***transportation effects are presented on the basis of where the seed originates***, rather than being allocated across the path in which the seed travels or where the seed might be delivered.

The totals in this section were pulled down a little by the poor 2021/22 crop.

- The direct economic impact of ***rail*** transportation of seed in Canada is quantified at an average of $480 million between 2020/21 and 2022/23, while the total impact, including indirect and induced impacts, is estimated at over $800 million.
- 900 individuals are employed directly in the ***rail*** transportation of canola seed, with a total employment impact of nearly 2,300 jobs.
- Wages directly attributable to ***rail*** transportation of canola seed amount to $95 million, with the total wage impact estimated at close to $180 million.

Table 20: Impact of canola seed transportation, average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Direct economic impact (C$ million)	0.0	0.8	1.2	202.4	506.4	171.8	3.9	886.6
by rail	*0.0*	*0.0*	*0.0*	*79.1*	*309.5*	*87.3*	*3.0*	*478.8*
by truck	*0.0*	*0.8*	*1.2*	*50.7*	*166.8*	*84.5*	*0.9*	*305.0*
by laker	*0.0*	*0.0*	*0.0*	*72.6*	*30.2*	*0.0*	*0.0*	*102.8*
Total economic impact (C$ million)	0.0	2.3	3.4	503.7	1,075.8	379.7	7.5	1,972.5
by rail	*0.0*	*0.0*	*0.0*	*132.8*	*519.9*	*146.6*	*5.0*	*804.3*
by truck	*0.0*	*2.3*	*3.4*	*139.8*	*459.9*	*233.1*	*2.6*	*841.0*
by laker	*0.0*	*0.0*	*0.0*	*231.1*	*96.0*	*0.0*	*0.0*	*327.1*
Direct employment (FTE jobs)	0	5	7	381	1,143	379	6	1,921
by rail	*0*	*0*	*0*	*160*	*583*	*149*	*5*	*897*
by truck	*0*	*5*	*7*	*159*	*535*	*230*	*1*	*938*
by laker	*0*	*0*	*0*	*61*	*26*	*0*	*0*	*87*
Total employment (FTE jobs)	0	12	18	997	2,847	929	16	4,819
by rail	*0*	*0*	*0*	*408*	*1,481*	*378*	*13*	*2,280*
by truck	*0*	*12*	*18*	*381*	*1,280*	*550*	*3*	*2,243*
by laker	*0*	*0*	*0*	*209*	*87*	*0*	*0*	*295*
Direct wages (C$ million)	0.0	0.3	0.5	33.5	97.0	29.8	0.6	161.7
by rail	*0.0*	*0.0*	*0.0*	*17.1*	*61.9*	*15.9*	*0.5*	*95.4*
by truck	*0.0*	*0.3*	*0.4*	*9.6*	*32.2*	*13.9*	*0.1*	*56.6*
by laker	*0.0*	*0.0*	*0.0*	*6.8*	*2.8*	*0.0*	*0.0*	*9.6*
Total wages (C$ million)	0.0	0.7	1.1	73.9	201.3	63.2	1.2	341.4
by rail	*0.0*	*0.0*	*0.0*	*31.9*	*116.0*	*29.7*	*1.0*	*178.6*
by truck	*0.0*	*0.7*	*1.1*	*23.2*	*77.6*	*33.5*	*0.2*	*136.4*
by laker	*0.0*	*0.0*	*0.0*	*18.7*	*7.7*	*0.0*	*0.0*	*26.4*

- The direct economic impact of seed transportation by ***truck***, which includes trucking to elevators in addition to trucking directly to crushing facilities, averaged over $305 million annually between 2020/21 and 2022/23. The total impact, meanwhile, is estimated at over $840 million.

- The direct employment impact of seed transportation by ***truck*** averaged nearly 940 jobs over the observed timeframe. When indirect and induced multipliers are applied, we calculate the total impact to exceed 2,200 jobs supported.

- More than $55 million in annual wages were earned directly through canola seed ***trucking*** over the observed three-year time frame. At the same time, the total wage impact from canola seed trucking was calculated to be over $135 million.

- Given the relatively small share of canola seed traffic that takes place in ***laker*** vessels, the economic impact of seed transported by laker vessel is small in comparison to that of canola transported by rail or truck. Direct economic impact between 2020/21 and 2022/23 averaged $100 million annually, with the total impact estimated at over $330 million.

- Jobs directly associated with ***laker*** transportation of canola seed and associated port activities averaged 90 over the observed time frame, whereas the total employment impact is estimated at about 300 jobs.

- Direct wages attributable to laker transportation of canola seed meanwhile averaged $10 million, with the total wage impact exceeding $25 million.

Methodology

With near-infinite combinations of farm origins and end-use destinations, determining the economic impact of canola seed transportation is the most complicated aspect of our economic impact model.

For rail, trucking and barge transport:

- The first step is to determine the inter-provincial trade flows of canola seed. To do this, we reconciled provincial-level canola production and estimates of factory level crush (from the next section on Crushing).

- The next step is to compile a distance matrix between the centers of canola production, canola processing and points of export (port facilities).

Note: Overseas exports are assigned to a province only if the seed left from a port located in that province. Hence, the overseas exports category is zero for Alberta and Saskatchewan, where no port facilities exist.

Trucking

Trucking canola seed was divided into two categories:

- ***Volumes trucked from farm to elevator*** were based on the volumes of seed passing through elevators (see previous section). These data were obtained in part from the Canadian Grain Commission.

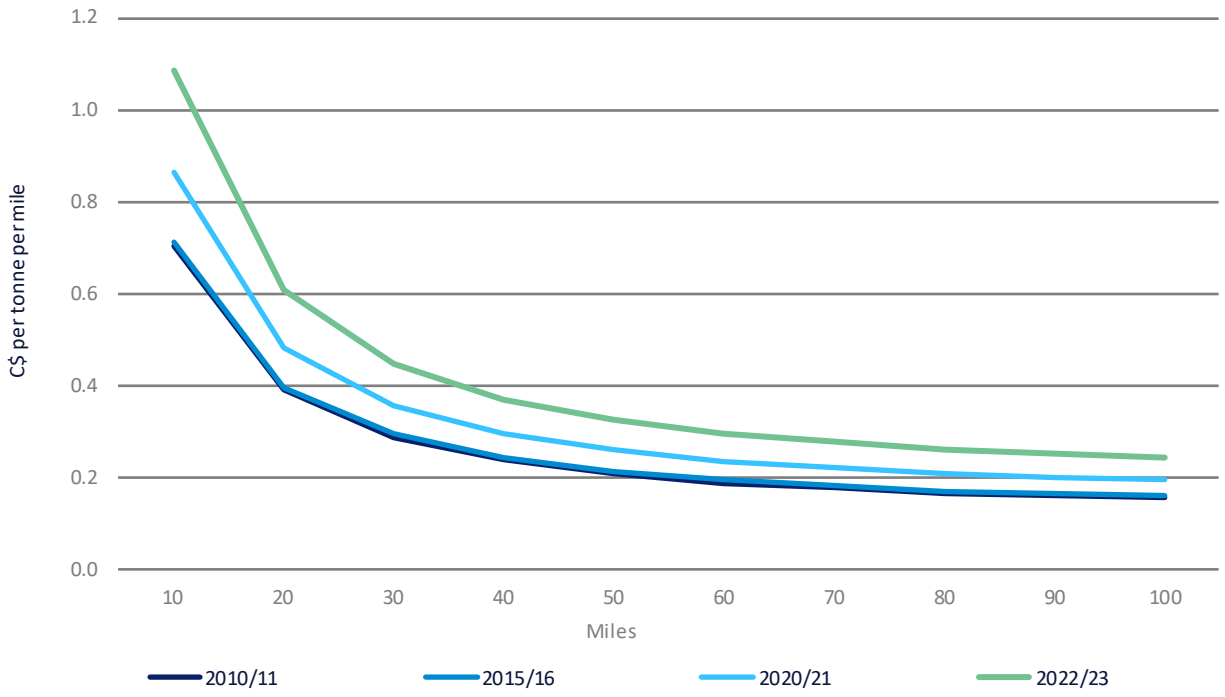
- Canola that does not pass through a primary elevator was accounted for in ***volumes trucked directly to crushing facilities***.

