



International

The Economic Impact of Canola on the Canadian Economy

Report for:

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Research and analysis to inform your business decisions

LMC International

Oxford

Clarendon House, 52 Cornmarket Street, Oxford, OX1 3HJ, UK
t: +44 1865 791737, f: +44 1865 791739
info@lmc.co.uk

Singapore

16 Collyer Quay #21-00, Singapore 049318
t: +65 6818 9231
info@lmc-sg.com

www.lmc.co.uk

osb206n

New York

1841 Broadway, New York, NY 10023, USA
t: +1 (212) 586-2427, f: +1 (212) 397-4756
info@lmc-ny.com

Kuala Lumpur

B-03-19, Empire Soho, Empire Subang, Jalan SS16/1, SS16,
47500 Subang Jaya, Selangor Darul Ehsan, Malaysia
t: +603 5611 9337
info@lmc-kl.com

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The Economic Impact of Canola on the Canadian Economy

Introduction

The Canola Council of Canada commissioned LMC International to undertake research and analysis 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 report provides the results of that independent analysis.

We focused specifically on the production of canola and canola products, spanning nine steps in 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 included 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 objective was to develop an up-to-date assessment, using:

- Official data as much as possible.
- The latest data for 2011/12 and previous years (which are officially revised over time).
- Interviews with industry participants.
- Current best practice in estimating economic benefits.

The analysis does not seek to update previous exercises on the same subject: rather, we have sought to provide the most accurate and independent assessment possible adopting all of the latest data and techniques available. To this end, we incorporated additional sources of data to those we have found in past exercises, and our methodology was enhanced not just by the additional data but also from methodologies we uncovered undertaking similar analysis in the last two years in other agricultural sectors in other countries.

The new and additional aspects result in an enhanced, robust examination of the benefits of canola to the Canadian economy. To increase its usefulness, we have developed a consistent series of data, employing the current methodology, all the way back to 2004/05. The trends over that long period are clear: **canola's benefit to the Canadian economy has increased and continues to increase, particularly over the past three crop years.**

Note: Value throughout the report is presented in Canadian dollars, whether noted by \$ or C\$.

Summary of results

For the 3-year average, 2009/10-2011/12:

- The total economic impact on the Canadian economy from the canola sector averaged C\$19.3 billion per year.
- 249,000 people are supported by the canola sector, comprising 184,000 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\$12.5 billion.

The economic benefits from canola demonstrate a clear upward trend. In the most recent year of our study, 2011/12:

- The total economic impact on the Canadian economy from the canola sector was C\$21.2 billion per year.
- 261,000 people are supported by the canola sector, comprising 194,000 paid jobs and an additional 67,000 family members (beyond the growers themselves) who support and are supported by canola farming operations.
- The total wage impact of the sector was C\$14.6 billion.

Relative to 2004/05, the first year covered in this study:

- The economic impact of the canola value chain has increased by \$14.2 billion or 202%.
- The employment impact of the sector has increased by 34%.
- The total wage impact of the sector increased over three fold.

Overview of results

In this study, we have evaluated the impact across the value chain for canola via three different metrics:

- **Economic impact** — quantifying the value added to the Canadian economy across the canola value chain.
- **Employment impact** — estimating the number of full-time equivalent (FTE) jobs contributed by canola production, processing and distribution.
- **Wage impact** — evaluating the total wages for individuals employed along the canola value chain.

For our purposes, we evaluated the canola value chain at ten distinct steps (Table 1), tracing the impact through the value-added products of refined oil, crude oil and meal.

- For **refined canola oil**, our analysis terminates at the point where this oil either 1) is produced into margarine, shortening and salad oil within Canada, or 2) is loaded on board a ship for overseas export, or 3) crosses from Canada into the United States for overland export.
- Our approach for **crude canola oil** was similar; however, the vast majority of crude oil used in Canada is not delivered to end-users — typically, it is refined first. The refiner is therefore treated as the *de facto* end-user.
- Canola meal is handled in the same manner as oil; however, given the important and quantifiable benefit of canola meal to the livestock sector, we extend our analysis one step further. For meal, we both: 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.

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	Total 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	By-product delivery	Delivery of crude oil, refined oil or meal to end user or point of export	yes	yes	yes	yes
8	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
9	Total 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
10	End users	Impact on major end uses products such as margarine, shortening and salad oil	yes	yes	yes	yes
*	International shipping	We have included estimates for international shipping for interest however these have not been included in the Canada total given that they take place outside the country on vessels that are typically foreign-owned	na	na	na	na

The economic indicators for each step of the canola value chain are evaluated at three different levels, Direct, Indirect and Induced:

- As the name suggests, the **Direct effect** is composed of the economic, employment and wage impacts that can be directly attributed to the canola value chain. These results were calculated first hand by LMC International based on models driven by publicly and privately available data, industry knowledge, and interviews with industry stakeholders.
- **Indirect effects** are 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** are those economic, employment and wage impacts that stem from household spending of the income earned from the canola sector.

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

To arrive at Canada-level results, data first needed to be collected and results tallied at the provincial level. Throughout the text of this report, our focus will be national-level results; nonetheless, we will highlight provincial-level data where interesting. The most recent three-year averages of provincial-level results are presented beginning with Table 15.

Overview of Direct-effect results

The direct-effect impacts of canola on the Canadian economy are illustrated in Diagram 1 with the economic impact, employment and wage impact delineated in Tables 2, 3, and 4, respectively.

- Between 2009/10 and 2011/12, **the direct economic impact of canola on the Canadian economy averaged 9.60 billion dollars. For 2011/12, the impact was 10.51 billion dollars** (Table 2). This is broadly similar to 2010/11 levels, the net result of a crop that was 1.3 million tonnes smaller, but with higher canola prices making up for some of this difference.
- Consistent with what is seen in the rest of agriculture, the direct employment impact across the canola value chain has been fairly stagnant over the last decade, despite significant increases in production – a reflection of greater productivity in the sector. Over the three most recently observed years, the canola sector is directly accountable for roughly 72,000 paying jobs (Table 3). When additional canola farm family members, who may contribute to the overall success of the farming enterprise, are included, **the number of jobs directly associated with the canola industry would register as high as 138,000 jobs over the observed time frame.**
- **Between 2009/10 and 2011/12, the direct wage impact of canola on the Canadian economy averaged 3.0 billion dollars (Table 3), with the 2011/12 wage estimated at \$3.5 billion.** This figure is inclusive of the canola share of grower gross margins.

Diagram 1: Direct effects of canola on the Canadian economy

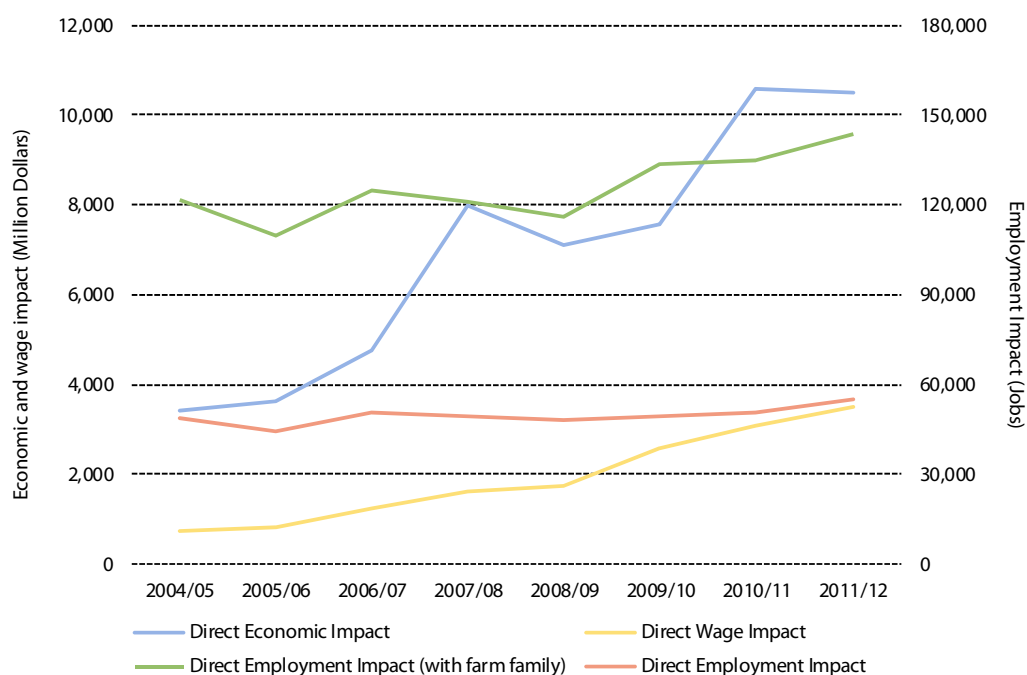


Table 2: Direct economic impact across the canola value chain on the Canadian economy (million C\$)

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	Average (2009/10 - 2011/12)
Seed development	na	na	na	na	na	na	na	na	na
Canola Farming	2,479	2,446	3,560	6,401	5,531	5,320	7,801	7,548	6,890
Elevation	87	127	129	151	189	187	225	252	221
Seed delivery	243	366	384	428	497	523	610	734	623
Crushing	229	300	242	465	352	355	515	469	446
Refining	122	118	149	169	141	34	99	115	83
By-product delivery	65	70	82	99	93	125	118	136	126
Impact at ports	55	62	90	91	134	159	165	199	174
Benefit to livestock sector	135	137	137	178	183	199	190	153	181
End uses	na	na	na	na	na	680	844	900	808
Direct Economic Impact	3,416	3,627	4,774	7,983	7,119	7,583	10,567	10,506	9,552

Note: Economic impacts of the seed development sector are not calculated explicitly. Instead, they are captured under canola farming. A detailed explanation as to how this avoids the pitfalls of double counting is discussed in our methodology section below.

Table 3: Direct employment impact across the canola value chain on the Canadian economy

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	Average (2009/10 - 2011/12)
Seed development	371	365	441	452	462	492	531	602	542
Canola Farming	48,662	44,281	50,875	49,750	48,198	49,196	50,439	54,902	51,512
Elevation	689	864	998	1,009	778	1,003	1,227	1,025	1,085
Seed delivery	534	803	794	882	1,266	1,061	1,182	1,349	1,197
Crushing	312	312	347	416	460	496	496	496	496
Refining	153	153	174	216	242	263	263	263	263
By-product delivery	240	245	256	302	325	369	335	360	355
Impact at ports	141	163	236	281	432	497	478	640	538
Benefit to livestock sector	na	na	na	na	na	na	na	na	na
End uses	na	na	na	na	na	16,136	16,186	16,619	16,314
Direct Employment Impact	51,101	47,186	54,121	53,308	52,164	69,512	71,137	76,256	72,302
<i>Additional canola farm-family members</i>	<i>70,452</i>	<i>62,465</i>	<i>70,383</i>	<i>67,671</i>	<i>63,959</i>	<i>64,290</i>	<i>63,991</i>	<i>67,357</i>	65,213
Total Employment Impact including farm family members	121,554	109,651	124,504	120,979	116,123	133,803	135,127	143,613	137,514

Table 4: Direct wage impact across the canola value chain on the Canadian economy (million C\$)

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	Average (2009/10 - 2011/12)
Seed development	23	23	29	30	31	34	37	43	38
Canola Farming	607	659	1,029	1,394	1,460	1,484	1,941	2,296	1,907
Elevation	39	46	64	60	50	66	84	72	74
Seed delivery	36	59	63	74	108	99	116	135	117
Crushing	17	17	22	25	29	33	34	35	34
Refining	9	8	11	13	15	17	18	19	18
By-product delivery	17	18	19	22	24	29	27	30	29
Impact at ports	7	9	13	16	25	31	30	43	35
Benefit to livestock sector	na	na	na	na	na	na	na	na	na
End uses	na	na	na	na	na	774	786	814	791
Direct Wage Impact	755	839	1,250	1,634	1,743	2,567	3,073	3,488	3,043

Overview of results including Direct, Indirect and Induced effects (total effect)

The total effect of canola on the Canadian economy is not limited to the people working directly in the industry. Its full effect can be best appreciated when its indirect and induced impacts are taken into account. These are illustrated in Diagram 2 and in Tables 5-7.

- In 2011/12, the total economic impact, which includes direct, indirect and induced effects, amounted to \$21.2 billion. **The average economic impact of canola on the Canadian economy over three years, 2009/10 to 2011/12, was \$19.3 billion.**

- **The total employment effect of canola between 2009/10 and 2011/12 averaged 249,000.** This includes canola farm family members.
- Over the same period, **the wage effect of canola on the Canadian economy averaged \$12.5 billion, reaching \$14.6 billion in 2011/12.** When divided by the jobs created, excluding those jobs to canola farm family members, the implied per-capita wage for 2011/12 was \$75,000. ***This suggests that the canola value chain, generally speaking, supports relatively higher paying jobs within the Canadian economy.***

Diagram 2: Total effects of canola on the Canadian economy

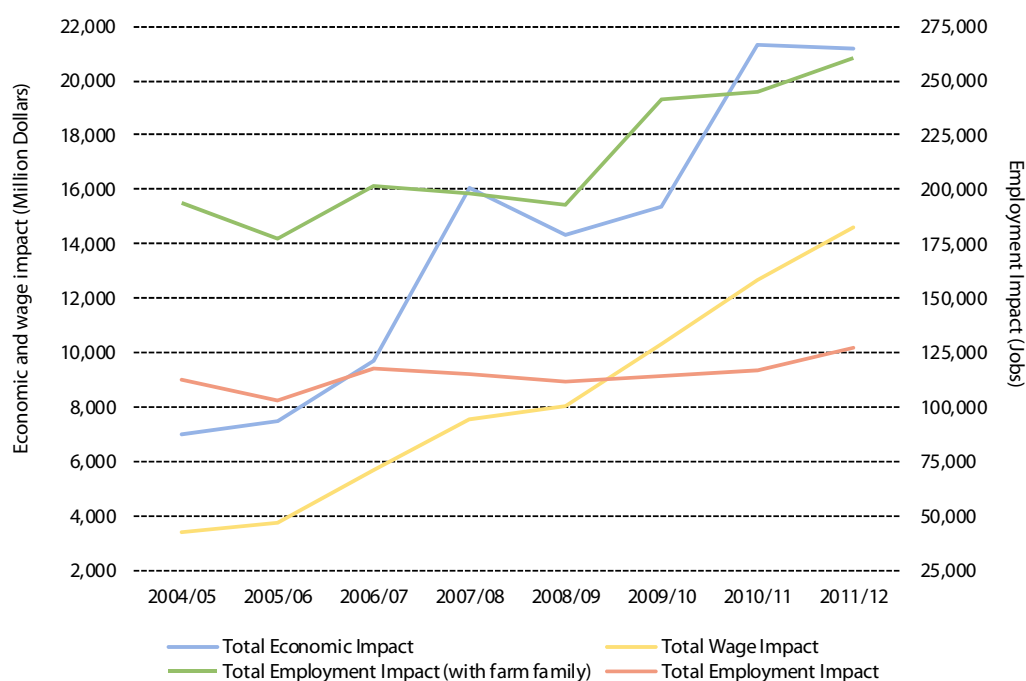


Table 5: Total economic impact across the canola value chain on the Canadian economy (million C\$)

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	Average (2009/10 - 2011/12)
Seed development	na	na	na	na	na	na	na	na	na
Canola Farming	4,787	4,723	6,873	12,359	10,678	10,271	15,061	14,573	13,302
Elevation	173	253	258	302	377	374	449	503	442
Seed delivery	528	793	830	927	1,058	1,129	1,325	1,591	1,349
Crushing	570	744	601	1,155	873	882	1,279	1,163	1,108
Refining	303	294	370	421	349	84	246	287	206
By-product delivery	135	146	169	206	192	258	247	283	263
Impact at ports	110	124	180	181	268	317	330	397	348
Benefit to livestock sector	392	397	398	518	531	579	551	444	525
End uses	na	na	na	na	na	1,450	1,799	1,919	1,723
Total Economic Impact	6,998	7,474	9,680	16,067	14,327	15,346	21,287	21,161	19,264

Table 6: Total employment impact across the canola value chain on the Canadian economy

