GlobalData.

Agri

January 2024

The Economic Impact of Grain Corn on Manitoba's Economy: 2023

Contents

List of Tables

List of Diagrams

Introduction

Manitoba Crop Alliance (MCA) commissioned GlobalData to undertake research that quantifies the benefit of grain corn to the Canadian province of Manitoba. This benefit is assessed in terms of:

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

This study provides the results of that independent analysis.

The focus is specifically on the production of grain corn and its associated goods within the province, spanning several steps in the value chain: from production to the subsequent storage and goods processing, to the transportation of grain feed, con ethanol, whisky and other processed goods either locally or to other provinces, as well as to the United States border for export.

Note that the results only consider the economic impact of grain corn produced within the province. Any imported grain corn from overseas or other provinces are discounted. Similarly, the results only consider the economic impact of processing that takes place within the province. Processing of Manitoba grown grain corn that takes place overseas or in other provinces is not considered in the final results.

The results capture:

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

The data are presented for ***Direct*** benefits and ***Total*** benefits (the sum of the direct, indirect and induced benefits above) for each step of the value chain.

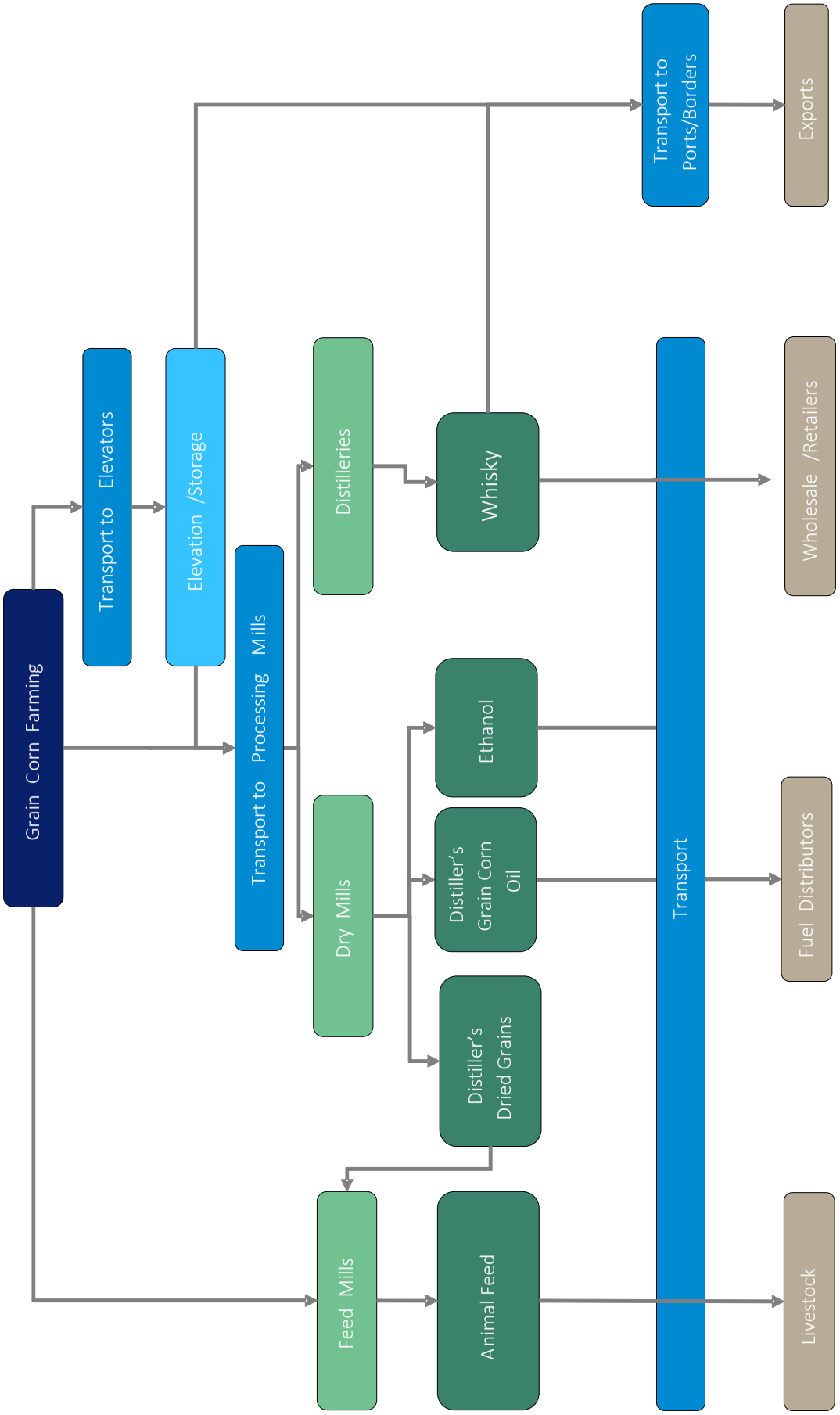
The objective is to develop an up-to-date assessment, using:

- Official data as far as possible
- The latest data for 2021/22 and previous years (which are officially revised over time)
- Interviews with industry participants
- Best practice in estimating economic benefits.

The analysis aims to provide the most accurate and independent assessment possible. To this end, we took guidance from industry participants, applied the most recent official data where relevant and used *Statistics Canada* multipliers to arrive at our totals in each category. The total results reflect the government's most recent multipliers for each sector.

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

The value chain presented on the next page represents the value chain for grain corn in Manitoba as covered by this report.


Grain Corn Farming
Transport to Elevators
Elevation /Storage
Transport to Processing Mills
Distilleries
Whisky
Transport to Ports/Borders
Exports
Wholesale /Retailers
Ethanol
Distiller's Grain Corn Oil
Dry Mills
Distiller's Dried Grains
Transport
Fuel Distributors
Feed Mills
Animal Feed
Livestock

Summary of Results

For the average of the past three years, ***2019/20-2021/22***:

- The ***total economic impact*** of the grain corn sector on Manitoba's economy averages over C$1.2 billion per year and peaked in 2019/2020 at C$1.3 billion.
- Over 3,680 ***full time equivalent jobs*** are supported by the grain corn sector, comprising around 3,385 paid jobs and close to 300 additional farm family members (beyond the growers themselves) who support and are supported by grain corn farming operations.
- The ***total wage impact*** of the sector averages close to C$320 million and peaked in 2021/22 at over C$370 million, following gains in local grain corn production.