For the Prairie provinces, where canola production is relatively evenly distributed, the average distance trucked from farm to elevator was determined by dividing the number of square miles of canola planted by the volume of canola harvested. For Quebec, Ontario and British Columbia, where canola production is smaller and more isolated, the average distance to elevators was determined in conversations with individuals with local canola expertise.

Distances for canola seed trucked directly from farm to processing facility were determined using the average distance between the geographic centers of canola production in a province and processing facilities situated within that province. In all cases, canola trucked directly to processing facilities was done at a distance of less than 205 miles, which would be at the high end of actual observed trucking distances.

Volumes were multiplied by distances to arrive at a figure in tonne-miles. This, in turn, was multiplied by a tonne-mile trucking rate sourced from StatCan to derive a final trucking expenditures number.

Diagram 13: Estimated Canadian trucking rates



The direct ***employment*** impact of canola seed trucking was calculated from the tonne-miles of canola seed delivered by truck. This was converted to a full-time employment impact by assuming that a typical truck (with one driver):

- Transports 18 tonnes of cargo
- Averages 40 miles per hour
- A full-time trucker drives 2,000 hours per year
- Trucking wages were obtained from StatCan data

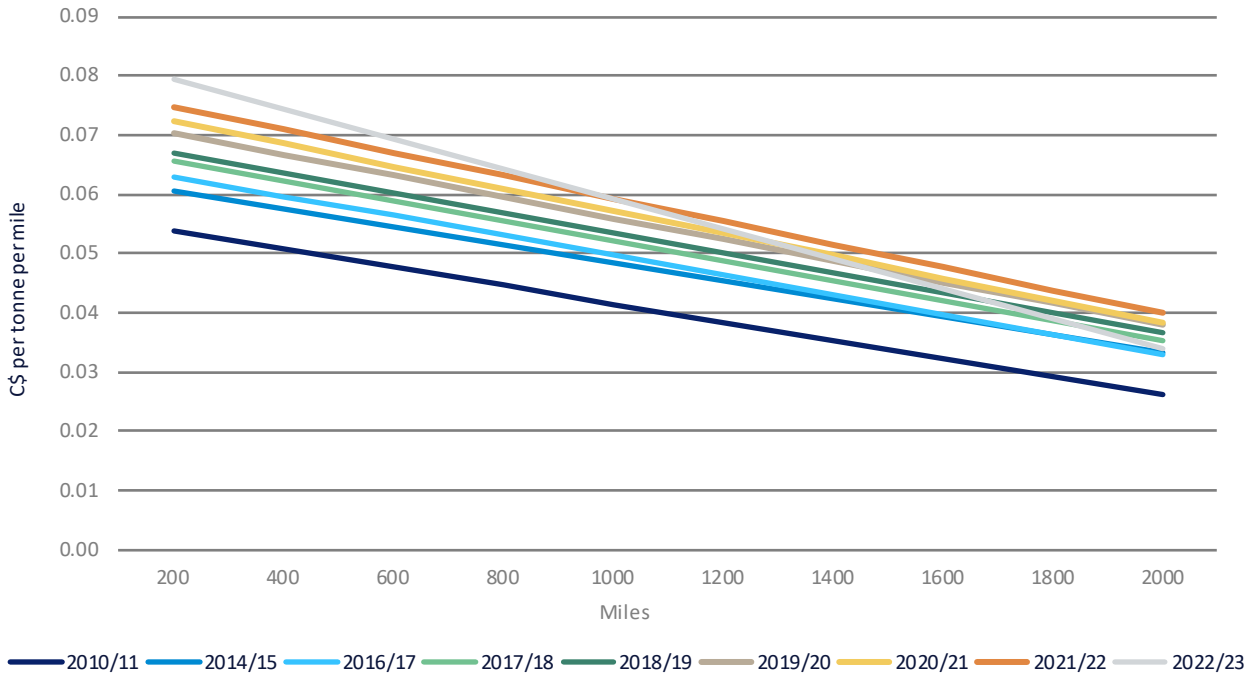
Rail

Our calculations on rail expenditures also begin with estimates of provincial canola trade flows with the US and net inter-provincial rail trade.

Note: There is a fair amount of canola moved by laker vessel between Ontario and Quebec. A large volume of canola crushed in Bécancours, QC that originates from the Prairie provinces is delivered by rail to Ontario and then delivered by laker vessel from Ontario to Quebec.

The inter-provincial trade estimates provide us with an estimate for tonne-miles of canola seed transported. The tonne-mile figure is then multiplied by a range of rail freight rates (which tend to be higher for shorter distances and lower for longer distances, as the diagram illustrates) to arrive at an estimate of rail freight expenditures.

Diagram 14: Trended range in Canadian rail rates



For ***employment***, according to the *Railway Association of Canada*, roughly 32,000 individuals are employed in freight rail in Canada, a number that has fallen slightly over the last decade. Using the *Association* estimate of tonne-miles of cargo transported in Canada annually, to estimate the number of individuals directly employed in the rail transportation of canola seed, we *multiplied total freight rail employment by the ratio of canola tonne-miles to total freight tonne-miles*.

Rail ***wages*** were also obtained from the *Railway Association of Canada* and multiplied by jobs to determine the direct wage impact.

Lakers

Estimates of the expenditures incurred through canola shipment by laker begin with the assumption that roughly 75% of the canola delivered to the two processing facilities in Ontario and one in Quebec is delivered by laker vessel. Most of this barge traffic originates around Thunder Bay, ON, based on rail shipments delivered from the Prairies. Laker shipping rates were obtained from the Canadian Grain Commission and average between $25-30 per tonne in recent years.

Employment and wages on both laker vessels themselves and at ports were based on conversations with experts in shipping in the Great Lakes and on a report entitled "*Ocean Shipping in the Great Lakes: an Analysis of Issues*" by Dr. John Taylor of Grand Valley State University.

Crushing

Canada's crushing sector adds value to ten million tonnes of canola seed annually, with expansion underway to raise this figure in future years.

Impact

- The direct economic impact of canola crushing on the Canadian economy is just over $920 million. The total economic impact, including indirect and induced impacts is $5.0 billion.

- 450 individuals are directly employed in canola crushing. However, as a capital intensive sector that relies heavily on contracted workers, the total employment impact of canola is estimated to be much higher, supporting almost 5,300 jobs.

- Over $30 million in wages are paid out to individuals directly employed in canola crushing. Like the employment impact, however, the total wage impact of canola crushing is much higher, in excess of $200 million.

Table 21: Impact of canola crushing, average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Direct economic impact (C$ million)	0.0	29.8	86.6	147.2	363.6	294.3	0.0	921.4
Total economic impact (C$ million)	0.0	163.5	474.6	806.9	1,993.4	1,613.7	0.0	5,052.2
Direct employment (FTE jobs)	0	17	41	107	156	129	0	450
Total employment (FTE jobs)	0	201	481	1,247	1,828	1,506	0	5,264
Direct wages (C$ million)	0.0	1.2	2.8	7.1	10.4	8.6	0.0	30.1
Total wages (C$ million)	0.0	7.7	18.4	47.7	70.0	57.6	0.0	201.5

Methodology

The economic impact of the canola crushing sector is determined based on the value it adds from processing seed into its crude oil and meal by-products. This is done on a provincial level by estimating the crush at each canola processing facility in Canada. We estimate this on the basis of each facility's processing capacity, while taking into account the fact that the Ontario and Quebec facilities devote a significant share of their capacity to soybeans.

