THE ECONOMIC IMPORTANCE OF ONTARIO’S CORN SECTOR

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Executive Summary

This study was undertaken in an attempt to quantify the importance of corn to the Ontario economy. Much of the Canadian population is becoming increasingly removed from production agriculture and less aware of the issues facing the industry. One of the main challenges facing Ontario corn producers is low corn prices due in part to government support in foreign countries, such as the U.S. Increasing the awareness of the impact that corn has on the economy in Ontario may be critical for encouraging government support for the corn sector.

This study employed the use of an input-output (I-O) model developed by Statistics Canada to estimate the number of jobs and dollars generated directly and indirectly by the corn sector. Multipliers were derived through this model, and were used to determine the magnitude of the impact of Ontario’s corn sector on the entire economy. As well, multipliers determined in previous agricultural economic impact studies in the U.S. and Ontario were used for comparison and for estimating induced impact multipliers, which the I-O model was unable to derive.

Some of the highlights of the study are provided below.

1. **The Ontario Corn Sector**

   Ontario corn production has remained relatively constant over the past 10 years but demand for corn has increased and now exceeds supply. Ontario imports corn from the U.S. in order to meet this demand. Feed use has been steadily increasing and industrial use is expected to increase in the future with new ethanol plants coming into production over the next two years.

   The Ontario corn price has experienced considerable variability over time. This is largely attributed to the effect of exchange rate, supply and demand. The Ontario price is based on the price of corn in the U.S., adjusted by a local basis. The U.S. price has been depressed due to the over-production that has been encouraged through price support programs in the U.S. The availability of lower-priced corn in the U.S. has made it more attractive to import corn into Ontario, and has negatively affected prices and profitability for corn producers in Ontario.

2. **Previous Economic Impact Studies**

   Economic impact studies have been conducted in a number of areas in the U.S. to show the impact that agriculture has on a particular county, region or state. This impact is reflected in the number of jobs that are supported by agriculture as well as the sales generated in the economy as a result of the agriculture industry.

   The results of these studies found impact multipliers for direct agricultural sales ranging from 1.59 in Wisconsin to 3.97 in California. This means that in Wisconsin every $1 of sales from agriculture generates another $0.59 in the
The Economic Importance of Ontario’s Corn Sector

economy. In California, each $1 of sales from agriculture will create an additional
$2.97 of sales in the economy. With respect to employment, the multipliers
ranged from 1.27 in Wisconsin to 1.83 in Arkansas. This means that in Wisconsin
for every 1 job in agriculture there are 0.27 jobs supported in the economy and in
Arkansas every agriculture job supports 0.83 jobs.

Several economic impact studies have also been undertaken to determine the
impact of agriculture in specific counties and regions across Ontario. The impacts
in nine of these studies are summarized in this report. The results indicate an
average multiplier of 2.74 for output, which implies that for every $1 of
agricultural sales an additional $1.74 of sales is created elsewhere in the economy.
In terms of employment, an average multiplier of 2.76 was reported from these
studies, indicating that each job in agriculture supports an additional 1.76 jobs in
the economy.

These studies were also used to derive an induced impact multiplier, since the
multipliers derived from the input-output model only accounted for the direct and
indirect impacts. Based on results from these studies, the induced impact
multiplier for GDP was estimated to be 0.41, while the multiplier for employment
was estimated to be 1.02. These multipliers could be added to the direct and
indirect multipliers generated by the model to determine the total impact
multipliers for GDP and employment for the corn sector.

3. Results of the Input-Output Model

A shock was imposed on corn production in the input-output model for the
purposes of determining the impact of the corn sector on the economy. The results
of the model indicated the impacts on GDP, employment and output. While the
results for each of these factors are discussed in this report, more emphasis should
be placed on the impacts on employment and on GDP, which is more of a
measure of the strength of the economy than is output. The majority of these
impacts affect Ontario; however, impacts are also distributed across Canada,
particularly in Quebec and Alberta.

The results of the I-O model indicated that the corn sector had a direct impact on
GDP of $314.2 million. A multiplier of 1.77 was generated by the model, with
direct and indirect impacts of the corn sector on GDP amounting to $556.3
million. Based on the estimated induced impact multiplier for GDP of 0.41, the
induced impact was calculated to be $128.8 million. Adding this figure to the
direct and indirect impacts resulted in a total impact on GDP of $685.1 million.

The I-O model reported a direct impact of the corn sector on employment of 6,131
jobs. An employment multiplier of 1.53 was estimated for the corn sector, based
on direct and indirect impacts on employment totaling 9,409 jobs. When the
estimated induced impacts are added to the impacts generated by the model, the
total impact on employment amounted to 15,663 jobs.
4. Other Methods of Estimating Impacts

This study incorporated two alternative methods for quantifying the economic impact of Ontario’s corn sector, in addition to using the I-O model. Due to some limitations of the I-O model, adjustments were made to the levels of direct impacts on GDP, employment and output to more accurately reflect the actual levels of these direct impacts. The levels of GDP and output in the model are derived from farm cash receipts, which do not account for inventory changes or on-farm feeding of corn. OMAFRA’s production estimates for 2001 provide a more accurate measure of total corn production. Another limitation of the I-O model was that the direct employment impact only accounted for farm employees and did not include farm operators. The number of farm operators that could be attributed to the corn sector was estimated and added to the direct impact reported by the model. The adjusted figures for direct GDP, output and employment were used for an alternative method of estimating the impacts of the corn sector. This method involved applying the multipliers derived in the I-O model to the adjusted direct impacts. This resulted in higher estimates of impacts, with total impacts of the corn sector on GDP amounting to $858.3 million, and the impacts on employment totaling 26,474 jobs.

The final method used for estimating the economic impacts of the corn sector involved applying impact multipliers from previous studies to the adjusted direct impacts. In general, the multipliers estimated in previous studies were larger than those generated by the I-O model. As a result, this method produced the largest estimates of the impacts of the corn sector. The impact on GDP was estimated to be $1.24 billion, while the impact on employment was estimated at 28,654 jobs.

5. Summary of Economic Impacts of the Corn Sector

The following three tables summarize the economic impacts of Ontario’s corn sector on GDP, employment and output, based on the results of the three methods utilized for estimating these impacts. Table 1 outlines the impacts from Method 1, which included the results of the I-O model, plus the estimated induced impacts. Table 2 displays the results from Method 2, which involved applying the multipliers from the I-O model to direct impacts that were adjusted to account for limitations of the model. In Table 3, the results from Method 3 are given, where multipliers from previous studies were applied to the adjusted direct impacts.

| Table 1: Impacts of Ontario’s Corn Sector – Method 1 |
|-------------------------------|-----------|-----------|-----------|-----------|
|                               | Direct    | Indirect  | Induced   | Total     |
| GDP ($ millions)              | $314.2    | $242.1    | $128.8    | $685.1    |
| Output ($ millions)           | $616.8    | $506.8    | $283.7    | $1,407.3  |
| Employment (jobs)             | 6,131     | 3,278     | 6,254     | 15,663    |
Method 1 produced the lowest estimates of the impacts of the corn sector; however, this estimate may be too conservative due to some limitations of the I-O model. The estimates from Method 2 may be a better representation of the impacts of the corn sector, as some adjustments were made to account for these limitations. Method 3 generated the highest levels of impacts, as the multipliers estimated in previous economic impact studies on agriculture were generally greater than those estimated through the I-O model. Assuming that the impact multipliers for the corn sector are not significantly different from multipliers for the agriculture industry as a whole, these results may also provide a reliable estimate of the impacts that the corn sector has on the economy.

It is evident from these results that the economic impacts of the corn sector extend well beyond the farm gate. There are many industries that are indirectly affected by the corn sector, and these effects are further extended when the induced impacts are taken into consideration. This indicates that the low prices that are affecting corn producers also have significant negative impacts on the economy as a whole. Taking actions to ensure the profitability of the corn sector will provide benefits throughout the economy. Based on the results of Method 2 and Method 3, which provide the best representations of the extent of the impacts, these benefits to the economy are estimated to be approximately $1 billion in GDP and about 27,500 jobs.
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1.0 Introduction

Agriculture in Ontario has experienced significant change over the years from a time of many small farms growing a diverse mix of livestock and crops to the current system of fewer, larger and more specialized farms. With the number of farms continually decreasing, the percentage of the population that is directly involved in primary agriculture is also on the decline. This trend may give the impression that the importance of agriculture is fading over time, and is no longer one of the main drivers of the economy. With increasing migration to urban centres, and with the urban population becoming further removed from agriculture, public attention has been deflected away from agriculture and its challenges.

One of the main challenges to the agriculture industry in recent years has been extremely low commodity prices. These prices have been depressed in part through market-distorting subsidies in other countries, such as the U.S., which have encouraged over-production. This has particularly affected the corn sector, which plays a major role in Ontario’s agriculture industry. Price supports for corn in the U.S. have had a negative impact on the prices received by corn producers in Ontario, and ultimately on the profitability of this sector. These producers have appealed for government support to level the playing field between Canadian and U.S. corn producers. However, this support may not be granted if the perception holds that corn production has little effect on the economy.

As such, quantifying the importance of corn to the economy of Ontario may be critical for changing current perceptions. It would be beneficial to gain an understanding as to the extent of the impact that corn production has across the province. This impact extends well beyond primary production. Corn producers and other industry stakeholders also play an important role in many Ontario communities through employing local people and purchasing goods and services locally.