Manitoba's overall grain corn sector has seen a rise in crop area over the last decade, but, until the last year in our series, prices had been relatively calm in recent years.

The report is structured as follows:

- **Part A** of the report focuses on the results, which are presented based on an average of *2019/20-2021/22* data across all stages in Manitoba's grain corn value chain.
- **Part B** of the report outlines the methodology for each stage of the value chain in more detail.

Part A. Manitoba's Results – Overview

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

- ***Economic impact:*** quantifies the value added to the Manitoba economy by its grain corn sector
- ***Employment impact:*** estimates the number of full-time equivalent (FTE) jobs contributed by the grain corn value chain in Manitoba
- ***Wage impact***: evaluates the sum of all wages for individuals employed on a FTE basis in the value chain

We evaluate Manitoba's grain corn value chain at several distinct steps, tracing the impact from production through to the value-added processing sectors.

- In each case, our analysis ends at the point where the grain corn is transported, either as a raw material or as a processed good, within Manitoba or to another province for domestic consumption, or when it crosses Manitoba to the United States as an overland export.

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

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

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

Table 1: Grain corn economic impact assessment by value chain component

Value chain component	Description	Economic impact	Employment	Wages	Multiplier used
Corn (grain) farming	Production of grain corn by farmers using land and inputs such as seed, fertilizers and crop protection	yes	yes	yes	yes
Farm family members	Unpaid family members who may indirectly support farm operation. Paid family members would be captured under farming	captured in corn farming	yes	captured in corn farming	no
Elevation	Primary elevation of corn	yes	yes	yes	yes
Crop delivery	Delivery of crop to elevators, processing plants or point of export via truck	yes	yes	yes	yes
Distilling	Whisky production using corn feedstock	yes	yes	yes	yes
Feed milling	Milling corn for use as animal feed	yes	yes	yes	yes
Dry milling	Ethanol production using corn feedstock	yes	yes	yes	yes
Product delivery	Delivery of corn feed, whisky, ethanol and by-products to end users or point of export	yes	yes	yes	yes

The direct impact of grain corn on Manitoba's economy

- Between 2019/20 and 2021/22, ***the direct economic impact of grain corn on the local Manitoba economy averaged C$493 million*** (Table 2). This value peaked in 2019/20 at C$518 million.
- The farming sector drives much of the ***direct employment impact*** in the grain corn value chain. As such, variation in grain corn employment is driven by grain corn area. Out of more than 1,000 full time equivalent jobs across the grain corn value chain, 60% of these are in the grain corn farming sector.
- When additional grain corn farm family members – who contribute to the overall success of the farming enterprise – are included in the overall direct employment impact figure, ***the number of people supported by the grain corn industry increases to around 1,380***.
- Between 2019/20 and 2021/22, ***the direct wage impact of grain corn on the local Manitoba economy averaged C$95 million*** (Table 4). This value peaked in 2021/22 at almost C$114 million.

Diagram 1 below illustrates the ***direct*** impact of grain corn on the local Manitoba economy. The diagram presents the aggregate results for the entire value chain according to our three separate measures: *economic impact*, *employment* and *wage impact.* The data for each measure, broken down by each stage in the value chain, are presented in Tables 2-4.

Diagram 1: Direct effects of grain corn on Manitoba's economy

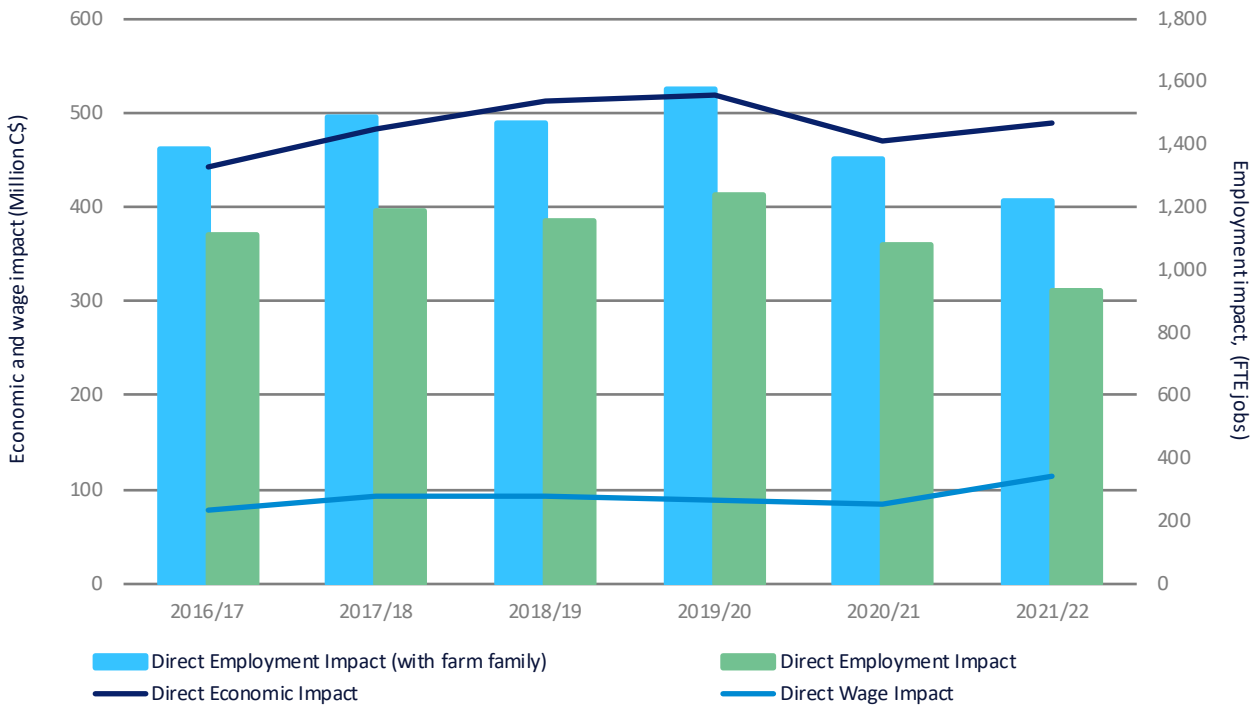


Table 2: Direct economic impact of grain corn on Manitoba's economy (C$ million)

