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Economic Contribution Study of British Columbia's Tree Fruit Sector

Prepared for the Ministry of Agriculture, Food and Fisheries of British Columbia

September 2021

Contents

Note to Reader

The results presented within this document have been provided to the Ministry of Agriculture, Food and Fisheries of British Columbia ("the Ministry") for the purpose of estimating the economic contribution of the BC Tree Fruit sector to the economy of British Columbia. The economic contribution of the BC Tree Fruit sector is assessed for the 2019 year that is the most recent year for which required Statistics Canada data sources are available.

This study does not represent a cost-benefit analysis for the Ministry or any other stakeholder and does not represent a comparison of the potential economic impact of Tree Fruit sector activities to the potential impact of an alternative use of resources. In particular, the study does not examine the costs associated with activities in the sector, including the opportunity costs of these activities.

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The analysis is provided as of September 24, 2021, and we disclaim any undertaking or obligation to advise any person of any change in any fact or matter affecting this analysis, which may come or be brought to our attention after the date hereof. Without limiting the foregoing, in the event that there is any material change in any fact or matter affecting the analyses after the date hereof, we reserve the right to change or modify the analysis but are under no obligation to do so. Observations are made on the basis of economic, industrial, competitive and general business conditions prevailing as at the date hereof. In the analyses, we may have made assumptions with respect to the industry performance, general business, and economic conditions and other matters, many of which are beyond our control, including government and industry regulation.

The full extent of the ongoing COVID-19 pandemic's impact on the economic outlook remains uncertain. It is, therefore, important for readers to consider that the analysis is based on third-party data (e.g., economic and industry data) up to September 2021 and does not include any consideration of the likely economic impact of either COVID events or the related fiscal stimulus measures.

No opinion, counsel, or interpretation is intended in matters that require legal or other appropriate professional advice. It is assumed that such opinion, counsel, or interpretations have been, or will be, obtained from the appropriate professional sources. To the extent that there are legal issues relating to compliance with applicable laws, regulations, and policies, we assume no responsibility therefore.

We believe that our analyses must be considered as a whole and that selecting portions of the analyses or the factors considered by it, without considering all factors and analyses together, could create a misleading view of the issues related to the report. Amendment of any of the assumptions identified throughout this report could have a material impact on our analysis contained herein. Should any of the major assumptions not be accurate or should any of the information provided to us not be factual or correct, our analyses, as expressed in this report, could be significantly different.

Executive Summary

About this Study

Background

In British Columbia (BC), tree fruit farmers produce a variety of fruits including apples, pears, cherries, peaches, nectarines, apricots and plums. The sector has been reportedly experiencing challenges. This has led to the Tree Fruit Industry Stabilization Project led by the BC Ministry of Agriculture, Food and Fisheries with the objective to "understand and evaluate the circumstances the B.C. tree fruit industry is currently facing and develop a strategic plan and implementation approach."[1]

Objective

As part of the Tree Fruit Industry Stabilization Project, Deloitte was engaged by the Ministry to estimate the economic contribution of the Tree Fruit sector to the economy of BC. The results of the analysis will inform the advisory group of the Tree Fruit Industry Stabilization Project and the Ministry on the economic importance of the sector for the province as they consider how to best support the sector.

For the purposes of the study, the Tree Fruit sector is defined as production of fruits. The analysis of downstream activities such as packaging of fruits, wholesale and retail activities or transportation of fruits is beyond the scope of the analysis.

Approach

This study uses an input-output ("I-O") methodology to measure the economic contribution of the Tree Fruit sector. This methodology traces how the expenditures associated with the Tree Fruit sector operations and investments ripple through the economy and captures not only ***direct*** economic contributions, but also the ***indirect*** contributions arising from creating demand for goods and services provided by suppliers to the sector. This study also estimates ***induced*** contributions, which arise from the spending of salaries and wages earned as a result of the Tree Fruit sector activities. These are reported separately, outside of the contribution totals.

Data on the Tree Fruit sector are limited, therefore Deloitte estimated the data inputs required for economic contribution modelling using available Statistics Canada sources for broader sectors. The economic contribution of the Tree Fruit sector is assessed for the 2019 year that is the most recent year for which the Statistics Canada data sources are available.

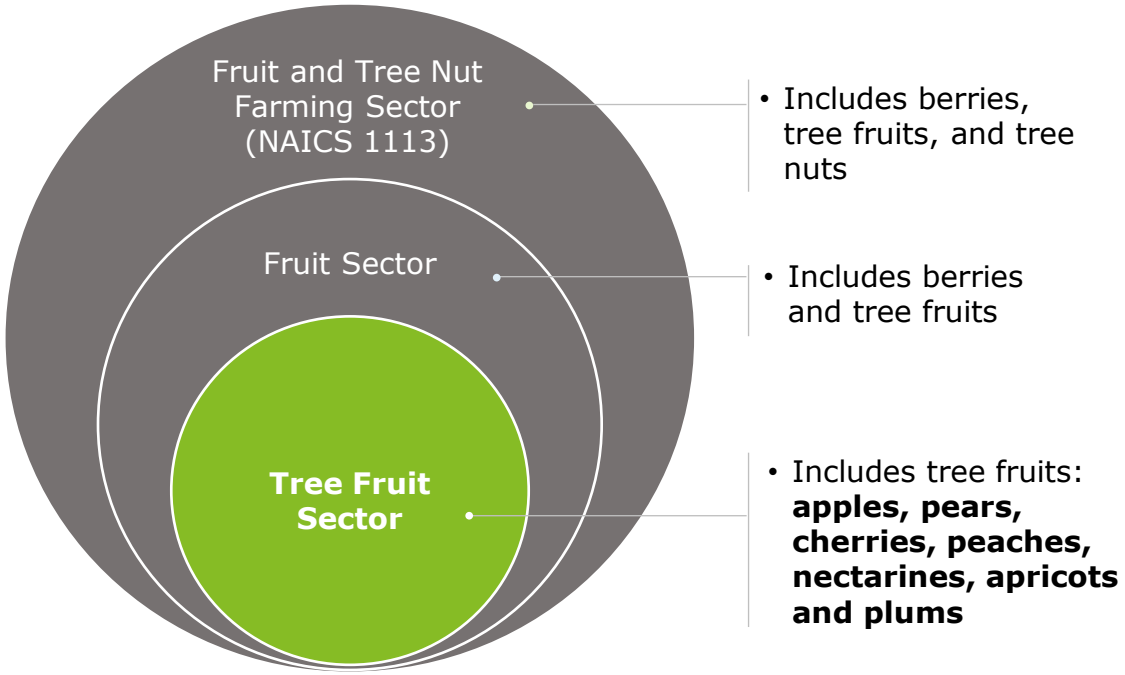
Beyond the economic contribution analysis, this study lists potential socio-economic benefits that the Tree Fruit sector could bring to communities across BC. Studying these benefits is not within the scope of this report but the benefits have been listed as suggested further areas of research.