This report will focus on determining the amount of money generated and the number of jobs created or maintained by the corn sector. An input-output model will be used to estimate the impacts of the corn sector on gross domestic product (GDP), employment and output, and to derive multipliers that reflect the magnitude of these impacts. Economic impact studies for agriculture previously undertaken in numerous regions in Ontario will be used to provide additional insight for this project. Economic impact analyses from various locations in the U.S. will also be used for comparison purposes.

The economic effects of the corn sector are normally strongest in the rural areas where production actually occurs; however, the benefits of the industry are also felt across the entire provincial economy. Agricultural production directly or indirectly supports businesses in both rural and urban areas.
1.1 The Problem

The problem which this study addresses stems primarily from two issues. The first issue of note is the population shift that has occurred from rural to urban areas and the resulting decline in awareness and knowledge regarding agricultural production and its challenges. This has given rise to the perception that agriculture is no longer important to the functioning of the economy. The second issue relates to subsidies in foreign countries that have distorted market prices, and the resulting impact on the profitability of corn producers.

Most of the Canadian population is well removed from agriculture. In 2001, only about 2.4% of Canada’s population lived on farms. In Ontario, Census statistics showed that only 1.6% of Ontario’s population lived on farms in 2001. As the urban population has grown due to increased immigration and the migration of rural people to urban centres, the percentage of the population living on farms has decreased.

The decreasing farm population is attributed in part to the trend toward consolidation and concentration. The total number of farms in Canada and Ontario has been declining but the average size of the farms has been increasing. This is shown in Table 1.1. Between 1971 and 2001 the number of farms decreased by about one-third in Canada and by 37% in Ontario.

Table 1.1: Number and Size of Farms, Canada & Ontario

<table>
<thead>
<tr>
<th></th>
<th>Canada</th>
<th></th>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
<td>Number of Farms</td>
<td>366,110</td>
<td>318,361</td>
<td>280,043</td>
<td>246,923</td>
</tr>
<tr>
<td>Average Acres/farm</td>
<td>463</td>
<td>511</td>
<td>598</td>
<td>676</td>
</tr>
<tr>
<td>Ontario</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Farms</td>
<td>94,722</td>
<td>82,448</td>
<td>68,633</td>
<td>59,728</td>
</tr>
<tr>
<td>Average Acres/farm</td>
<td>169</td>
<td>181</td>
<td>196</td>
<td>226</td>
</tr>
</tbody>
</table>

Source: Statistics Canada, Census

Consolidation in agriculture has occurred for several reasons. Many rural people are seeking higher-paying wages in urban areas. Advances in technology have enabled farmers to expand their operations without requiring additional labour. Depressed commodity prices have reduced margins, requiring farmers to increase the size of their farms in order to be profitable. These factors have all contributed to the decreasing rural population, which in turn has led to a decreasing awareness of agriculture, its challenges, and its effects on the economy.

Price supports in the U.S. for commodities such as corn have had a negative impact on producers in Canada, and in particular on grains and oilseed producers. For example, counter-cyclical payments under the 2002 U.S. Farm Bill guarantee corn producers a price per bushel of $2.63 (U.S.), or $3.09 (Cdn)\(^1\), for 85% of

\(^1\) Price in Canadian dollars is based on an exchange rate of $1 Cdn = $0.85 U.S.
their historical average acreage based on their historical average yields. In addition, U.S. corn producers may further benefit from a direct payment of $0.28 (U.S.) per bushel\(^2\). These price supports have encouraged increased production, which has negatively impacted prices for corn in Canada. The increased production has reduced the market price, and has led to increased imports in Ontario of cheap U.S. corn. Since the price received by corn producers in Ontario is based on the U.S. price, the U.S. price supports have depressed the prices in Ontario. By not receiving similar support from the government, it has become difficult for corn producers, as well as other grains and oilseeds producers, to remain profitable.

This reduced profitability does not only affect the grains and oilseeds producers. The effects are felt up and down the chain by businesses that sell inputs to or buy commodities from these producers. In general, the business conditions that exist for primary agricultural producers – whether negative or positive – economically impact other businesses in the Ontario economy.

As stated previously, the rural farm population is decreasing while the rest of the population becomes increasingly removed from production agriculture. Fewer people understand or have basic knowledge of how crops are produced or how livestock is raised. They also do not realize the impact agriculture has on the entire Ontario economy. To bridge this information gap, a measure of this impact must be determined. This can be done by quantifying the number of jobs that are affected by agriculture production, not only from the standpoint of input suppliers and producers, but also further along the value chain through transportation companies, processors, distributors and retailers. As well, the amount of business activity in terms of total dollars generated by each of the stakeholders mentioned above will provide a measure of the value of agriculture in the economy of Ontario. This study will focus primarily on quantifying the impact of Ontario’s corn sector on the economy.

### 1.2 Study Objectives

Specifically, the objectives of this study were to:

i) Provide an overview of the corn sector in Ontario.

ii) Model the direct and indirect impacts of corn on the Ontario economy.

iii) Estimate the induced impacts that the corn sector has on the economy.

iv) Quantify the total impact that the corn sector has on the economy, in terms of dollars and jobs.

\(^2\) Producers always receive the direct payment of $0.28 per bushel, however, if the market price is low, this payment is included in the target price of $2.63
1.3 Methodology

The methodology for this study involves the use of an input-output (I-O) model developed by Statistics Canada. This model is one of the most complete and detailed accounting frameworks of the Canadian economy available, representing the linkages that exist between various sectors within the economy. At the most detailed level, the framework consists of 309 industries and 727 commodities. This framework can be utilized to determine the amount of goods and services required to attain a specific production level, and how these commodities are exchanged among the various industries in the economy. In the case of a shortfall in domestic production of goods and services required for meeting the specified production level, some goods and services may be imported to ensure a balance between supply and demand.

The input-output model can be used to qualify a number of economic issues. Examples include evaluating the impact of an investment in a particular industry on the economy, analyzing the effects of changes in the supply or demand of goods and services, and determining the relative importance of a particular industry in the overall economy. This study involved implementing supply shocks to the model for the purpose of measuring the importance of the corn sector in the economy of Ontario.

Implementing a supply shock to the input-output model permits an evaluation of the direct and indirect impacts that the industry in question has on the economy. The direct impacts include the changes in output and production factors for the industry as well as the changes in demand for inputs. Since production requires specific materials, equipment, and services, the industries that provide these goods and services will be directly affected by changes in the production level. The change in production will also have direct impacts on industries that use this production as inputs for other goods and services. The effects of the original change in production extend further along the chain, as the effects on industries directly impacted by the change in production will in turn affect the industries from which the input suppliers purchase goods and services. These effects are referred to as the indirect effects.

Both the direct and indirect effects may occur in the form of imports. There are a number of industries in Canada that rely on imported inputs to achieve a certain level of production. Thus, changes in production levels can have direct impacts on levels of imports. These imports represent leakages outside the economy of Canada, and can reduce the magnitude of the direct and indirect impacts of the change in production. This must be taken into consideration for this project, as imports play a significant role in Ontario’s corn sector.

The accounting framework used for the I-O model differentiates between an industry’s gross production and its net production, also referred to as value-added production. Gross production is the sum of the gross outputs of all the industries
involved in the production process. However, gross production is not used as a measure of the total output an industry contributes to the economy, as this measure may account for this production several times, for each of the industries involved along the steps of the production process. For this reason, the contribution of an industry to the economy is measured through its net production, which is derived by subtracting the value of inputs purchased from the total sales value. This net production, also referred to as GDP, is a measure of the value added to the economy by an industry, and is equal to the sum of earned income, which includes salaries, and earnings on capital, which includes profits, interest, and rent. The sum of the value-added from various industries that is generated from a supply shock represents a measure of the industry’s importance to the economy.

The results of the input-output model indicate the impact on output for each industry and each commodity arising from the supply shock. These results are a combination of direct and indirect impacts. The sum of these impacts can provide some measure of the economic importance of the industry. The results also indicate the impact on employment for each industry. This provides a measure of the direct and indirect employment generated by a particular industry.

The production function for each industry links net production to employment. Based on these functions, the amount of employment required to achieve a specific production level can be determined for industries that are directly and indirectly involved in this production. This allows for the evaluation of the impact that a variation in output has on direct and indirect employment levels. In addition, the model allows for the determination of the income associated with these employment levels.

Input-output modeling generates impacts on sales and employment, which can be used to derive impact multipliers. A multiplier is calculated by dividing the total impacts by the direct impacts. It indicates the level of change in the overall economy due to a unit change in the direct effects. Changes in direct effects can be measured through a number of methods, such as output, GDP, or jobs. For example, an output multiplier of 2.5 implies that for every dollar of sales created by a particular industry, another $1.50 in sales are created in other parts of the economy. Thus, a total of $2.50 in sales is generated for the entire economy.

1.3.1 Assumptions of the Input-Output Model

As with any model of this size and scope, a number of assumptions must be made for the purpose of simplification. In this model, technology is assumed to be stable, and variations in output do not have an impact on the productivity or efficiency of the production process. Consequently, for an increase in production, the per-unit level of inputs remains constant, and input requirements for the increased production are adjusted accordingly. It is also assumed that existing
capital in each industry is sufficient to meet a change in demand. Since capital is fixed in the short-run, labour will change in response to variations in output.

1.3.2 Limitations of the Input-Output Model

The I-O model is more of an accounting model than an economic model. General equilibrium economic models will include money supply, relative prices, and inflation, all of which are not included in this model. Without relative prices, there can be no economic response to a shock that has an impact on scarce or limited resources. The model is not dynamic, and thus does not indicate changes and adjustments that would occur as the economy moves toward a new equilibrium. The model simply indicates the results of the new equilibrium, but does not indicate how it arrived at these results.