	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	**Average 2019/20 - 21/22**
Farming	192.40	195.33	213.23	227.60	201.27	261.91	**230.26**
Elevation	4.52	6.62	2.69	1.81	1.66	3.01	**2.16**
Crop delivery	17.89	20.69	21.91	21.77	21.40	15.92	**19.70**
Distilling	79.67	87.40	85.33	87.03	84.27	84.07	**85.12**
Dry milling	88.34	105.69	126.31	117.33	101.73	77.83	**98.96**
Feed milling	47.25	51.57	48.59	47.95	46.04	35.06	**43.02**
Product delivery	13.22	15.70	15.75	15.46	15.20	11.86	**14.17**
Direct Economic Impact	**443.28**	**483.01**	**513.82**	**518.95**	**471.57**	**489.65**	**493.39**

Table 3: Direct employment impact of grain corn on Manitoba's economy (jobs)

	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	**Average 2019/20 - 21/22**
Farming	553	620	638	696	562	587	**615**
Elevation	5	8	3	2	2	6	**3**
Crop delivery	114	119	121	121	117	86	**108**
Distilling	48	48	48	48	48	48	**48**
Dry milling	19	21	20	19	19	14	**17**
Feed milling	303	299	263	286	269	142	**233**
Product delivery	64	69	66	65	63	51	**60**
Direct Employment Impact	**1,107**	**1,186**	**1,158**	**1,239**	**1,080**	**935**	**1,085**
Additional farm family members	268	300	309	338	272	284	**298**
Direct Employment (with farm family)	**1,376**	**1,486**	**1,467**	**1,576**	**1,352**	**1,219**	**1,382**

Table 4: Direct wage impact of grain corn on the Manitoba's economy (C$ million)

	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	**Average 2019/20 - 21/22**
Farming	50.22	64.29	66.26	58.50	55.74	94.66	**69.63**
Elevation	0.30	0.48	0.23	0.17	0.11	0.39	**0.22**
Crop delivery	5.52	6.13	6.42	6.88	6.63	5.18	**6.23**
Distilling	2.23	2.33	2.21	2.18	2.28	2.32	**2.26**
Dry milling	0.88	1.00	0.90	0.87	0.88	0.69	**0.81**
Feed milling	15.01	15.84	13.55	15.94	15.17	7.81	**12.97**
Product delivery	3.11	3.56	3.51	3.72	3.58	3.04	**3.45**
Direct Wage Impact	**77.26**	**93.63**	**93.08**	**88.27**	**84.39**	**114.09**	**95.58**

The total impact of grain corn on Manitoba' economy (direct + indirect + induced effects)

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

- In 2019/20, the total ***economic impact***, which includes direct, indirect and induced effects, peaked at around C$1.3 billion. The average economic impact of grain corn on Manitoba over the past three years of full data, 2019/20 and 2019/20, was ***C$1.22 billion.***

- The total ***employment effect*** of Manitoba grain corn between 2019/20 and 2021/22 averages over 3,385 FTE jobs. This includes grain corn farm family members.

- Over the same period, the ***wage effect*** of grain corn on the local Manitoba economy averages ***C$319 million***.

Table 5: Total economic impact of grain corn on Manitoba's economy (C$ million)

	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	**Average 2019/20 - 21/22**
Farming	372.29	361.94	436.70	466.13	412.21	536.40	**471.58**
Elevation	7.76	11.51	4.77	3.21	2.95	5.34	**3.83**
Crop delivery	49.31	56.78	63.26	62.85	61.78	45.95	**56.86**
Distilling	162.22	183.90	180.48	184.06	178.23	177.80	**180.03**
Dry milling	245.24	276.70	326.77	303.52	263.18	201.34	**256.02**
Feed milling	223.86	242.65	241.19	238.02	228.53	174.04	**213.53**
Product delivery	36.44	43.09	45.48	44.64	43.87	34.24	**40.92**
Total Economic Impact	**1,097.12**	**1,176.57**	**1,298.64**	**1,302.44**	**1,190.75**	**1,175.11**	**1,222.76**