To account for the swing crush capacity in Ontario and Quebec, we first estimate total jobs at the swing plants in these provinces, and then apportion jobs to canola by canola's crush quantity relative to soybeans in that province.

Once seed crush volumes are estimated, we have to choose which set of canola seed and by-product prices are most representative of the crush value added. Consulting with crushers suggests that spot Prairie prices may overstate the value of by-products and understate the value of seed, while Vancouver prices may cause the opposite problem. We opted for the board crush margin (which actually relies on soybeans for by-product prices), as a midpoint between the two. The ***total economic impact*** of the crushing sector was then taken to be the product of volumes crushed and the board indicator of value added. Note that the board margins for 2021/22 were negative because the very poor crop raised seed values considerably. Negative margins are set at zero as economic value added cannot be negative for the purpose of the multiplier effect.

The ***employment*** impact of the canola crushing sector was determined via discussions with employees of the major crushers in Canada as well as through press releases citing the number of individuals employed in given facilities.

The average ***wages*** for employees of crushing facilities were obtained from StatCan data.

Diagram 15: Canadian canola crush

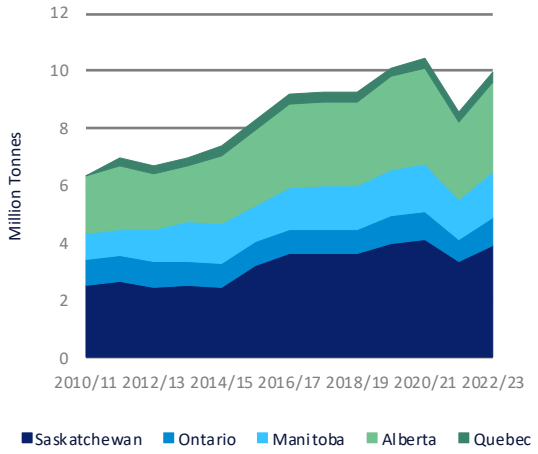
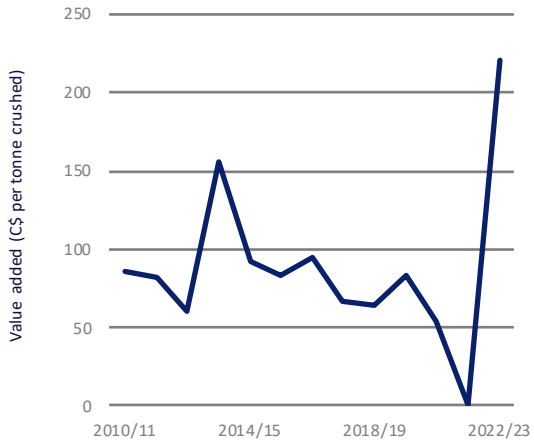


Diagram 16: Canadian crushing value added



Refining

Most crushing facilities in Canada refine a portion of the crude oil they produce on site. The notable exception is the Cargill facility in Camrose, AB, which does not currently refine oil, transferring some crude oil output to Clavet, SK. Bunge in Saskatchewan also transfers crude oil to its Wainwright facility, also in Saskatchewan. Overall, 60-70% of Canada's crude canola oil is usually refined in Canada.

Impact

- The direct economic impact on the Canadian economy from refining crude canola oil averaged close to $565 million annually between 2020/21 and 2022/23. This has received a boost from high margins in the past couple of years. The total economic impact, meanwhile, is estimated at over $3.1 billion annually because this sector, like crushing, enjoys a high multiple with many associated benefits for the local economy.

- Approximately 300 people are directly employed by canola refining in Canada. With the substantial multiplier effect, the total employment impact is estimated at close to 3,400 jobs.

- $19 million in wages are directly attributable to canola refining while the total wage impact, again thanks to important multiplier effects in this sector, is $130 million.

Table 22: Impact of canola refining, average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Direct economic impact (C$ million)	0.0	20.3	53.0	90.2	283.6	119.5	0.0	566.6
Total economic impact (C$ million)	0.0	111.3	290.8	494.4	1,555.2	655.2	0.0	3,106.9
Direct employment (FTE jobs)	0	10	27	46	145	62	0	290
Total employment (FTE jobs)	0	116	318	541	1,692	728	0	3,395
Direct wages (C$ million)	0.0	0.7	1.8	3.1	9.7	4.2	0.0	19.4
Total wages (C$ million)	0.0	4.4	12.2	20.7	64.8	27.8	0.0	129.9

Methodology

The value added to the Canadian economy by canola refining is calculated by estimating the volumes produced multiplied by the value added per tonne of crude oil refined. Total canola oil refined is estimated as:

- crude canola oil production

- *minus* crude oil exports
- *minus* biofuel use of canola oil, which we assume is refined at integrated biofuel facilities, if required.

This total was then allocated across Canada's processing facilities based on crude canola oil production, adjusting for the fact that Camrose, AB does not refine crude canola oil in the same province. Note that we treat the Bunge Saskatchewan crushing and refining plants as an integrated process, although they take place at distinct facilities.

Diagram 17: Canadian canola refining

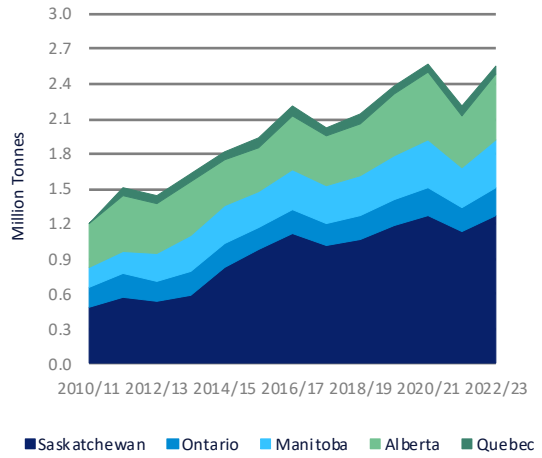
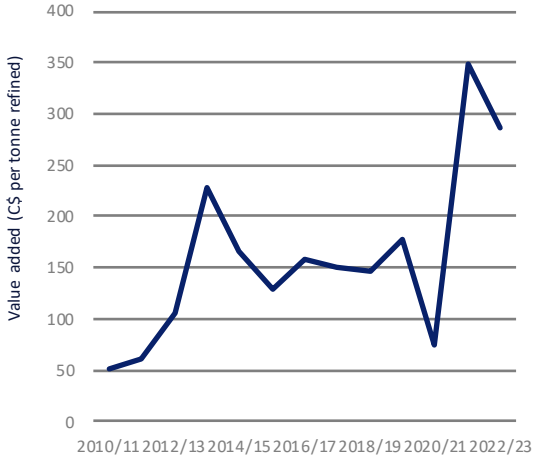


Diagram 18: Canadian refining value added



To account for the canola/soy swing plants in Ontario and Quebec, we estimate total refining jobs at the swing plants in these provinces, and then apportion jobs to canola by canola's refining quantity relative to soybeans in that province (similar to our treatment of crushing at these plants).

The value added per tonne of canola oil was based on the spread between unit export values for crude and refined canola oil, obtained from Canadian trade data.

Biofuel production

Canadian biofuel use of canola oil is rising steeply and accounts for over 400,000 tonnes of oil per year today. This has had significant impact across the canola value chain.