1. Government of British Columbia. Tree Fruits. Ministry Program / Project Updates. 2021. https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/animals-and-crops/crop-production/tree-fruits.

The BC Tree Fruit Sector

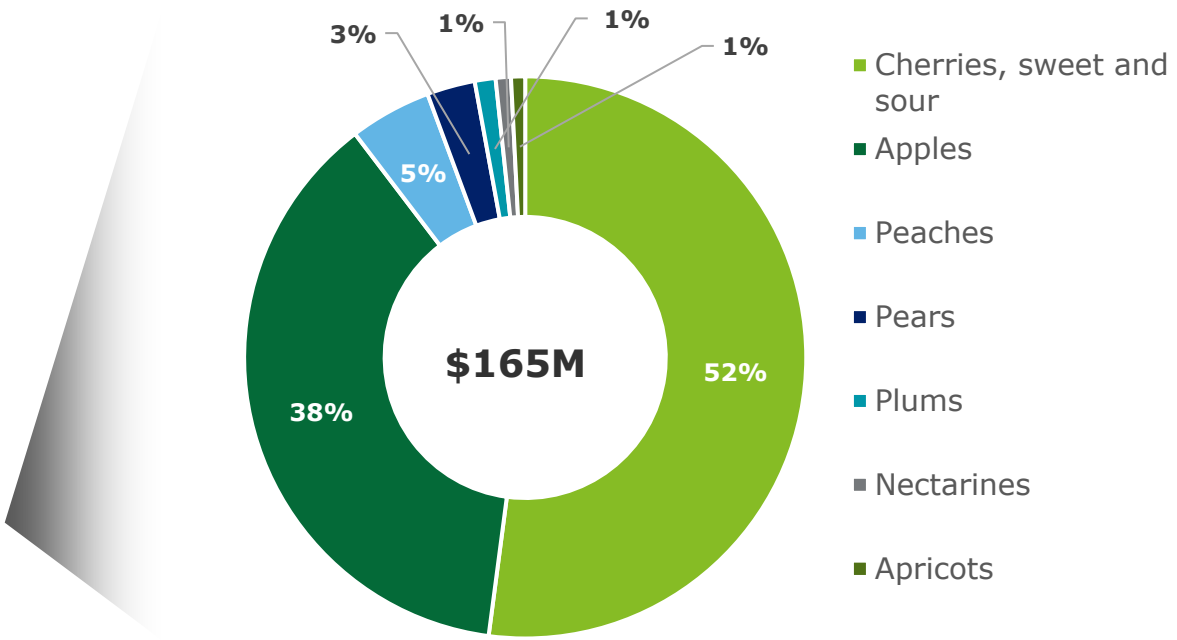
For the purposes of this study, the Tree Fruit sector is defined to include activities associated with tree fruits production, including apples, pears, cherries, peaches, nectarines, apricots and plums; apple and cherry production accounts for approximately 90% of farm gate value.[1]

Figure 1. Definition of Tree Fruit Sector



Source: Deloitte analysis using Statistics Canada data and North American Industry Classification System definitions

Figure 2. Tree Fruit Sector Farm Gate Value[1] Breakdown, BC, 2019



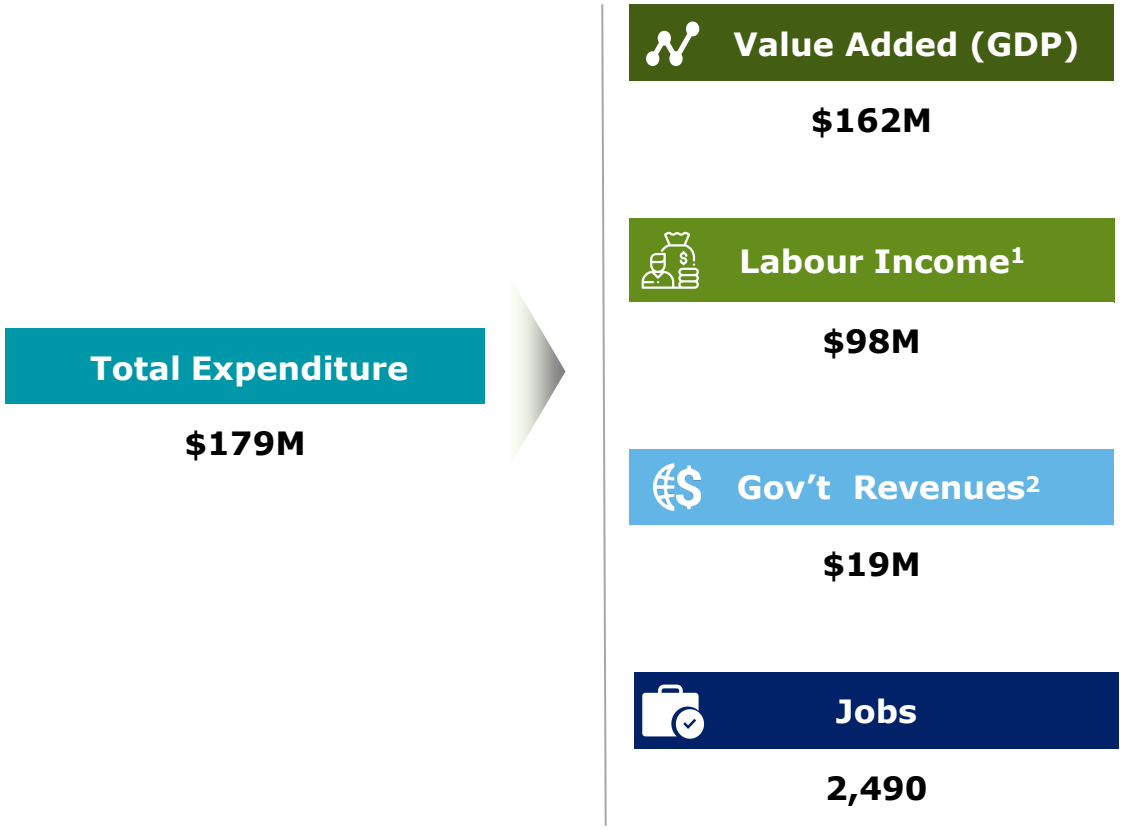
Source: Deloitte calculations using Fruits and Vegetables Survey Data, CANSIM table 32-10-0364-01

1. Farm gate value refers to "the net value of a farm's production as it leaves for the market, after selling costs have been subtracted" (Statistics Canada, Fruits and Vegetables Survey).