Diagram 2: Total effect of grain corn on the Canadian economy

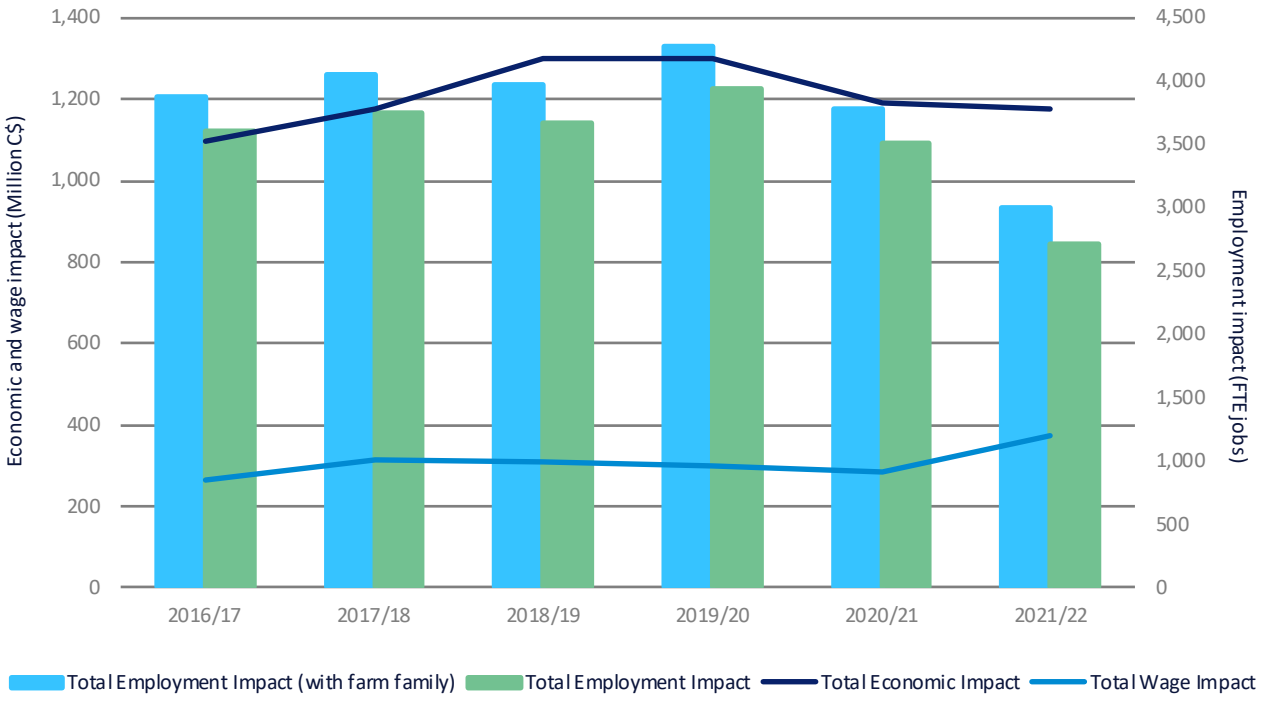


Table 6: Total employment impact of grain corn on Manitoba's economy (jobs)

	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	**Average 2019/20 - 21/22**
Farming	1,237	1,362	1,493	1,631	1,317	1,375	**1,441**
Elevation	8	12	5	3	3	9	**5**
Crop delivery	272	281	284	285	274	203	**254**
Distilling	107	109	106	106	106	106	**106**
Dry milling	125	135	132	130	125	97	**117**
Feed milling	1,686	1,676	1,489	1,621	1,527	808	**1,319**
Product delivery	156	166	159	158	152	122	**144**
Total Employment Impact	**3,591**	**3,741**	**3,668**	**3,933**	**3,503**	**2,719**	**3,385**
Additional farm family members	268	300	309	338	272	284	**298**
Total Employment (with farm family)	**3,859**	**4,041**	**3,977**	**4,271**	**3,775**	**3,002**	**3,683**

Table 7: Total wage impact of grain corn on Manitoba's economy (C$ million)

	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	**Average 2019/20 - 21/22**
Farming	167.27	209.60	217.19	191.75	182.71	310.30	**228.25**
Elevation	0.44	0.72	0.35	0.25	0.17	0.58	**0.33**
Crop delivery	13.30	14.59	15.48	16.60	15.99	12.50	**15.03**
Distilling	5.00	5.14	5.03	4.96	5.17	5.28	**5.13**
Dry milling	3.24	3.64	3.37	3.28	3.29	2.60	**3.06**
Feed milling	67.37	71.70	61.53	72.36	68.88	35.45	**58.90**
Product delivery	7.62	8.61	8.63	9.17	8.83	7.48	**8.49**
Total Wage Impact	**264.24**	**314.00**	**311.58**	**298.37**	**285.04**	**374.18**	**319.20**

Part B. Methodology for deriving direct and total impact of Manitoba's grain corn value chain

This section presents the methodology applied in deriving the direct and total economic, employment and wage impact across the distinct steps of Manitoba's the grain corn value chain. It begins with an outline of how the multipliers are derived, before delving into the various steps of the value chain. Note all sectors assess only the value added and jobs created by *Manitoba-grown* grain corn.

Multipliers

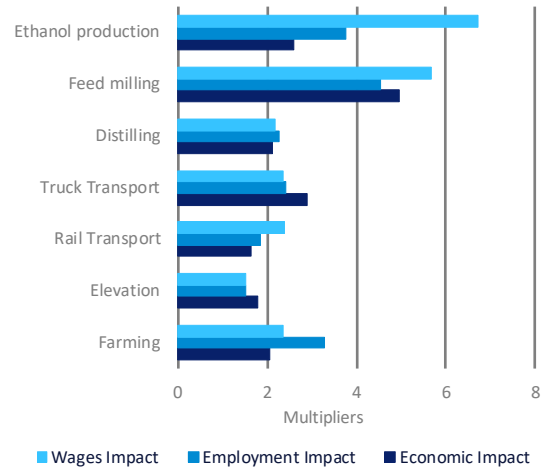
The **direct effects** of grain corn ignore the additional effects the industry generates In Manitoba via a ripple effect on supporting industries. This is known as the **indirect effects**. For some steps in the grain corn value chain, the indirect effect can be significant, particularly in capital intensive sectors such as food processing.

Many jobs associated with keeping a facility operational, from white collar jobs in engineering to trade professions like electricians, plumbers and pipefitters, are done on a contractual basis with outside firms, making the true impact of the processing facility much higher.

Similarly, direct effects fail to capture the economic activity stemming from expenditures of households drawing a salary from a given sector. While these "**induced**" effects are typically smaller than indirect effects, they can still constitute a sizeable economic force, particularly in a local area.

These economic and employment spin-offs are known as the ***multiplier effect*** in established economic literature. Multipliers measure the impact on the broader economy from an exogenous shock to a specific sector of the economy. In this report, we employ different multipliers for the economic, employment, and wage effects, and the size of the multiplier effect also varies geographically and across different subsectors of the grain corn value chain. Fortunately, ***StatCan maintains industry multipliers at a detailed sectoral level.***

Diagram 3: Grain corn multipliers by steps in the value chain



Statistics Canada's Industry Accounts Division has estimated over 250 economic multipliers. ***We adopt national-level multipliers throughout when estimating the total impact of grain corn on the Manitoba economy.***

This ensures consistency with existing economic impact studies. The multipliers are available for each of our impact measures, i.e. 1) economic impact, 2) employment impact and 3) wage impact, at the direct, the direct+indirect, and the direct+indirect+induced levels.