Impact

- The value added to the Canadian economy of producing biofuels from canola oil depends on the price of the biofuel output less the price of the canola oil input. On occasion, canola oil prices can rise above the biofuel price, such as when very high vegetable oil prices resulted from the Russian invasion of Ukraine. A similar effect can and does occur in other processing sectors, such as crushing. However, these relative price movements tend to even out over time, resulting in positive value added in biofuels in Canada, averaging $0.25 billion directly per year and $1.36 billion in total per year over the last three years.
- 50 full time jobs are directly attributable to biofuel production from canola oil in Canada. The total attributable employment impact is estimated at over 570 jobs because of a high multiplier effect in this sector, with substantial spin-off benefits for the local economy.
- Over $3 million in wages are directly attributable to canola refining, while the total wage impact is over $20 million.

Table 23: Impact of biofuel production from canola oil, average 2020/21–2022/23

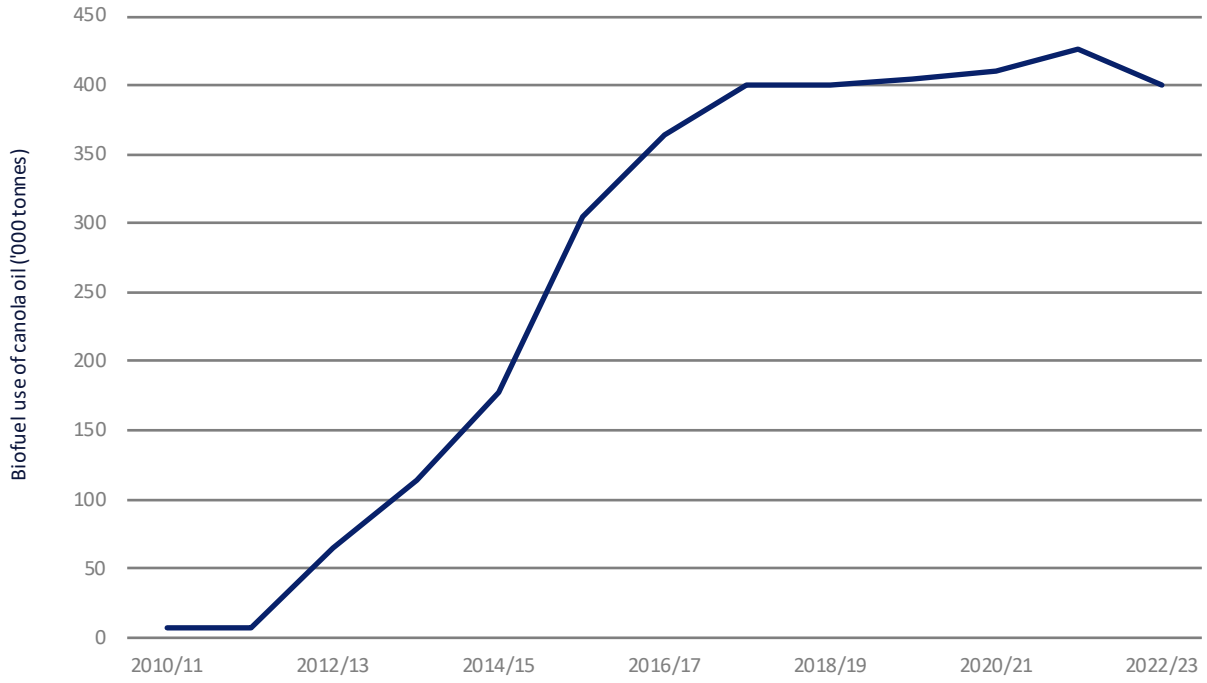
	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Direct economic impact (C$ million)	0.0	25.6	113.2	0.0	8.0	97.6	4.2	248.6
Total economic impact (C$ million)	0.0	140.4	620.9	0.0	43.6	535.1	23.2	1,363.3
Direct employment (FTE jobs)	0	5	22	0	2	19	1	49
Total employment (FTE jobs)	0	59	260	0	18	227	10	574
Direct wages (C$ million)	0.0	0.3	1.5	0.0	0.1	1.3	0.1	3.3
Total wages (C$ million)	0.0	2.2	9.9	0.0	0.7	8.7	0.4	22.0

Methodology

The economic impact of the biofuel sector was taken to be a function of canola oil used in biofuel production, as reported by the USDA, and the premium of diesel fuel over crude canola oil.

We use the wholesale FAME biodiesel price from Iowa, US, with a freight adjustment to a Canadian basis, because no publicly available wholesale biofuel price series exists for Canada.

Diagram 19: Canola oil used in Canadian biofuel production



By-product delivery

Most canola crushing facilities produce and distribute three different by-products in considerable volumes — crude oil, refined oil and canola meal. In this section, we track the distribution of these products across Canada, by truck or by rail, to domestic users (including biofuel producers), to port facilities for overseas export, or to the US border in the event that the product is being shipped to the US or Mexico. Deliveries of *biofuels* from production facility to blending facility are not included.

Impact

We present our results for the economic impact of canola by-product delivery for crude oil, refined oil and meal in the table below. For all three by-products, results are presented for both rail and truck transportation.

Crude oil

- The direct ***economic impact*** of crude canola oil shipped by rail is over $15 million with the total impact estimated at $25 million. For truck shipments (mostly for biofuel production) the numbers are $0.7 million and $2 million, respectively.
- Nearly 40 ***jobs*** are directly attributable to the rail shipment of crude canola oil while the total employment impact is almost 90 jobs. For truck shipments, these figures are 2 and 6.
- The direct and total ***wage impact***, meanwhile, averaged $4 million and $7 million respectively for rail over the last three years. For truck shipments of crude canola oil, wages paid amount to less than $1 million dollars annually.