Tree Fruit Sector's Economic Contribution to BC

It is estimated that the Tree Fruit sector operations and capital investments, directly and indirectly, contributed $162M to BC's GDP in 2019, of which $98M was in contribution to labour income, and $19M was in provincial and municipal government revenues; it is also estimated that the sector sustained 2,490 jobs.

Estimated *direct* and *indirect* economic contribution to BC in 2019



In 2019, it is estimated that:

- For every dollar spent on the Tree Fruit sector related activities, the Tree Fruit sector added **0.90 dollars** of direct and indirect GDP contribution and up to **1.1 dollars** of GDP when induced impacts are also included.[3]
- For every million dollars spent on the Tree Fruit sector related activities, the sector created or sustained **14 jobs** considering direct and indirect contribution and up to **16 jobs** when induced impacts are also included in BC.[3]

Notes:
1. At the direct level, labour income contribution does not include labour income of self-employed individuals; their income is included in the contribution to GDP.
2. Government revenues include provincial and municipal taxes, including product and production taxes, personal income tax and corporate income tax
3. The 0.9 dollars and 14 jobs estimates account for direct and indirect contributions only (i.e., incorporate the contributions of the Tree Fruit sector and its suppliers); the 1.1 dollars and 16 jobs estimates include induced contributions, which account for spending of wages and salaries by employees of the Tree Fruit sector and suppliers earned as a result of Tree Fruit sector related activity.

Additional Potential Socio-Economic Benefits

Beyond the economic contribution estimated in this report, the Tree Fruit sector could potentially be associated with a range of socio-economic benefits to BC communities; studying these benefits is not within the scope of this report but have been included as suggested further areas of research.

Economic development and diversification in rural communities: A sector that has a large concentration in rural communities can be a catalyst for the development of supply-chains and clusters of supporting industries across the region. With respect to both operating and capital investment activities, BC's Tree Fruit sector can enable the growth and maturation of local suppliers, including benefits to small and medium size enterprises (SMEs). As analyzed in this study, the Tree Fruit sector's operating and capital investment activities spur economic activity in a range of supplier industries; from manufacturing to professional services.

Investment attraction: The sector could be stimulating investment attraction to the region, including investments by both companies in the sector, as well as their suppliers (or companies further down the supply chain such as food manufacturing) that need to scale-up capacity in order to meet the demand from the sector. Stimulated investments outside of the sector could be bringing a range of economic and social benefits in their own right, above and beyond the economic benefits of the sector itself.

Innovation and technologies capacity development: Companies in the sector could be developing or adopting new technology, thereby increasing the technological capacity and competitiveness of the sector. This could be with regards to improving the quality of fruit produced, introducing new fruit varieties, or improving growing conditions through technology using new equipment and processes. The sector could also provide opportunities for Canadian technology companies to develop and supply innovative products or services regarding crop production, thereby stimulating growth in the technology sector.

Human capital attraction and development: The sector could be creating opportunities that attract and retain workers in local communities and develop their skillsets, thus enriching local labour markets. This could be particularly beneficial to underrepresented or vulnerable segments of the labour market, such as recent immigrants, workers with limited skills/experience, youth, and others. The seasonal job opportunities in the sector might be offering an added benefit to such groups.

Local community contributions: Companies in the sector could be making important contributions to local communities via employment opportunities, sponsorships, volunteering and contributions to government revenues, which are reinvested in local communities. Beyond financial contributions, the sector could be bringing important quality of life, health, and community engagement benefits to local communities (for example via the provision of fresh, local produce and by promoting social cohesion in the community through events such as farmers markets and festivals).

Contributions to exports: The Tree Fruit sector could be making significant contributions to BC's exports. Tree fruits account for some of the top fruit and vegetable exports from BC[1] and sector growth in the future could further support exports from the province. Furthermore, tree fruit orchards could contribute to attracting tourists to BC by providing unique settings, festivals, and fruit markets for tourists to enjoy, and further contributing to province's exports.

1. Government of British Columbia, B.C. 2021 Agrifood & Seafood Export-Ready Catalogue, 2021.

Overview of the Tree Fruit Sector

Introduction to BC's Tree Fruit Sector

BC's Tree Fruit Sector is an important contributor to the economy of BC, particularly in the interior of the province; production of some fruits in the sector, such as apples and cherries, has experienced challenges in recent years.

In BC, tree fruit farmers produce a variety of fruits including apples, pears, cherries, peaches, nectarines, apricots and plums. The Tree Fruit sector is comprised of around 400 commercial growers[1] who cultivate approximately 17,000 acres of land.[2]

One of the advantages of the Tree Fruit sector in BC highlighted by local industry associations is the low-pest population due to the dry northern climate found in BC's Okanagan region. Correspondingly, the sector is primarily concentrated in the Okanagan Valley, between Salmon Arm, Osoyoos, Similkameen Valley and the Creston Valley in the Kootenays. It is a contributor to the labour market in that region. It is estimated that the sector was a source of employment for approximately 1,520 jobs in 2019 in BC, including full-time, part-time, seasonal, and self-employed positions.[3]

In 2019, the sector generated farm gate value of $165M, of which cherries accounted for $86M and apples accounted for $62M.[2] Together, cherries and apples accounted for approximately 90% of BC's Tree Fruit sector in 2019. In recent years, the production of these key fruits appears to have been challenged. The production of fresh apples has been stagnant since 2014 (Figure 1) while the production of sweet cherries has declined since 2018, reversing a previous growth trend (Figure 2).[4]