Prices in this model cannot be shocked, so shocks must be made on production. To implement shocks, the production level is converted into revenue, based on a price for a particular point in time that is assumed to remain constant.

Another limitation of the I-O model is that it represents a snapshot of the economy at a specific point in time. In this case, the effects of agricultural production are determined based on the year 2001. For an industry that has significant variability in output and other economic factors, the production year that is incorporated into the model may not be representative of average or expected production and income levels. For example, corn production, in terms of total revenue, was significantly lower in 2001 than in 2002. Thus, the estimated impacts could vary considerably from year to year, depending on the set of conditions that exist for the period of time which the model represents.

Previously, this section discussed the factors involved in the direct and indirect impacts. There is a third level of impacts to consider, the induced impacts. Induced impacts include consumer expenditures on goods and services by employees of businesses that are directly or indirectly related to the industry in question. Thus, induced impacts would include expenditures by these employees on goods and services such as groceries, clothing, and travel. While direct and indirect impacts focus on dollars or jobs created by a specific industry, consideration must also be given to household expenditures that are made possible through the creation of these jobs.

Thus, total economic impacts are comprised of direct, indirect, and induced impacts. The I-O model solves for the direct and indirect impacts, but does not have the capabilities to determine the induced impacts. This presents another limitation of the model. Instead, the induced impacts will be estimated based on the results of previous economic impact studies. These induced impacts can be added to the direct and indirect impacts determined by the model to derive an aggregate measure of the impact of the corn sector on the economy.
1.3.3 The Use of Previous Economic Impact Studies

As stated previously, the methodology for this study uses results from previous input-output analyses and economic impact studies on agriculture in other regions to provide a benchmark for comparison and for estimation purposes. The results of these studies will be used in part for estimating the induced impacts of Ontario’s corn sector. Since the I-O model is unable to measure these impacts, an estimate will be derived based on induced impact multipliers from previous studies. While no previous study was related specifically to corn, it is assumed that the economic impact multipliers for corn would not differ significantly from the multipliers for agriculture that were derived in these studies. Thus, these multipliers may provide a relatively reliable representation of the induced impacts of the corn sector. These induced impacts can then be added to the direct and indirect impacts, as determined by the model, to derive a measure of the aggregate impacts of Ontario’s corn sector on the economy.

In addition to using the multipliers from previous studies to estimate the induced impacts, these multipliers will also be applied to Ontario’s corn sector to estimate the aggregate (direct, indirect, and induced) impacts, providing an alternative method for estimating the economic impacts of this sector. These estimates will then be compared with the results of the I-O model.
2.0 Background on the Corn Sector

2.1 Overview of Corn Production

Corn production has been occurring in Ontario for centuries. Although originally used as food for man and livestock, the uses for corn have grown significantly. Feeding corn to livestock is still a primary use, accounting for 60% of total production in Ontario. However, the ability to further process corn and separate the starch, oil and protein has enabled corn to be used in many products. The production of ethanol has been receiving a lot of attention recently as Ontario seeks a way to reduce greenhouse gas emissions. By January 2007, gasoline sold in Ontario will be required to contain 5% ethanol. Ethanol is viewed as an environmentally friendly fuel that uses renewable resources, such as corn, as the feedstock.

Corn is also used in the production of sweeteners that are commonly found in carbonated drinks and candy. Corn is often associated with products such as corn chips, corn meal, corn oil and breakfast cereals such as Corn Flakes. As well, corn is used in a variety of other products such as wallpaper, toothpaste, carpets, soaps, insulation, crayons, and dyes.

Corn acreage in Canada has increased considerably over time. This is due in part to improved technologies that have allowed for corn to be grown in areas of Canada that could not previously grow corn because of short growing seasons. As well, there is more livestock being raised, which increases the need for corn as feed. Total grain corn acreage in Canada in 2001 was more than double what was grown in 1971, though the number of farms growing corn remained fairly constant. Census statistics on corn acreage and the number of farms growing corn are given in Table 2.1.

In Ontario, corn acreage increased rapidly until the early 1980’s. Since this time, acreage has remained relatively constant, and has even declined slightly in recent years as soybean acreage increased. The number of farms on which corn is grown has decreased, while the average corn acreage per farm has doubled since 1971.

<table>
<thead>
<tr>
<th>Table 2.1: Census Statistics on Corn Farms in Canada &amp; Ontario</th>
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<tbody>
<tr>
<td>Total Acres Corn for Grain</td>
</tr>
<tr>
<td># Farms -Corn for Grain</td>
</tr>
<tr>
<td>Average Acres/farm</td>
</tr>
<tr>
<td><strong>Ontario</strong></td>
</tr>
<tr>
<td>Total Acres Corn for Grain</td>
</tr>
<tr>
<td># Farms -Corn for Grain</td>
</tr>
<tr>
<td>Average Acres/farm</td>
</tr>
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Source: Statistics Canada, Census
2.2 Ontario Corn Supply and Demand

Ontario’s harvested corn acreage has been around 1.7 to 1.8 million acres during the last 20 years. Production has varied considerably, often due to the influences of weather, but is generally around 200 million bushels (see Figure 2.1). Advances in technology have resulted in improved corn varieties that are better able to withstand disease and weather related conditions.

Figure 2.1: Ontario Corn Acreage Harvest and Production History

Figure 2.2 shows Ontario supply and demand since 1995. While production has remained relatively constant, demand for corn for feed and industrial uses have increased steadily during this time and surpassed production levels in the province. As a result, Ontario is currently a net importer of corn. Feed and industrial use has increased and is likely to continue increasing. Ontario is feeding more livestock than 10 years ago and industrial use is expected to further increase with the announcements of 5 new ethanol plants already under construction or planning to be built in Ontario within the next two years.

Much of the increase in industrial use during the late 1990’s was due to the Commercial Alcohols Inc. ethanol plant beginning operation in Chatham. Unless Ontario corn production increases significantly in the future, imports of U.S. corn will continue to increase. However, under the current market conditions of low prices and availability of relatively cheap U.S. corn imports, it is unlikely that Ontario production will increase.
2.3 Ontario Corn Prices

Ontario grain corn producers either grow corn to feed to livestock or to sell, often to local elevators. Producers may also sell to feed mills or industrial end users such as Commercial Alcohols Inc. or CASCO, which produces high fructose corn syrup, starch and glucose. Grain elevators typically supply much of the corn for the large industrial users due to the amount of corn they require.

As corn production in the U.S. is 45 to 50 times greater than in Ontario\(^3\), the Ontario corn price is based on the U.S. price. The corn price in Ontario is determined by taking the futures market price in Chicago and adding a local ‘basis’. The basis value takes into consideration transportation, exchange rate, supply and demand, brokerage fees, place and timing of delivery and storage and carrying costs.

Ontario corn prices from 1981 to 2004, adjusted by the CPI, are displayed in Figure 2.3. It is evident from this chart that the real price of corn has been trending downward over time. There is also considerable year-to-year variability. Much of this variability is attributed to exchange rate, supply and demand. Exchange rate is an important element, and is a major factor that impacts the local basis levels in Ontario. When the Canadian dollar is strong relative to the U.S. dollar (i.e. $C1.19 = $US1.00) Ontario corn prices are lower than if the Canadian

---

\(^3\) Based on production statistics from 2001 to 2004 as reported by Statistics Canada and the United States Department of Agriculture.
Figure 2.3: Real Ontario Corn Prices ($/bu)

Source: Ontario Ministry of Agriculture, Food and Rural Affairs; Statistics Canada

Figure 2.4: Ontario versus U.S. Corn Prices

Source: OMAFRA website, Statistics Canada, USDA, ERS, NASS
dollar is weak (i.e. $C1.50 = $US1.00), due to differences in the basis levels. Because the U.S. dollar has historically been stronger than the Canadian dollar, prices in Ontario have been higher than in the U.S. This is shown in Figure 2.4.

Supply and demand conditions in Ontario are also reflected in the basis. The basis will increase when demand increases. If local supply of corn is tight or if there is strong demand, the basis may increase. The basis will decrease if local supply is greater than demand or when transportation charges increase.

2.4 Gross Domestic Product

Gross domestic product (GDP) is a measurement of the value of final goods or services, such that these are consumed by an end user and not used in the further production of other goods. GDP takes into account consumption and investment as well as net exports (i.e. exports less imports).

Statistics Canada breaks down GDP by industry of origin, and indicates the allocation of GDP among sectors within these industries. These allocations can be used to display the relative importance of specific industries. Figure 2.5 shows the GDP for manufacturing industries in Ontario in 2004. Out of the total GDP for manufacturing of $91 billion, the food, beverage and tobacco sector, which includes products manufactured using corn, was reported as generating 11% of this GDP ($10 billion).

Figure 2.5: GDP for Manufacturing Industries, Ontario, 2004

Figure 2.6 shows the breakdown for the $131.3 billion in GDP created by the goods-producing industries in Ontario for 2004. There are two main categories that include GDP activity generated in part by the corn sector – agriculture and food, beverage and tobacco manufacturing. Together, these two industries represent 10.2% or $13.4 billion of the GDP for the goods-producing sector.

**Figure 2.6: GDP for Goods Producing Industries, Ontario, 2004**

3.0 Literature Review

A literature review was undertaken in order to provide perspective and comparison of the economic impact of the agri-food industry in various regions. These regions included areas in the U.S. as well as individual counties within Ontario.

