

Economic Contribution Analysis of the Corn and Wheat Industries of Ohio



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Table of Contents

Executive Summary	1
Table 1. Summary of Estimated Economic Benefits of Corn & Wheat Industries in Ohio	1
Introduction	2
Corn Production Trends	2
Figure 1. Corn acreage planted and average yield from 1973 to 2018.	3
External Trends Impacting Corn Industry	3
Figure 2. U.S. total corn production and corn used for fuel ethanol production.....	3
Figure 3. U.S. feed and residual corn usage.	4
Wheat Production Trends	4
Figure 4. Wheat acreage planted and average yield from 1973 to 2018.....	5
External Trends Impacting the Wheat Industry	5
Methodology	5
Table 2. Project Input Factors	6
Economic Contribution – Corn and Wheat Industries Combined	7
Table 3. Combined Corn and Wheat Industry Impact Summary.....	7
Figure 5. Top Ten Sectors Affected by both the Corn and Wheat Industry for Employment	7
Figure 6. Top Ten Sectors Affected by both the Corn and Wheat Industries for Labor Income.....	8
Figure 7. Top Ten Sectors Affected by both the Corn and Wheat Industry for Value Added.....	8
Economic Contribution – Corn Industry	9
Table 4. Corn Industry Impact Summary	9
Figure 8. Top Sectors Affected by the Corn Industry for Employment	9
Figure 9. Top Ten Sectors Affected by the Corn Industry for Labor Income	10
Figure 10. Top Ten Sectors Affected by the Corn Industry for Value Added.....	10
Economic Contribution – Wheat Industry	10
Table 5. Wheat Industry Impact Summary	11
Figure 11. Top Ten Sectors Affected by the Wheat Industry for Employment.....	11
Figure 12. Top Ten Sectors Affected by the Wheat Industry for Labor Income.....	11
Figure 13. Top Ten Sectors Affected by the Wheat Industry for Value Added	12
Conclusion	12
References	13

Economic Contribution Analysis of the Corn and Wheat Industries in Ohio

Executive Summary

The Ohio Corn and Wheat Growers Association is an advocacy and educational organization dedicated to the success of corn and wheat producers throughout Ohio. In 2018, the organization commissioned Ohio State University Extension to conduct a contribution analysis of Ohio’s corn and wheat industries to estimate how these two sectors impact Ohio’s economy. This contribution analysis estimates the portion of the Ohio economy, in terms of jobs, labor income, value added and output, that are supported by the two industries separately, and combined.

The analysis uses an economic input-output (I-O) modeling software program, IMPLAN, to measure the economic contribution of the corn and wheat industries based on a current level of production (2017 USDA data). The IMPLAN model captures indirect and induced effects of existing industries on other sectors in the state or region.

Table 1. Summary of Estimated Economic Benefits of Corn & Wheat Industries in Ohio

Industry Sector	Jobs	Labor Income	Value Added	Output
Corn	28,207	\$676,677,886	\$1,198,328,196	\$3,846,512,574
Wheat	2,329	\$56,785,183	\$100,364,861	\$313,702,928
Total	30,536	\$733,463,069	\$1,298,693,057	\$4,160,215,502

Table 1 presents the total estimated jobs, labor income, value added, and output supported in the Ohio economy as a result of the production of corn and wheat. Jobs represent the direct, indirect, and induced positions supported by the corn and wheat sectors. Value added is the best measure of the economic contribution of both industries as it estimates the added benefit to the economy beyond the grain sector. Output represents total production, including intermediate expenditures to the grain sector, and is therefore not as reliable a measure since it double-counts sales between industries.

In sum, the corn and wheat industries contribute to the support of over 30,000 jobs, \$733 million in labor income, and almost \$1.3 billion in value added to Ohio’s economy.