Figure 1. Fresh apples, marketed production, tons, BC, 2010-2020

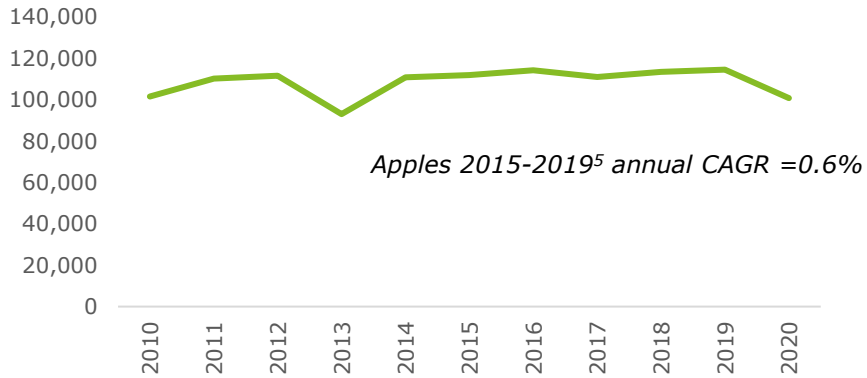
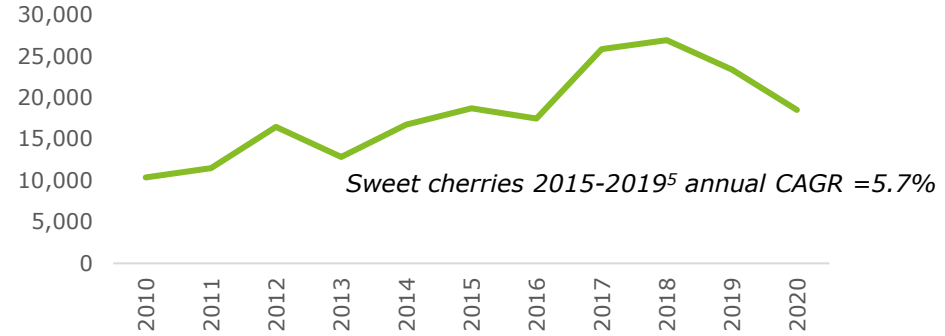


Figure 2. Fresh sweet cherries, marketed production, tons, BC, 2010-2020



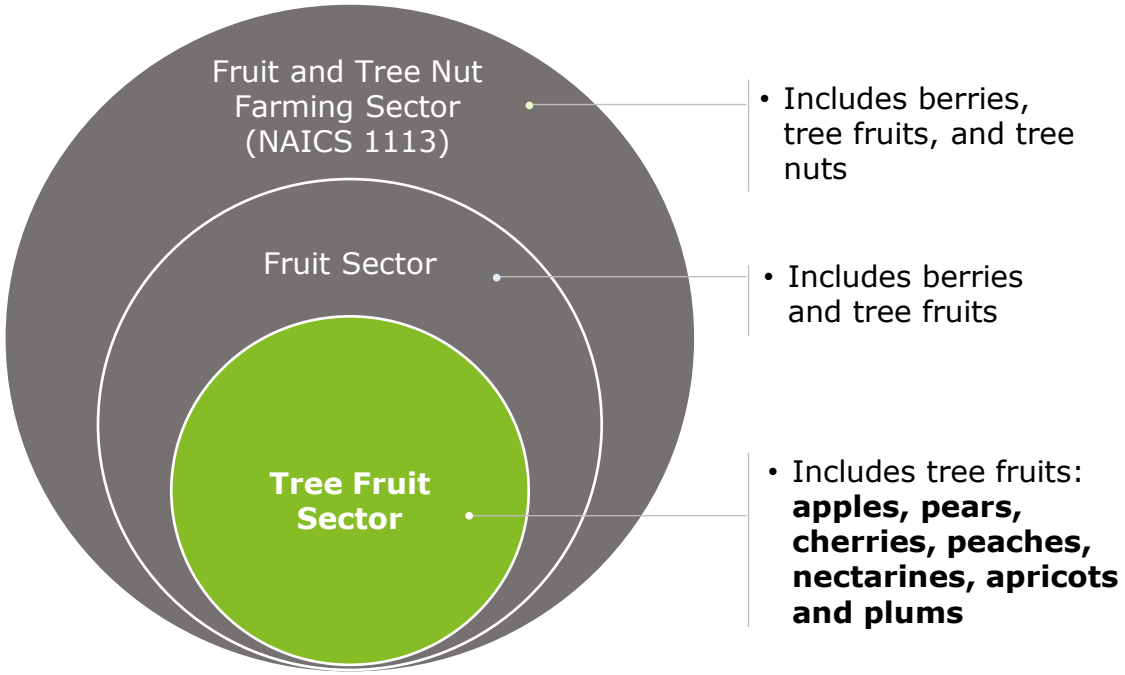
Source: Deloitte calculations using Fruits and Vegetables Survey Data

1. Government of British Columbia, Tree Fruits, 2021.
2. Statistics Canada. Table 32-10-0364-01. Area, production and farm gate value of marketed fruits.
3. Jobs in the Tree Fruit sector were estimated using the methodology outlined in Appendix A: Tree Fruit Sector Data Estimation.
4. The production of sour cherries is very small compared to the production of sweet cherries in the province.
5. The calculation of CAGR covers the most 5 years of data prior to the COVID-19 pandemic.

Defining the BC Tree Fruit Sector

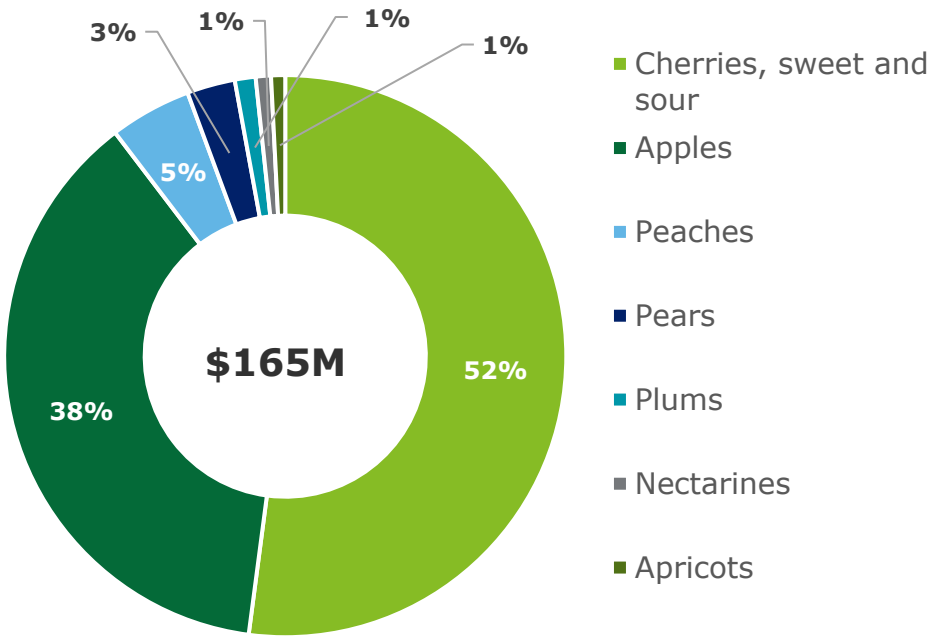
For the purposes of this study, the Tree Fruit sector is defined to include activities associated with tree fruits production,[1] including apples, pears, cherries, peaches, nectarines, apricots and plums; apple and cherry production accounts for approximately 90% of farm gate value.[2]