3.1 Economic Impact Studies for Agriculture in the United States

Many economic impact studies that have been carried out in the U.S. have used the IMPLAN (Impact analysis for Planning) system for the analysis. IMPLAN was first developed in the 1980’s by the U.S. Forest Service, and is now maintained by MIG Inc. of Stillwater, Minnesota. IMPLAN creates input-output models by using county level databases. A number of economic impact studies for agriculture have made use of IMPLAN. The following is a discussion of results from selected studies in various regions of the U.S.

3.1.1 Wisconsin

In March 2004 a paper entitled “Wisconsin and the Agricultural Economy” was released\(^4\). The IMPLAN system was used for the analysis in this study. Information was included for the following: production agriculture, such as dairy, crop and specialty farming; agricultural processing, which includes cheese production, poultry processing, bakeries and breweries; and horticulture, including greenhouses, nurseries and landscaping businesses. The resulting economic impacts of agriculture in Wisconsin are displayed in Table 3.1.

The direct impacts of all agriculture in the economy reflect the sales from these three sectors (i.e. production agriculture, agricultural processing, and horticulture). The indirect impacts reflect the business-to-business transactions that occur as agri-businesses buy from and sell to each other. The induced impacts are the result of wages being spent by employees employed in agriculture and related agri-businesses. The industry output data shows that the multiplier effect for production agriculture is 1.59. This means that for every $1 of extra sales in agriculture, $0.59 in sales will be generated in other areas of the local economy.

With respect to employment, the multiplier effect from production agriculture is 1.27. Every new job created in agriculture results in 0.27 new jobs being created in the Wisconsin economy. The multiplier for all agriculture is 2.29.

The category “Total Income” shown in Table 3.1 is the “Gross State Product” or the total income for Wisconsin derived from all of agriculture. The economic multiplier for total income (a measure of GDP) from production agriculture is 2.78\(^5\).

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\(^4\) Steven C. Deller, Wisconsin and the Agricultural Economy, Staff Paper No. 471, University of Wisconsin-Madison, Department of Agricultural & Applied Economics, March 2004

\(^5\) Ibid, p. 15.
### Table 3.1: Economic Impact of Agriculture in Wisconsin

<table>
<thead>
<tr>
<th>Industry Output ($mil)</th>
<th>Direct</th>
<th>Indirect</th>
<th>Induced</th>
<th>Total</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production Agriculture</td>
<td>$6,678</td>
<td>$2,987</td>
<td>$924</td>
<td>$10,589</td>
<td>1.59</td>
</tr>
<tr>
<td>Agricultural Processing</td>
<td>21,172</td>
<td>14,464</td>
<td>4,159</td>
<td>39,795</td>
<td>1.88</td>
</tr>
<tr>
<td>Horticulture</td>
<td>712</td>
<td>156</td>
<td>225</td>
<td>1,093</td>
<td>1.54</td>
</tr>
<tr>
<td><strong>All Agriculture</strong></td>
<td>$28,562</td>
<td>$17,607</td>
<td>$5,308</td>
<td>$51,477</td>
<td>1.80</td>
</tr>
</tbody>
</table>

### Employment

<table>
<thead>
<tr>
<th>Industry Output</th>
<th>Direct</th>
<th>Indirect</th>
<th>Induced</th>
<th>Total</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production Agriculture</td>
<td>144,622</td>
<td>26,009</td>
<td>12,665</td>
<td>183,296</td>
<td>1.27</td>
</tr>
<tr>
<td>Agricultural Processing</td>
<td>68,205</td>
<td>115,120</td>
<td>56,736</td>
<td>240,062</td>
<td>3.52</td>
</tr>
<tr>
<td>Horticulture</td>
<td>17,926</td>
<td>1,776</td>
<td>3,100</td>
<td>22,802</td>
<td>1.27</td>
</tr>
<tr>
<td><strong>All Agriculture</strong></td>
<td>183,661</td>
<td>163,376</td>
<td>73,304</td>
<td>420,341</td>
<td>2.29</td>
</tr>
</tbody>
</table>

### Total Income ($ mil)

<table>
<thead>
<tr>
<th>Industry Output</th>
<th>Direct</th>
<th>Indirect</th>
<th>Induced</th>
<th>Total</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production Agriculture</td>
<td>$1,109</td>
<td>$1,415</td>
<td>$563</td>
<td>$3,087</td>
<td>2.78</td>
</tr>
<tr>
<td>Agricultural Processing</td>
<td>5,241</td>
<td>4,772</td>
<td>2,498</td>
<td>12,511</td>
<td>2.39</td>
</tr>
<tr>
<td>Horticulture</td>
<td>424</td>
<td>91</td>
<td>137</td>
<td>653</td>
<td>1.54</td>
</tr>
<tr>
<td><strong>All Agriculture</strong></td>
<td>$6,774</td>
<td>$6,820</td>
<td>$3,243</td>
<td>$16,836</td>
<td>2.49</td>
</tr>
</tbody>
</table>

Source: Steven C. Deller, Wisconsin and the Agricultural Economy, Staff Paper No. 471, University of Wisconsin-Madison, Department of Agricultural & Applied Economics, March 2004

### 3.1.2 Iowa

A study by Imerman et al. (2005) examined the economic importance of agriculture in Iowa. This study used the IMPLAN input-output model to estimate the value of the state’s agri-food system. The results indicated that the agri-food industry’s share of economic output was 28.3%, while the industry share of value-added was 21.07%. Output multipliers were derived for individual sectors of the agri-food industry, such as oilseed farming, grain farming, cattle ranching and farming, and various processing and manufacturing sectors. Multipliers from selected sectors are reported in Table 3.2. For primary production, most of the multipliers were close to 1.60, indicating that for every dollar of sales created at the farm level, another $0.60 is created elsewhere in the economy. The multiplier that may provide the best estimate for the corn sector would be the multiplier of 1.61 for grain farming.

### Table 3.2: Output Multipliers for Agriculture in Iowa

<table>
<thead>
<tr>
<th>Sector</th>
<th>Direct</th>
<th>Indirect</th>
<th>Induced</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oilseed farming</td>
<td>1.00</td>
<td>0.2942</td>
<td>0.3456</td>
<td>1.6398</td>
</tr>
<tr>
<td>Grain farming</td>
<td>1.00</td>
<td>0.3272</td>
<td>0.2874</td>
<td>1.6146</td>
</tr>
<tr>
<td>All other crop farming</td>
<td>1.00</td>
<td>0.3075</td>
<td>0.2407</td>
<td>1.5482</td>
</tr>
</tbody>
</table>


---

6 Employment figures for All Agriculture do not equal the sum of employment figures Production Agriculture, Agricultural Processing, and Horticulture due to some gaps and overlaps in reporting methods.
3.1.3 California

Kuminoff, Sumner, and Goldman (2000) used IMPLAN to assess the economic impact of agriculture in California’s economy. The results are shown in Table 3.3. The food/feed grains, hay and flour/grain mill products are separated out from the other commodity groups. The “Direct Sales” column represents sales of agricultural products. The “Sales” column is the economic activity achieved when agricultural inputs, equipment and services are purchased (i.e. indirect impact) and “Total Income” is the expenditure of farm income and income of service and input suppliers (i.e. induced impact). These values indicate an economic multiplier of 3.97 for food/feed grains, etc. and a multiplier effect of 4.03 for total agriculture in California. Essentially, for every one dollar of agriculture generated at the farm level another $3 are generated in the local economy.

This study reported the total number of direct, indirect and induced jobs to be 192,422. However, without knowing the number of direct jobs, it is not possible to determine the employment multiplier.

Table 3.3: Economic Impact of California Agriculture

<table>
<thead>
<tr>
<th></th>
<th>Direct Sales ($ million)</th>
<th>Sales ($ million)</th>
<th>Total Income ($ million)</th>
<th>Total Impacts ($ million)</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food/Feed Grains, Hay &amp;</td>
<td>11,400</td>
<td>24,118</td>
<td>9,772</td>
<td>45,290</td>
<td>3.97</td>
</tr>
<tr>
<td>Flour/Grain Mill Products</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Other</td>
<td>56,250</td>
<td>121,284</td>
<td>49,716</td>
<td>227,250</td>
<td>4.04</td>
</tr>
<tr>
<td>Total</td>
<td>67,650</td>
<td>145,402</td>
<td>59,488</td>
<td>272,540</td>
<td>4.03</td>
</tr>
</tbody>
</table>


3.1.4 Arkansas

The IMPLAN system was also used by researchers at the University of Arkansas to estimate the impacts of agricultural production and processing on the economy of Arkansas. These impacts were estimated for agriculture as a whole, as well as separately for the crop sector, the livestock sector, and the forestry sector. The agriculture industry was found to contribute over 20% of value added in the state, and accounted for over 20% of all jobs. The employment and value added impacts of the crop sector are displayed in Table 3.4.

Table 3.4: Economic Impacts of the Crop Sector in Arkansas

<table>
<thead>
<tr>
<th></th>
<th>Direct</th>
<th>Indirect</th>
<th>Induced</th>
<th>Total</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value added ($ millions)</td>
<td>2,562</td>
<td>1,181</td>
<td>798</td>
<td>4,542</td>
<td>1.77</td>
</tr>
<tr>
<td>Employment (jobs)</td>
<td>55,548</td>
<td>25,497</td>
<td>20,524</td>
<td>101,569</td>
<td>1.83</td>
</tr>
</tbody>
</table>

3.1.5 Oklahoma

Using IMPLAN data from 1985, researchers from Oklahoma State University determined the multiplier effects on income (GDP) and employment for livestock and products and crops and forestry. They are displayed in Table 3.5. The multipliers are Type III multipliers, which mean they include the direct, indirect and induced impacts. The multipliers for “Crops and Forestry” would be a closer representation of impact multipliers for the corn sector. These multipliers indicate that for every dollar generated by crops and forestry, an additional $1.51 is generated in the economy, and for every job created in these industries, an additional 0.69 jobs are created elsewhere in the economy.