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	Average (2009/10 - 2011/12)
Seed development	1,842	1,814	2,192	2,247	2,297	2,442	2,639	2,989	2,690
Canola Farming	112,857	102,697	117,988	115,381	111,781	114,095	116,977	127,328	119,467
Elevation	1,565	1,962	2,268	2,293	1,768	2,277	2,788	2,328	2,464
Seed delivery	1,181	1,785	1,754	1,960	2,798	2,365	2,642	3,006	2,671
Crushing	3,697	3,697	4,110	4,932	5,453	5,878	5,878	5,878	5,878
Refining	1,815	1,815	2,063	2,556	2,869	3,124	3,124	3,124	3,124
By-product delivery	528	539	563	664	717	812	737	792	780
Impact at ports	320	370	536	639	981	1,129	1,086	1,454	1,223
Benefit to livestock sector	na	na	na	na	na	na	na	na	na
End uses	na	na	na	na	na	44,984	45,122	46,332	45,479
Total Employment Impact	123,805	114,679	131,473	130,672	128,664	177,107	180,993	193,231	183,777
<i>Additional canola farm-family members</i>	<i>70,452</i>	<i>62,465</i>	<i>70,383</i>	<i>67,671</i>	<i>63,959</i>	<i>64,290</i>	<i>63,991</i>	<i>67,357</i>	65,213
Total Employment Impact including farm family members	194,258	177,144	201,856	198,343	192,623	241,397	244,984	260,587	248,989

Table 7: Total wage impact across the canola value chain on the Canadian economy (million C\$)

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	Average (2009/10 - 2011/12)
Seed development	89	89	109	114	119	129	142	164	145
Canola Farming	2,996	3,253	5,077	6,878	7,205	7,322	9,578	11,329	9,410
Elevation	78	93	130	122	101	134	170	146	150
Seed delivery	70	117	125	149	213	200	235	275	236
Crushing	107	102	137	152	180	201	208	214	208
Refining	52	50	69	79	95	107	110	114	110
By-product delivery	32	34	35	42	46	55	52	57	55
Impact at ports	15	17	27	33	51	62	61	87	70
Benefit to livestock sector	na	na	na	na	na	na	na	na	na
End uses	na	na	na	na	na	2,085	2,116	2,193	2,131
Total Wage Impact	3,439	3,754	5,709	7,568	8,008	10,294	12,671	14,578	12,514

Use of multipliers to evaluate indirect and induced impacts

Although the direct effects of canola on the Canadian economy are significant, they fail to capture the ripple effect that canola has 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, like crushing. To illustrate this point, one must consider that a typical canola crushing facility in Canada, with an average capacity of 530,000 tonnes annually, directly employs between 50 and 100 people only. 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, making the true impact of that 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.

While multipliers vary across subsectors of the canola value chain the economic, employment and wage multipliers can also vary considerably within the same category. When a wage multiplier is higher than an employment multiplier it can be interpreted as a subsector indirectly supporting higher paying jobs elsewhere in the Canadian economy. When a wage multiplier is lower than an employment multiplier the opposite inference can be made.

To capture indirect and induced effects, economists use multipliers, which are developed from “input-output” tables, which in turn measure the impact on the broader economy from some kind of exogenous shock to a specific sector of the economy.

Because input-output tables and economic multipliers are the convention when estimating indirect and induced effects, they are available for many economies globally. However, because of limited resources, many countries may offer multipliers only at the broadest level of the economy. Fortunately, for the purposes of this study, that is not the case for Canada, which 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 as many as 282 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, to 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 that are more commonly found in these provinces, despite the fact that we are strictly interested in canola.
- Lastly, 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 making any estimates for the total effect of canola on the Canadian economy, including at the provincial level.

Multipliers exist for 1) economic impact, 2) employment impact, and 3) wage impact at the direct, the direct+indirect, and the direct+indirect+induced levels.

- ***The purpose of this study is to gauge, with as much accuracy as possible, the economic impact of canola on the Canadian economy.*** For this reason, direct economic impact, employment and wages were tallied at each step of the value chain. This approach is far more accurate than the alternative of estimating direct employment and wage effects using multipliers and is far more accurate. Multipliers are therefore reserved for estimating indirect and induced effects only.

- Based on our first-hand accounting of direct effects, we learned that Direct+Indirect and Direct+Indirect+Induced multipliers underestimated impacts for canola at some stages of the value chain. For economic and employment impacts, the StatCan multipliers are presented in terms of \$1 of exogenous industry output shock. For employment, multipliers are presented in terms of jobs per million dollars of output.
- To make use of StatCan multipliers, we took the ratios of indirect effects to direct effects and of induced effects to direct effects.
- These national-level StatCan multipliers are presented in Table 8.

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

Value-added activity	StatCan Industry Designation	Economic Impact		Employment Impact		Wage Impact	
		Indirect Multiplier	Induced Multiplier	Indirect Multiplier	Induced Multiplier	Indirect Multiplier	Induced Multiplier
GM Seed Development	Pesticides, Fertilizer and Other Agricultural Chemical Manufacturing	0.82	0.24	2.62	1.34	2.02	0.79
Farming	Crop Production (except Greenhouse, Nursery and Floriculture Production)	0.73	0.20	0.96	0.36	2.91	1.02
Rail Transport	Rail Transportation	0.64	0.40	0.61	0.60	0.50	0.39
Truck Transport	Truck Transportation	0.89	0.47	0.62	0.43	0.76	0.46
Barge Transport	Water Transportation	0.99	0.44	1.13	0.78	0.98	0.52
Crushing	Starch and Vegetable Fat and Oil Manufacturing	1.24	0.25	8.44	2.42	3.86	1.27
Refining	Starch and Vegetable Fat and Oil Manufacturing	1.24	0.25	8.44	2.42	3.86	1.27
Elevation	Farm Product Warehousing and Storage	0.57	0.43	0.71	0.57	0.60	0.42
Port Activities	Farm Product Warehousing and Storage	0.57	0.43	0.71	0.57	0.60	0.42
Livestock	Animal Production (except Animal Aquaculture)	1.56	0.35	0.92	0.28	3.17	1.09
End uses	Other Miscellaneous Food Manufacturing	0.80	0.33	1.16	0.62	1.14	0.56

Overview of provincial-level results

Below we provide an overview of provincial-level results, first presenting our findings for *direct* impacts, followed by our findings for direct+ indirect+induced (or total) impacts.

Direct impacts

- At the provincial level, Saskatchewan was the epicenter for the economic impact of Canadian-grown canola between 2009/10 and 2011/12, reconciling with the province's position as the leading producer of canola seed and home to most of the country's processing capacity. Saskatchewan accounted for over \$4 billion in economic impact, roughly 43% of the Canadian total of \$9.60 billion (Table 9 and Diagram 3).
- Alberta and Manitoba comprised 32% and 18% of the Canadian economic impact, respectively, meaning that collectively, Canada's Prairie Provinces accounted for 93% of the economic impact from canola.
- Similarly, the Prairies also dominate in terms of the employment and wage impacts of canola. In Saskatchewan, 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 86% of canola's employment impact is felt in the Canadian prairies (Table 10 and Diagram 4).
- Finally, of the \$3.05 billion in direct wages derived from canola, \$2.2 billion are paid into the Prairies (Table 11 and Diagram 5).

Table 9: Direct economic impact by province (million C\$), 3-year average (2009/10–2011/12)

	Maritimes	PQ	ON	MB	SK	AB	BC	Unsp. Canada	All Canada
Seed Development	na	na	na	na	na	na	na	na	na
Canola Farming	0	16	33	1,016	3,273	2,520	31	0	6,890
Additional Farm Family Members	na	na	na	na	na	na	na	na	na
Elevation	0	0	24	84	112	1	0	0	221
Seed delivery	0	0	13	86	256	265	3	0	623
Crushing	0	26	26	80	240	74	0	0	446
Refining	0	6	6	19	33	18	0	0	83
By-product delivery	0	7	8	23	63	25	0	0	126
Impact at ports	0	1	9	0	0	0	164	0	174
Benefit to livestock sector	11	66	58	11	6	16	13	0	181
End uses	0	3	160	358	132	155	0	0	808
Total	11	127	338	1,677	4,114	3,075	211	0	9,552

Diagram 3: Direct economic impact by province, 3-year average (2009/10–2011/12)

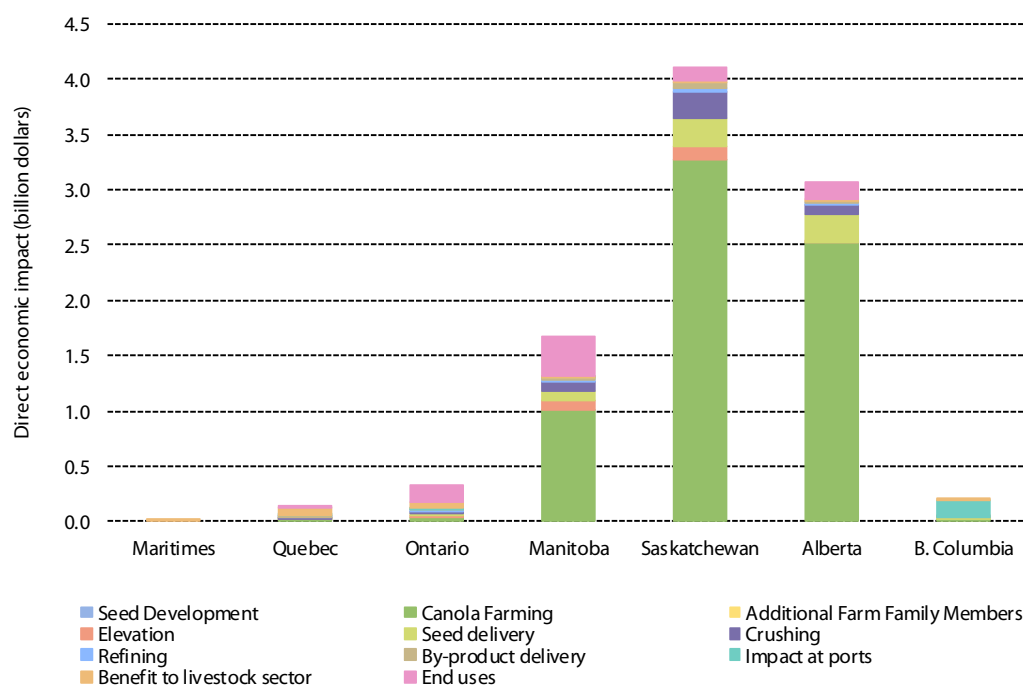


Table 10: Direct employment impact by province (including farm family members), 3-year average (2009/10–2011/12)

	Maritimes	PQ	ON	MB	SK	AB	BC	Unsp. Canada	All Canada
Seed Development	na	na	na	na	na	na	na	542	542
Canola Farming	0	439	789	10,756	23,143	16,271	114	0	51,512
Additional Farm Family Members	0	768	1,339	11,305	29,591	22,054	156	0	65,213
Elevation	0	0	2	119	411	547	7	0	1,085
Seed delivery	0	0	1	222	530	439	6	0	1,197
Crushing	0	36	64	108	181	106	0	0	496
Refining	0	22	39	65	75	64	0	0	263
By-product delivery	3	8	29	130	152	32	0	0	355
Impact at ports	0	4	26	1	0	0	507	0	538
Benefit to livestock sector	0	0	0	0	0	0	0	0	0
End uses	0	6,128	6,128	468	468	1,561	1,561	0	16,314
Total	3	7,404	8,417	23,173	54,550	41,074	2,351	542	137,514

Diagram 4: Direct employment impact by province (including farm family members), 3-year average (2009/10–2011/12)

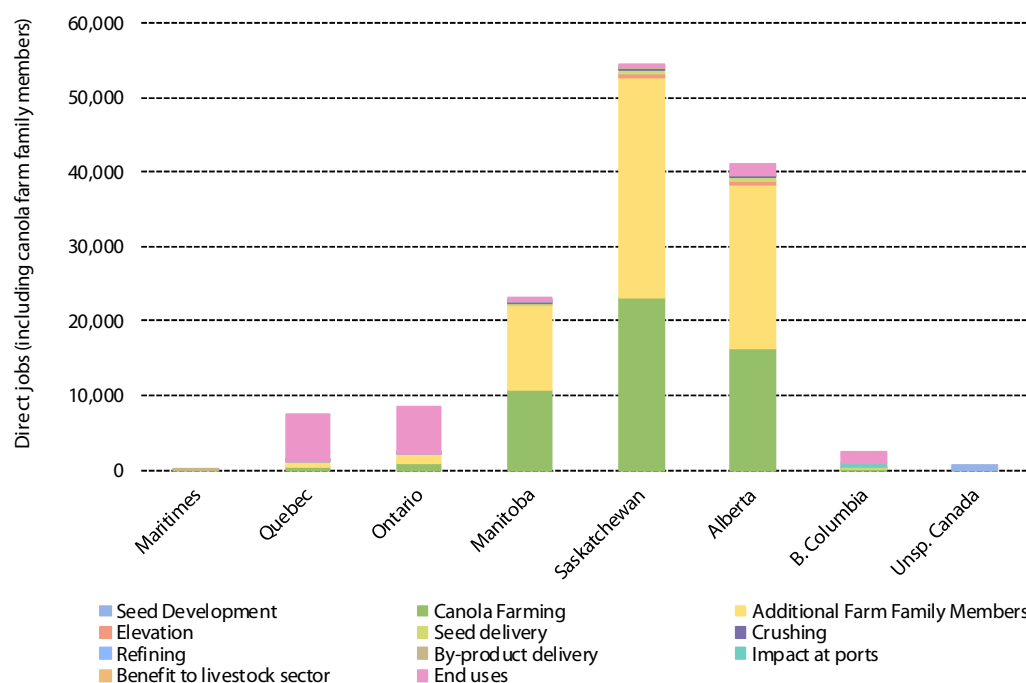
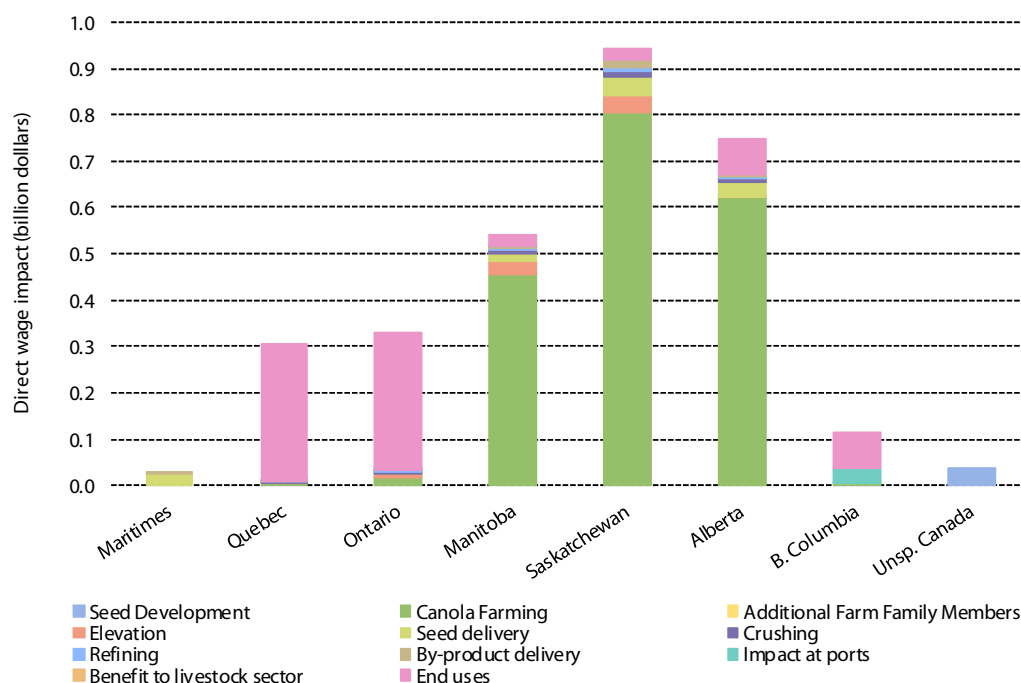


Table 11: Direct wage impact by province (million C\$), 3-year average (2009/10–2011/12)