One challenge associated with using multipliers for sophisticated economies is that multipliers can change over time to reflect not only new economic realities, but also methodological developments. Also, constructing multiplier tables is both data and labour-intensive, resulting in infrequent reporting. As of the time of writing, the most recent multipliers available were from 2018 (Table 8).

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

		Multipliers		
Value-added activity	StatCan Industry Designation	Economic Impact	Employment Impact	Wages Impact
Farming	Crop Production	2.05	3.28	2.34
Elevation	Warehousing and Storage	1.77	1.51	1.53
Rail Transport	Rail Transportation	1.64	1.84	2.39
Truck Transport	Truck Transportation	2.89	2.41	2.35
Distilling	Wineries and distilleries	2.12	2.27	2.18
Feed milling	Animal Food Manufacturing	4.96	4.54	5.67
Ethanol production	Basic Chemical Manufacturing	2.59	3.76	6.71

Grain corn farming

We determine the economic impact of grain corn farming in Manitoba by considering the ***grain corn revenues*** earned by farmers; ***i.e. volumes produced multiplied by prices received***.

Unlike the other sectors in our analysis, *this calculation does not estimate the value added by the sector*: to do this, we would have to subtract the prices of inputs in order to derive a grain corn farming gross margin. However, if we did that, we would fail to capture the economic impact of the wide array of inputs used in grain corn farming, such as seed, fertilizers and crop protection. To include these would necessitate a multitude of value-added calculations for each input into grain corn farming.

The best way to view the grain corn ***farming impact*** in this report, therefore, is to view it as ***a summation of all the value added by all the sectors up to and including the farming stage***.

The value of grain corn farming is determined by two main factors:

- ***Grain corn prices:*** We use a monthly aggregated ex-farm Winnipeg grain corn price series, provided by MCA.
- ***Grain corn output:*** We use planted area and production series provided by StatCan and by MCA.

For this study, we took full-time equivalent paid grain corn farm employment to be a combination of ***growers and paid labour***. This would include any family members employed directly on the farm and paid an income. While many growers may hire an immediate family member (such as a son or daughter), we assumed that hired labour was primarily found outside the immediate family. The employment effect on unpaid family members is captured in the next section.

Diagram 4: Manitoba grain corn production and ex-farmgate grain corn price

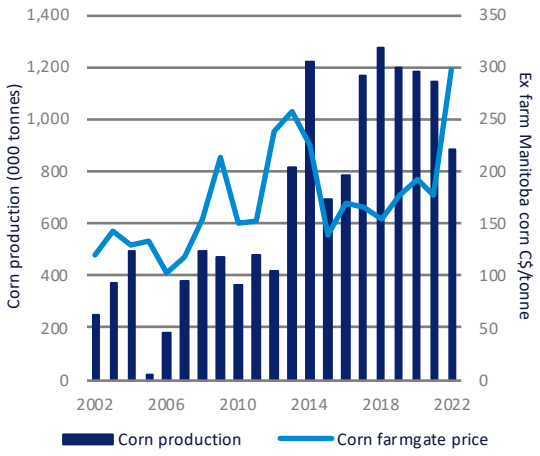
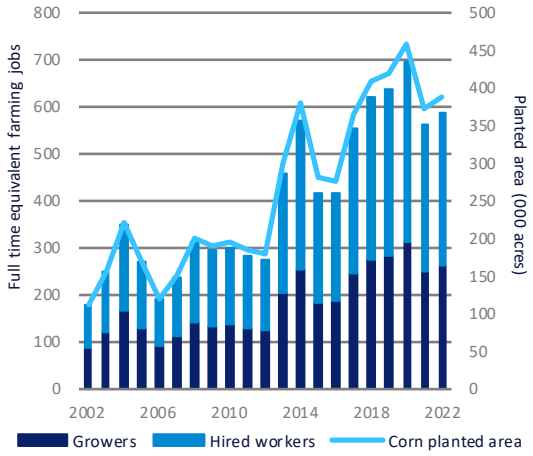


Diagram 5: Manitoba grain corn direct farming jobs and planted area



Estimating ***grower employment*** in grain corn farming was made on the basis of the grain corn area in Manitoba as a proportion of the total field crop area in the province. This percentage was then applied to the total number of field crop farms in Manitoba, assuming that there is one full time farmer per farm. This data series is constructed every five years, with the last data from 2021/22.

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

Estimates for ***hired labour*** were based on crop budgets developed by agricultural ministry extension specialists from across the prairie provinces. While there was some variability in these budgets in terms of labour requirements, we estimated labour requirements at slightly above the default 1.6 man-hours per acre for typical broad-acre crops, on account of the extra drying stage required for grain corn. By multiplying the number of grain corn acres by the man-hours per acre figure and dividing by 2,000 (50 weeks x 40 hours/week), we arrived at the number of hired hands working on grain corn farms on a full-time basis annually.

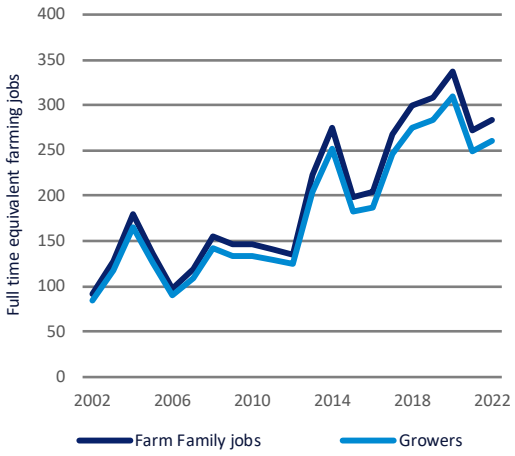
Wages **for hired labour were also taken from StatCan, with total wages paid being the product of the number of hired workers and the prevailing wage.**

Farm family members

Estimating the employment impact of an agricultural commodity presents the added challenge of how to account for farm family members other than the growers themselves. In some families, spouses and children may provide just a supporting role in farm operations, be it through keeping the books, buying supplies, or providing labour on an occasional basis. For other families, however, spouses and grown children may work on a nearly full-time basis, supported by farm revenues *but not receiving a direct wage*.