Table 3.5: Multiplier Effects of Agriculture in Oklahoma

<table>
<thead>
<tr>
<th></th>
<th>Income Multiplier</th>
<th>Employment Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock and Products</td>
<td>2.72</td>
<td>2.02</td>
</tr>
<tr>
<td>Crops and Forestry</td>
<td>2.51</td>
<td>1.69</td>
</tr>
</tbody>
</table>


3.2 Economic Impact Studies for Agriculture in Ontario

Across Ontario, a number of rural counties/municipalities have sponsored studies to determine the economic impact that agriculture has on the economy. These studies estimated the number of jobs and sales that are supported by agriculture.

Table 3.6 summarizes the results from a number of studies regarding the number of direct, indirect and induced jobs impacted by agriculture in each area. The direct jobs reflect the number of jobs at the farm level, indirect jobs are the related agri-business jobs and induced jobs are found in businesses that benefit from the wages spent by employees in agriculture and agriculture-related businesses. Induced jobs are often found in the service sector.

Table 3.6: Impact of Agriculture Jobs in Various Ontario Regions

<table>
<thead>
<tr>
<th>County/Region</th>
<th>Direct</th>
<th>Indirect</th>
<th>Induced</th>
<th>Total</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRSDG*</td>
<td>5,955</td>
<td>4,516</td>
<td>7,415</td>
<td>17,886</td>
<td>3.00</td>
</tr>
<tr>
<td>Huron</td>
<td>4,428</td>
<td>12,128</td>
<td>3,528</td>
<td>20,084</td>
<td>4.54</td>
</tr>
<tr>
<td>Ottawa</td>
<td>3,510</td>
<td>1,045</td>
<td>5,466</td>
<td>10,021</td>
<td>2.85</td>
</tr>
<tr>
<td>Perth</td>
<td>4,935</td>
<td>3,133</td>
<td>3,066</td>
<td>11,134</td>
<td>2.26</td>
</tr>
<tr>
<td>Middlesex</td>
<td>6,370</td>
<td>2,240</td>
<td>3,444</td>
<td>12,054</td>
<td>1.89</td>
</tr>
<tr>
<td>GTA**</td>
<td>11,150</td>
<td>6,231</td>
<td>17,920</td>
<td>34,701</td>
<td>3.11</td>
</tr>
<tr>
<td>Elgin, Middlesex, Oxford</td>
<td>16,515</td>
<td>6,856</td>
<td>9,349</td>
<td>32,720</td>
<td>1.98</td>
</tr>
<tr>
<td>Lambton</td>
<td>3,920</td>
<td>1,624</td>
<td>3,382</td>
<td>8,926</td>
<td>2.28</td>
</tr>
<tr>
<td>Simcoe</td>
<td>4,770</td>
<td>2,237</td>
<td>7,007</td>
<td>14,014</td>
<td>2.94</td>
</tr>
</tbody>
</table>

Average: 2.76

*Prescott, Russell, Stormont, Dundas and Glengarry; **Greater Toronto Area
The multiplier represents the impact that agriculture has on employment. For example, a multiplier of 2.5 would indicate that for every job in agriculture another 1.5 jobs are supported in the general economy. The regions shown in Table 3.6 have estimated multipliers that range from 1.89 to 4.5, with an average of about 2.76.

Table 3.7 shows the direct and indirect impacts of agricultural sales on the economy; however, induced impacts were not calculated for these studies. The estimated multipliers range from 2.18 to 3.91, with an average of 2.74. This indicates that for every dollar in sales at the farm level there is another $1.74 in sales generated in the economy.

### Table 3.7: Impact of Agriculture Sales in Various Ontario Regions

<table>
<thead>
<tr>
<th>County/Region</th>
<th>Sales ($ millions)</th>
<th></th>
<th></th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct</td>
<td>Indirect</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>PRSDG*</td>
<td>364</td>
<td>756</td>
<td>1,120</td>
<td>3.08</td>
</tr>
<tr>
<td>Huron</td>
<td>512</td>
<td>1,489</td>
<td>2,000</td>
<td>3.91</td>
</tr>
<tr>
<td>Ottawa</td>
<td>137</td>
<td>265</td>
<td>402</td>
<td>2.93</td>
</tr>
<tr>
<td>Perth</td>
<td>430</td>
<td>653</td>
<td>1,083</td>
<td>2.52</td>
</tr>
<tr>
<td>Middlesex</td>
<td>450</td>
<td>534</td>
<td>984</td>
<td>2.18</td>
</tr>
<tr>
<td>GTA</td>
<td>585</td>
<td>743</td>
<td>1,300</td>
<td>2.22</td>
</tr>
<tr>
<td>Elgin, Middlesex, Oxford</td>
<td>1,131</td>
<td>1,490</td>
<td>2,621</td>
<td>2.32</td>
</tr>
<tr>
<td>Lambton</td>
<td>301</td>
<td>472</td>
<td>774</td>
<td>2.57</td>
</tr>
<tr>
<td>Simcoe</td>
<td>265</td>
<td>519</td>
<td>784</td>
<td>2.96</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>2.74</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Prescott, Russell, Stormont, Dundas and Glengarry; **Greater Toronto Area

### 3.2.1 Chatham-Kent

An agricultural economic impact study was also conducted for the Municipality of Chatham-Kent. This study used two approaches to determine the economic impact. First, a multiplier of 0.79 was used to determine the number of induced jobs. This multiplier was based on the average of multipliers obtained in previous economic impact studies. The total number of direct and indirect jobs was multiplied by 0.79 to determine the number of induced jobs. The impact of Chatham-Kent’s agriculture was then estimated in the 2002 study to be $2 billion in sales and 16,087 jobs. This is shown in Table 3.8.

However, this study determined the above approach may be conservative because it seems to underestimate the number of jobs and sales that are created or affected by agriculture. The impact is felt in areas outside of the study region (i.e. Chatham-Kent) and not just those jobs or businesses found in the study area. For example, further processors, distributors of further processors, and retailers may not be included in these conservative numbers even though they are reliant on the agriculture industry for their business.

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8 Ibid, p. 133.
Table 3.8: Impact of Chatham-Kent Agriculture on Sales and Jobs

<table>
<thead>
<tr>
<th></th>
<th>$ Sales</th>
<th># Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>$439,758,272</td>
<td>4,860</td>
</tr>
<tr>
<td>Indirect</td>
<td>1,536,049,631</td>
<td>4,127</td>
</tr>
<tr>
<td>Induced</td>
<td></td>
<td>7,100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1,975,807,903</strong></td>
<td><strong>16,087</strong></td>
</tr>
</tbody>
</table>


For the second approach, a study of the pork industry was used as a starting point. The economic multipliers shown in Table 3.9 were applied to Chatham-Kent agriculture. The results showed that $440 million in farm gate sales resulted in $2.6 billion and almost 32,000 jobs in economic activity when sales and jobs further up the chain were included.

Table 3.9: Total Impact of Chatham-Kent Agriculture

<table>
<thead>
<tr>
<th></th>
<th>$ Sales</th>
<th># Jobs Direct + Indirect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Sales</td>
<td>$439,758,272</td>
<td>8,987</td>
</tr>
<tr>
<td>Multiplier Effect</td>
<td>6.0</td>
<td>3.56</td>
</tr>
<tr>
<td><strong>Total Sales</strong></td>
<td><strong>$2,638,549,632</strong></td>
<td><strong>31,994</strong></td>
</tr>
</tbody>
</table>


3.2.2 Niagara

A separate economic impact study was commissioned in the Niagara region to assess the importance of agriculture to the Niagara economy. The Niagara Region Impact Model (NRIM) was developed to estimate the total economic impact of agricultural activity on the regional economy. This model was able to estimate the direct, indirect, and induced effects that are generated for a given level of production. These effects were estimated for all the major commodity groups in the region, and were used to derive output multipliers. For the cash crop sector, the simple output multiplier (direct and indirect impacts) was estimated to be 2.20, while the total output multiplier (direct, indirect, and induced impacts) was estimated to be 2.74. This indicates that for every dollar of cash crop sales, an additional $1.74 in sales was generated in the Niagara region.

3.3 Summary of Previous Studies

There has been a number of economic impact studies on agriculture conducted in both Canada and the U.S. Many of these studies used an input-output modeling system for estimating impact multipliers for the agriculture industry. There was some variation in the reported multipliers for the various regions, but this was to

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9 Ken McEwan, Economic Impact of the Ontario Pork Industry, November 1997
11 Planscape, Bracebridge, ON, Niagara Regional Agricultural Economic Impact Study, July, 2003, p. 5.4.
be expected due to regional differences in the structure of agriculture industries and local economies.

In the U.S. studies discussed above, output multipliers for agriculture ranged from 1.59 to 3.97. Employment multipliers ranged from 1.27 to 1.83, displaying relatively low variation. The GDP (or value added) multipliers reported in these studies were 1.77 and 2.78.

For the economic impact studies conducted in Ontario, the output multipliers ranged from 2.18 to 3.91. In general, these multipliers only included the direct and indirect impacts. Only the study in the Niagara region estimated an output multiplier that included induced impacts. Employment multipliers in these studies ranged from 1.89 to 4.54.