Introduction

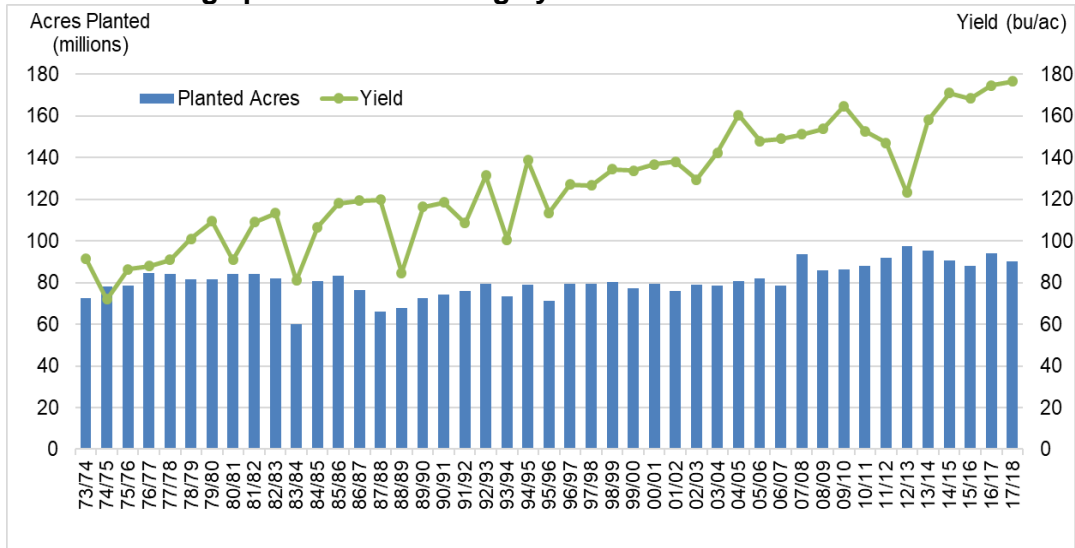
The growing demand for food, feed, and fuel is driven by several key factors including population growth trends, changing dietary preferences, alternative fuel demands, and economic development. Population growth is expected to continue with moderate projections estimating 9 billion people by 2050 (UN, 2017). In addition, wealth accumulation in developing countries is also shifting the demographics of the global population creating the need to increase production to satisfy their changing lifestyle preferences. US grain production, namely corn and wheat, will play a crucial role in meeting these demands.



Corn Production Trends

Corn production in the United States occurs on approximately 90 million acres, with 3.4 million acres in Ohio (USDA-NASS, 2017). Figure 1 shows the planted acreage and yield from 1973 to 2018. Planted acreage peaked at 97.3 million acres in 2012, driven by commodity price increases caused by an increased demand for plant-based ethanol mandated by the Renewable Fuel Standard. Although planted acreage has experienced a slight decrease since 2013, production has steadily increased due to improvements in management, technology, and genetic potential of the crop. In 2017, the Ohio corn crop averaged a state record yield of 177 bushels per acre (USDA-NASS, 2017).

Figure 1. Corn acreage planted and average yield from 1973 to 2018.

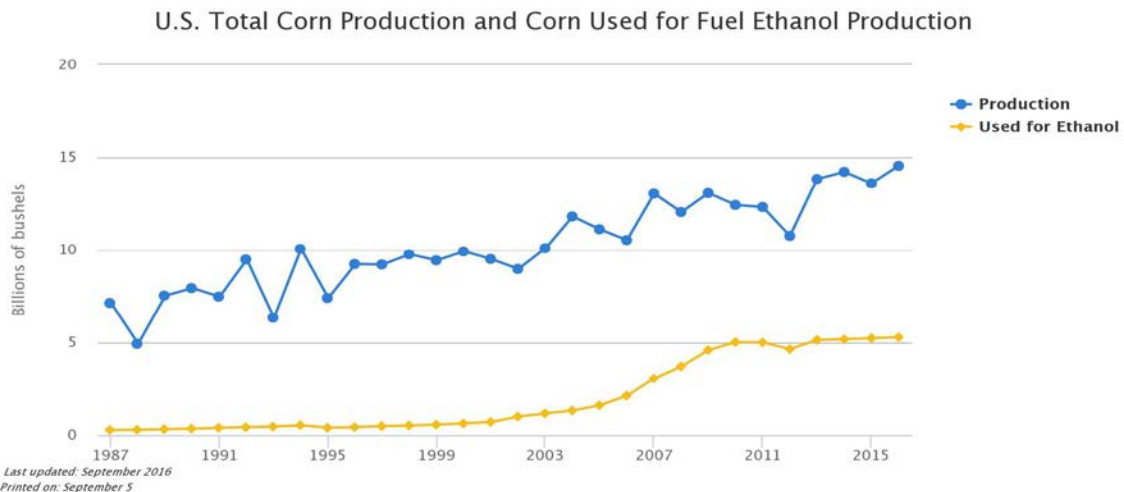


Source data: USDA OCE, 2018

External Trends Impacting Corn Industry

According to the August 2018 USDA World Agriculture Supply and Demand Estimates (WASDE) Report, 36% of domestic production in 2016-17 is used for ethanol and byproducts (USDA OCE, 2018). The Renewable Fuel Standard (RFS), created by the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007, established targets for the volume of renewable fuels used to produce transportation fuels. Figure 2 shows a dramatic increase in corn used for ethanol production soon after the RFS was enacted with a plateau in consumption being reached in 2010.