Figure 3. Definition of Tree Fruit Sector



Source: Deloitte analysis using Statistics Canada data and North American Industry Classification System definitions

Figure 4. Tree Fruit Sector Farm Gate Value[2] Breakdown, BC, 2019



Source: Deloitte calculations using Fruits and Vegetables Survey Data, CANSIM table 32-10-0364-01

1. Tree fruit farms operations may include activities other than production of tree fruits, for example, in addition to tree fruits farmers may grow vegetables or conduct marketing or transportation activities outside of farms. Based on the revenue data for the broader sector, Fruit and Tree Nut Farming, it is estimated that production of tree fruits represents 89% of farm operations.
2. Farm gate value refers to the "net value of a farm's production as it leaves for the market, after selling costs have been subtracted" (Statistics Canada, Fruits and Vegetables Survey).

BC's Tree Fruit Sector's Expenditures

It is estimated that in 2019 BC's Tree Fruit sector spent $143M on operations, an additional $36M on capital investments, and directly sustained 1,520 jobs.

BC's Tree Fruit sector directly sustains

1,520 Jobs[1] **including 1,170 employee jobs and 350 self-employed jobs**

With 2019 employee compensation[2] totaling

$ 46 M

the average Tree Fruit sector compensation per employee job[2] in BC is

$ 39 K

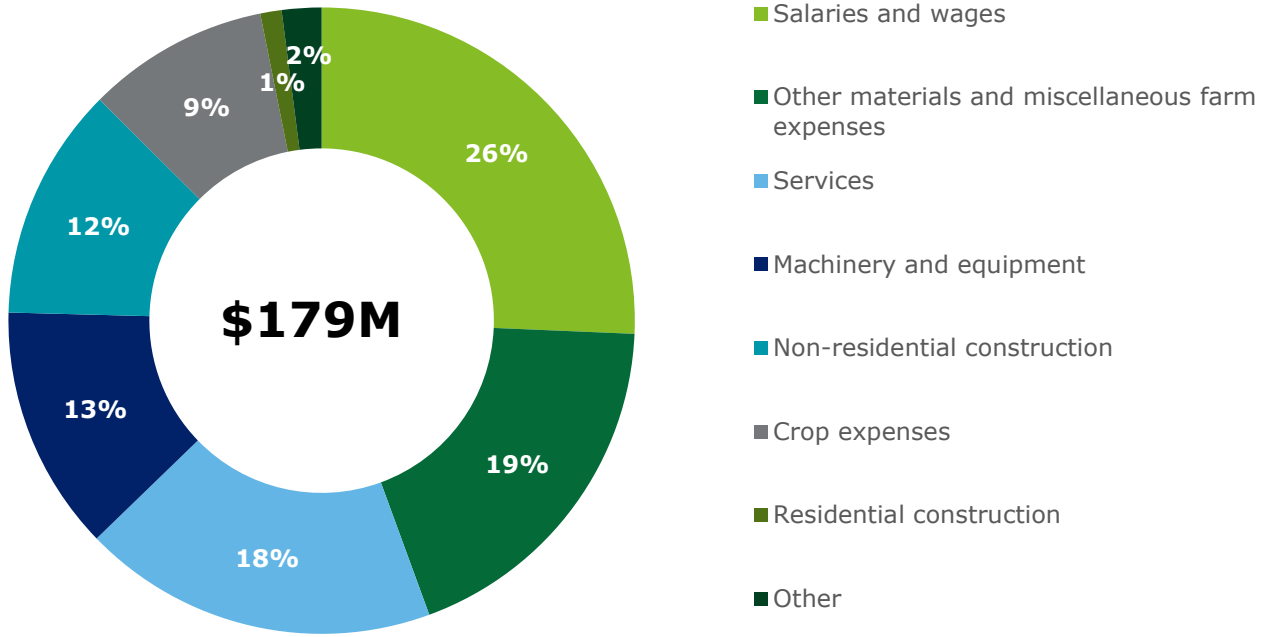
In 2019, BC's Tree Fruit sector's operating expenditures totaled

$ 143 M

In 2019, total capital expenditures totaled

$ 36 M

Figure 5. Breakdown of BC's Tree Fruit Operating and Capital Expenditures (2019)



Source: Estimates using the approach outlined in Appendix A

1. The jobs figure includes estimates of employee and self-employed jobs full-time, part-time and seasonal. Data regarding the Tree Fruit sector operating and capital expenditures as well as jobs figures were estimated using the methodology outlined in Appendix A: Tree Fruit Sector Data Estimation.
2. Compensation includes wages and salaries and employers' social contributions (e.g., employers' contributions to pension funds, employment insurance and workers' compensation programs).

Economic Contribution of the Tree Fruit Sector

Methodology of Economic Contribution Modelling

This study estimates *direct* and *indirect* economic contribution of the Tree Fruit sector in terms of value-added (GDP), labour income, employment and government revenues; *induced* economic contribution is also estimated but excluded from the totals reported.

01

Direct contribution

Directly associated with BC's Tree Fruit sector capital investments and operating expenditures. For example, employment of the Tree Fruit sector, salaries and wages paid to Tree Fruit sector employees, and income of tree fruit farmers.

02

Indirect contribution

Associated with the economic contribution of suppliers due to demand for goods and services arising from Tree Fruit sector activities. For example, economic activity stimulated in the manufacturing, transportation and financial service sectors among others.