To account for this impact, we have included a sub-category in our employment estimates for ***grain corn farm family members***. As labour that is unpaid in the traditional sense, this category is differentiated from the rest of our employment estimates across the grain corn value chain, which represent workers who draw a cash wage from working in the grain corn sector. Consequently, the total employment effect in this study is presented with and without this number. Note that the figure provides an estimate of the additional farm family members supported by grain corn production: *it is not intended as an estimate of the family members employed by grain corn activities on the farm*.

Diagram 6: Grain corn farmers and farm family members



A number of data sets detail the average size of Canadian families over time, maintained by StatCan. One series suggests an average Canadian farm family size of 3.1 resident persons. Using this series would, therefore, imply that for every grower, there are just over two additional farm family members.

These family members are supported by *all* crops grown on the farm, and therefore we assume just over one farm family member is supported by each full time (FTE) grain corn farmer. Because these family members are assumed to be uncompensated through wages, ***no indirect or induced multiplier has been applied to this group and totals are the same whether looking at direct or total impacts***.

Lastly, we note that the economic impact associated with these workers has been captured under the "grain corn farming" category.

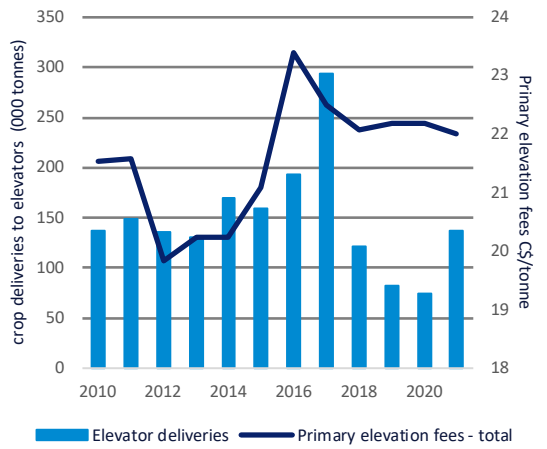
Elevation

The economic impact of grain corn elevation was determined by the product of volumes of grain corn being elevated and the fees incurred for elevation. For Manitoba, elevated grain corn volumes were determined from data available through the *Canadian Grain Commission* as well as conversations with industry experts.

- We estimate around 100,000 tonnes of grain corn pass through elevators facilities in Manitoba, based on a latest three-year average. However, these recent volumes are significantly lower than the preceding five-year average, of around 175,000 tonnes.

- Fees for primary elevation were also obtained from the *Canadian Grain Commission* based on annual surveys they conduct on the costs of moving grain to point of export. Total fees, for receiving, removal of dockage and storage of grain corn, typically average from $22 per tonne over the period.

Diagram 7: Grain corn deliveries to elevators and total elevation fees



To understand the employment impact of grain corn elevation, we began with a *"Working in Canada"* report developed by the Canadian government. This identifies 6,250 individuals employed in the elevation of all agricultural commodities in Canada.

The grain corn share of this total was calculated by multiplying the total jobs figure by the ratio of grain corn in commercial positions over all grains in commercial positions.

Salaries for these positions were based on a *StatCan* series for jobs in grain processing and handling. The product of Manitoba grain corn elevation employment and salaries gives the wage.

Crop and product delivery

The value added from grain corn transport comprises:

- ***Crop delivery:*** transporting the grain corn crop to elevators, to our three primary processing categories (distilling, feed milling and dry milling) plus transporting the crop interprovincially to processors and to overseas export ports, and finally transporting the crop overland to the US.

- ***Product delivery:*** transporting DCO, DDGs, grain corn feed and ethanol to local feed operators and blenders within Manitoba, as well as transporting whisky to distributors/retailers, both in Manitoba and inter-provincially, as well as to overseas export ports or overland to the US.

With near-infinite combinations of farm origins, processing facilities and end-use destinations, determining the economic impact of transportation of Manitoba grain corn and its products is the most complicated aspect of our economic impact model.

As simplifying assumptions, for rail and trucking transport:

- The first step is to determine the transport mode employed for each type of delivery. After interviews with industry experts, we assume that crop and product deliveries to local elevators, processors, retailers, other provinces and the US border are conducted via truck, with negligible volumes delivered via rail.

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

Note: The overseas exports (ports) category is zero for Manitoba as no grain corn is exported by seaport within the province, while exports to the United States are transported overland by truck.

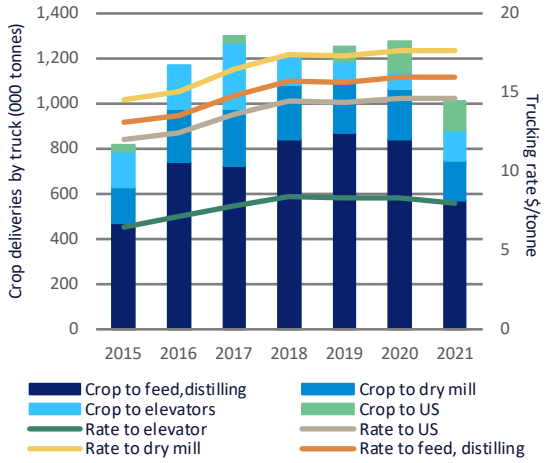
Because grain corn transport networks are nationwide rather than being fixed at a single point, ***transportation effects are presented on the basis of where the grain corn originates***. Thus, if Manitoba grain corn is transported by truck to another province, then Manitoba captures all of the crop delivery benefits accrued in our model.

Trucking

Trucking grain corn and its products was dealt with as follows:

- ***Grain corn volumes trucked from farm to elevator/processor/retailer*** were based on the volumes of grain corn passing through elevators (see previous section), as well as the volumes of grain corn processed locally in Manitoba (see next section). These data were obtained in part from StatCan and the Canadian Grain Commission.
- **Unprocessed grain corn** that does not pass through a primary elevator or processor is accounted for in ***volumes trucked overland for export to the United States.*** This is because no grain corn is exported from Manitoba via seaports (Churchill) within the province.
- ***Processed grain corn*** is assumed to be trucked locally and inter-provincially to retail markets in Canada. The proportion of grain corn trucked locally in Manitoba vs inter-provincially is based on data provided by industry participants.