Figure 2. U.S. total corn production and corn used for fuel ethanol production.

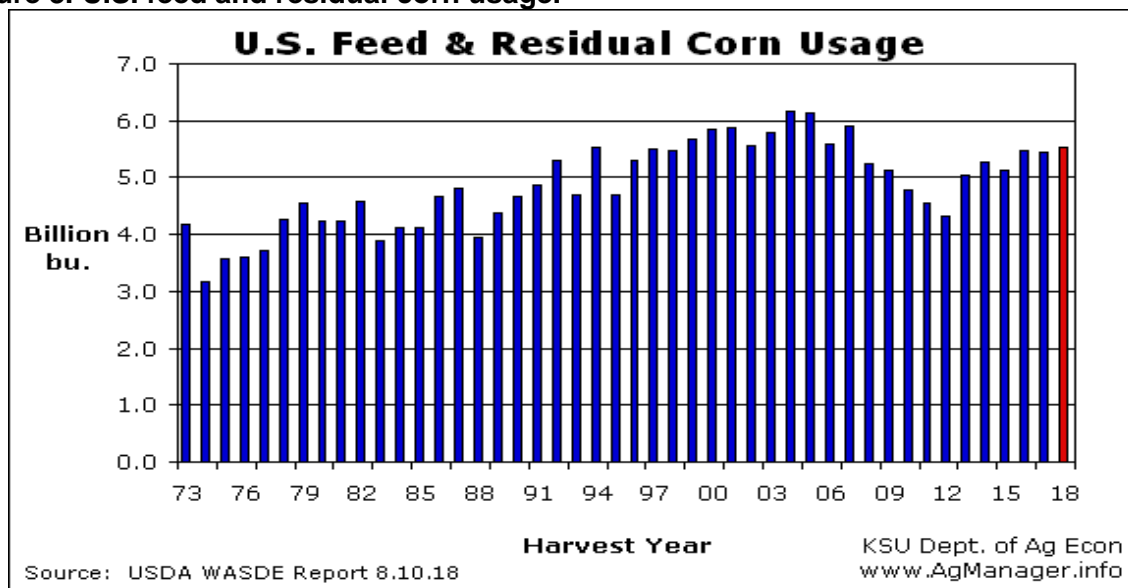


Last updated: September 2016
Printed on: September 5

Source: USDE, 2016

According to the WASDE report, another 36% of production is used for feed and residuals (USDA OCE, 2018). Growing population and shifting demographics are driving an increased demand for animal protein, globally. The World Health Organization estimates meat production to reach 376 million tons by 2030, up from 218 million tons in 1999 (FAO, 2003). Figure 3 shows the feed and residual corn usage. Feed usage trended down as ethanol production drove corn commodity prices upward and livestock producers shifted to cheaper feed grains. Consumption has steadily rebounded since 2013 as prices have adjusted.

Figure 3. U.S. feed and residual corn usage.



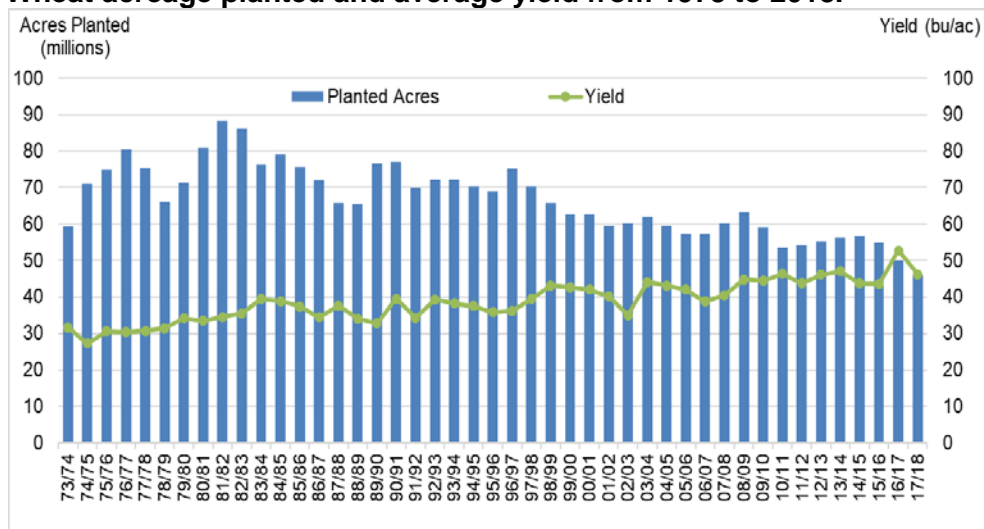
Source: USDA WASDE Report August 2018, data summarized by Kansas State University, Department of Agricultural Economics.