	Maritimes	PQ	ON	MB	SK	AB	BC	Unsp. Canada	All Canada
Seed Development	na	na	na	na	na	na	na	38	38
Canola Farming	0	5	17	455	805	620	5	0	1,907
Additional Farm Family Members	0	0	0	0	0	0	0	0	0
Elevation	0	0	8	28	37	0	0	0	74
Seed delivery	24	0	0	17	40	35	0	0	117
Crushing	0	2	4	7	12	7	0	0	34
Refining	0	1	3	4	5	4	0	0	18
By-product delivery	0	0	1	5	18	5	0	0	29
Impact at ports	0	0	2	0	0	0	33	0	35
Benefit to livestock sector	0	0	0	0	0	0	0	0	0
End uses	0	297	297	23	23	76	76	0	791
Total	24	307	331	540	941	748	114	38	3,043

Diagram 5: Direct wage impact by province, 3-year average (2009/10–2011/12)



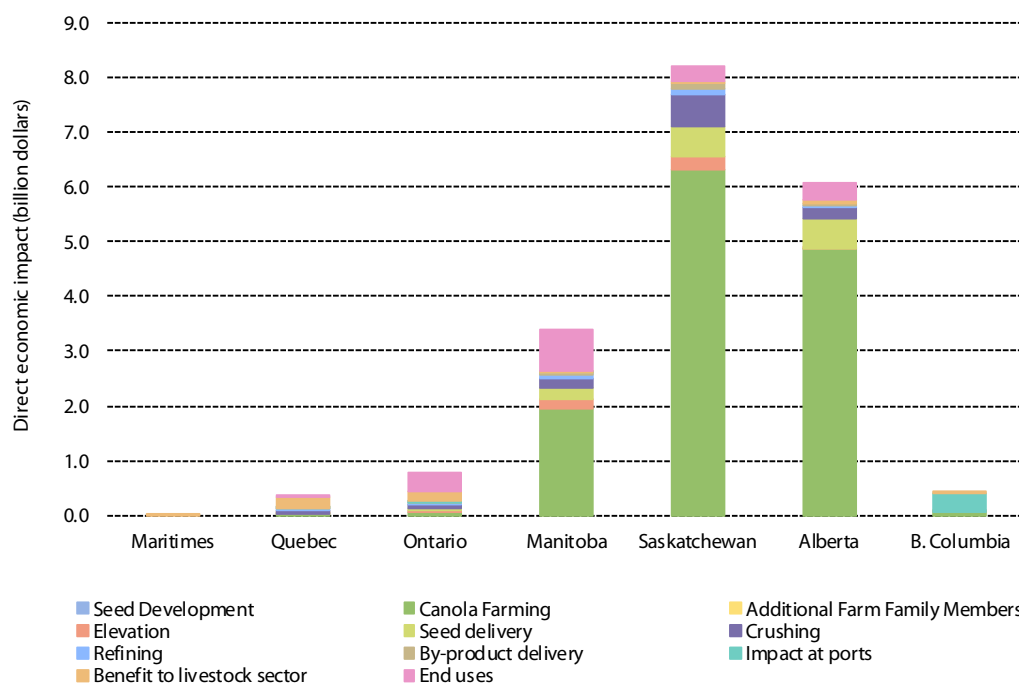
Direct+ Indirect+ Induced (total) impacts

- As mentioned above, only by including indirect and induced impacts do we capture the true magnitude of canola’s impacts on the Canadian economy. That said, applying the indirect and induced multiplier effects does little to change the relative impacts of Canada’s various provinces.
- Of the over \$19 billion in total economic impact of canola on the Canadian economy, \$8.2 billion stems from Saskatchewan, with another \$9.5 billion coming out of Alberta and Manitoba (Table 12 and Diagram 6).

Table 12: Total economic impact by province (million C\$), 3-year average (2009/10–2011/12)

	Maritimes	PQ	ON	MB	SK	AB	BC	Unsp. Canada	All Canada
Seed Development	na	na	na	na	na	na	na	na	na
Canola Farming	0	31	63	1,962	6,319	4,866	60	0	13,302
Additional Farm Family Members	na	na	na	na	na	na	na	na	na
Elevation	0	1	48	167	223	3	0	0	442
Seed delivery	0	1	31	189	563	558	7	0	1,349
Crushing	0	65	66	198	595	184	0	0	1,108
Refining	0	16	16	47	83	44	0	0	206
By-product delivery	0	16	19	47	128	52	0	0	263
Impact at ports	0	3	17	1	0	0	327	0	348
Benefit to livestock sector	31	193	169	31	18	45	38	0	525
End uses	na	5	341	764	281	331	0	0	1,723
Total	31	331	770	3,406	8,210	6,085	432	0	19,264

Diagram 6: Total (direct+indirect+induced) economic impact by province ('000 C\$), 3-year average, (2009/10–2011/12)

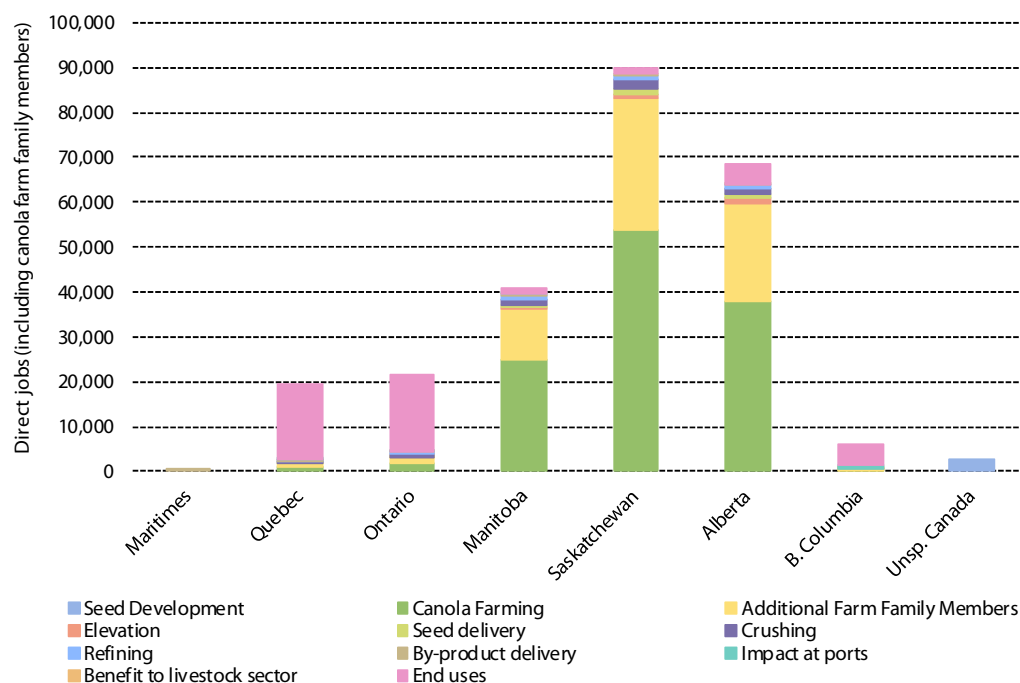


- Of the 249,000 Canadian people supported by the canola sector (a figure including farm family members), roughly 199,000 are in the Canadian prairies, with 90,000 people dependent on the canola sector in Saskatchewan alone (Table 13 and Diagram 7).

Table 13: Total employment impact by province (including farm family members), 3-year average (2009/10–2011/12)

	Maritimes	PQ	ON	MB	SK	AB	BC	Unsp. Canada	All Canada
Seed Development	na	na	na	na	na	na	na	2,690	2,690
Canola Farming	0	1,019	1,831	24,944	53,673	37,735	265	0	119,467
Additional Farm Family Members	0	768	1,339	11,305	29,591	22,054	156	0	65,213
Elevation	0	0	5	270	933	1,242	15	0	2,464
Seed delivery	0	1	2	528	1,168	961	12	0	2,671
Crushing	0	425	763	1,278	2,151	1,260	0	0	5,878
Refining	0	255	458	767	888	756	0	0	3,124
By-product delivery	7	17	64	287	334	71	0	0	780
Impact at ports	0	8	60	2	0	0	1,153	0	1,223
Benefit to livestock sector	0	0	0	0	0	0	0	0	0
End uses	na	17,083	17,083	1,305	1,305	4,352	4,352	0	45,479
Total	7	19,576	21,604	40,686	90,042	68,431	5,953	2,690	248,989

Diagram 7: Total employment impact by province (including farm family members), 3-year average (2009/10–2011/12)

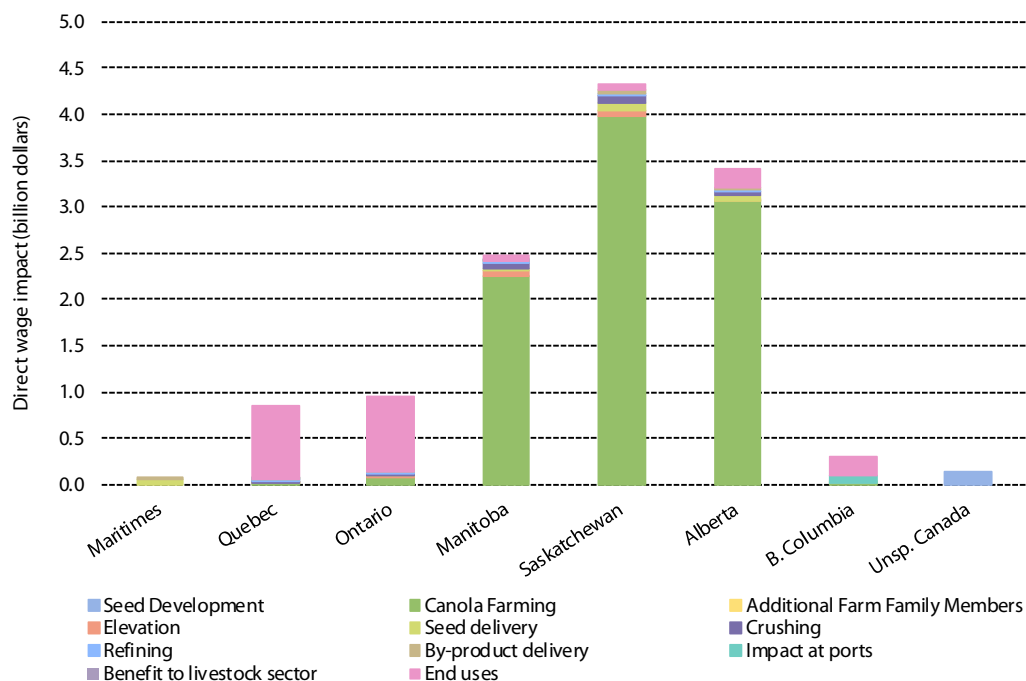


- Lastly, of the \$13.4 billion in wages attributable directly, indirectly, or in an induced manner to canola, on average between 2009/10 and 2011/12 \$10.2 billion stem from the canola industries of the Canadian prairies, with the balance attributable to British Columbia and Canada's eastern provinces (Table 14 and Diagram 8).

Table 14: Total wage impact by province (million C\$), 3-year average (2009/10–2011/12)

	Maritimes	PQ	ON	MB	SK	AB	BC	Unsp. Canada	All Canada
Seed Development	na	na	na	na	na	na	na	145	145
Canola Farming	0	23	83	2,247	3,974	3,060	24	0	9,410
Additional Farm Family Members	0	0	0	0	0	0	0	0	0
Elevation	0	0	16	57	76	1	0	0	150
Seed delivery	55	0	0	36	78	66	1	0	236
Crushing	0	15	27	45	76	44	0	0	208
Refining	0	9	16	27	31	27	0	0	110
By-product delivery	0	1	1	9	33	10	0	0	55
Impact at ports	0	0	3	0	0	0	66	0	70
Benefit to livestock sector	0	0	0	0	0	0	0	0	0
End uses	na	801	801	61	61	204	204	0	2,131
Total	55	849	947	2,483	4,330	3,412	294	145	12,514

Diagram 8: Total wage impact by province (billion C\$), 3-year average (2009/10-2011/12)



Results and methodology 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 nine distinct steps in the canola value chain.

For interest, we have also included estimates on the economic impact from international shipping. However, because this occurs outside of Canada, frequently on foreign-owned vessels, as mentioned earlier, international shipping does not count toward our Canadian total.

Seed development

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

Impact and methodology

Estimates of the economic, employment and wage impacts of the sector are based on first-hand discussions with industry stakeholders.

- **For the purposes of this study, we have not provided a specific line item estimate of the economic impact of the Canadian canola breeding industry in our summary of Direct and Indirect impacts.** Economic impacts of the canola seed sector are not listed explicitly because the impacts of the sector are captured under canola farming as improved yields and higher quality seed. **However, to provide the reader with as much detail as possible we have included an estimate of the economic impact from canola farming attributable to the seed sector in Tables 15 and 16 below.**

- Of the \$6.9 billion in direct economic impacts from canola farming, it is estimated that \$74 million stem specifically from the canola seed sector.¹ Of the \$13.3 billion in Total economic impacts from canola farming, it is estimated that \$152 million are directly attributable to the seed sector.
- The direct employment impact of the Canadian seed industry is estimated at 542 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 145 million.
- Total direct wages for the sector are estimated at \$38 million, while the total wage impact is estimated at \$145 million.

Table 15: Direct economic, employment and wage impact of the Canadian canola seed industry, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	na	xx	xx
Quebec	na	xx	xx
Ontario	na	xx	xx
Manitoba	na	xx	xx
Saskatchewan	na	xx	xx
Alberta	na	xx	xx
British Columbia	na	xx	xx
Canada	74	542	38

Table 16: Total economic, employment and wage impact of the Canadian canola seed industry, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	na	xx	xx
Quebec	na	xx	xx
Ontario	na	xx	xx
Manitoba	na	xx	xx
Saskatchewan	na	xx	xx
Alberta	na	xx	xx
British Columbia	na	xx	xx
Canada	152	2,690	145

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.

Canola farming

Canola farming is the foundation of the canola chain within Canada and accounts for 77% of the direct *economic* impact, 43% of the direct *employment* impact, and 84% of the direct *wage* impact of the canola value chain.

Impacts

- The direct economic impact of canola farming over the observed timeframe is \$6.9 billion, with **the total economic impact estimated at \$13.3 billion**. As mentioned earlier in the report, this impact is concentrated in the Prairie Provinces.
- Canola farming directly employs an estimated 52,000 paid individuals.. This figure does not include canola farm family members, who will be discussed in the next section. When the indirect and induced multipliers are applied, **the total employment impact of canola farming is estimated at just under 120,000**.
- \$1.9 billion in wages are directly attributable to canola farming. For growers, this includes profits from the canola share of their farm, while for hired labor it comprises wages paid out by growers. Including indirect and induced effects, **the total wage impact of canola farming is \$9.4 billion**.

Table 17: Direct economic, employment and wage impact of Canadian canola farming and production, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	16	439	5
Ontario	33	789	17
Manitoba	1,016	10,756	455
Saskatchewan	3,273	23,143	805
Alberta	2,520	16,271	620
British Columbia	31	114	5
Canada	6,890	51,512	1,907

Table 18: 3-year average (2009/10–2011/12) total economic, employment and wage impact of Canadian canola farming and production

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	31	1,019	23
Ontario	63	1,831	83
Manitoba	1,962	24,944	2,247
Saskatchewan	6,319	53,673	3,974
Alberta	4,866	37,735	3,060
British Columbia	60	265	24
Canada	13,302	119,467	9,410

Methodology

For this study, **the economic impact of canola farming is determined by the product of canola volumes and canola seed prices at the farm gate level**. While one could argue that

the value added to canola farming would be better captured by subtracting canola farming costs from canola farming revenues this approach would fail to capture the economic impact of the wide array of inputs used in canola farming such as seed, fertilizers and crop protection, hence our approach.

Crop-district production figures were obtained from provincial ministries of agriculture across Canada and these were then reconciled with provincial-level data from StatCan. The result is presented in Table 19.