Table 24: Impact of canola oil and meal distribution, average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Direct economic impact (C$ million)	0.0	3.1	16.3	16.6	97.3	85.0	0.0	218.4
crude oil by rail	*0.0*	*0.0*	*0.2*	*0.0*	*3.3*	*12.2*	*0.0*	*15.6*
crude oil by truck	*0.0*	*0.1*	*0.5*	*0.0*	*0.0*	*0.0*	*0.0*	*0.7*
meal by rail	*0.0*	*0.8*	*5.9*	*10.0*	*59.2*	*47.5*	*0.0*	*123.4*
meal by truck	*0.0*	*0.0*	*4.2*	*1.0*	*0.5*	*1.2*	*0.0*	*6.9*
refined oil by rail	*0.0*	*0.7*	*1.4*	*5.1*	*33.9*	*22.6*	*0.0*	*63.7*
refined oil by truck	*0.0*	*1.5*	*4.1*	*0.5*	*0.4*	*1.5*	*0.0*	*8.0*
Total economic impact (C$ million)	0.0	7.2	37.8	28.8	158.3	140.3	0.1	372.6
crude oil by rail	*0.0*	*0.0*	*0.3*	*0.0*	*5.2*	*19.2*	*0.0*	*24.7*
crude oil by truck	*0.0*	*0.4*	*1.4*	*0.0*	*0.1*	*0.0*	*0.1*	*2.1*
meal by rail	*0.0*	*1.2*	*9.4*	*15.9*	*93.5*	*75.1*	*0.0*	*195.1*
meal by truck	*0.0*	*0.0*	*12.4*	*2.9*	*1.3*	*3.6*	*0.0*	*20.2*
refined oil by rail	*0.0*	*1.2*	*2.4*	*8.6*	*56.9*	*37.9*	*0.0*	*107.0*
refined oil by truck	*0.0*	*4.4*	*12.0*	*1.4*	*1.2*	*4.5*	*0.0*	*23.5*
Direct employment (FTE jobs)	0	12	67	80	441	329	1	930
crude oil by rail	*0*	*0*	*0*	*0*	*8*	*29*	*n.a.*	*38*
crude oil by truck	*0*	*0*	*1*	*n.a.*	*0*	*0*	*1*	*2*
meal by rail	*0*	*3*	*27*	*56*	*235*	*199*	*0*	*519*
meal by truck	*0*	*0*	*18*	*4*	*2*	*5*	*0*	*29*
refined oil by rail	*0*	*2*	*5*	*18*	*194*	*90*	*0*	*310*
refined oil by truck	*0*	*6*	*16*	*2*	*2*	*6*	*0*	*32*
Total employment (FTE jobs)	0	28	163	199	1,077	809	1	2,278
crude oil by rail	*0*	*0*	*1*	*0*	*19*	*69*	*n.a.*	*88*
crude oil by truck	*0*	*1*	*3*	*n.a.*	*0*	*0*	*1*	*6*
meal by rail	*0*	*7*	*68*	*142*	*598*	*505*	*0*	*1,320*
meal by truck	*0*	*0*	*42*	*10*	*4*	*12*	*0*	*68*
refined oil by rail	*0*	*5*	*12*	*43*	*452*	*209*	*0*	*720*
refined oil by truck	*0*	*14*	*38*	*5*	*4*	*14*	*0*	*75*
Direct wages (C$ million)	0.0	0.9	5.4	7.9	44.8	33.1	0.0	92.2
crude oil by rail	*0.0*	*0.0*	*0.0*	*0.0*	*0.8*	*3.0*	*n.a.*	*3.9*
crude oil by truck	*0.0*	*0.0*	*0.1*	*n.a.*	*0.0*	*0.0*	*0.0*	*0.1*
meal by rail	*0.0*	*0.3*	*2.7*	*5.7*	*24.0*	*20.3*	*0.0*	*52.9*
meal by truck	*0.0*	*0.0*	*1.1*	*0.3*	*0.1*	*0.3*	*0.0*	*1.8*
refined oil by rail	*0.0*	*0.2*	*0.5*	*1.9*	*19.8*	*9.1*	*0.0*	*31.6*
refined oil by truck	*0.0*	*0.4*	*1.0*	*0.1*	*0.1*	*0.4*	*0.0*	*1.9*
Total wages (C$ million)	0.0	2.0	11.4	14.7	81.5	60.6	0.1	170.4
crude oil by rail	*0.0*	*0.0*	*0.1*	*0.0*	*1.5*	*5.5*	*n.a.*	*7.0*
crude oil by truck	*0.0*	*0.1*	*0.2*	*n.a.*	*0.0*	*0.0*	*0.1*	*0.4*
meal by rail	*0.0*	*0.5*	*4.9*	*10.3*	*43.5*	*36.8*	*0.0*	*96.1*
meal by truck	*0.0*	*0.0*	*2.8*	*0.7*	*0.3*	*0.8*	*0.0*	*4.5*
refined oil by rail	*0.0*	*0.4*	*0.9*	*3.4*	*35.9*	*16.6*	*0.0*	*57.3*
refined oil by truck	*0.0*	*0.9*	*2.6*	*0.3*	*0.3*	*1.0*	*0.0*	*5.0*

Refined oil

- The direct ***economic impact*** of refined canola oil transportation averaged over $60 million for rail and almost $8 million for truck. Total impacts were close to $110 million and $24 million respectively.
- Over 310 ***jobs*** were directly dependent on refined canola oil shipped by rail with over 30 further jobs linked to trucking. The total employment impacts for these categories are 700 jobs and 75 jobs, respectively.
- The total ***wage impact*** of refined oil transportation averaged close to $60 million for rail and around $5 million for trucking.

Meal

- The total ***economic impact*** of meal transportation is $195 million for rail and $20 million for trucking.
- Transportation via rail and truck supports totals of close to 1,300 ***jobs*** and 70 jobs respectively.
- Collectively, the total ***wage impact*** of canola meal transportation is estimated at $100 million.

Methodology

Crude oil: We first determine the quantities of crude oil that will be exported from each crushing facility, and the likely point of export for these volumes. The likely point of export was determined based on the importing trade partner, with the majority of US shipments being made overland, shipments to Asia generally being channeled through BC ports, and western European and some of the Middle Eastern demand being fulfilled by shipments out of the St. Lawrence. Once tonne-miles were calculated, we then applied a range of rail rates similar to those used in seed transportation.

Refined oil: The economic impact of refined oil shipments was determined by first estimating how much oil would be moved out of each province and how much consumed provincially. Demand was estimated as a function of a given province's population.

- For demand that is met by production in a province, it was assumed that delivery was made by truck at a distance averaging 100 miles.
- For demand that is met by production outside of a province, or for any delivery to a port or the US border, it was assumed that delivery was made by rail.
- With tonne-miles determined, a rail or trucking rate was applied to determine expenditures.

Meal: Similarly, the calculations behind meal transportation began by determining how much meal is consumed within the province and how much is moved out of the province. To do this, meal demand in each province is based on a meal allocation by livestock species, reflecting the particular benefit of canola meal to dairy cattle, and the population of livestock in a given province.

Diagram 20: Canola meal consumption

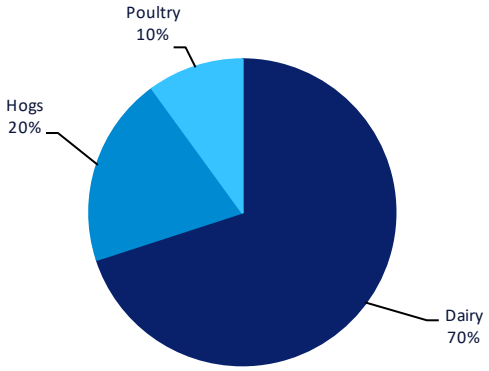


Diagram 21: Dairy cow population

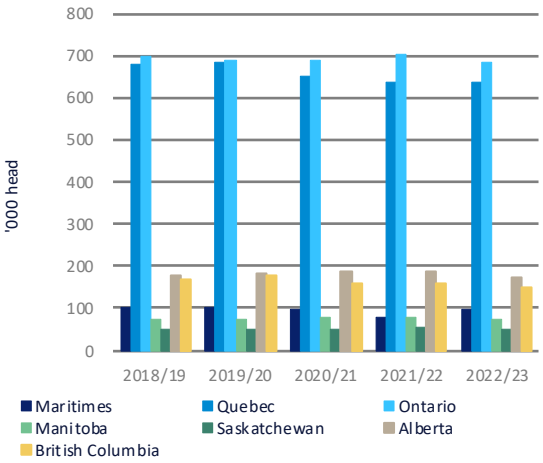


Diagram 22: Hog population, by province

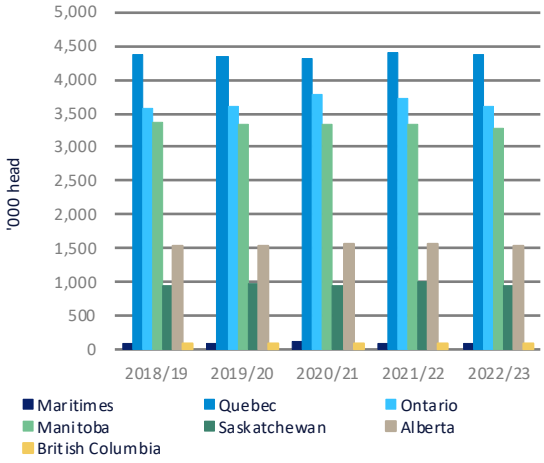
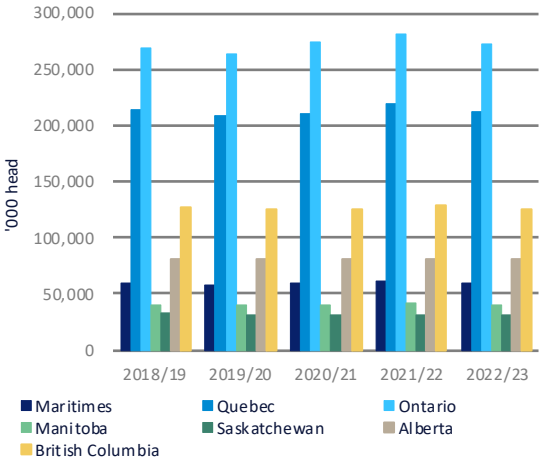


Diagram 23: Poultry population, by province



After developing provincial-level supply/demand balances, the distances and modes of delivery were determined in the same manner as for refined oil, with local deliveries made by truck and long-distance deliveries made by rail.