One of the purposes behind the review of previous studies was to determine an estimate of induced impacts for the agriculture industry. This estimate can be added to the results of the input-output model, which only generates direct and indirect impacts, to determine the aggregate impacts of the corn sector. The studies in which induced impacts were measured for output are displayed in Table 3.10. The estimated induced impact multipliers in this table are calculated by dividing the induced effect by the direct effect, based on figures from previous tables in this section.

<table>
<thead>
<tr>
<th>Region</th>
<th>Output</th>
<th>GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niagara</td>
<td>0.54</td>
<td></td>
</tr>
<tr>
<td>Wisconsin</td>
<td>0.14</td>
<td>0.51</td>
</tr>
<tr>
<td>Iowa</td>
<td>0.29</td>
<td></td>
</tr>
<tr>
<td>California</td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td>Arkansas</td>
<td></td>
<td>0.31</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>0.46</td>
<td>0.41</td>
</tr>
</tbody>
</table>

Based on results from previous studies, the average induced impact multiplier was 0.46 for output and 0.41 for GDP. The estimated induced impact multiplier for employment was 1.02, and was determined by taking the average of the multipliers from the economic impact studies in Ontario, based on the figures in Table 3.6. These induced impact multipliers will be applied to the results of the model to determine the total impact of the corn sector in terms of output, GDP, and employment.

In addition, the employment and output multipliers from Tables 3.6 and 3.7 will be used for comparative purposes against the results of the input-output model. These multipliers will be used to provide alternate measures of the impact that the corn sector has on the economy of Ontario.

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12 This figure was determined by subtracting the simple output multiplier of 2.20 from the total output multiplier of 2.74, with the difference between these multipliers being the induced impacts.

13 This figure was calculated by dividing the induced number of jobs by the direct number of jobs for each county, then taking the simple average of these ratios.
4.0 Impact Analysis

Since the I-O model is a linear model, the actual magnitude of the shock does not affect the scope of the impacts. For example, the impacts of a 100% production shock would be ten times greater than the impacts of a 10% shock. For the purposes of this analysis, a shock was imposed on output of corn (both grain corn and corn fodder), with output reduced by 100%. Removing corn production completely from the model allows for an evaluation of the total direct and indirect impacts of the corn sector. However, the same results could have been obtained by reducing output by 10%, then multiplying the resulting impacts by ten to determine the total impacts on the economy. Obviously, a complete reduction in corn production is not a likely occurrence, but for the purposes of this analysis, it is an effective method for determining an aggregate measure of impacts across the economy.

4.1 Input-Output Model Results

This section contains a discussion of the results generated by the I-O model after imposing a supply shock on output of corn in Ontario. While the shock imposed on the model for this study occurs only in Ontario, the impacts extend beyond its borders into other provinces. Some of these impacts, particularly those occurring in Quebec and Alberta, will also be discussed. It must be noted that the framework of the model incorporates data for the agriculture industry from the 2001 production year. All impacts reported in this section are specific to the set of circumstances that existed in the industry during that year.

This section focuses on the impacts on three components of the economy – GDP, employment, and output. Generally, the strength of the economy is measured through the level of GDP. While the results will focus on the impacts on GDP, the impacts on output will also be considered, since the shock imposed on the model was in terms of output. It is important to understand the difference between GDP and output, where output is a measure of total production while GDP is a measure of value-added production.

4.1.1 Impacts on GDP

The results of the model indicate that the corn sector directly contributes $314.2 million in GDP to the economy of Ontario. The GDP multiplier associated with the corn sector is 1.77, resulting in total direct and indirect impacts on the national GDP of $556.3 million. While the majority of the impacts are felt in Ontario, where the corn sector creates $476.9 million in GDP, the impacts extend to some degree across the country, particularly in Quebec and Alberta. The impact of Ontario’s corn sector on the GDP of Quebec amounts to $21.9 million, with this impact mainly affecting the crop production, fertilizer manufacturing, wholesale trade, and trucking industries. A similar degree of impact is felt on Alberta’s GDP, measuring $20.3 million. This impact primarily affects the oil and gas industry. The breakdown of the impacts on GDP between Ontario and the rest of the country for a number of industries is shown in Figure 4.1.
Many input and service industries are dependent to some degree on primary agriculture. There are a large number of industries that are indirectly impacted by the corn sector, primarily those which are directly upstream and downstream from corn production. The following are some of the notable indirect impacts, in terms of GDP. Support activities for crop production depend on the corn sector for $2.9 million in GDP within Ontario, and $4.5 million across Canada. Corn production has an impact of about $17.8 million on the oil and gas industry, as corn production requires extensive use of diesel for field operations and natural gas for drying as well as for production of nitrogen fertilizer. Corn production requires a considerable amount of fertilizer, and the impact on the fertilizer industry in Canada amounts to $13.1 million. There is also widespread use of herbicides in corn production, and the impact on herbicide manufacturing is about $2.1 million. This impact is relatively low, as most herbicides used in corn production are not manufactured in Canada. The level of impact that the corn sector has on herbicide production is better represented by the impact on imports of herbicides, as discussed in Section 4.1.4 below.

Figure 4.1: Indirect Impacts of Ontario’s Corn Sector on GDP, by Industry

The livestock industry is dependent on corn for $5.3 million in GDP. This impact seems relatively low considering that the livestock industry in Ontario is a $4 billion dollar industry. Corn serves as the main source of feed for many livestock operations, thus the corn sector should play an important role in the value-added output of the livestock industry. With 60% of corn production in the province used for feed, it is expected that the corn sector would have a substantial impact on the livestock industry. This relatively low measure of impact could be due to limitations or assumptions of the model regarding the linkages that exist between the corn sector and livestock industry.
With the corn sector dependent on machinery to carry out production activities, there is an impact on machinery and metal manufacturing, with this impact totaling $4.7 million. With the need to transport vast quantities of corn from the field to processors, corn production provides plenty of business for the trucking industry, having an impact of $10.2 million. The construction industry is also heavily impacted by the corn sector, with this impact measuring $11.5 million.

The corn sector has impacts on industries that extend well beyond primary agricultural production. Farming operations are often capital intensive, requiring debt servicing from lending institutions, and these operations also involve extensive bookwork, which generally requires the services of accountants. The impact of the corn sector on accounting and legal services totaled $8.1 million, and the impact on banking and credit union services totaled $12.1 million. The corn sector also has an impact of $6.4 million on the insurance industry, and an impact of $3.2 million on the real estate industry. There is a significant amount of trade at the wholesale and retail levels that depend on the corn sector, with this combined impact measuring $40.4 million. The food manufacturing sector depends on the corn sector for $1.7 million in GDP.

### 4.1.2 Impacts on Employment

The results of the I-O model indicate that the corn sector accounts for direct employment of 6,131. The I-O model estimated an employment multiplier for Ontario of 1.39. For each job in the corn sector, there are an additional 0.39 jobs that can be indirectly attributed to corn production. Thus, the impact that the corn sector has on total direct and indirect employment is 8,529 jobs, based on the direct employment figure of 6,131. When the impact of Ontario’s corn sector on employment in other provinces is included, the employment multiplier increases to 1.53, with the aggregate impact on employment increasing to 9,409 jobs. Just over 300 of these jobs are created in Quebec, mainly in the crop production, fertilizer manufacturing, wholesale trade, and trucking industries. At least 130 jobs are created in each of Manitoba, Saskatchewan, and Alberta. In Manitoba and Saskatchewan, the majority of these jobs are in the crop production industry, while in Alberta, more of these jobs are in oil and gas and wholesale trade industries.

The indirect impact that the corn sector has on employment can be broken down more specifically by industry. The breakdown of these impacts between Ontario and the rest of Canada can be viewed in Figure 4.2. There is a considerable amount of employment within the agriculture industry that exists due to the corn sector. There are 192 jobs in animal production that can be attributed to the corn sector. Support activities for crop production include 117 jobs that result from corn production. There are 95 jobs in the fertilizer and chemical manufacturing industries that have been created to support corn production.
The employment effects of the corn sector extend into a number of supporting industries. Employment in wholesale and retail trade related to the corn sector numbers 711 jobs. Employment in the trucking industry includes 167 jobs that can be attributed to corn production. Employment in the construction industry includes 161 jobs that are an indirect result of corn production. There are 105 jobs in banks and credit unions that are related to the corn sector. There is a significant number of jobs in legal and accounting firms that are due to the corn sector, with this impact measuring 134 jobs. Employment impacts of the corn sector also extend to the food service, travel, and recreation industries.

### 4.1.3 Impacts on Output

The impacts on output are considerably larger than the impacts on GDP, as GDP is a measure of value-added for each industry while output only measures the value of production without taking into consideration the input costs. As a 100% shock was imposed on the output of corn, the change in direct output of $616.8 million represents the total value of production of corn. The results of the model indicated an output multiplier of 1.82, with direct and indirect impacts of the corn sector measuring $1.12 billion in national output. Again, these impacts occur to some degree in provinces outside of Ontario, particularly in Quebec and Alberta. In Quebec, some $50 million in output is related to Ontario’s corn sector. Affected industries include crop production, fertilizer manufacturing, petroleum refining, trucking, and wholesale trade. In Alberta, the impacts on output occur mainly in the oil and gas, fertilizer manufacturing, and wholesale trade industries, and account for $40 million in total.
Total direct and indirect impacts that the corn sector has on output can be broken down by industry, to provide a more detailed representation of the distribution of these impacts. These industry impacts on output are displayed in Figure 4.3. The corn sector has a significant impact on a number of industries that are closely related to agriculture. The impact of corn on animal production measures $19.7 million in terms of output. As previously discussed, the livestock industry is quite dependent on corn as a source of feed for animals, thus the size of this impact appears to be low considering the size of the livestock industry.