Table 19: Ag District canola production data ('000 tonnes)

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	Average (2009/10 - 2011/12)
EASTERN PROVINCES	51	26	56	85	68	101	110	83	98
Ontario	25	14	38	50	45	76	74	50	66
Southern	3	4	3	1	1	2	2	2	2
Western	15	5	18	27	22	43	39	26	36
Central	3	3	1	5	6	6	5	5	5
Eastern	0	0	0	0	1	2	3	1	2
Northern	4	3	15	16	15	23	25	16	21
Quebec	26	12	19	35	24	25	36	33	31
PRAIRIE PROVINCES	9,369	8,947	9,507	12,528	12,780	12,648	14,442	13,136	13,409
Manitoba	1,261	1,826	1,950	2,576	2,892	2,216	1,746	2,100	2,021
1	163	213	241	247	385	259	207	256	241
2	149	164	210	299	320	275	195	242	237
3	188	242	224	310	373	301	225	277	268
4	100	94	103	109	108	139	90	106	112
5	188	162	147	180	207	165	144	166	158
6	121	159	130	218	234	87	130	158	125
7	101	225	298	368	418	299	235	304	279
8	193	346	364	552	573	518	349	446	438
9	9	79	85	122	143	72	70	94	79
10	7	26	3	7	5	4	7	9	7
11	19	62	86	95	80	59	55	72	62
12	23	53	58	70	45	36	39	50	42
Saskatchewan	4,457	3,697	4,155	5,629	6,260	5,693	7,348	6,137	6,393
1a	172	172	163	203	277	312	55	223	197
1b	164	149	172	265	370	266	71	240	192
2a	85	57	94	113	146	187	62	123	124
2b	120	119	197	214	318	390	284	270	315
3an	47	30	38	40	30	68	107	59	78
3as	40	33	40	48	71	126	109	77	104
3bn	76	50	75	52	64	107	198	102	136
3bs	19	7	8	5	11	8	29	14	17
4a	13	6	9	5	8	3	8	9	7
4b	17	17	16	14	20	49	60	32	47
5a	388	297	388	572	624	465	429	521	472
5b	483	453	395	645	811	420	1,074	706	733
6a	492	441	489	586	746	523	886	686	699
6b	264	210	217	285	374	408	480	369	419
7a	86	84	99	113	81	199	379	171	250
7b	230	244	253	304	310	398	497	369	421
8a	425	280	335	547	445	287	718	500	502
8b	459	378	423	635	515	281	738	565	528
9a	496	384	452	583	618	635	619	624	626
9b	381	287	291	401	423	560	545	476	527

Table 19 cont'd.: Ag District canola production data

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	Average (2009/10 - 2011/12)
Alberta	3,651	3,425	3,402	4,323	3,629	4,740	5,348	4,899	4,996
1	34	40	42	44	55	94	148	78	107
2	131	135	152	242	189	171	304	228	234
3	42	63	55	88	71	90	116	90	99
4	25	35	27	40	12	50	71	45	55
5	371	395	354	604	458	659	856	635	717
6 & 15	156	197	179	268	221	236	316	270	274
7	371	357	281	405	341	499	550	482	510
8	198	189	161	321	234	263	280	283	275
9	0	0	0	0	0	4	0	1	1
10	687	660	647	836	545	950	874	893	906
11	437	325	364	419	296	406	366	449	407
12	102	103	110	147	82	159	124	142	142
13	228	234	234	296	341	412	431	374	406
14	3	5	10	10	19	11	9	11	10
16	0	0	0	0	0	0	0	0	0
17	264	216	244	244	266	303	337	322	321
18	29	27	38	28	31	24	27	35	29
19	573	442	506	330	469	409	536	561	502
BRITISH COLUMBIA	64	27	48	32	50	40	56	83	60
TOTAL CANADA	9,483	9,000	9,611	12,645	12,898	12,789	14,608	13,302	13,566

While canola prices are typically quoted FOB Vancouver for this study we used farm gate canola prices, also obtained from StatCan, for the basis of our canola valuation. The reason for using farm gate prices rather than the Vancouver price is that the latter is inclusive of the value added via transportation from prairie to port. Given that we account for transportation elsewhere in this study, the use of the Vancouver price would amount to a double counting. Provincial-level prices are delineated in Table 20.

Table 20: Provincial-level canola prices (C\$ per MT)

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
British Columbia	269	272	373	493	438	417	530	561
Alberta	269	272	373	493	438	417	530	561
Saskatchewan	255	268	370	518	427	418	537	570
Manitoba	262	279	369	505	422	410	534	575
Ontario	239	261	361	517	418	415	529	559
Quebec	251	207	338	397	386	406	540	569
Canada	261	272	370	506	429	416	534	567

Note: Alberta farm gate prices were also used for British Columbia, for which no series on canola farm gate prices exists.

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

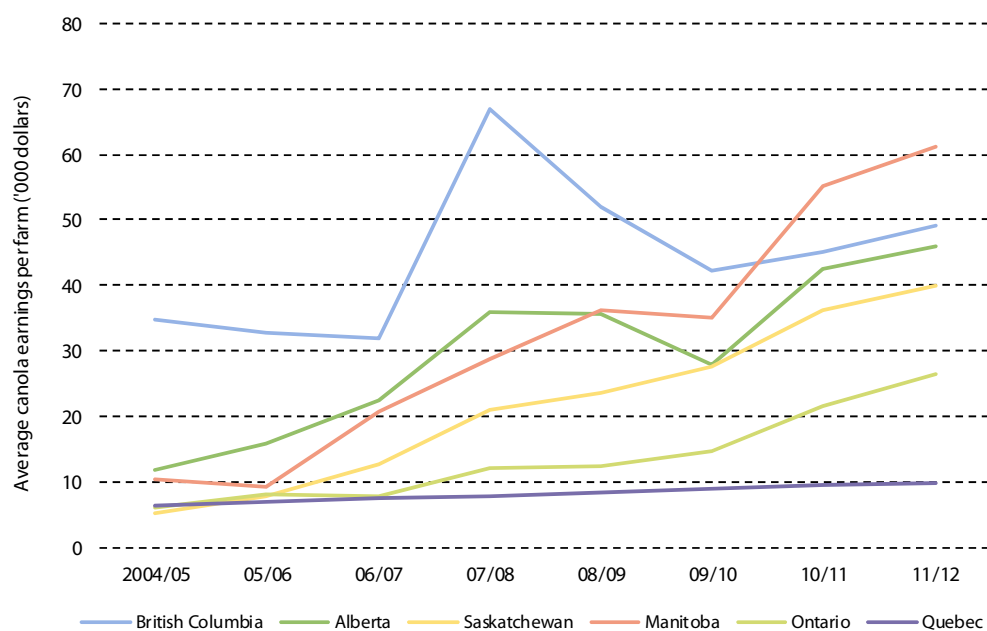
Estimating grower employment in canola farming was straightforward and done on the basis of the number of farms in Canada that grow canola (Table 21).

Table 21: Number of farms growing canola in Canada

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
British Columbia	74	55	60	51	63	82	72	96
Alberta	11,199	11,106	11,809	11,618	10,665	11,326	11,877	12,208
Saskatchewan	17,699	14,937	16,956	15,759	15,296	14,730	15,935	16,860
Manitoba	6,945	6,372	7,314	6,926	6,764	6,571	5,231	6,334
Ontario	616	180	618	642	515	773	843	530
Quebec	547	225	288	621	360	354	446	434
Canada	37,080	32,876	37,044	35,616	33,663	33,837	34,404	36,463

Canola 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 on rotation). Had we accounted for the fact that canola farming may make up 1/2 to 1/3 of a grain and oilseed growers time, presenting the employment number in terms of "Full-time Equivalent" the number would have been lower.

Diagram 9: Canola earnings per farm by province (per farm growing canola)



Canola 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. Canola earnings per farmer have increased rapidly as canola prices and as canola's share of acreage have grown (Diagram 9).

Estimates for hired labor 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 labor requirements, the data was fairly tightly clustered at around 1.5 man-hours per acre of canola. By multiplying the number of canola acres by 1.5 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 (Table 22).

Table 22: Number of hired workers dedicated to canola acreage

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
British Columbia	25	19	21	18	22	30	26	36
Alberta	3,180	3,328	3,723	3,845	3,697	4,104	4,490	4,807
Saskatchewan	4,659	4,420	5,572	5,694	6,027	6,285	7,321	8,297
Manitoba	3,656	3,614	4,453	4,489	4,721	4,842	4,080	5,209
Ontario	37	12	46	53	46	75	88	59
Quebec	26	11	16	36	22	23	30	31
Canada	11,582	11,405	13,831	14,134	14,536	15,359	16,035	18,439

Wages for hired labor were also taken from StatCan with total wages paid being the product of the number of hired workers and the prevailing wage. For reference, the average wage for a hired farm hand for 2011/12 was taken to be approximately \$16.00 per hour for Canada, on average, for the 2011/12 crop year.

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 labor 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 labor 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 impacts given at the beginning of this study are presented with and without this number.

A number of data sets exist detailing the average size of Canadian families over time, both maintained by StatCan. One series estimates the number of farm families by size, ranging from two members to more than 5 members. Because this last category is indeterminate, one could derive an average farm family size from this series only by making an estimate. Instead of making an estimate, we opted to use an alternate series providing an average family size for all Canadian families. According to this series, the average family size in Canada in 2012 was roughly 3 members per household. This would imply that for every grower, there are approximately two additional canola farm family members, with the number declining

somewhat over the observed time frame as the average family size in Canada has shrunk (Table 23). 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 impacts. Lastly, the economic impact associated with these workers has been captured under the previous heading “canola farming.”

Table 23: Direct/total economic, employment and wage impact of canola farm family members, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	na	0	na
Quebec	na	768	na
Ontario	na	1,339	na
Manitoba	na	11,305	na
Saskatchewan	na	29,591	na
Alberta	na	22,054	na
British Columbia	na	156	na
Canada	na	65,213	na

Primary elevation

In recent years, between 20% and 40% of the canola produced in Canada has been 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.

Impacts

- The direct economic impact of canola elevation in Canada averaged \$220 million between 2009/10 and 2011/12. The total economic impact, meanwhile, is estimated at \$440 million.
- An estimated 1,085 individuals are directly employed in primary canola elevation. When indirect and induced effects are included, the total effect is estimated at just under 2,500 jobs.
- Lastly, wages directly attributable to primary canola elevation are quantified at \$74 million over the observed time frame, with the total wage effect estimated at \$150 million.

Table 24: Direct economic, employment and wage impact of primary canola elevation, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	0	0	0
Ontario	24	2	8
Manitoba	84	119	28
Saskatchewan	112	411	37
Alberta	1	547	0
British Columbia	0	7	0
Canada	221	1,085	74

Table 25: Total economic, employment and wage impact of primary canola elevation, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	1	0	0
Ontario	48	5	16
Manitoba	167	270	57
Saskatchewan	223	933	76
Alberta	3	1,242	1
British Columbia	0	15	0
Canada	442	2,464	150

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 (Table 26). For Quebec, Ontario, and British Columbia, the volumes of canola passing through elevators (versus being delivered directly to processing facilities) were derived based on conversations with industry stakeholders.

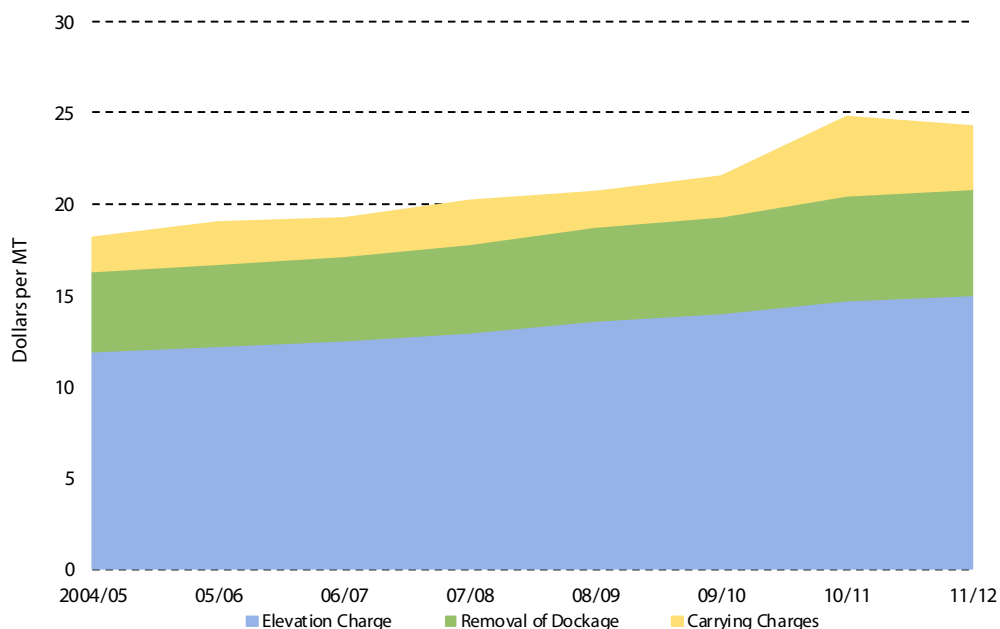
- For 2011/12, an estimated 10.3 million tonnes of canola passed through primary elevation facilities in Canada, 78% of the country's total production. This is up considerably from 2004/05 when 4.8 million tonnes of canola were elevated, 50% of the total production that year.

Table 26: Volumes of canola elevated

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Quebec	0	0	0	0	0	0	0	0
Ontario	4	2	7	8	8	21	19	11
Manitoba	241	891	781	1,060	1,983	1,404	684	1,036
Saskatchewan	2,235	2,644	2,997	3,361	4,069	2,915	3,765	3,927
Alberta	2,253	3,109	2,896	3,039	3,023	4,335	4,564	5,309
British Columbia	48	25	47	23	47	37	48	94
Total volume elevated	4,780	6,671	6,728	7,491	9,130	8,711	9,080	10,377
Total production	9,483	9,000	9,611	12,645	12,898	12,789	14,608	13,302
% of crop elevated	50%	74%	70%	59%	71%	68%	62%	78%

Primary elevation fees were also obtained from the Canadian Grain Commission based on annual surveys they conduct on the costs of moving grain to point of export. In Diagram 10, we illustrate how these fees have risen from roughly \$18 per tonne in 2004/05 to \$24 per tonne in 2011/12.

Diagram 10: Primary elevation fees in Canada



To understand the employment impact of primary canola elevation, we began with a “Working in Canada” report developed by the Canadian government. It states that, in 2010, there were 6,234 individuals employed in the direct 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. As mentioned above, the majority of seed will first be delivered to elevators for rail shipment to 1) Canadian ports, 2) the US border or 3) processing facilities within Canada, while a declining share will be delivered by farmers directly to processing facilities within Canada. Within Canada, most seed is transported by rail, although seed delivered directly to processing facilities is transported by truck. A small share is also delivered by laker vessel, making up a portion of the canola seed crushed by processing facilities within Ontario and Quebec.

Impacts

The economic impact of seed deliveries is presented individually for rail, truck, and barge. Because transportation networks span nation-wide rather than being isolated to a single point, transportation impacts 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. Because the impact of laker-transported canola on Great Lakes ports is relatively small (compared with the impact on ports carrying canola for exports), we have included it in this section.

- The direct economic impact of rail transportation of seed in Canada is quantified at an average of \$374 million between 2009/10 and 2011/12, while the total impact, including indirect and induced impacts, is estimated at \$761 million.
- Roughly 940 individuals are *directly* employed in the rail transportation of canola seed, which has a *total* employment impact of more than 2,000 jobs.
- Wages directly attributable to rail transportation of canola seed amount to \$84 million, with the *total* wage impact estimated at nearly \$160 million.

Table 27: Direct economic, employment and wage impact of canola seed transportation by rail, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	6
Quebec	0	0	0
Ontario	0	0	0
Manitoba	43	134	11
Saskatchewan	123	406	34
Alberta	204	392	32
British Columbia	3	6	0
Canada	374	938	84

Table 28: Total economic, employment and wage impact of canola seed transportation by rail, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	11
Quebec	0	0	0
Ontario	1	0	0
Manitoba	88	297	21
Saskatchewan	250	896	64
Alberta	416	864	61
British Columbia	6	12	1
Canada	761	2,069	158

- The direct economic impact of seed transportation by truck, which includes trucking to elevators in addition to trucking directly to crushing facilities, averaged \$225 million annually between 2009/10 and 2011/12. The total impact, meanwhile, is estimated at \$530 million.
- The direct employment impact of seed transportation by truck averaged 177 jobs over the observed timeframe. When indirect and induced multipliers are applied, we calculate the total impact to equal 363 jobs supported.
- \$14 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 \$31 million.