Diagram 8: Trucked crop delivery volumes and rates to elevators/processors and the US border



The average distance trucked from farm to elevator was determined by dividing the number of square miles of grain corn planted by the volume of grain corn harvested.

Distances for grain corn trucked directly from farm to elevators and processors, and from there to retailers, were determined using the average distance between the geographic centers of production and elevation/processing facilities, as well as the average distance of geographic centres of these latter facilities to retail markets.

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

Distilling

The economic impact of distilling reflects the value added from producing grain corn whisky in Manitoba *from grain corn cultivated within the province*, i.e. it estimates the value added to Manitoba grain corn, not the value added in distilling in Manitoba in general. This is calculated by subtracting the input cost from the revenue generated from whisky production, and then ensuring that the final value-added figure captures only the proportion generated from Manitoba's grain corn crop inputs.

We start with estimates of the annual grain corn utilization at Manitoba's distilling plant, and of the volume of locally-sourced grain corn. These estimates are derived through marketing information from industry bodies, as well as interviews with industry participants.

We also estimate that it takes close to 8.5lbs of grain corn to produce 1 gallon of whisky, in line with general marketing information from the *Spirits Canada* trade association.

Revenue is determined by the output produced and the export unit values of the primary ingredients — grain corn, rye and barley — of bulk and bottled whisky, while the input cost is determined by the volume produced and the farmgate price of the primary ingredients of both whisky types.

Finally, the value added is estimated by subtracting the revenue generated from sales of both whisky types from the input cost of producing them. In each case, the revenue and input cost calculated is proportionate to the amount of grain corn used relative to rye and barley primary ingredients. This is to ensure that the value added captured is only that which is generated from Manitoba's grain corn crop sector alone.

Diagram 9: EUV's of the product and input costs for Manitoba whisky

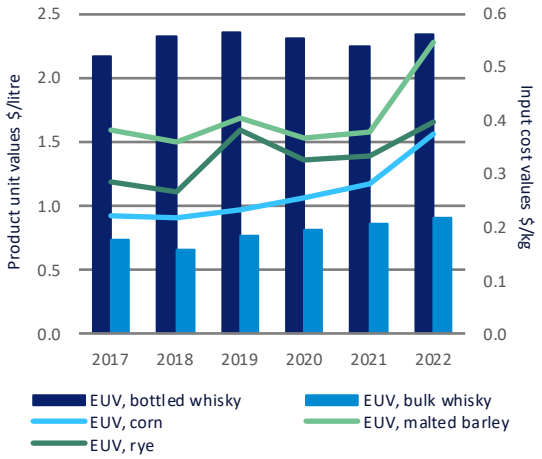
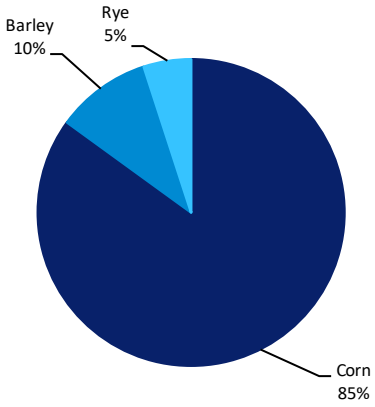


Diagram 10: Share of inputs used in the production of whisky in Manitoba



For distilling ***employment***, we start with an estimate of over 70 full-time equivalent jobs at similar-sized distillery. Then, to ensure this is proportionate to the amount of exclusively Manitoba-cultivated grain corn processed at the facility, we multiply this estimate by the fraction of local grain corn utilized in the annual production of whisky, and the share of grain corn per unit of whisky production relative to other primary ingredients.

The ***wages*** were obtained from an aggregated beverage production wage series provided by *StatCan*. This was multiplied by the number of jobs to determine the wage impact.

Feed milling

The ***economic impact*** of Manitoba's feed milling sector reflects the value added from processing locally-grown grain corn into animal feed. The value added from feed milling is determined by the product of the volume of Manitoba grain corn milled and the gross margin from processing grain corn for animal feed. Interviews with industry participants indicated that this margin averages $60 per tonne above the farmgate value of Manitoba grain corn.

Volumes milled are estimated as the residual of local grain corn production after distilling, dry milling, exports to the US and inter-provincial shipment volumes are accounted for.

Feed milling is the largest processing stage for Manitoba's grain corn. We estimate the average volume directed to feed mills at around 700,000 tonnes per annum in the last three years, roughly two-thirds of Manitoba's overall domestic grain corn crop production between 2019/20 and 2021/22.

To arrive at the ***employment impact*** of grain corn feed milling, we start with an estimate for the number of grain grain corn feed milling facilities in Manitoba, which is then multiplied by the average feed employment per facility. The number of grain grain corn feed milling facilities are derived from data by the *Animal Nutrition Alliance of Canada* (2020), while the average feed employment per facility number is arrived at through discussions with employees of feed mills in Canada.

The average ***wages*** for feed milling were obtained from *StatCan* and multiplied by jobs to determine the direct wage impact.

Diagram 11: Grain corn volumes to feed mills and overall Manitoba grain corn production

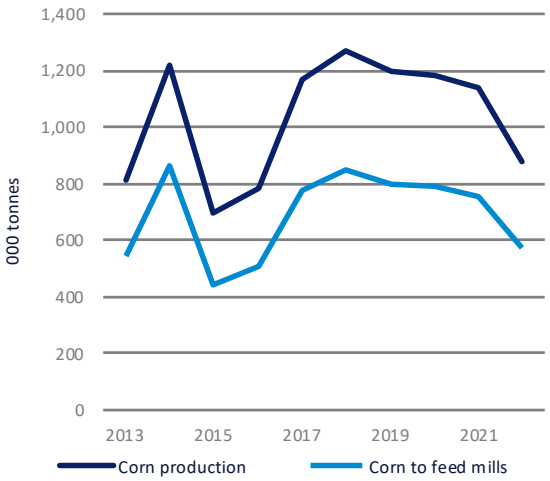


Diagram 12: Estimated Manitoba grain corn feed price

Dry milling

The economic impact of dry milling is determined based on the value added from processing Manitoba-grown grain corn into ethanol, distillers' grain corn oil (DCO) and dried distillers' grains (DDGs) within the province. This is done by first estimating the volume of Manitoba's grain corn production dedicated to dry milling. The estimate used is based on indications from industry participants.