For all by-product transportation, ***employment*** and ***wage impact*** were calculated in the same manner as for the transportation of seed.

Impact at ports

Canada exports as much as 15 million tonnes of canola products annually, including seed, meal, crude oil, and refined oil. While the majority of meal exports take place overland to the US and Mexico, the majority of seed and oil canola products leave Canada via its ports. Although most overseas shipments of canola products leave Canada via ports in British Columbia, canola also represents a sizeable share of exports out of Ontario and Quebec ports. As the bulk of Canadian meal exports are overland to the US and Mexico, the impact of meal exports on Canadian ports is significantly smaller than for seed.

Impact

In our model, we calculated the economic impact of canola products on Canadian ports separately for seed, meal, crude, and refined canola oil.

- The total effects of ***canola seed*** exports on Canadian ports are an economic impact of $190 million, an employment impact of over 1,000 jobs, and a wage impact of $80 million.

Table 25: Impact of canola seed, meal and oil at Canadian ports, average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Direct economic impact (C$ million)	0.0	2.1	7.2	0.0	0.0	0.0	181.9	191.2
ports - seed	*0.0*	*1.9*	*6.9*	*0.0*	*0.0*	*0.0*	*118.3*	*127.1*
ports - crude	*0.0*	*0.0*	*0.2*	*0.0*	*0.0*	*0.0*	*31.1*	*31.4*
ports - refined	*0.0*	*0.2*	*0.0*	*0.0*	*0.0*	*0.0*	*2.5*	*2.7*
ports - meal	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*29.9*	*30.0*
Total economic impact (C$ million)	0.0	3.2	10.8	0.0	0.0	0.0	273.3	287.3
ports - seed	*0.0*	*2.8*	*10.4*	*0.0*	*0.0*	*0.0*	*177.8*	*191.0*
ports - crude	*0.0*	*0.0*	*0.3*	*0.0*	*0.0*	*0.0*	*46.8*	*47.1*
ports - refined	*0.0*	*0.3*	*0.0*	*0.0*	*0.0*	*0.0*	*3.7*	*4.1*
ports - meal	*0.0*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*45.0*	*45.1*
Direct employment (FTE jobs)	0	9	123	0	0	0	725	856
ports - seed	*0*	*8*	*122*	*0*	*0*	*0*	*472*	*602*
ports - crude	*0*	*0*	*1*	*0*	*0*	*0*	*124*	*125*
ports - refined	*0*	*1*	*0*	*0*	*0*	*0*	*10*	*11*
ports - meal	*0*	*0*	*0*	*0*	*0*	*0*	*119*	*119*
Total employment (FTE jobs)	0	15	211	0	0	0	1,246	1,471
ports - seed	*0*	*13*	*209*	*0*	*0*	*0*	*812*	*1,034*
ports - crude	*0*	*0*	*1*	*0*	*0*	*0*	*213*	*214*
ports - refined	*0*	*2*	*0*	*0*	*0*	*0*	*17*	*19*
ports - meal	*0*	*0*	*0*	*0*	*0*	*0*	*204*	*204*
Direct wages (C$ million)	0.0	0.8	10.7	0.0	0.0	0.0	63.2	74.6
ports - seed	*0.0*	*0.7*	*10.6*	*0.0*	*0.0*	*0.0*	*41.2*	*52.4*
ports - crude	*0.0*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*10.8*	*10.9*
ports - refined	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.9*	*1.0*
ports - meal	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*10.4*	*10.4*
Total wages (C$ million)	0.0	1.1	16.4	0.0	0.0	0.0	96.6	114.2
ports - seed	*0.0*	*1.0*	*16.2*	*0.0*	*0.0*	*0.0*	*63.0*	*80.2*
ports - crude	*0.0*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*16.5*	*16.6*
ports - refined	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*1.3*	*1.5*
ports - meal	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*15.9*	*15.9*

- Total effects of ***meal*** exports include an economic impact of $45 million, an employment impact of over 200 jobs, and a wage impact of over $15 million.

- Total effects of ***crude canola oil*** exports on Canadian ports meanwhile are estimated at an economic impact of $47 million, an employment impact of more than 210 jobs, and a wage impact of $17 million.

- ***Refined canola oil*** exports by Canada are small in comparison with crude oil exports and have a total economic impact estimated at $4 million, with a total employment impact of around 20 jobs and wages estimated at roughly $1.5 million.

Methodology

The ***economic impact*** of canola products on Canadian ports is calculated as the product of volumes multiplied by port fees.

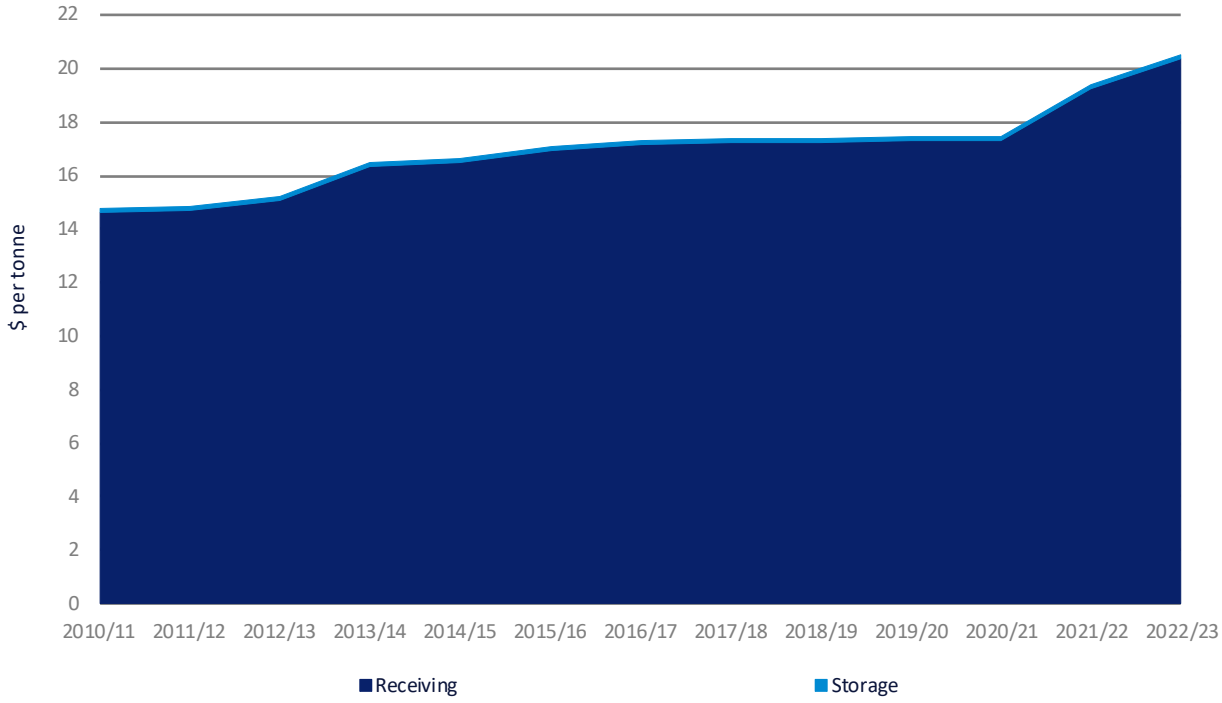
- Canadian seed volumes by port and direct Prairie exports (overland) were obtained from data provided by the Canadian Grain Commission.
- Export volumes by port for meal, crude, and refined oils were obtained from Canadian trade data.