Table 29: Direct economic, employment and wage impact of canola seed transportation by truck, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	6
Quebec	0	0	0
Ontario	1	1	0
Manitoba	34	27	1
Saskatchewan	129	102	5
Alberta	60	47	2
British Columbia	0	0	0
Canada	225	177	14

Table 30: Total economic, employment and wage impact of canola seed transportation by truck, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	13
Quebec	1	1	0
Ontario	3	2	0
Manitoba	80	55	3
Saskatchewan	305	208	10
Alberta	142	97	5
British Columbia	0	0	0
Canada	531	363	31

- 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 2009/10 and 2011/12 averaged \$24 million annually, with the total impact estimated at \$57 million. This includes port fees incurred at Great Lakes and St. Lawrence ports.
- Jobs directly associated with laker transportation of canola seed and associated port activities averaged 82 over the observed time frame, whereas the total employment impact is estimated at 240 jobs.
- Direct wages attributable to laker transportation of canola seed meanwhile averaged \$19 million, with the total wage impact equating to \$47 million.

Table 31: Direct economic, employment and wage impacts of canola seed transportation by laker vessel (including impact at ports), 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	12
Quebec	0	0	0
Ontario	11	0	0
Manitoba	9	61	5
Saskatchewan	4	22	2
Alberta	0	0	0
British Columbia	0	0	0
Canada	24	82	19

Table 32: Total economic, employment and wage impact of canola seed transportation by laker vessel (including impact at ports), 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	30
Quebec	0	0	0
Ontario	28	0	0
Manitoba	21	176	13
Saskatchewan	9	63	4
Alberta	0	0	0
British Columbia	0	0	0
Canada	57	240	47

Methodology

Given the infinite combinations of farm origin and end-use destination, determining the economic impact of canola seed transportation proved to be the most complicated aspect of our economic impact model.

The first step in estimating expenditures associated with canola seed transportation was to determine inter-provincial trade flows of canola seed. To do this, we began by constructing provincial-level supply/demand tables. This was done in part with our knowledge of provincial-level canola production and estimates of factory level crush (see Diagram 14 in the next section on Crushing). Our results are presented below.

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. For seed that originates within a province and is ultimately exported we track it through inter-provincial trade which will be discussed in greater detail below.

Table 33: Quebec — supply/demand ('000 tonnes)

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	2011/12
Beginning stocks	1	1	2	2	1	43	68	64
Beginning stocks on farms	1	1	2	2	1	2	4	3
Beginning stocks in commercial positions	0	0	0	0	0	40	64	61
Production	21	12	17	27	23	25	32	36
Net Inter-Canadian Trade	-14	6	66	11	148	289	344	426
<i>Net barge trade</i>	-14	6	66	11	147	273	324	403
<i>Net rail trade</i>	1	0	0	0	0	16	21	23
Imports from US	0	0	0	0	0	0	0	0
International Exports	-6	-17	-83	-38	-129	-6	-7	-77
Overseas Exports	-6	-17	-83	-38	-129	-6	-7	-77
Overland Exports to US/MX	0	0	0	0	0	0	0	0
Seed, feed and losses	-1	0	-1	-1	0	-1	0	-1
Crush within province (I)	0	0	0	0	0	-283	-372	-413
Ending Stocks	1	2	2	1	43	68	64	35
Ending stocks on farms	1	2	2	1	2	4	3	3
Ending stocks in commercial positions	0	0	0	0	40	64	61	32
Deliveries of seed grown in province	19	11	17	27	21	23	32	35

Table 34: Ontario — supply/demand ('000 tonnes)

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	2011/12
Beginning stocks	25	44	55	123	70	48	73	66
Beginning stocks on farms	1	1	4	3	2	7	8	4
Beginning stocks in commercial positions	25	42	51	121	68	41	64	61
Production	20	15	35	38	44	76	65	55
Net Inter-Canadian Trade	498	715	563	612	373	353	492	582
<i>Net barge trade</i>	14	-6	-66	-11	-147	-273	-324	-403
<i>Net rail trade</i>	483	721	629	622	520	626	816	985
Imports from US	0	0	0	0	0	6	0	0
International Exports	-305	-500	-326	-249	-129	-125	-189	-253
Overseas Exports	-305	-500	-326	-249	-129	-125	-182	-253
Overland Exports to US/MX	0	0	0	0	0	0	-7	0
Seed, feed and losses	-1	-1	-1	-1	0	-2	-1	-2
Crush within province (I)	-193	-218	-203	-454	-310	-284	-374	-415
Ending Stocks	44	55	123	70	48	73	66	33
Ending stocks on farms	1	4	3	2	7	8	4	1
Ending stocks in commercial positions	42	51	121	68	41	64	61	32
Deliveries of seed grown in province	18	11	36	38	38	74	68	57

Table 35: Manitoba — supply/demand ('000 tonnes)

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	2011/12
Beginning stocks	133	365	540	440	322	340	392	366
Beginning stocks on farms	29	188	226	138	117	218	199	182
Beginning stocks in commercial positions	104	177	314	301	205	122	193	185
Production	1020	1924	1826	1958	2835	2235	1529	2306
Net Inter-Canadian Trade	208	-685	-371	-356	-1466	-959	-308	-1036
<i>Net barge trade</i>	0	0	0	0	0	0	0	0
<i>Net rail trade</i>	208	-685	-371	-356	-1466	-959	-308	-1036
Imports from US	104	135	186	178	121	122	224	97
International Exports	-241	-206	-411	-704	-518	-444	-325	-285
Overseas Exports	0	-26	-39	0	0	0	-44	0
Overland Exports to US/MX	-241	-181	-372	-704	-518	-444	-282	-285
Seed, feed and losses	-48	-75	-76	-62	-21	-47	-19	-77
Crush within province (I)	-813	-918	-1256	-1132	-932	-855	-1126	-1249
Ending Stocks	365	540	440	322	340	392	366	122
Ending stocks on farms	188	226	138	117	218	199	182	26
Ending stocks in commercial positions	177	314	301	205	122	193	185	96
Deliveries of seed grown in province	814	1810	1838	1918	2712	2207	1527	2385

Table 36: Saskatchewan — supply/demand ('000 tonnes)

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	2011/12
Beginning stocks	262	650	805	656	730	928	1419	1087
Beginning stocks on farms	103	380	481	302	253	561	838	531
Beginning stocks in commercial positions	159	270	324	354	477	367	582	556
Production	3606	3895	3891	4279	6137	5741	6433	6740
Net Inter-Canadian Trade	-1515	-1815	-2255	-2245	-3333	-2292	-3059	-3238
<i>Net barge trade</i>	0	0	0	0	0	0	0	0
<i>Net rail trade</i>	-1515	-1815	-2255	-2245	-3333	-2292	-3059	-3238
Imports from US	4	0	0	0	0	0	0	0
International Exports	-299	-375	-327	-495	-390	-267	-237	-240
Overseas Exports	0	0	0	0	0	0	0	0
Overland Exports to US/MX	-299	-375	-327	-495	-390	-267	-237	-240
Seed, feed and losses	-169	-152	-161	-136	-46	-120	-81	-225
Crush within province (I)	-1238	-1398	-1296	-1329	-2169	-2571	-3388	-3758
Ending Stocks	650	805	656	730	928	1419	1087	366
Ending stocks on farms	380	481	302	253	561	838	531	76
Ending stocks in commercial positions	270	324	354	477	367	582	556	290
Deliveries of seed grown in province	3160	3642	3909	4192	5782	5344	6659	6969

Table 37: Alberta — supply/demand ('000 tonnes)

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	2011/12
Beginning stocks	186	524	600	560	337	581	790	596
Beginning stocks on farms	85	352	394	232	147	467	610	424
Beginning stocks in commercial positions	101	172	206	327	191	114	180	172
Production	2955	3608	3186	3286	3557	4781	4682	5380
Net Inter-Canadian Trade	-1691	-2507	-2287	-2173	-2414	-3675	-3767	-4481
<i>Net barge trade</i>	0	0	0	0	0	0	0	0
<i>Net rail trade</i>	-1691	-2507	-2287	-2173	-2414	-3675	-3767	-4481
Imports from US	0	4	17	0	0	0	0	0
International Exports	0	0	0	-1	-5	0	-1	-1
Overseas Exports	0	0	0	0	0	0	0	0
Overland Exports to US/MX	0	0	0	-1	-5	0	-1	-1
Seed, feed and losses	-139	-141	-132	-104	-27	-100	-59	-180
Crush within province (I)	-787	-888	-824	-1230	-869	-796	-1050	-1164
Ending Stocks	524	600	560	337	581	790	596	150
Ending stocks on farms	352	394	232	147	467	610	424	61
Ending stocks in commercial positions	172	206	327	191	114	180	172	90
Deliveries of seed grown in province	2549	3425	3216	3267	3210	4538	4809	5563

Table 38: British Columbia — supply/demand ('000 tonnes)

	2004/05	05/06	06/07	07/08	08/09	09/10	10/11	2011/12
Beginning stocks	1	3	6	2	2	4	6	7
Beginning stocks on farms	1	3	6	2	2	4	6	7
Beginning stocks in commercial positions	0	0	0	0	0	0	0	0
Production	51	29	45	24	49	40	49	91
Net Inter-Canadian Trade	2512	4286	4292	4159	6706	6284	6297	7750
<i>Net barge trade</i>	0	0	0	0	0	0	0	0
<i>Net rail trade</i>	2512	4286	4292	4159	6706	6284	6297	7750
Imports from US	0	0	0	0	0	0	0	0
International Exports	-2562	-4312	-4341	-4183	-6753	-6322	-6346	-7847
Overseas Exports	-2562	-4312	-4341	-4183	-6753	-6322	-6346	-7847
Overland Exports to US/MX	0	0	0	0	0	0	0	0
Seed, feed and losses	-2	-1	-2	-1	0	-1	-1	-3
Crush within province (I)	0	0	0	0	0	0	0	0
Ending Stocks	3	6	2	2	4	6	7	1
Ending stocks on farms	3	6	2	2	4	6	7	1
Ending stocks in commercial positions	0	0	0	0	0	0	0	0
Deliveries of seed grown in province	48	25	47	23	47	37	48	94

The next step in determining transportation expenses was to compile a distance matrix between the centers of canola production, canola processing and points of export (port facilities). These distances are presented in Table 39.

Table 39: Distances between geographic centers of canola production (by province) and port facilities, the US border and processing facilities (miles)

		Center of provincial canola production					
		Becancours, QC	Hornepayne, ON	Gladstone, MB	Kenaston, SK	Red Deer, AB	Fort St. John, BC
Port	Becancours, QC	x	823	1,589	2,038	2,459	x
Port	Thunder Bay, ON	x	308	539	911	1,284	x
Port	Churchill, MB	x	x	1,063	x	x	x
Port	Prince Rupert, BC	x	x	x	x	934	717
Port	Vancouver, BC	3,206	2,157	1,360	985	687	x
US Border	Grand Portage, MN	x	345	x	x	x	x
US Border	Crystal City, ND	x	x	93	x	x	x
US Border	Estevan, SK	x	x	x	250	x	x
US Border	Crescent Lake, WA	x	x	x	x	444	x
Processing Facility	Fort Saskatchewan, AB	x	x	x	x	116	x
Processing Facility	Lethbridge, AB	x	x	x	x	218	x
Processing Facility	Lloydminster, AB	x	x	x	x	242	x
Processing Facility	Camrose, AB	x	x	x	x	85	x
Processing Facility	Yorkton, SK	x	x	x	204	x	x
Processing Facility	Nipawin, SK	x	x	x	212	x	x
Processing Facility	Clavet, SK	x	x	x	43	x	x
Processing Facility	Harrowby, MB	x	x	135	261	x	x
Processing Facility	Altona, MB	x	x	133	506	x	x
Processing Facility	Ste. Agathe, MB	x	x	115	487	x	x
Processing Facility	Hamilton, ON	469	690	1,452	1,824	x	x
Processing Facility	Windsor, ON	x	953	1,404	1,547	x	x
Processing Facility	Becancours, QC	x	828	1,590	1,945	x	x

Trucking

With an understanding of provincial-level supply/demand balances and estimates of the annual crush of each processing facility in Canada we began our transportation estimates with trucking. Trucking canola seed was then divided up into two categories.

- **Volumes trucked from farm to elevator** were based on the volumes of seed passing through elevators, data that was obtained in part from the Canadian Grain Commission and was presented in (Table 26).
- Canola that did not pass through a primary elevator was credited toward **volumes trucked directly to crushing facilities**.

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

Distances for canola seed trucked directly from farm to processing facility were determined using the 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 figure in tonne-miles. This, in turn, was multiplied by a tonne-mile trucking rate sourced from StatCan (Diagram 11) to arrive at a trucking expenditures figure.

Diagram 11: Canadian trucking rate (CD cents per tonne-mile)



The direct employment impact of canola seed trucking was calculated on the basis of 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) can transport 18 tonnes of cargo and averages 40 miles per hour and that a full-time trucker drives 2000 hours per year. Trucking wages were obtained from StatCan data.

Rail

Our calculations on rail expenditures also begin with the provincial supply/demand balances shown in Tables 29 through 34 above where we included estimates on rail trade with the US and net interprovincial rail trade. In Tables 40 to 45 below we provide a more detailed look at our interprovincial canola rail trade estimates

Note: There is a fair amount of canola moved by laker vessel between Ontario and Quebec. A large volume of canola crushed in Becancours, QC that originates from the Prairie Provinces is delivered by rail to Ontario (captured in Table 42) and then delivered by laker vessel from Ontario to Quebec. These laker movements are not included in Tables 40 or 41.

Table 40: Quebec inter-provincial canola rail trade ('000 tonnes)

	2005	2006	2007	2006	2004	2010	2018	2012
TOTAL	1	0	0	0	0	16	21	23
Quebec	na	na	na	na	na	na	na	na
Ontario	0	0	0	0	0	0	0	0
Manitoba	0	0	0	0	0	16	21	23
Saskatchewan	1	0	0	0	0	0	0	0
Alberta	0	0	0	0	0	0	0	0
British Columbia	0	0	0	0	0	0	0	0

Table 41: Ontario inter-provincial canola rail trade ('000 tonnes)

	2005	2006	2007	2006	2004	2010	2018	2012
TOTAL	483	721	629	622	520	626	816	985
Quebec	0	0	0	0	0	0	0	0
Ontario	na	na	na	na	na	na	na	na
Manitoba	0	684	370	355	520	611	287	963
Saskatchewan	483	37	259	267	0	16	529	23
Alberta	0	0	0	0	0	0	0	0
British Columbia	0	0	0	0	0	0	0	0

Table 42: Manitoba inter-provincial canola rail trade ('000 tonnes)

	2005	2006	2007	2006	2004	2010	2018	2012
TOTAL	208	-685	-371	-356	-1,466	-959	-308	-1,036
Quebec	0	0	0	0	0	-16	-21	-23
Ontario	0	-684	-370	-355	-520	-611	-287	-963
Manitoba	na	na	na	na	na	na	na	na
Saskatchewan	208	0	0	0	0	0	0	0
Alberta	0	0	0	0	0	0	0	0
British Columbia	0	0	0	0	-945	-333	0	-51

Table 43: Saskatchewan inter-provincial canola rail trade ('000 tonnes)

	2005	2006	2007	2006	2004	2010	2018	2012
TOTAL	-1,515	-1,815	-2,255	-2,245	-3,333	-2,292	-3,059	-3,238
Quebec	0	0	0	0	0	0	0	0
Ontario	-483	-37	-259	-267	0	-16	-529	-23
Manitoba	-208	0	0	0	0	0	0	0
Saskatchewan	na	na	na	na	na	na	na	na
Alberta	0	0	0	0	0	0	0	0
British Columbia	-823	-1,778	-1,996	-1,978	-3,332	-2,277	-2,531	-3,215

Table 44: Alberta inter-provincial canola rail trade ('000 tonnes)