03

Induced contribution

Associated with the spending of wages and salaries earned as a result of BC's Tree Fruit sector activities and stimulated activity of suppliers to the Tree Fruit sector. For example, purchases of household goods and services by employees of the Tree Fruit sector. This study **excludes induced contribution** from the totals reported.[1]

We measure the economic contribution in terms of:

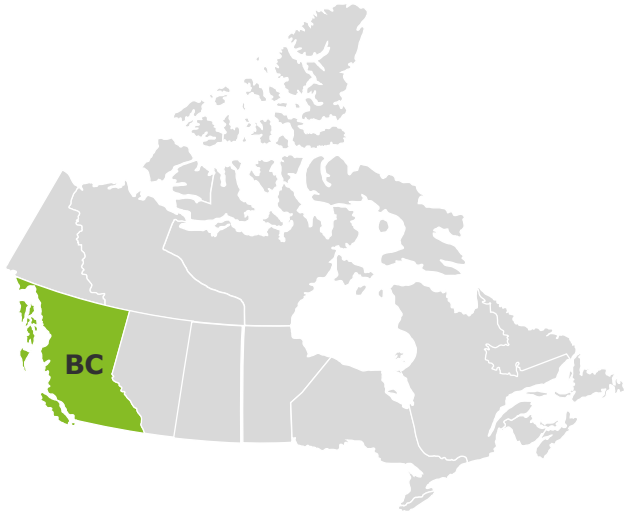
Value-added (Gross Domestic Product) is a measure of "total unduplicated value of goods and services produced in the economic territory of a country or region during a given period."[2] GDP includes household income from current productive activities (wages, salaries and unincorporated business income), profits and other income earned by corporations, as well as some types of taxes.

Labour income represents the total earnings of employees consisting of wages and salaries as well as employers' social contributions (such as employers' contributions to pension funds, employment insurance and workers' compensation programs) and labour income of self-employed individuals.

Employment is estimated in terms of employee and self-employed jobs. A job refers to work performed for pay or profit, including unpaid family work.

Government revenue refers to provincial and municipal product and production taxes such as sales taxes (HST), payroll taxes and property taxes. This report also includes corporate income taxes and personal income taxes. Federal taxes are not reported because the economic contribution is estimated for BC.

The economic contribution is estimated for BC only



1. Induced impacts tend to overestimate the total impacts of final expenditures within a one-year production cycle because of the rigid assumptions about incomes used in the derivation of induced multipliers such as fixed expenditure shares relative to incomes and fixed shares of household expenditures. As a result, this study reports induced contributions separately.
2. Statistics Canada. Glossary. https://www150.statcan.gc.ca/n1/pub/13-605-x/gloss/gloss-g-eng.htm#Grossdomesticproduct

Economic Contribution of the Tree Fruit Sector to British Columbia

In 2019, the BC Tree Fruit sector contributed (directly and indirectly) $162M to BC's GDP, sustained 2,490 jobs, and generated $19M in provincial and municipal government revenues.

In 2019, the Tree Fruit sector's operating expenditures and capital investments in BC totaled **$179M** (nominal terms).[1,2]

Accounting for the **direct and indirect** economic contribution, it is estimated that the BC Tree Fruit sector contributed **$162M** to BC's GDP[3] in 2019, of which approximately **$98M** was contribution to labour income[4] that sustained the employment of **2,490 jobs** across BC.

On a direct and indirect basis, the results indicate that:

- Approximately **$0.90** of economic activity (in terms of GDP) is added to the BC economy for every dollar spent by the Tree Fruit sector
- Approximately **14 jobs** are sustained in BC for every million dollars expended by the Tree Fruit sector.

It is also estimated that the economic activity stimulated by the Tree Fruit sector's operations and capital investments generated **$15M** in provincial taxes, and **$5M** in municipal taxes in 2019. These government revenues include taxes on products and production (for example, provincial sales taxes and property taxes), corporate income taxes, and personal income taxes.

1. All dollar figures presented on this page are expressed in terms of 2019 Canadian dollars unless stated otherwise.
2. Data regarding Tree Fruit sector operating and capital expenditures as well as jobs figures were estimated using the methodology outlined in Appendix A: Tree Fruit Sector Data Estimation.
3. It can be noted that these estimates are conservative as they exclude induced contribution, which arise from the spending of salaries and wages earned as a result of the Tree Fruit sector activities. Estimates of these impacts are provided on the next page of this document.
4. At the direct level, labour income contribution does not include labour income of self-employed individuals; their income is included in the contribution to GDP.

Figure 6. Economic Contributions of the BC Tree Fruit sector to BC, 2019

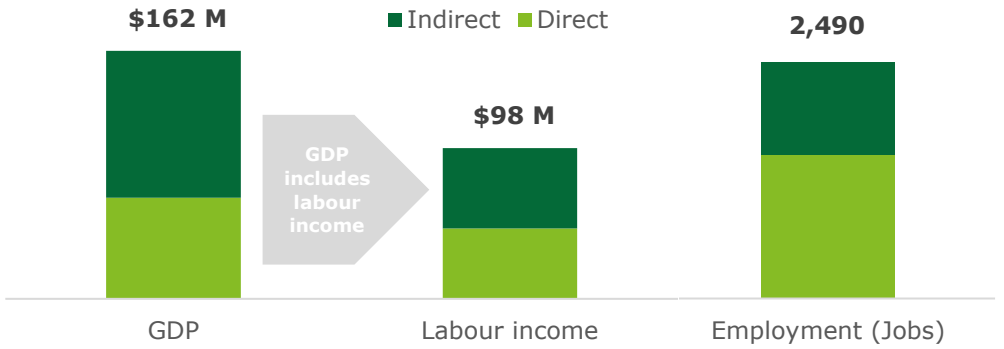
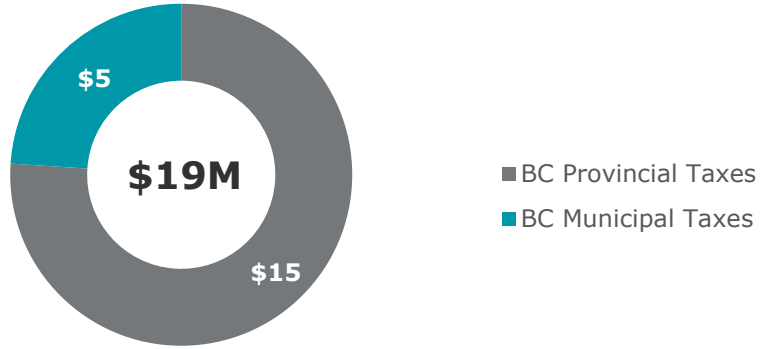


Figure 7. BC Tree Fruit Sector Contribution to Government Revenues in BC, 2019 *($M)*



Note: The exhibit above for government revenue contributions includes direct and indirect contributions in BC. Contributions to federal taxes are not estimated in this analysis. Totals may not add due to rounding.