![Figure 4.3: Indirect Impacts of Ontario’s Corn Sector on Output, by Industry](image)

Production activities result in significant demand for petroleum products, with this demand having an indirect effect on output of the oil and gas industry amounting to $50.6 million. The construction industry depends on the corn sector for $20.3 million, with corn producers often in need of drive sheds or other structures to be built. With corn being a heavy user of nitrogen, the impact on fertilizer manufacturing amounts to $41.4 million. The impact on herbicide manufacturing is much lower, at $6.1 million. The corn sector has a considerable impact on wholesale and retail trade, with these impacts measuring $58.6 million and $10.7 million, respectively. The effect that corn production has on output for the trucking industry is $21.1 million. The impacts of the corn sector also extended to lending institutions as well as legal and accounting firms, with these impacts amounting to $16.5 million and $11.9 million, respectively.

### 4.1.4 Impacts on Imports

The corn sector also has a major impact on the level of international imports that come into Ontario, with this indirect impact measuring $139.2 million. The distribution of this impact is displayed in Figure 4.4. Much of this impact affects
input suppliers, as a considerable amount of farm inputs that are utilized in the corn sector are manufactured outside the country, primarily in the U.S. Corn producers are major users of herbicides and fertilizers. While the corn sector had a relatively small impact on pesticide manufacturing within Canada, imports of herbicides are fairly dependent on corn production, with this impact measuring $28.6 million. Imports of fertilizer to support corn production amount to $14.5 million, which is less than the impact on domestic fertilizer manufacturing. The corn sector has an impact of $15.1 million on imports of machinery, as the majority of farm machinery used in corn production is manufactured outside of Canada. Imports of crude mineral oils are also affected by the corn sector, with this impact measuring $8.0 million.

**Figure 4.4: Indirect Impacts of Ontario’s Corn Sector on Imports, by Commodity**

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Ontario ($'000)</th>
<th>Other Provinces ($'000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Mineral Oils</td>
<td>5,000</td>
<td>1,000</td>
</tr>
<tr>
<td>Tires &amp; Tubes</td>
<td>1,000</td>
<td>200</td>
</tr>
<tr>
<td>Metal Products</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Machinery</td>
<td>20,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Motor Vehicle Parts</td>
<td>10,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Electrical &amp; Electronics</td>
<td>8,000</td>
<td>4,000</td>
</tr>
<tr>
<td>Fertilizers</td>
<td>5,000</td>
<td>2,500</td>
</tr>
<tr>
<td>Insecticides/Herbicides</td>
<td>1,000</td>
<td>500</td>
</tr>
<tr>
<td>Transportation &amp; Storage</td>
<td>30,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Finance/Insurance/Real Estate</td>
<td>20,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Business &amp; Computer Srvcs</td>
<td>10,000</td>
<td>5,000</td>
</tr>
</tbody>
</table>

### 4.2 Summary of I-O Model Results

The results generated by Statistics Canada’s Input-Output model indicated that the total impact of the corn sector on GDP amounted to $556.3 million, with a direct impact of $314.2 million and an indirect impact of $242.1 million. The total impact on employment was 9,409 jobs, with a direct impact of 6,131 jobs and an indirect impact of 3,278 jobs. In terms of output, the corn sector generated an impact of $1.124 billion, comprised of a direct impact of $616.8 million and an indirect impact of $506.8 million.

To determine the total impact on the economy, induced impacts must be added to these figures. Induced impact multipliers were estimated in Section 3.3 based on results from previous economic impact studies. Induced impact multipliers of 0.41 and 0.46 were estimated for GDP and output, respectively, based on an average of multipliers reported in studies from various states in the U.S. An induced impact
multiplier of 1.02 was estimated for employment, based on an average of induced impacts reported in studies from a number of counties in Ontario.

These induced impact multipliers were applied to the direct impacts to calculate the level of induced impacts on GDP, output, and employment. These impacts were added to the direct and indirect impacts generated by the model to determine the total impacts. The total impact of the corn sector on GDP measured $685.1 million, the impact on output was $1.4 billion, while the impact on employment accounted for 15,663 jobs. These results, compared with results from other methods used for estimating these impacts, are shown in the following section, in Figures 5.1, 5.2, and 5.3.
5.0 Alternative Measures of the Economic Impact of Ontario’s Corn Sector

In addition to the use of the input-output model, two alternative methods were used to measure the impact that Ontario’s corn sector has on the economy. The second method involved adjusting the levels of direct impacts to account for limitations of the I-O model, then applying the multipliers determined by the model to these adjusted figures to estimate the total impact of the corn sector. The adjustments that were made, and the resulting impacts on GDP, output, and employment, are described in Section 5.1. The third method involved applying estimated impact multipliers from previous economic impact studies to the adjusted levels of direct impacts. This method was utilized for comparison purposes with the results of the I-O model, and the estimated impacts are discussed in Section 5.3. Comparisons of the results of the three methods are displayed in Figures 5.1, 5.2, and 5.3.

5.1 Adjustments to Account for Model Limitations

An issue that could potentially affect the estimated impacts is the method used for measuring output. The figures derived for the baseline output in the model are based on farm cash receipts, and do not account for inventories or on-farm feeding of corn. Because farm operations use a cash-based accounting system, if production is not sold until the following year, it does not count as revenue for the year in which it was actually produced. Corn that is produced on mixed farming operations and fed directly to livestock is not accounted for in Statistics Canada’s measure of farm cash receipts. Thus, farm cash receipts may not accurately depict the level of production for a given year.

The baseline output given by the model for corn in 2001 is $616.8 million. This figure includes both grain corn and corn fodder. Based on production estimates by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) for 2001, output of grain corn and corn fodder totaled $771.1 million. The difference between the two figures is most likely due to on-farm feeding and to changes in inventories. If a relatively large amount of production was fed directly to livestock on the same operation or was not sold until the following year, this amount would not be accounted for in the level of output given by the model.

If OMAFRA’s production figures were used in place of the model’s baseline output, the impact measures would increase substantially. The direct and indirect impacts of the corn sector on output, based on OMAFRA’s production estimates and the impact multiplier derived from the model, would total $1.40 billion. Adding the estimated induced impacts, based on a multiplier of 0.46 as determined in Section 3.3, yields a total impact of $1.76 billion.

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14 Taken from OMAFRA’s statistics on Provincial Field Crop Estimates
http://www.omafra.gov.on.ca/english/stats/crops/estimate_imperial.html
For estimating the impact on GDP, the ratio of GDP to output is assumed to be constant, with this ratio based on the reported figures from the model\textsuperscript{15}. Thus, the level of GDP would be adjusted by the same percentage as the output level. This results in direct and indirect impacts of the corn sector on GDP totaling $696.9 million, with a direct impact of $393.6 million and an indirect impact of $303.3 million. In Section 3.3, an induced impact multiplier of 0.41 for GDP was determined based on previous studies. Adding the induced impact to the direct and indirect impacts results in a total impact of $858.3 million.

Another limitation of the model is that the direct employment figure of 6,131 only accounts for farm employees, it does not include farmers. To determine a more accurate approximation of employment directly related to the corn sector, an estimate of the number of farm operators that can be attributed to corn production must be added to the direct employment figure indicated by the model. While there are about 21,000 corn producers in Ontario, corn production does not generally account for their entire operation\textsuperscript{16}. Thus, the direct employment attributable to corn production would only constitute a fraction of this number.

To estimate this employment figure, the number of farm operators in Ontario was multiplied by the percentage of total farm cash receipts earned from corn production. In 2001, corn production represented 5\% of total farm cash receipts in Ontario, while the number of farm operators in the province was 85,015\textsuperscript{17}. This resulted in the equivalent of 4,251 farm operators involved in corn production. Combining this figure with the number of farm employees in the corn sector yields a total direct employment estimate of 10,382 that is attributable to the corn sector. If the employment multiplier of 1.53 is applied to this estimate, this would result in a total of 15,884 jobs that are directly or indirectly related to the corn sector in Ontario.

### 5.2 Comparison of Model Results to Previous Studies

The impact multipliers, as determined by the I-O model, are relatively low compared to multipliers from previous economic impact studies on agriculture. The results of the model indicated a multiplier of 1.77 for GDP, while two studies from the U.S. found multipliers of 2.78 and 1.77. The I-O model found the output multiplier to be 1.82, while the average multiplier from studies in nine counties or regions in Ontario was 2.74. The employment multiplier produced by the model was 1.53, while the average multiplier from the studies in Ontario was 2.76.

While the multipliers from the I-O model do not account for induced impacts, the magnitude of the indirect impact multipliers from previous studies tended to be

\textsuperscript{15} The I-O model reported a direct impact on GDP of $314.2 million and a direct impact on output of $616.8 million. This yields a GDP to output ratio of 0.51.

\textsuperscript{16} Number of corn producers sourced from the OCPA website

\textsuperscript{17} Number of farm operators taken from Statistics Canada’s 2001 Census of Agriculture; corn production as a percentage of farm cash receipts determined based on OMAF’s farm cash receipts statistics.
higher than was indicated by this model. It is difficult to determine the source of these discrepancies in impact multipliers. One potential explanation could be that differences are due to the structure or shortcomings of the model, which may not fully account for all industry inter-relationships. Another possibility could be that differences exist in the structures of agriculture industries and economies in the regions where previous studies took place, as compared to Ontario’s agriculture industry and economy, and these differences resulted in discrepancies between magnitudes of impact multipliers. Additionally, the impacts of a specific sector, such as corn, may differ from the impacts of the agriculture industry as a whole.