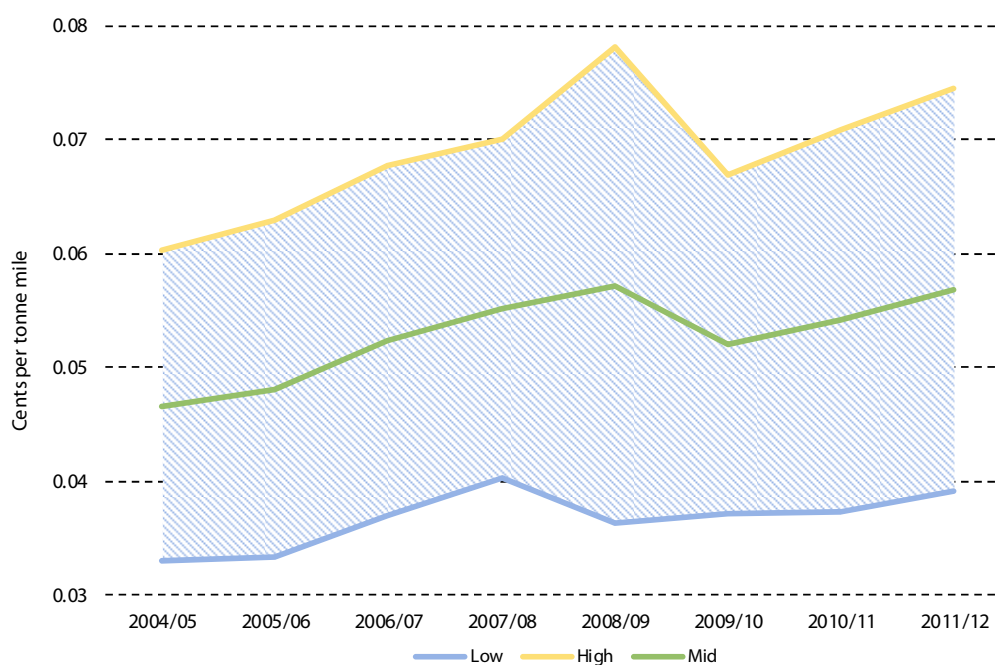
	2005	2006	2007	2006	2004	2010	2018	2012
TOTAL	-1,691	-2,507	-2,287	-2,173	-2,414	-3,675	-3,767	-4,481
Quebec	0	0	0	0	0	0	0	0
Ontario	0	0	0	0	0	0	0	0
Manitoba	0	0	0	0	0	0	0	0
Saskatchewan	0	0	0	0	0	0	0	0
Alberta	na	na	na	na	na	na	na	na
British Columbia	-1,691	-2,507	-2,287	-2,173	-2,414	-3,675	-3,767	-4,481

Table 45: British Columbia inter-provincial canola rail trade ('000 tonnes)

	2005	2006	2007	2006	2004	2010	2018	2012
TOTAL	2,512	4,286	4,292	4,159	6,706	6,284	6,297	7,750
Quebec	0	0	0	0	0	0	0	0
Ontario	0	0	0	0	0	0	0	0
Manitoba	0	0	0	0	945	333	0	51
Saskatchewan	823	1,778	1,996	1,978	3,332	2,277	2,531	3,215
Alberta	1,691	2,507	2,287	2,173	2,414	3,675	3,767	4,481
British Columbia	na	na	na	na	na	na	na	na

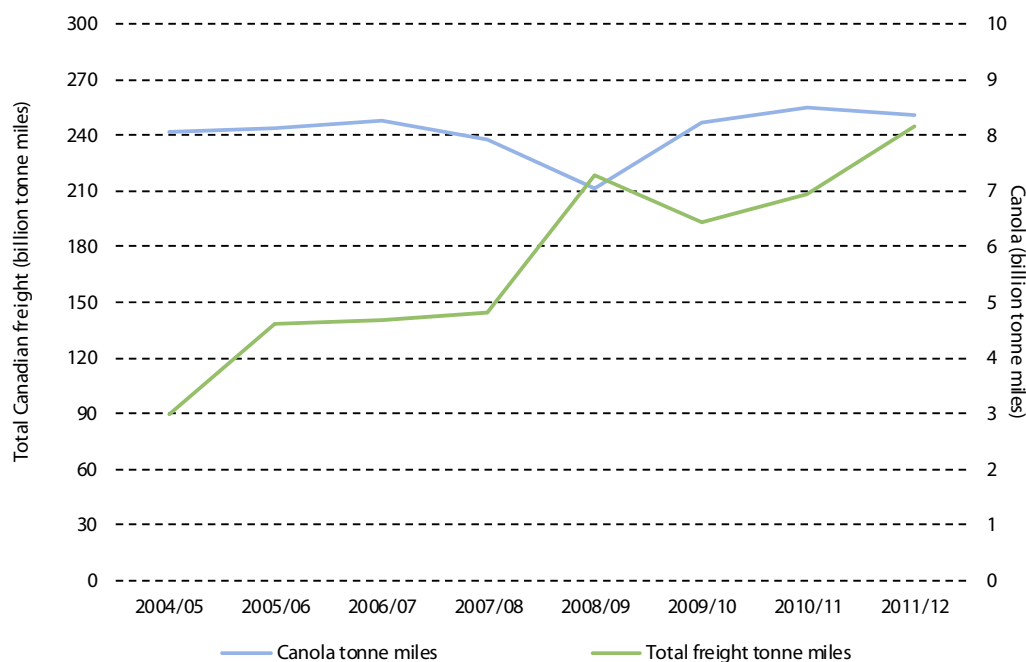
Based on the volumes of interprovincial trade shown in Tables 40 through 45 and the distances delineated in Table 39, we arrive at a figure for tonne-miles of canola seed transported. The tonne-mile figure is then multiplied by a range of rail freight rates (with the exact rate dependent on distance traveled) (Diagram 12) to arrive at an estimate of rail freight expenditures.

Diagram 12: Range in Canadian rail rates



According to the Railway Association of Canada roughly 33,000 individuals are employed in freight rail in Canada, a number that has only fallen slightly over the last decade. Additionally, the Association states that roughly 250 billion tonne-miles of cargo are 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 (Diagram 13). Rail wages were also obtained from the Railway Association of Canada and multiplied by jobs to determine the direct wage impact.

Diagram 13: Total rail freight and canola tonne-miles in Canada



Lakers

Estimates of the expenditures incurred through canola shipment by laker begin with the assumption that roughly 60% 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 have ranged between \$20 and \$24 per tonne in recent years. In addition to transportation expenditures we have also included port fees as part of our estimate for economic impact of canola shipping via laker vessel.

Employment and wages on both laker vessels themselves and at ports was 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. http://www.lakeinvaders.com/Learn_More_files/OceanShippingPhasell.pdf

Crushing

Canada’s crushing sector adds value to roughly 7 million tonnes of canola seed annually. There are 13 canola crushing facilities within Canada with a 14th under construction in Camrose, AB.

Impacts

- The direct economic impact of canola crushing on the Canadian economy is just under \$450 million. The total economic impact, including indirect and induced impacts is \$1.1 billion.
- Roughly 500 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 5,900 jobs.

- \$34 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 46: Direct economic, employment and wage impact of canola crushing, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	26	36	2
Ontario	26	64	4
Manitoba	80	108	7
Saskatchewan	240	181	12
Alberta	74	106	7
British Columbia	0	0	0
Canada	446	496	34

Table 47: Total economic, employment and wage impact of canola crushing, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	65	425	15
Ontario	66	763	27
Manitoba	198	1,278	45
Saskatchewan	595	2,151	76
Alberta	184	1,260	44
British Columbia	0	0	0
Canada	1,108	5,878	208

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 (Diagram 15), which in turn is estimated on the basis of each facility's processing capacity, while taking into account that the Ontario and Quebec facilities devote a significant share of their capacity to soybeans. Once seed volumes are estimated, the volume of oil and meal produced is determined on the meal/oil ratio for a given year, with the meal share ranging as low as 56% and as high as 63% in recent years.

Diagram 14: Estimated volume of canola seed crushed by facility

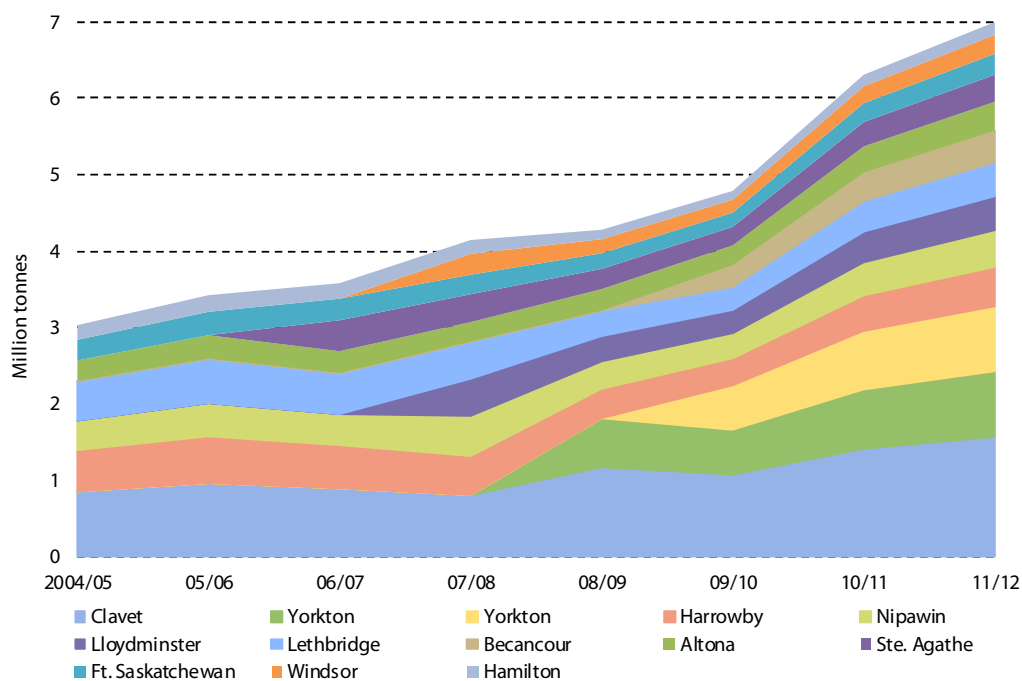


Diagram 15: Prices for canola by-products at the Prairies and Vancouver



Once the quantities of meal and crude oil produced have been determined their values are estimated on the basis of their prairie prices. Although oil and meal prices are most frequently quoted in terms of FOB Vancouver this takes into account transportation, which we have captured elsewhere in the study, hence our use of the prairie price (Diagram 15). With the value

of by-products produced calculated we find the value added through crushing by netting out the value of seed, the economic impact of which was captured in our discussion on canola farming.

The employment impact of the canola crushing sector was determined through discussions with employees of the major crushers in Canada as well as through press releases citing the number of individuals employed in a given facility. The average salary for employees of crushing facilities was obtained from StatCan data.

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 Clavet, SK, which does not currently refine oil, instead exporting the bulk of its crude oil to the US and overseas markets.

Impacts

- The direct economic impact on the Canadian economy from refining crude canola oil averaged \$90 million annually between 2009/10 and 2011/12. The total economic impact, meanwhile, is estimated at \$220 million annually.
- Approximately 260 people are directly employed by canola refining in Canada. Like crushing, however, the multiplier effect of refining is high, with the total employment impact estimated at over 3,100 jobs.
- \$24 million in wages are directly attributable to canola refining while the total wage impact is in the vicinity of \$150 million.

Table 48: Direct economic, employment and wage impact of canola refining, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	6	22	1
Ontario	6	39	3
Manitoba	19	65	4
Saskatchewan	33	75	5
Alberta	18	64	4
British Columbia	0	0	0
Canada	83	263	18

Table 49: Total economic, employment and wage impact of canola refining, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	16	255	9
Ontario	16	458	16
Manitoba	47	767	27
Saskatchewan	83	888	31
Alberta	44	756	27
British Columbia	0	0	0
Canada	206	3,124	110

Methodology

The value added to the Canadian economy through canola refining has been determined on the basis of volumes produced multiplied by the refining margin. Total canola oil refined was estimated as the sum of domestic oil consumption and refined oil exports. This total was then allocated across Canada’s processing facilities based on crude canola oil production, adjusting for the fact that Clavet, SK does not refine crude canola oil (Diagram 16).

Diagram 16: Estimated volume of canola oil refined by facility

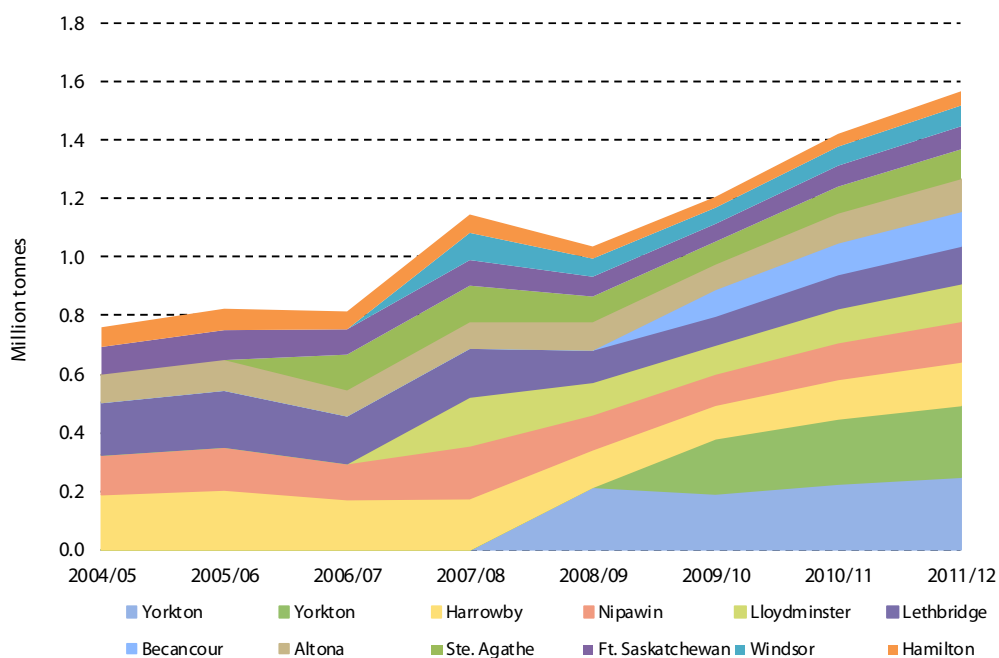


Diagram 17: Canola oil refining margin



The refining margin for canola oil was based on the spread between unit export values for crude and refined canola oil, obtained from Canadian trade data (Diagram 17).

By-product delivery

Most Canola crushing facilities produce and distribute three different by-products of considerable size, 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, port facilities for overseas export or up the US border in the event the product is being shipped to the US or Mexico.

Impacts

We present our results for the economic impact of canola by-product delivery separately for 1) crude oil, 2) refined oil and 3) meal. For refined oil and meal distribution we present results for both rail and truck transportation.

- The direct economic impact of crude oil shipped by rail is \$42 million with the total impact estimated at \$86 million.
- 128 jobs are directly attributable to the rail shipment of crude canola oil while the total employment impact is 281 jobs.
- The direct and total wage impact, meanwhile, averaged \$11 million and \$20 million respectively over the observed time frame.

Table 50: Direct economic, employment and wage impact of crude canola oil distribution by rail, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	0	0	0
Ontario	1	3	0
Manitoba	7	14	1
Saskatchewan	28	95	8
Alberta	6	16	1
British Columbia	0	0	0
Canada	42	128	11

Table 51: Total economic, employment and wage impact of crude canola oil distribution by rail, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	0	1	0
Ontario	2	6	0
Manitoba	14	30	2
Saskatchewan	56	210	15
Alberta	13	34	2
British Columbia	0	0	0
Canada	86	281	20

- The direct economic impact of refined canola oil shipped averaged \$19 million for rail and \$6 million for truck. Total impacts were \$40 million and \$15 million respectively.
- 58 jobs were directly dependent on refined canola oil shipped by rail with another 5 jobs linked to trucking. The total employment impacts for these categories are 128 jobs and 10 jobs, respectively.
- The total wage impact of refined oil transportation averaged \$9 million for rail and around \$1 million for trucking.