Port fees for canola seed were also obtained from the Canadian Grain Commission and are illustrated below.

The ***employment impact*** at the ports was based on canola products' share of total port movements, combined with an understanding of the total number of individuals employed at Canadian ports.

Wages, meanwhile, were based on a study detailing the economic impact of Vancouver ports and indexed against other wage changes over time: ***www.portmetrovancouver.com***

Diagram 24: Grain charges at Canadian ports



Benefits to livestock sector

The Canadian livestock sector benefits from the availability of canola meal in a number of ways:

- For ***all livestock***, canola usually represents a lower cost protein alternative than soybean meal, even when adjusted for its lower protein content. This benefit per tonne has been reducing in recent years as canola and soybean meal prices edge closer to one another.

- For the ***dairy sector***, canola provides an additional advantage because the amino acid profile of canola meal is superior to most other protein meals for milk yield. Canola meal has been shown to increase milk yields by one liter of milk per cow per day.

Impact

For the livestock sector, we assume that the effects of canola consumption are confined to economic impact, i.e. no jobs or wages in the livestock sector are attributed to canola meal, given that there would likely be little difference in the size of the sector in a world with or without canola meal. Canola meal does, however, have significant positive implications for the value added in the Canadian livestock sector, most importantly in the dairy sector.

Table 26: Impact of canola meal, average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Direct economic impact (C$ million)	10.4	75.4	80.9	10.5	6.5	21.7	17.9	223.3
dairy cost savings	*2.2*	*15.2*	*16.4*	*1.8*	*1.2*	*4.4*	*3.7*	*44.9*
poultry cost savings	*0.1*	*0.2*	*0.3*	*0.0*	*0.0*	*0.1*	*0.1*	*0.8*
hog cost savings	*0.1*	*2.4*	*2.0*	*1.8*	*0.5*	*0.8*	*0.0*	*7.6*
dairy yield boost	*8.1*	*57.6*	*62.2*	*6.8*	*4.7*	*16.5*	*14.1*	*170.1*
Total economic impact (C$ million)	55.7	403.5	433.1	55.7	34.6	116.3	96.1	1,195.0
dairy cost savings	*11.1*	*78.0*	*84.0*	*9.2*	*6.3*	*22.3*	*19.0*	*229.9*
poultry cost savings	*0.3*	*1.1*	*1.4*	*0.2*	*0.2*	*0.4*	*0.6*	*4.1*
hog cost savings	*0.3*	*12.0*	*10.2*	*9.2*	*2.6*	*4.3*	*0.2*	*38.9*
dairy yield boost	*44.1*	*312.4*	*337.5*	*37.1*	*25.4*	*89.3*	*76.3*	*922.1*

Methodology

The ***economic impact from canola meal cost savings*** is calculated based on the price of canola meal relative to soybean meal, adjusted for useable protein. For the dairy sector, we assume canola meal provides 80% as much protein as soy on a per-weight basis. For hogs and poultry, the percentages were 75% and 70%, respectively, accounting for the digestibility issues of high fiber meals for monogastric animals. This generates the larger cost savings for dairy, and smaller savings for poultry (per tonne) shown in the diagrams below. The relative cost savings are then multiplied by the quantities of canola meal consumed by the livestock sector to determine the total savings derived from canola meal consumption.

The calculation for ***economic impact from dairy yield boost*** was made on the basis of research showing that cattle fed canola experience a yield boost averaging one liter per cow per day. To achieve this boost, we assume a cow needs to consume 2.7 kilograms of canola meal per day while lactating, and that a cow lactates for an average of 300 days per year.

The total number of cows being fed a “full” meal ration was determined using the annual canola meal consumption per-cow figures divided by the total amount of canola thought to go into the dairy sector (around 70% of the total).

Multiplying the number of canola-fed cows by 300 liters per year, multiplied by the Canadian wholesale milk price, gives us the economic value of the canola dairy boost. This value has received a significant boost from high prices the past two years.

Diagram 25: Canola meal savings relative to soy meal

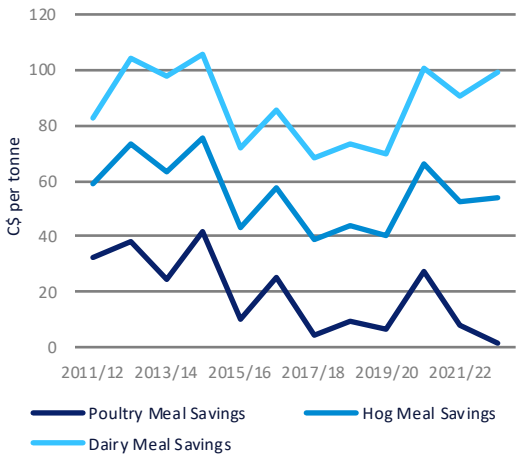
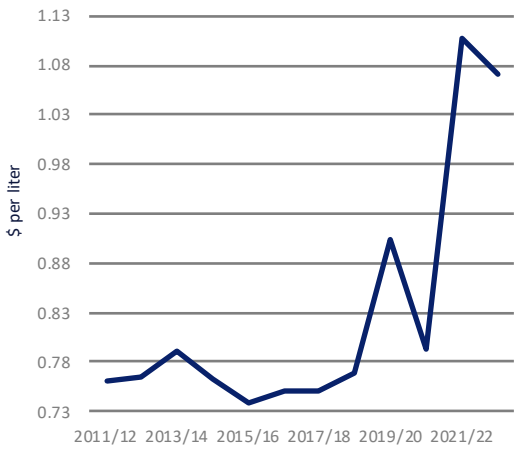


Diagram 26: Canadian wholesale milk price



Adding value to canola oil in food end uses

The food processing sector adds value to canola after the refining stage by incorporating refined oil into industrial food applications. In this section, we explore some of the downstream benefits derived from canola products in a selection of end-use sectors —margarine, shortening and liquid oils for human consumption. The liquid oils category includes:

- Baking and frying uses
- Salad and cooking oils (but not where these are bottled & packed — see below)

The "bottling/packing" category that follows in the next section represents a sub-category of the salad and cooking oils category above, and includes all the refined oils put into bottles/cans of various sizes for home and small-scale restaurant use, either as salad oils or for cooking. If this sub-category were not included, the bottled/packed oils would be included in this end-use section, as they represent part of the value added to refined oil in the liquid oils category. The bottling/packing sector value added and employment is, however, presented separately in the next section and is not included in this food end uses section: to include it would mean double-counting the bottling/packing values and employment.

This is the most difficult sector of the value chain to quantify accurately. While we include the estimates from food processing for end uses in our grand totals of the benefits to Canada from the canola industry, we remind readers that they do *not* represent an exhaustive assessment of the end-use benefits of canola.

The further processing of refined canola oil into food end uses is difficult to quantify due to the following factors:

- Ingredient use and product formulations of processed foods are sensitive information from the perspective of industrial food manufacturers.
- Branding and marketing add significant value to consumer products. This is the difference between consumer products at this stage of the chain and the commodity products at earlier stages. Branding and marketing make it very difficult to quantify the value that canola can claim in the further processing chain, as the large mark-ups are not attached solely to canola oil — if canola were not available, many products could switch to an alternative oil, often without any price effect. The growing healthy oil market may be more closely associated with canola, but again the difficulty lies in stripping out the part of the large value-added in consumer and wholesale prices that is attributable to canola rather than branding and marketing.

Impact

As an illustration of the scale of the potential value derived in the lucrative food processing sector, we present estimates of the value added to canola oil through processing into the food products of margarine, shortening, and liquid (cooking, baking & frying and salad) oils. We remind readers that this ***does not include bottled/packed oils***, which are covered separately in the next section. Salad oils, for example, may be almost wholly contained in the bottling and packing sector.