5.3 Estimated Impacts Based on Previous Studies

The third method for estimating the impact of the corn sector involves applying the impact multipliers from previous studies to OMAFRA’s production estimates for corn. The average output multiplier from previous studies in Ontario was 2.74, as reported in Section 3.2. Adding the average induced impact multiplier of 0.46 yields an aggregate output multiplier of 3.20. Applying this multiplier to OMAFRA’s 2001 production estimates of $771.8 million for grain corn and corn fodder results in a total impact on output of $2.47 billion.

For estimating the impact multiplier for GDP, two assumptions need to be imposed. First, since the results of the I-O model indicated that the direct and indirect impact multipliers for output and GDP were very similar, they are assumed to be equal for the purposes of this estimation. Based on previous studies in Ontario, this multiplier was estimated to be 2.74. Adding the induced impact multiplier of 0.41, as estimated in Section 3.3, yields a total impact multiplier of 3.15. The second assumption is identical to the assumption made in Section 5.1 regarding the constant ratio of GDP to output. Thus, the level of direct GDP resulting from OMAFRA’s 2001 corn production estimates would be $393.6 million. Applying the multiplier of 3.15 to this level of direct GDP produces an estimate of $1.24 billion for the impact of the corn sector on GDP.

An estimate of employment impacts can be derived by applying the average impact multiplier from previous studies in Ontario to the estimated direct number of jobs affected by corn production. This number of jobs, as determined above in Section 5.1, is 10,382, which includes farm employees as well as farm operators. With an average impact multiplier for employment of 2.76, as reported in Section 3.2, the impact that the corn sector has on employment is 28,655 jobs.

Comparisons of the estimated impacts on GDP, output, and employment for each of the three methods utilized in this study are presented in Figures 5.1, 5.2, and 5.3. The impacts estimated by the I-O model in Method 1 were, in comparison, the lowest estimates for each of the three factors. Method 3, which utilized impact multipliers from previous studies, produced the largest estimates of the economic impacts of the corn sector.
**Figure 5.1: Estimated Impacts of Ontario’s Corn Sector on GDP**

Method 1 includes the results of the I-O model, plus the estimated induced impacts; Method 2 involves applying the multipliers from the I-O model to direct impacts that are adjusted to account for limitations of the model; Method 3 involves applying multipliers from previous studies to the adjusted direct impacts.

**Figure 5.2: Estimated Impacts of Ontario’s Corn Sector on Output**
5.4 Aggregate Impact of the Corn Sector on the Economy

The GDP for Ontario in 2001 was $417.7 billion. The aggregate impact of the corn sector on the economy, which the I-O model estimated to be $556.3 million in direct and indirect impacts, appears to be quite small when compared to the GDP for the entire province. However, a significant percentage of the provincial GDP originates in the Greater Toronto Area, where agriculture plays almost no role. Toronto alone accounts for 44% of Ontario’s GDP\textsuperscript{19}. If the analysis were to focus on regions where agriculture does play a role in the economy, the impact of the corn sector would become much more significant. In particular, there are a number of rural counties, such as Huron and Perth, which have relatively large agriculture industries. The impact of the corn sector would be more prevalent in these counties, where the economy is more dependent on agriculture.

\textsuperscript{19} Burleton, Derek, A Choice Between Investing in Canada’s Cities or Disinvesting in Canada’s Future, TD Bank Financial Group, \<http://www.civicnet.bc.ca/files/%7BE7CBD22A-28B5-4398-B16D-4D92C27CAB2B%7DTDBurletonPresentation.pdf>, accessed December 21, 2005.
6.0 Summary and Conclusion

The profitability of Ontario’s corn sector can have a notable impact on the functioning of regional economies that are more dependent on agriculture. Adverse shocks to the corn sector would have negative impacts on the entire regional economy, and these impacts could then reverberate to a greater degree through the province’s economy. The resulting impact could be greater than the estimated impact, which does not take into account spatial distribution of the effects. Thus, taking steps to maintain the profitability of the corn sector is imperative to reducing the potential negative impacts that could spread throughout the economy. However, without quantifying these impacts, the degree to which the corn sector is purported to affect the economy is pure conjecture.

6.1 Summary of Impacts

This study has attempted to quantify this impact, in order to progress beyond this speculation. Three methods were utilized to estimate the impact. The first method involved the use of an input-output model, where a shock was imposed on output of corn, which allowed for a measure of the impact of this sector on other industries across the economy. Since the model could only estimate direct and indirect impacts, multipliers from previous studies were used to estimate induced impacts, which were added to the results of the model. These impacts are provided below in Table 6.1.

This method produced a conservative estimate of the impact due to some limitations of the model. In particular, the manner in which total output of corn was measured, based on Statistics Canada’s figures for farm cash receipts, did not fully account for all production of corn in Ontario. Additionally, the measure of direct employment did not include farm operators.

These shortcomings led to the use of a second method for measuring the impacts of the corn sector. This method involved adjusting the direct impacts on GDP, output, and employment to account for the model’s limitations, then applying the multipliers which were estimated by the I-O model. This method may be more accurate, as it incorporates a better measure of the direct impacts of the corn sector. The results of this method are presented in Table 6.2.

A third method was employed for comparison purposes. This method involved deriving estimates of impact multipliers for GDP, output, and employment based on previous economic impact studies. These multipliers were then applied to the measures of direct impacts that were determined in the second method. The resulting impacts are displayed in Table 6.3.

Because the estimated multipliers from previous studies were larger than those in the first two methods. This method may in
effect set an upper bound for the impact of Ontario’s corn sector on the economy, while the impacts determined through the first method set the lower bound.

Due to the shortcomings involved in Method 1, the impact estimates for Method 2 and Method 3 are considered to be more representative of the actual level of impacts that Ontario’s corn sector has on the economy. The results from these two methods can be averaged to derive a final estimate, for the purposes of quantifying these impacts. Thus, Ontario’s corn sector has an impact of approximately $1 billion on GDP, an impact on employment of about 27,500 jobs, and an impact on output of just over $2 billion\(^2\).

Table 6.1: Impacts of Ontario’s Corn Sector – Method 1

<table>
<thead>
<tr>
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<th>Direct</th>
<th>Indirect</th>
<th>Induced</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP ($ millions)</td>
<td>$314.2</td>
<td>$242.1</td>
<td>$128.8</td>
<td>$685.1</td>
</tr>
<tr>
<td>Output ($ millions)</td>
<td>$616.8</td>
<td>$506.8</td>
<td>$283.7</td>
<td>$1,407.3</td>
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<tr>
<td>Employment (jobs)</td>
<td>6,131</td>
<td>3,278</td>
<td>6,254</td>
<td>15,663</td>
</tr>
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</table>

Table 6.2: Impacts of Ontario’s Corn Sector – Method 2

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<th>Induced</th>
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</tr>
</thead>
<tbody>
<tr>
<td>GDP ($ millions)</td>
<td>$393.6</td>
<td>$303.3</td>
<td>$161.4</td>
<td>$858.3</td>
</tr>
<tr>
<td>Output ($ millions)</td>
<td>$771.8</td>
<td>$634.2</td>
<td>$355.0</td>
<td>$1,761.0</td>
</tr>
<tr>
<td>Employment (jobs)</td>
<td>10,382</td>
<td>5,502</td>
<td>10,590</td>
<td>26,474</td>
</tr>
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</table>

Table 6.3: Impacts of Ontario’s Corn Sector – Method 3

<table>
<thead>
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<th>Direct</th>
<th>Indirect</th>
<th>Induced</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP ($ millions)</td>
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<td>$684.9</td>
<td>$161.4</td>
<td>$1,239.9</td>
</tr>
<tr>
<td>Output ($ millions)</td>
<td>$771.8</td>
<td>$1,342.9</td>
<td>$355.0</td>
<td>$2,469.7</td>
</tr>
<tr>
<td>Employment (jobs)</td>
<td>10,382</td>
<td>7,683</td>
<td>10,590</td>
<td>28,655</td>
</tr>
</tbody>
</table>

Though some variability exists in the results of the three methods, it is evident that the impacts of the corn sector extend well beyond primary production. The indirect and induced impacts affect GDP and employment for industries throughout the economy. This study has been able to identify a number of industries that are significantly affected by the corn sector. The inability of the corn sector to remain profitable would have considerable negative impacts on these industries. By quantifying the extent of these impacts, this study was able to provide a measure of the importance of Ontario’s corn sector to the economy.

6.2 Conclusion

Ensuring the profitability of corn producers is imperative for preventing the negative impacts discussed above. Recently, the main barrier to achieving this profitability in Ontario has been low commodity prices, which have been

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\(^2\) These figures are an approximation of the average of the total impacts estimated by Method 2 and Method 3.
artificially depressed through price supports and other subsidies in competing markets. Actions must be taken to ensure that corn producers in Ontario are able to receive a fair price for their corn, a price that is comparable to those received by their competitors. The lack of a level playing field will not only affect the corn producers, it will also have significant negative impacts on the economy as a whole. The estimated levels of these impacts on GDP, employment, and output were determined through this study.

The final estimate of the impact that the corn sector has on the economy is based on Method 2 and Method 3, which are considered to be more reliable measures of these impacts. The most important factors to consider in quantifying the economic importance of an industry or sector are the impacts on GDP and employment. Since GDP is generally used as a measure of the strength of the economy, the impact on GDP is a more important consideration than the impact on output. The final estimate of the economic impacts of the corn sector include an impact of approximately $1 billion on GDP and an impact on employment of about 27,500 jobs.
Bibliography


The Economic Importance of Ontario’s Corn Sector