Table 52: Direct economic, employment and wage impact of refined canola oil distribution by rail, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	0	0	0
Ontario	0	0	0
Manitoba	7	20	2
Saskatchewan	6	22	2
Alberta	6	16	1
British Columbia	0	0	0
Canada	19	58	5

Table 53: Total economic, employment and wage impact of refined canola oil distribution by rail, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	0	0	0
Ontario	0	0	0
Manitoba	14	44	3
Saskatchewan	13	49	3
Alberta	13	35	2
British Columbia	0	0	0
Canada	40	128	9

Table 54: Direct economic, employment and wage impact of refined canola oil distribution by truck, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	2	2	0
Ontario	2	2	0
Manitoba	0	0	0
Saskatchewan	0	0	0
Alberta	1	1	0
British Columbia	0	0	0
Canada	6	5	0

Table 55: Total economic, employment and wage impact of refined canola oil distribution by truck, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	5	4	0
Ontario	6	4	0
Manitoba	1	1	0
Saskatchewan	1	0	0
Alberta	3	2	0
British Columbia	0	0	0
Canada	15	10	1

- The total economic impact of meal transportation is \$95 million for rail and \$27 million for trucking.
- Meal transportation via rail and truck supports a total of 342 jobs and 19 jobs respectively.
- Collectively, the total wage impact of canola meal transportation is estimated at \$25 million.

Table 56: Direct economic, employment and wage impact of canola meal distribution by rail, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	0	2	0
Ontario	1	24	0
Manitoba	8	96	2
Saskatchewan	28	33	8
Alberta	10	0	3
British Columbia	0	0	0
Canada	47	155	13

Table 57: Total economic, employment and wage impact of canola meal distribution by rail, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	0	5	0
Ontario	1	52	0
Manitoba	16	212	4
Saskatchewan	57	73	15
Alberta	21	0	5
British Columbia	0	0	0
Canada	95	342	24

Table 58: Direct economic, employment and wage impact of canola meal distribution by truck, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	3	0
Quebec	4	3	0
Ontario	4	1	0
Manitoba	1	0	0
Saskatchewan	1	1	0
Alberta	1	0	0
British Columbia	0	0	0
Canada	11	9	0

Table 59: Total economic, employment and wage impact of canola meal distribution by truck, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	7	0
Quebec	10	7	0
Ontario	10	2	0
Manitoba	3	1	0
Saskatchewan	1	2	0
Alberta	3	0	0
British Columbia	0	0	0
Canada	27	19	1

Methodology

We began our calculations of expenditures from crude oil shipments by determining surplus quantities of crude oil by crushing facility and the likely point of export for these surpluses. The likely point of export was determined based on the importing trade partner, with the majority of US and Mexican 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 determined, we applied a range of rail rates similar to those used in seed transportation.

The economic impact of refined oil shipments was determined by first constructing a provincial-level refined oil balance, with supply being our production estimates (shown in Diagram 16) and demand being 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. The distance matrix shown in Table 39 was also used in this exercise. With tonne-miles determined, a rail or trucking rate was applied to determine expenditures.

Similarly, the calculations behind meal transportation began with building provincial-level supply/demand tables. Meal demand in each province was based on a meal allocation by livestock species, reflecting the particular benefit of canola meal to dairy cattle (Diagram 18), and the population of livestock in a given province (Diagrams 19-21).

Diagram 18: Canola meal consumption by sector

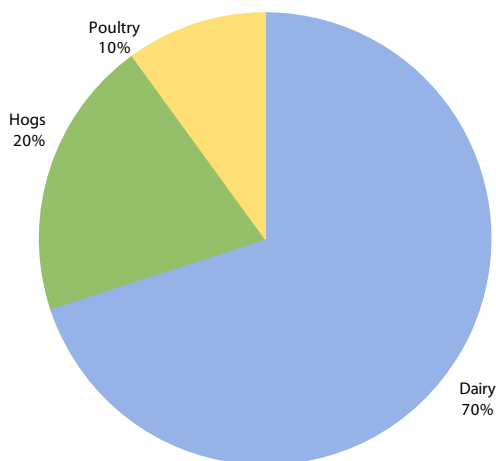


Diagram 19: Dairy cow population by province

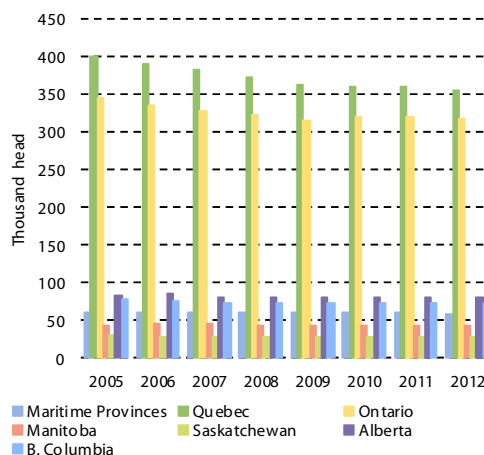


Diagram 20: Hog population by province

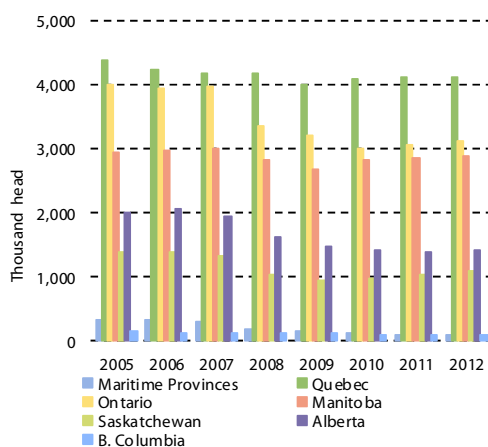
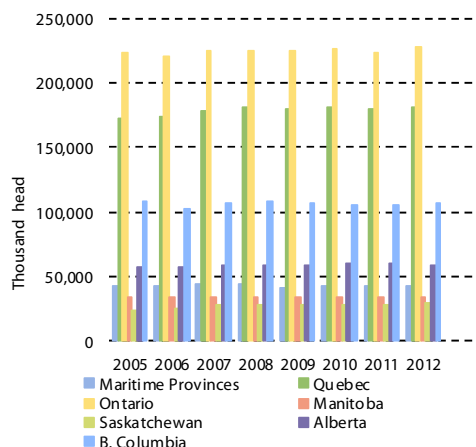


Diagram 21: Poultry (Broilers, Layers and Turkeys) population by province



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 by-product transportation, employment and wage impacts were calculated in the same manner as for the transportation of seed

Impacts at ports

In 2011/12, Canada exported nearly 15 million tonnes of canola products, including seed, meal, crude oil, and refined oil. While the majority of meal exports take place overland to the US and Mexico, nearly 10 million tonnes of canola products leave Canada via its ports. Although most shipments of overseas exports of canola products leave Canada via ports in British Columbia, canola also represents a sizeable share of exports out of Ontario and Quebec ports. A small amount of canola seed has even been exported out of Churchill, MB in recent years.

Impacts

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

- The direct effects of canola seed exports on Canadian ports are an economic impact of \$141 million, 437 direct jobs and a wage impact of \$28 million (Table 60).
- The total effects of canola seed exports on Canadian ports are an economic impact of \$282 million, an employment impact of 992 jobs, and a wage impact of \$57 million (Table 61).

Table 60: Direct economic, employment and wage impact of canola seed at Canadian ports, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	1	2	0
Ontario	4	12	1
Manitoba	0	1	0
Saskatchewan	0	0	0
Alberta	0	0	0
British Columbia	137	422	27
Canada	141	437	28

Table 61: Total economic, employment and wage impact of canola seed at Canadian ports, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	1	4	0
Ontario	7	26	2
Manitoba	1	2	0
Saskatchewan	0	0	0
Alberta	0	0	0
British Columbia	273	959	55
Canada	282	992	57

Because the bulk of Canadian meal exports takes place overland to the US and Mexico, the impacts of meal exports on Canadian ports are significantly smaller than they are for seed.

- The direct economic impact of meal exports on Canadian ports is \$11 million, with 33 jobs and total wages of roughly \$2 million directly attributable to this activity (Diagram 63).
- Total effects include an economic impact of \$21 million, an employment impact of 74 jobs, and a wage impact of \$4 million (Diagram 64).

Table 62: Direct economic, employment and wage impact of canola meal at Canadian ports, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	0	0	0
Ontario	1	3	0
Manitoba	0	0	0
Saskatchewan	0	0	0
Alberta	0	0	0
British Columbia	10	29	2
Canada	11	33	2

Table 63: Total economic, employment and wage impact of canola meal at Canadian ports, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	0	1	0
Ontario	2	7	0
Manitoba	0	0	0
Saskatchewan	0	0	0
Alberta	0	0	0
British Columbia	19	67	4
Canada	21	74	4

- Direct effects of crude canola exports include an economic impact of \$21 million, an employment impact of 64 jobs, and a wage impact of \$4 million (Table 64).
- Total effects of crude canola export on Canadian ports meanwhile are estimated at an economic impact of \$41 million, an employment impact of 146 jobs and a wage impact of \$8 million (Table 66).

Table 64: Direct economic, employment and wage impact of canola crude oil at Canadian ports, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	1	2	0
Ontario	4	11	1
Manitoba	0	0	0
Saskatchewan	0	0	0
Alberta	0	0	0
British Columbia	16	51	3
Canada	21	64	4

Table 65: Total economic, employment and wage impact of canola crude oil at Canadian ports, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	2	4	0
Ontario	7	26	1
Manitoba	0	0	0
Saskatchewan	0	0	0
Alberta	0	0	0
British Columbia	32	116	7
Canada	41	146	8

- Refined canola oil exports by Canada are small in comparison with crude oil exports and have a direct economic impact of \$2 million and directly provide 5 jobs, with a wage impact of less than a million dollars (Table 66).
- The total economic impact is estimated at \$3 million with a total employment impact of around 11 jobs with wages estimated at roughly \$1 million (Table 67).

Table 66: Direct economic, employment and wage impact of refined canola oil at Canadian ports, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	0	0	0
Ontario	0	0	0
Manitoba	0	0	0
Saskatchewan	0	0	0
Alberta	0	0	0
British Columbia	1	5	0
Canada	2	5	0

Table 67: Total economic, employment and wage impact of refined canola oil at Canadian ports, 3-year average (2009/10–2011/12)

	Economic Impact (million Dollars)	Employment Impact (Jobs)	Wage Impact (million Dollars)
Maritimes	0	0	0
Quebec	0	0	0
Ontario	0	0	0
Manitoba	0	0	0
Saskatchewan	0	0	0
Alberta	0	0	0
British Columbia	3	11	1
Canada	3	11	1

Methodology

The economic impact of canola products on Canadian ports was determined to be 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 (Diagram 22).
- Export volumes by port for meal, crude, and refined oils, meanwhile, were based on export destination. Exports to the US and much of the exports to Mexico were found to leave Canada overland via rail. Exports to Asia, meanwhile, were assumed to leave via Vancouver (Diagrams 23-25).

Diagram 22: Seed exports by port and overland

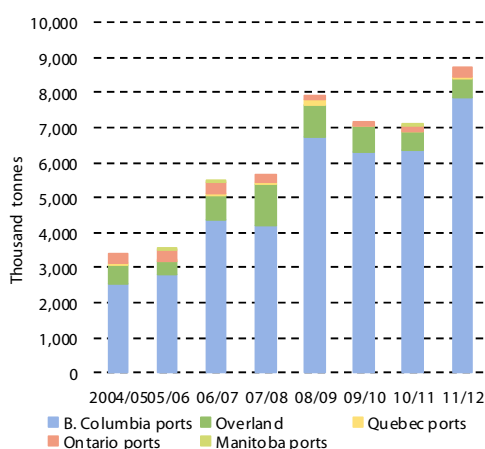


Diagram 23: Meal exports by port and overland

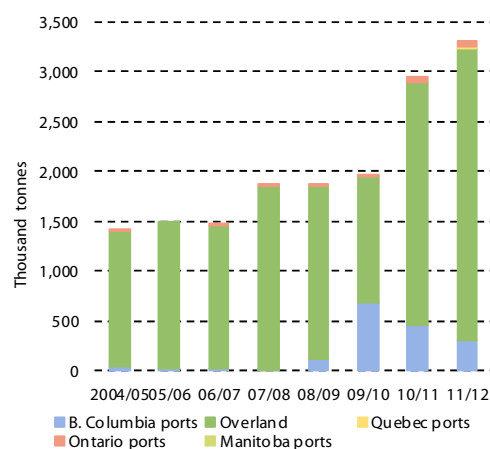


Diagram 24: Crude oil exports by port and overland

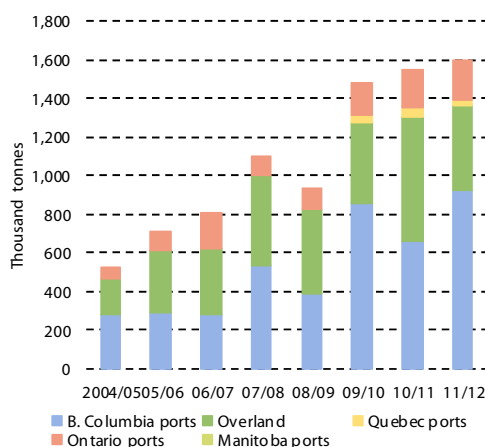
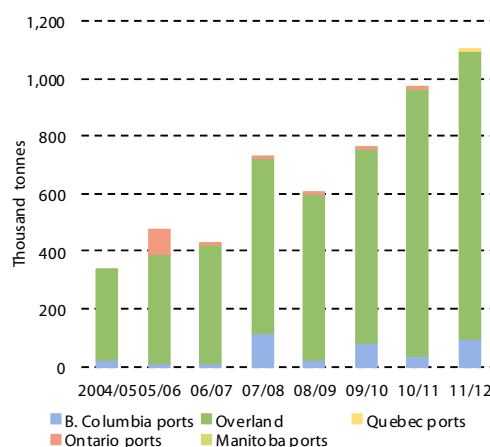
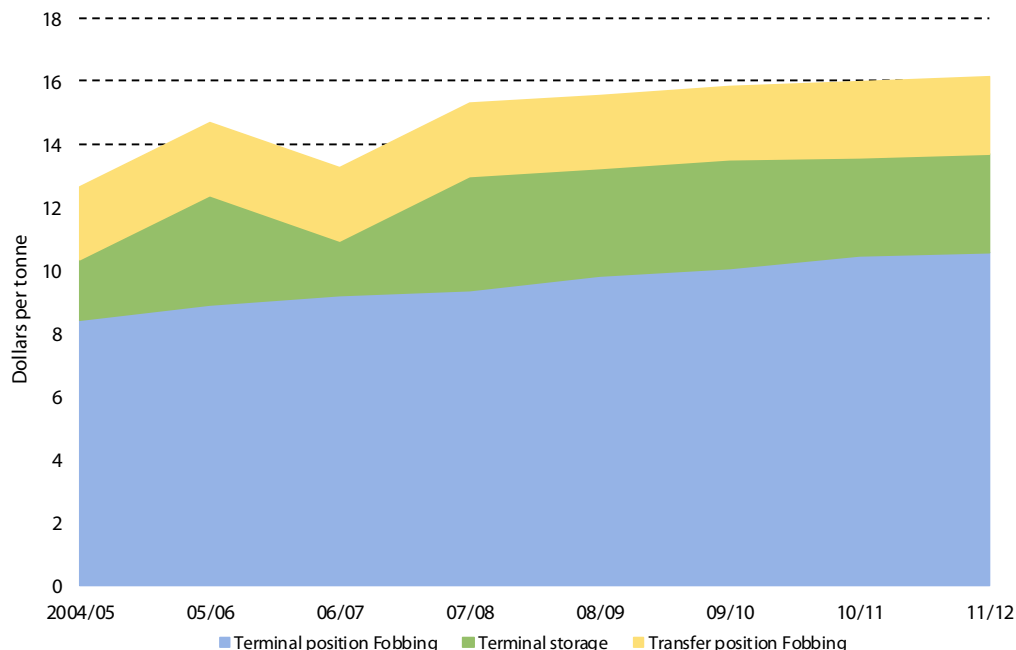


Diagram 25: Refined oil exports by port and overland



Port fees for canola seed were also obtained from the Canadian Grain Commission and are illustrated in Diagram 26. 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 of a study detailing the economic impact of Vancouver ports: www.portmetrovancover.com

Diagram 26: Grain charges at Canadian ports



Benefits to livestock sector

The Canadian livestock sector is benefited by the availability of canola meal in a number of ways. For all livestock, canola represents a lower cost protein alternative compared to soybean, even when adjusted for a lower protein content and an inferior set of amino acids for some species. For the dairy sector, the amino acid profile of canola meal is superior to most other protein meals and has been shown to increase milk yields by 1 liter of milk per cow per day.