- Among the three selected end products, canola oil demand for liquid oils accounts for over half of the aggregate volumes; hence, it generates the highest impact.
- Direct effects through processing canola oil into the three end products have created an economic impact of over $2.1 billion (without bottling/packing), boosted considerably by high prices recently. Meanwhile, the direct employment impact is estimated at close to 2,900 jobs, creating a direct wage impact averaging $187 million a year during the last three years.
- Total economic impact of end uses is estimated at $4.67 billion. Total jobs created is approaching 7,800, with a total wage impact of $450 million.

Table 27: Impact of canola oil end uses, average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Direct economic impact (C$ million)	62.2	244.0	442.1	245.4	656.8	386.8	67.4	2,104.7
Total economic impact (C$ million)	147.7	564.3	1,008.1	510.9	1,448.0	821.9	160.0	4,660.9
Direct employment (FTE jobs)	101	373	655	279	871	475	111	2,863
Total employment (FTE jobs)	273	1,007	1,769	753	2,354	1,282	299	7,737
Direct wages (C$ million)	7.4	26.3	45.2	15.4	56.2	28.1	8.1	186.7
Total wages (C$ million)	18.0	63.8	109.5	37.4	136.1	68.1	19.7	452.7

Methodology

The ***economic impact*** of end uses is calculated based on the estimated volume of canola oil used in each of the products: margarine, shortening and liquid oils. We then apply the volume to estimates of unit import prices (as a proxy without branding/marketing mark ups) of the three end products to derive the direct economic impact.

Diagram 27: Volumes of canola oil end uses

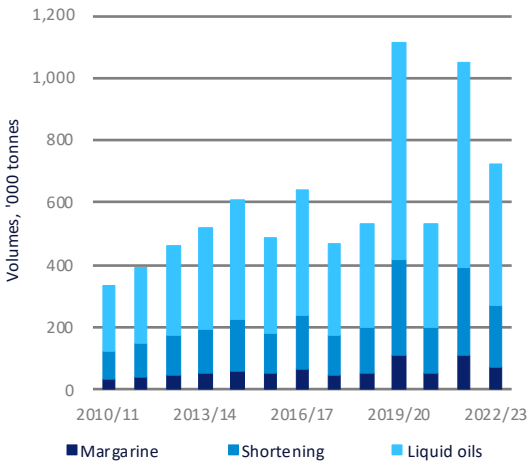
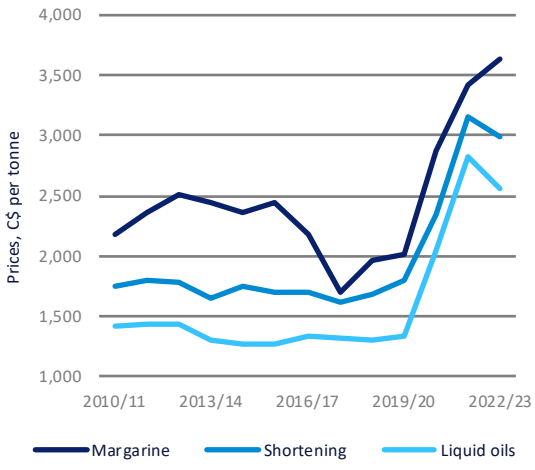


Diagram 28: Prices of canola oil end uses



The total number of people employed in the food end use sector attributable to canola was based on previous reports on the economic impacts of canola with trends applied to the present day and corroborated by industry interview estimates. Provincial level employment was then taken to be a function of provincial canola oil refining capacity and food manufacturing revenues.

One problem with including this analysis in the main value-added calculations is that the quantification methodology employed here is necessarily less robust than in the rest of the analysis in this study, because we cannot obtain firm data from the food processing sector, which regards such information as proprietary, nor from *Statistics Canada*, which does not report this level of detail in its *Canada Food Statistics* data. Taking these caveats into consideration, the analysis presented here should be taken as indicative.

For the share of each type of oil used in margarine, shortening, and liquid/cooking/frying/salad oils, we relied on historical data from *Statistics Canada*. This is the only data available that offer a snapshot of the breakdown of these processed oils by type of oil of which we are aware.

To calculate the value of these processed products, we used the unit value export price of each of these products for export to the US, as reported by *Statistics Canada*.

Bottling and packing

As we discuss above, bottling and packing represents a sub-sector within the end uses category. Bottling and packing can be defined in a number of ways, but for our purposes:

- We consider only ***refined canola oil that is bottled and packed into bottles/cans for home and small-scale restaurant use.***
- We do not include oils that are transported in bulk, in shipping containers, or in drums. This rules out the use of canola oil in baking and frying industrial uses, such as for chips and snacks, and in some large scale cooking oils, such as quick-serve restaurants. These are included in the wider end-use category above.
- Neither does the bottling/packing sector here include the packing of canola oil-based products other than bottled oils. We do not, for example, include packing of margarine or shortenings — these are again included in the wider end use category above. In terms of packing, therefore, we include only the packing of bottled oils.

Overall, to place the bottling/packing sub-sector in perspective, we estimate it accounts for close to ***10% of all Canadian refined oil consumed domestically*** each year. This leaves around 90% of domestic use of refined canola oil for the wider end-use category described above.

Impact

- Direct effects of bottling/packing refined canola oil create a direct economic impact of $140 million a year. The direct employment impact is estimated at 320 jobs, creating an annual direct wage impact approaching $25 million during the period from 2020/21 to 2022/23.
- Total economic impact of bottling/packing is estimated at almost $340 million a year. Total jobs created stood at 860 jobs with a total wage impact of over $55 million.

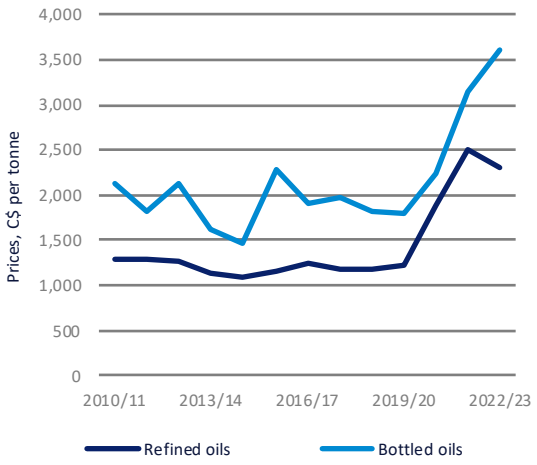
Table 28: Impact of canola oil bottling & packing, average 2020/21–2022/23

	Maritimes	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Canada
Direct economic impact (C$ million)	0.0	6.5	17.9	30.3	47.4	40.9	0.0	143.0
Total economic impact (C$ million)	0.0	15.5	42.4	72.1	112.6	97.2	0.0	339.8
Direct employment (FTE jobs)	0	14	40	68	105	91	0	318
Total employment (FTE jobs)	0	39	107	183	285	246	0	860
Direct wages (C$ million)	0.0	1.1	2.9	5.0	7.7	6.7	0.0	23.3
Total wages (C$ million)	0.0	2.6	7.1	12.0	18.8	16.2	0.0	56.6

Methodology

For calculating the ***economic impact***, we assume, based on industry interviews, that around 10% of all Canadian refined oil used domestically is utilized in the bottling/packing sector. This is distributed across the provinces proportionately according to refined oil output in each in province.

Diagram 29: Unit import values of refined oils and bottled oils



For prices, we assume the value added on all bottled oil reflects the difference between the US unit import values for refined oil in bulk vs. bottled oils (containing less than 5% soybean oil). Again, high prices has increased value added in this sector considerably in recent years.

The ***jobs impact*** is calculated in the same proportions as the economic impact, meaning around 10% of total end use jobs are found in the bottling/packing sector, with the same provincial distribution.