Direct, Indirect and Induced Economic Contribution Details

A breakdown of the economic contribution of BC's Tree Fruit sector at the direct, indirect and induced levels is provided in the table below.

- To avoid overestimation of total economic contributions, induced impacts are excluded from the totals reported in the previous page. Accounting for the **direct, indirect and induced** economic contribution, it is estimated that the BC Tree Fruit sector contributed **$195M** to BC's GDP in 2019, of which approximately **$112M** was contribution to labour income[3] that sustained the employment of **2,780** jobs across BC.

Figure 8: Summary of *direct*, *indirect,* and *induced* economic contribution to BC

	Tree Fruit Sector's Estimated Expenditures and Economic Contribution in BC (2019)		
	Direct	**Indirect**	**Induced**
Expenditure[1]	**$179M**	**N/A**	**N/A**
GDP	**$66M** in GDP	**$96M** in GDP	**$34M** in GDP
Labour Income	**$46M** in labour income[3]	**$52M** in labour income	**$14M** in labour income
Employment (Jobs)	**1,520** Jobs created or sustained	**970** Jobs created or sustained	**290** Jobs created or sustained
Gov't Revenues	**$9M** in provincial and municipal taxes	**$11** in provincial and municipal taxes	**$7** in provincial and municipal taxes

1. The expenditure data includes both operating and capital investments in BC's Tree Fruit sector in 2019.
2. Data regarding Tree Fruit sector operating and capital expenditures as well as jobs figures were estimated using the methodology outlined in Appendix A: Tree Fruit Sector Data Estimation.
3. At the direct level, labour income contribution does not include labour income of self-employed individuals; their income is included in the contribution to GDP.

Employment and GDP Impacts by Industry

The Tree Fruit sector creates demand for products and services across a range of supplier industries, including crop and animal production; finance, insurance and real estate; and professional, scientific and technical services.

To understand how the economic contributions of the Tree Fruit sector ripple through the economy, this study analyzed the industry breakdown for indirect employment and GDP contributions associated with the Tree Fruit sector's activities.

Results indicate that approximately 68% of the indirect jobs and 72% of indirect GDP associated with the Tree Fruit sector are concentrated in five industries – crop and animal production; finance, insurance, and real estate; professional, scientific and technical services; manufacturing and non-residential building construction.

The remaining 32% of indirect jobs are spread across a range of other industries, such as other services, repair construction, retail trade and transportation and warehousing. Similarly, the remaining 28% of GDP creates demand in industries such as transportation and warehousing, other services, utilities, and mining, quarrying, and oil and gas extraction.

Notably, the Tree Fruit sector creates significant demand in the broader crop and animal production sector. This suggests that there are important intra-industry supply chain linkages in the crop and animal production sector.

Figure 9: Indirect Employment and GDP Impacts by Industry, 2019, BC (Percent)

Top Industries Impacted	Indirect Impacts by Industry	Employment Distribution	GDP Distribution
	Crop and animal production	22%	15%
	Finance, insurance, real estate, rental and leasing and holding companies	13%	25%
	Professional, scientific and technical services	12%	11%
	Manufacturing	11%	11%
	Non-residential building construction	10%	10%
	Other services (except public administration)	8%	5%
	Repair construction	3%	2%
	Transportation and warehousing	3%	3%
	Other industries	18%	18%
	Total	**100%**	**100%**

Additional Potential Socio-Economic Benefits

Beyond the economic contribution estimated in this report, the Tree Fruit sector could potentially be associated with a range of socio-economic benefits to BC communities; studying these benefits is not within the scope of this report but have been included as suggested further areas of research.

Economic development and diversification in rural communities: A sector that has a large concentration in rural communities can be a catalyst for the development of supply-chains and clusters of supporting industries across the region. With respect to both operating and capital investment activities, BC's Tree Fruit sector can enable the growth and maturation of local suppliers, including benefits to small and medium size enterprises (SMEs). As analyzed in this study, the Tree Fruit sector's operating and capital investment activities spur economic activity in a range of supplier industries; from manufacturing to professional services.

Investment attraction: The sector could be stimulating investment attraction to the region, including investments by both companies in the sector, as well as their suppliers (or companies further down the supply chain such as food manufacturing) that need to scale-up capacity in order to meet the demand from the sector. Stimulated investments outside of the sector could be bringing a range of economic and social benefits in their own right, above and beyond the economic benefits of the sector itself.

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Local community contributions: Companies in the sector could be making important contributions to local communities via employment opportunities, sponsorships, volunteering and contributions to government revenues, which are reinvested in local communities. Beyond financial contributions, the sector could be bringing important quality of life, health, and community engagement benefits to local communities (for example via the provision of fresh, local produce and by promoting social cohesion in the community through events such as farmers markets and festivals).

Contributions to exports: The Tree Fruit sector could be making significant contributions to BC's exports. Tree fruits account for some of the top fruit and vegetable exports from BC[1] and sector growth in the future could further support exports from the province. Furthermore, tree fruit orchards could contribute to attracting tourists to BC by providing unique settings, festivals, and fruit markets for tourists to enjoy, and further contributing to province's exports.

1. Government of British Columbia, B.C. 2021 Agrifood & Seafood Export-Ready Catalogue, 2021.

Appendix A: Tree Fruit Sector Data Estimation

Tree Fruit Sector Data Estimation Approach

The required industry data to complete the economic contribution study was available only at the Fruit and Tree Nut Farming sector level in BC (e.g., limited for the Tree Fruit sector specifically); therefore, an approach was developed to estimate the required data for the purposes of modelling the economic contributions of the Tree Fruit sector.