Impacts

For the livestock sector, it is assumed that the effects of canola consumption are confined to economic impact. 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 profitability of the sector (Tables 68 and 69).

Table 68: Direct economic impact of canola meal by livestock sector, 3-year average (2009/10–2011/12)

	Economic Impact Dairy Cost Savings (million Dollars)	Economic Impact Poultry Cost Savings (million Dollars)	Economic Impact Hog Cost Savings (million Dollars)	Economic Impact Dairy yield Boost (million Dollars)
Maritimes	4	0	0	7
Quebec	21	2	4	39
Ontario	19	2	4	34
Manitoba	3	0	3	5
Saskatchewan	2	0	1	3
Alberta	5	0	2	9
British Columbia	4	1	0	8
Canada	57	6	14	104

Table 69: Total economic impact of canola meal by livestock sector, 3-year average (2009/10 – 2011/12)

	Economic Impact Dairy Cost Savings (million Dollars)	Economic Impact Poultry Cost Savings (million Dollars)	Economic Impact Hog Cost Savings (million Dollars)	Economic Impact Dairy yield Boost (million Dollars)
Maritimes	10	1	1	19
Quebec	62	4	13	114
Ontario	54	5	10	100
Manitoba	7	1	9	14
Saskatchewan	5	1	3	9
Alberta	14	1	5	25
British Columbia	12	3	0	23
Canada	164	17	40	303

Methodology

The economic impact from canola meal cost savings was calculated based on the price of canola relative to soy, adjusted for useable protein. For the dairy sector, it was assumed canola provided 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. The relative cost savings (Diagram 27) were then multiplied by quantities consumed by livestock sector to determine the total savings of canola meal consumption.

The calculation for the dairy yield boost was made on the basis of research showing that cattle that are fed canola experienced a yield boost averaging 1 liter per cow per day. To achieve this boost, it was assumed that a cow needed to consume 2.7 kilograms of canola meal per day while it was lactating, and that a cow lactated an average of 300 days per year. The total number of cows being fed a “full” meal ration was determined, using these annual per-cow canola consumption 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 by the Canadian wholesale milk price (Diagram 28) gave us the economic value of the canola dairy boost.

Diagram 27: Canola meal savings relative to soy meal

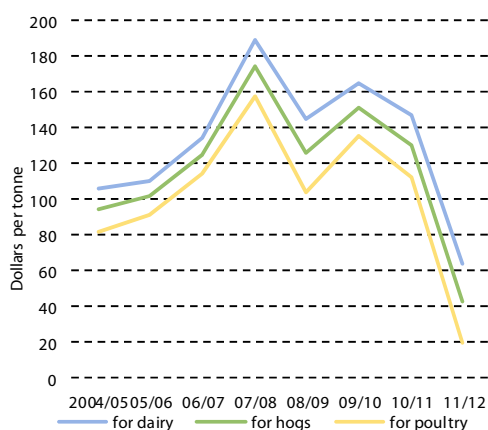
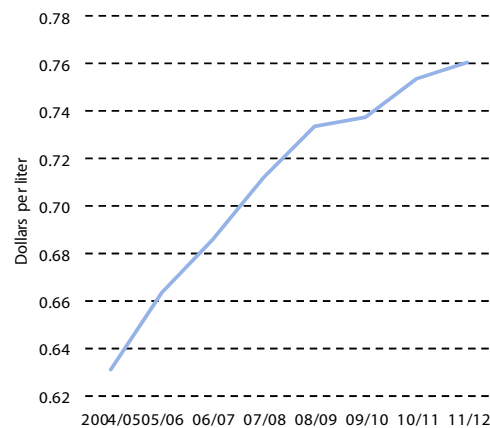


Diagram 28: Canadian wholesale milk price



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 that are derived from canola products in a selection of end-use sectors—margarine, shortening and salad oil for human consumption.

The further processing of refined canola oil into food end uses make some significant contributions to the Canadian economy but it is difficult to quantify due to the following factors:

- Firstly, ingredient use and product formulations of processed foods are sensitive information from the perspective of industrial food manufacturers.
- Secondly, branding and marketing add a large part of the 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 typically to canola oil — if canola were not available, many products would simply switch to an alternative oil without any price effect. The growing healthy oil market may be more closely associated with canola, but again the difficulty is 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 effects.

We include the estimates from these end-uses in our grand totals of the benefits to Canada of the canola industry; however, we remind readers that they do not represent an exhaustive assessment of the end-use benefits of canola. Thus, our final total for the benefit of canola to Canada necessarily represents an under-estimation of the true figure.

Impact

We have discussed previously the difficulties in extending the analysis of canola's value into the downstream food processing sector. However, as an illustration of the scale of the potential value derived in this lucrative sector, below we present estimates of the value added to canola oil through processing into the food products of margarine, shortening and salad & cooking (frying) oil.

- Among the three selected end products, canola oil demand for salad oil accounts for over 60% in volume (Table 70, Diagram 29 and Diagram 30), hence represents the highest impact.
- Direct effects through processing canola oil into the three end products have created an economic impact of 808 million C\$. Meanwhile the direct employment impact is estimated at over 16,000 jobs, creating a direct wage impact of 791 million C\$ during the period between 2009/10 to 2011/12 (Table 73).
- Total economic impact of end uses is estimated at 1,723 million C\$. Total job created stood at over 45,000 with total wage impact of 2.1 billion (Table 74).

Table 70: Volume of refined and processed canola oil products, '000 tonnes

	2009/10	2010/11	2011/12	Average 2010-20012
Margarine	57	60	62	60
Shortening	155	162	169	162
Salad oil	368	381	395	381
Total	580	603	626	603

Table 71: Value of refined and processed oils (million C\$)

	2009/10	2010/11	2011/12	Average 2010-20012
Margarine	102	109	125	112
Shortening	212	244	263	240
Salad oil	366	490	513	456
Total	680	844	900	808

Table 72: Prices for refined and processed oil products, based on unit value export prices to the us from Canada (\$/tonne)

	2009/10	2010/11	2011/12
Margarine	1,800	1,827	2,000
Shortening	1,363	1,509	1,555
Salad Oil	995	1,287	1,299

Table 73: Direct economic, employment and wage impact of canola oil end uses, 3-year average (2009/10–2011/12)

	Economic Impact (Million dollars)	Employment Impact (Jobs)	Wage Impact (Million dollars)
Quebec	3	6,128	297
Ontario	160	6,128	297
Manitoba	358	468	23
Saskatchewan	132	468	23
Alberta	155	1,561	76
British Columbia	0	1,561	76
Canada	808	16,314	791

Table 74: Total economic, employment and wage impact of canola oil end uses, 3-year average (2009/10–2011/12)

	Economic Impact (million dollars)	Employment Impact (Jobs)	Wage Impact (million dollars)
Quebec	5	17,083	801
Ontario	341	17,083	801
Manitoba	764	1,305	61
Saskatchewan	281	1,305	61
Alberta	331	4,352	204
British Columbia	-	4,352	204
Canada	1,723	45,479	2,131

Diagram 29: Volume of canola oil in processed products, 2009/2010-2010/12

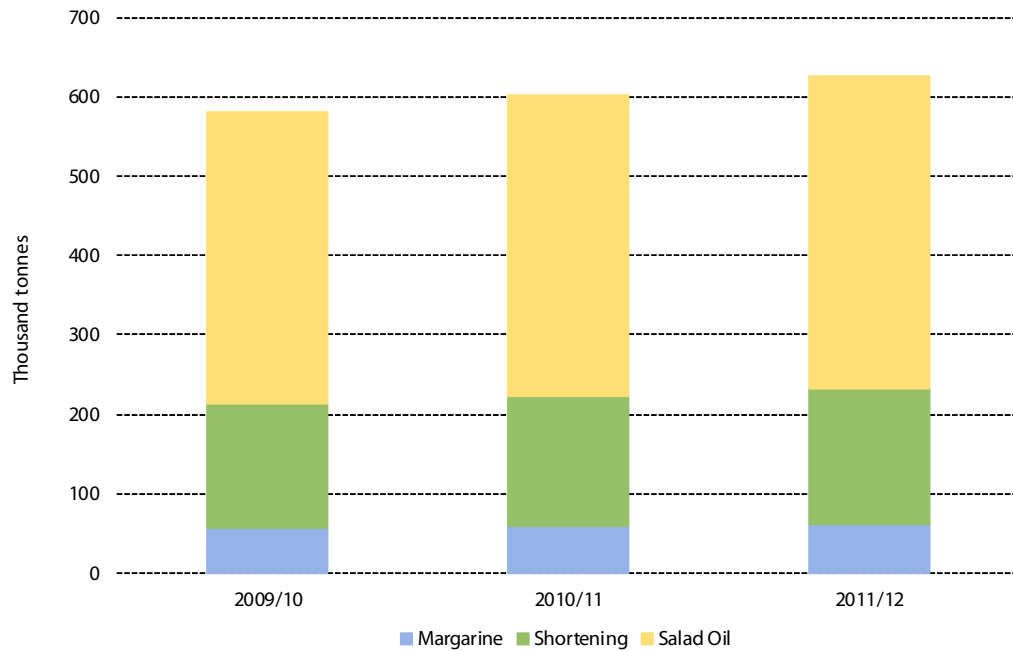
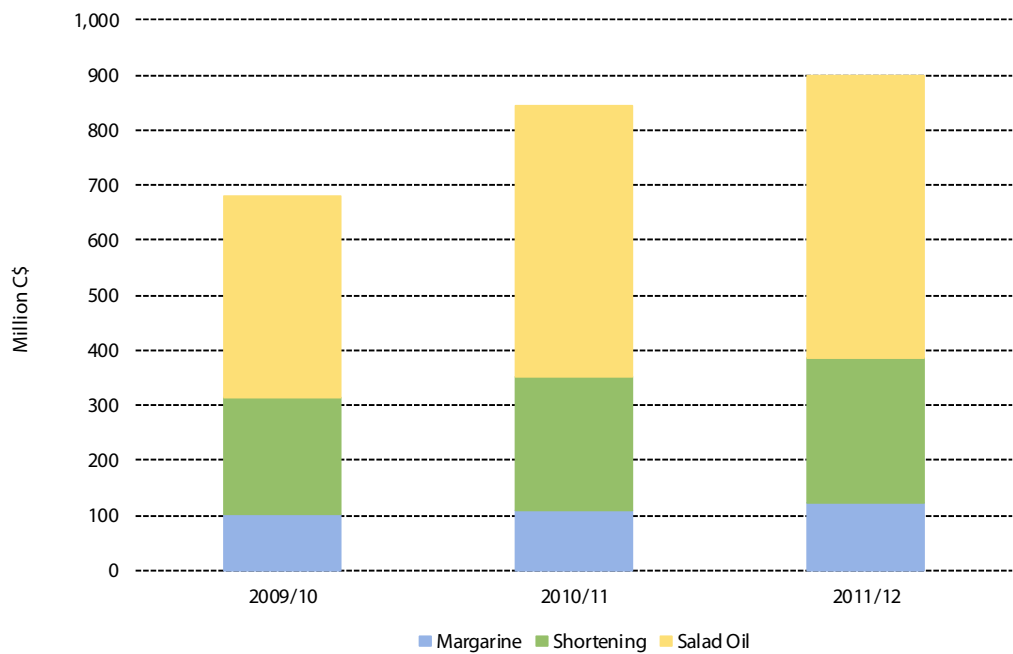


Diagram 30: Value of canola oil in processed products 2009/10-2011/12



Methodology

The economic impact of end uses is calculated based on the estimated volume of canola oil uses in each of the products: margarine, shortening and salad oil (Table 71). We then apply the volume to the unit prices of the three end products in Table 72 to derive the direct economic impact.

The number of people employed in the sector is derived from StatCan's Industrial Statistics on vegetable oil food manufacturing. We then allocate employment to each of the selected regions according to its refining capacities.

One problem with including this analysis into the main value added calculations is that the quantification methodology employed here is necessarily less robust and therefore provides results that are open to question. This is because we do not have firm data from the refining sector, which regards such information as proprietary, nor does Statistics Canada report this level of detail in its Canada Food Statistics data. The analysis presented here should be taken as indicative only.

We relied on Statistics Canada Canada Food Statistics for the consumption in kg/person of margarine, shortening and salad & cooking oil till 2009/10. Under the absence of official data for the latest two years – 2010/11 and 2011/12 we assume the per capita demand for these products to grow at the same rate with the growth of national total food oil demand. We extrapolated this to the population at large by multiplying by the total population in Canada to give the total consumption of margarine, shortening and salad oil.

For the volume of each type of oil used in margarine, shortening and salad oil, we relied on 1998-2001 data from Statistics Canada. This is the only data available which offers a snapshot of the breakdown of these processed oils by type of oil. Using these four years of data, we calculate the share of each of oil used and assume the share of canola oil for these end uses expands at a rate of 1% to reflect the superior health benefit of canola oil that allows it to gradually capturing more market from other oils. We then apply the share to estimate demand for canola oil in each of the three products till 2011/12.

For the volume of each vegetable oil consumed in food products in Canada, including for margarine, shortening and salad & cooking oil, we used data from FAS-USDA.

To estimate the volume of canola oil in each of the margarine, shortening and salad oil categories from Canada Food Statistics, we multiplied the proportion of canola oil calculated in the trend projections for processed oils, by the total volume of margarine, shortening and cooking oil estimates from Canada Food Statistics. These data are presented in Table 70 and Diagram 29.

To calculate the value of these processed products, shown in Table 71 and Diagram 31, we utilized the unit value export price of each of these products for export to the US, as reported by Statistics Canada. These prices are given in Table 72.

International ocean-going shipping estimates

Because international shipping of canola products takes place outside of Canada and on vessels and by crews that are generally not Canadian, we have not included international shipping in our final Economic Impact calculations. Instead, these have been included for reader interest only. Wage and employment impacts of international shipping have not been modeled - only the economic impact has been calculated and only at the direct level.

Global impacts

Impacts are presented by province based on the province of export for the canola product.

- Expenditures on international shipping of canola seed averaged roughly \$220 million between 2009/10 and 2011/12. For meal, crude oil, and refined oil, expenditures were \$18 million, \$96 million, and \$6 million, respectively.

Table 75: Total economic impact of international ocean-going shipments of canola seed, canola meal, crude canola oil and refined canola oil, 3-year average (2009/10–2011/12)

	Economic Impact Seed Shipping (million Dollars)	Economic Impact Meal Shipping (million Dollars)	Economic Impact Crude Oil Shipping (million Dollars)	Economic Impact Refined Oil Shipping (million Dollars)
Maritimes	0	0	6	0
Quebec	1	0	55	4
Ontario	9	3	9	0
Manitoba	1	0	0	0
Saskatchewan	0	0	0	0
Alberta	0	0	0	0
British Columbia	211	15	25	2
Canada	222	18	96	6

Methodology

Expenditures were determined based on canola product volumes, destinations, and prevailing shipping rates. Shipping rates from Vancouver and Quebec are presented in Diagrams 31 and 32.

Diagram 31: Canola seed shipping rates from Vancouver

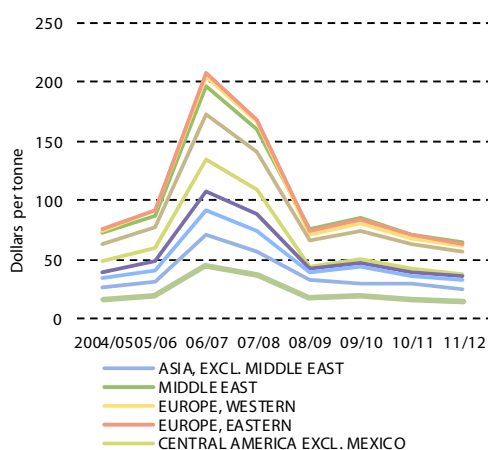


Diagram 32: Canola seed shipping rates from Quebec