Then, prices for ethanol, DCO and DDGs are derived using EUVs and representative regional prices. The total economic impact is then taken to be the combined product of the value added by each processing step and the volumes of dry milled grain corn.

The ***employment impact*** of dry milling was determined by the product of average plant ethanol full-time equivalent jobs and the estimated fraction of Manitoba grain corn used in dry milling within the province. The average annual ***wage*** from dry milling was estimated from a series by StatCan and multiplied by the above full-time equivalent jobs figure to arrive at an overall wage impact.

Dagram 13: Production of ethanol, DDGs and DCO from Manitoba-grown grain corn

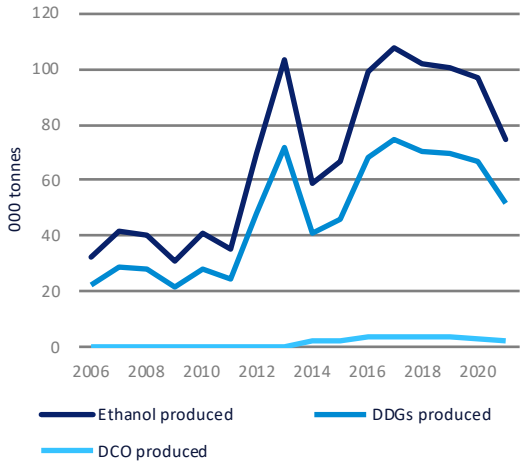
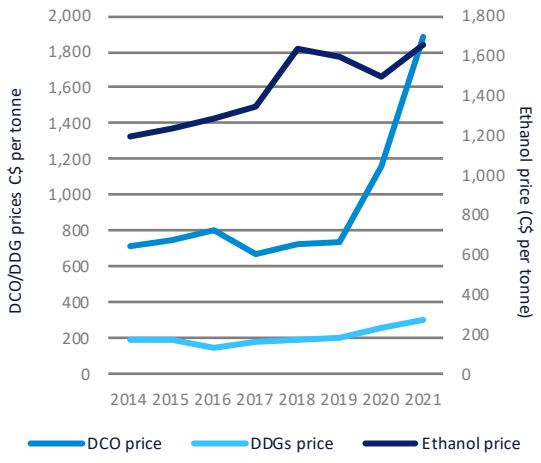


Diagram 14: Representative prices for ethanol, DDGs and DCO in Manitoba



Dagram 14: Production of ethanol, DDGs and DCO from Manitoba-grown grain corn

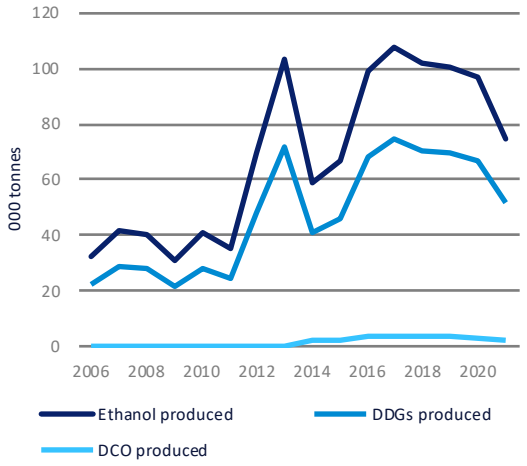
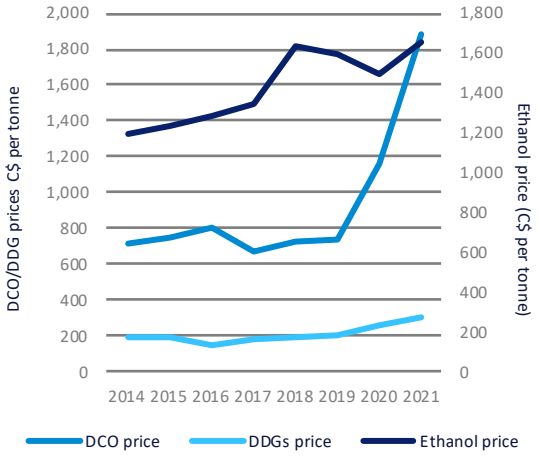


Diagram 15: Representative prices for ethanol, DDGs and DCO in Manitoba



About GlobalData

GlobalData is a leading provider of data, analytics, and insights on the world's largest industries.

In an increasingly fast-moving, complex, and uncertain world, it has never been harder for organizations and decision makers to predict and navigate the future. This is why GlobalData's mission is to help our clients to decode the future and profit from faster, more informed decisions. As a leading information services company, thousands of clients rely on GlobalData for trusted, timely, and actionable intelligence. Our solutions are designed to provide a daily edge to professionals within corporations, financial institutions, professional services, and government agencies.

| Unique Data

We continuously update and enrich 50+ terabytes of unique data to provide an unbiased, authoritative view of the sectors, markets, and companies offering growth opportunities across the world's largest industries.

| Expert Analysis

We leverage the collective expertise of over 2,000 in-house industry analysts, data scientists, and journalists, as well as a global community of industry professionals, to provide decision-makers with timely, actionable insight.

| Innovative Solutions

We help you work smarter and faster by giving you access to powerful analytics and customizable workflow tools tailored to your role, alongside direct access to our expert community of analysts.

| One Platform

We have a single taxonomy across all of our data assets and integrate our capabilities into a single platform – giving you easy access to a complete, dynamic, and comparable view of the world's largest industries.

Contact Us

If you have any more questions regarding our research, please contact us:

info.agri@globaldata.com