Estimation approaches of key Tree Fruit sector data used in modelling:

- **Output** is assumed to be the farm gate value of tree fruits (apples, pears, cherries, peaches, nectarines, apricots and plums) reported by Statistics Canada from the Fruits and Vegetables Survey (CANSIM 32-10-0364-01). This reflects the definition of the sector in terms of the activities associated with tree fruits production as opposed to farm operations. The latter may include activities associated with products other than tree fruits (e.g., vegetables) or marketing and transportation activities outside of the farm.
- **Gross operating surplus** is estimated based on the margin in terms of percent calculated using farm operating revenues and expenses data for Fruit and Tree Nut Farming sector (CANSIM 32-10-0136-01). It is applied then to the output of the Tree Fruit sector to estimate gross operating surplus of the sector in dollar value terms.
- **Jobs** are estimated based on the direct jobs multiplier for the Crop Production (except Cannabis, Greenhouse, Nursery and Floriculture Production) industry (CANSIM 36-10-0595-01) that is applied to the estimate of Tree Fruit sector output.[1] Jobs estimate is further broken down into employed and self-employed jobs based on the proportions calculated for Crop Production industry (CANSIM 36-10-0489-01), 77% and 23% respectively.
- **Operating expenditures** are estimated as the difference between sector output, on the one hand, and gross operating surplus and taxes, on the other hand. Operating expenditures are further broken down into individual expenditure categories based on the expenditure profile of the Fruit and Tree Nut Farming sector shown in Figure A1 (the breakdown used in the model included more granular categories than shown in the figure). The expenditure profile is calculated using CANSIM 32-10-0136-01.
- **Labour income** is estimated as "salaries and wages, including benefits related to employee salaries" as part of the operating expenditures estimation. As such it does not include labour income of self-employed individuals. The latter is part of the gross operating surplus and therefore it is included in the estimate of GDP.
- **Capital expenditures** are estimated based on capital investments data for fruit and tree nut farms provided by Statistics Canada from the Farm Financial Survey as a custom request. Capital investments for fruit and tree nut farms are broken down by individual investment category based on the investment expenditure profile of all farms in the province (with gross farm revenue equal to or greater than $25,000) shown in Figure A2. The expenditure profile is calculated using CANSIM 32-10-0104-01. Further, expenditures in each investment category of fruit and tree nut farms are scaled down to Tree Fruit sector. The scaling factor is estimated at 30% as Tree Fruit farm gate value (CANSIM 32-10-0364-01) divided by the total operating revenue of Fruit and Tree Nut Farming sector (CANSIM 32-10-0136-01).

[1] This approach assumes similar labour productivity levels between the broader Crop Production sector and the Tree Fruit sector. Developing a productivity-adjusted scaling factor was considered to refine this estimate, however productivity-related data for the Tree Fruit sector are limited and inconsistent between sectors which limited the reliability of estimations.

Figure A1. Operating Expenditures Profile of Fruit and Tree Nut Sector Farming, BC, 2019

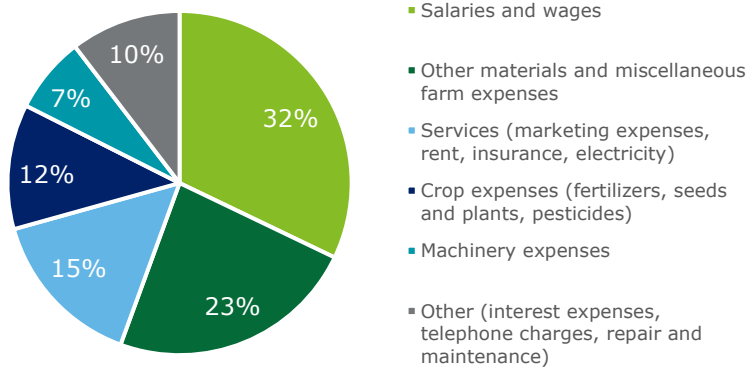
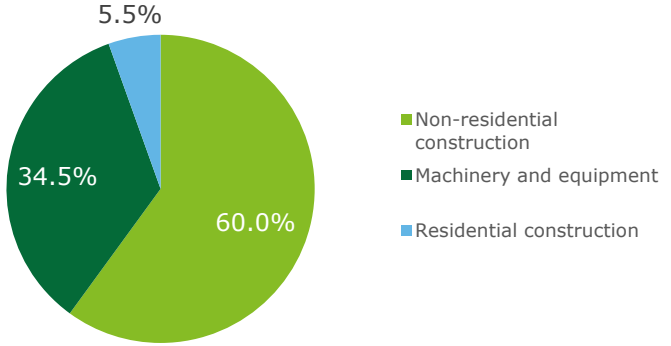


Figure A2. Capital Investments Profile of Farms, BC, 2019



Note: Some expenditures (e.g. livestock expenses) are excluded from the expenditure profiles shown in the figures above as they are not relevant to Tree Fruit sector.
Source: Deloitte calculations using the Agriculture Taxation Data Program and Farm Financial Survey.

Appendix B: Economic Contribution Assumptions and Limitations

Economic Model Assumptions and Limitations

Introduction to Input-Output Modelling

Input-output models (I-O models) are used to simulate the economic impact of an expenditure on a given basket of goods and services or economic impact of output of an industry. Input-output analysis uses data on the flow of goods and services among various sectors of the economy, and attempts to model how an expenditure, increase in demand, or investment ripples through region's economy. This is done by mapping the production of goods and services by each industry, and identifying the intermediate inputs used in the production of each final good or service used by consumers, sold as an export, or purchased by government. The model can then aggregate all of the employment and value-added impacts generated in the supply chain as commodities are produced. I-O models also consider the role of imports, which tie the supply chain to the global economy. This data is combined into a single model of the economy which can be solved to determine how much additional production is generated by a change in the demand for one or more commodities or by a change in the output of an industry.

Assumptions and Limitations of the Input-Output Model

The Input-Output model is subject to a number of general assumptions and limitations. The model reflects a simplified macroeconomic structure, and does not include some variables of interest for macroeconomic analysis such as interest rates or unemployment rates. The model assumes that the Canadian economy has the capacity to produce the goods and services stimulated by the economic shock. The model is not able to forecast situations in which demand may outpace the capacity to produce the required goods and services, however it does estimate the portion of goods and services sourced from other provinces in Canada and internationally. The model makes a basic underlying assumption that the number of jobs created maintains a linear relationship with short-term gross output and that technologies are fixed. The model also assumes that prices of products do not change in response to higher demand.

Statistics Canada also makes an important note on induced economic contribution: not taking into account induced economic effects underestimates economic contribution because household spending is absent from the model; including induced effects, however, tends to overestimate economic contribution because of the rigid assumptions about incomes (such as fixed expenditure shares relative to incomes). Therefore, generally, economic contribution based on direct and indirect effects alone and based on direct, indirect and induced effects are considered as upper and lower bounds of economic contribution estimates.[1] This study reports induced contribution separately (outside the total contribution reported).

1. Statistics Canada. Industry Accounts Division. Provincial Input-Output Multipliers, 2014. Catalogue no. 15F0046XDB.

Deloitte.