The WASDE report estimates exports consume approximately 15% of production. Other uses include processing for food and industrial products, and seed (USDA OCE, 2018).

Wheat Production Trends

Wheat is produced on approximately 50.2 million acres in the United States, with 460 thousand acres being planted in Ohio (USDA-NASS, 2017). Figure 4 shows the planted acreage and national average yields from 1973 to 2018. Wheat acreage has trended downward steadily. This decrease can be attributed to increased competition from foreign producers and also decreased domestic demand due to changes in dietary preferences. Wheat acreage has seen a steep decline in Ohio, down over half since 2000. In 2017, the Ohio wheat crop averaged a state record yield of 74 bushels per acre (USDA-NASS, 2017).

Figure 4. Wheat acreage planted and average yield from 1973 to 2018.



Source data: USDA OCE, 2018

External Trends Impacting the Wheat Industry

Wheat is the third largest crop produced by planted acreage in the United States (USDA-NASS, 2017). There are five different types of wheat, each with unique uses. Ohio produces soft red winter wheat which is used to produce many baked goods and pastries including cookies, cakes, and crackers.

According to the August 2018 USDA WASDE Report, food use accounted for approximately 45% of the 2017/18 soft red winter wheat production (USDA OCE, 2018). 26% of the 2017/18 crop was dedicated to exports while 18% was used for feed and seed (USDA OCE, 2018).

Methodology

This report measures the economic contribution of two grain industry sectors, corn and wheat, using IMPLAN (IMPact analysis for PLANning) data and software, developed by IMPLAN Group LLC. The IMPLAN database contains federal, state, and local economic statistics and data by county and zip code. IMPLAN can be used to estimate the effect of a new economic change or contribution of an existing industry on a local or regional economy. For this report, the geographic area is the state of Ohio.

Using IMPLAN modeling, we can estimate the extent to which the production of corn and wheat in Ohio contributes to other employment, income, and value added. IMPLAN provides estimates for three types of economic effects—direct, indirect, and induced—using 2017 IMPLAN data for the state (the latest data available as of December, 2018). A breakdown of impact types is as follows:

- **Direct effects** are the value of corn and wheat sector production, sector employment, and value added (which includes labor income).

- **Indirect effects** occur as Ohio businesses provide goods and services used by grain producers, and when these businesses, in turn, make additional purchases from Ohio businesses.
- **Induced effects** occur as workers or proprietors in the directly and indirectly affected industries receive income that they then use to purchase goods and services from other businesses in Ohio, in addition to subsequent rounds of labor income spending generated by industries affected by the first round.

IMPLAN uses multiplier models built on social accounting matrices (SAM) that capture dollar amounts of all business transactions in a regional economy. These multipliers measure impacts based on industry inputs and the region's unique economic structure and trade relationships. IMPLAN requires at least one input factor (employment, labor income, or sales/investment) to generate resulting estimates. For this report, total production (investment) using 2017 USDA data was the primary input factor (Table 2).

Table 2. Project Input Factors

Sector	Total Production (Investment)
Grain (Corn Production)	\$1,966,736,000
Grain (Wheat Production)	\$157,731,000

The corn and wheat industries were modeled separately in IMPLAN using an analysis-by-parts (ABP) approach. The ABP approach can be used to refine an analysis to more accurately represent a specific industry that falls within an aggregate IMPLAN sector, e.g., corn production (refined industry) as opposed to grain farming (aggregate industry) by altering industry balances and customizing spending patterns. Although the corn and wheat industries share a similar spending pattern, some inputs were modified, including fertilizers and fuels, to simulate USDA budgetary values for Ohio.

To conduct the analysis, we used a single sector (grain) for both corn and wheat. Since corn and wheat farmers make up almost the entirety of the grain farming industry in Ohio, we followed IMPLAN's step-by-step process for conducting a multi-industry ABP (analysis-by-parts) approach, making modifications to the model prior to analysis to avoid double-counting. The modifications constrain so that purchases of the grain sector cannot exceed the sector's total production, adjusting for intermediate expenditures that occur when purchases are made from the grain farming sector.

In the following sections, contribution results are described for corn and wheat by employment, labor income, value added, and output. Although output is shown in the tables, it is not the best representation of economic contribution as it double-counts the sales between industries. In 2017, OSU's Department of Agricultural, Environmental and Developmental Economics released a report, "The Economic Contribution of Agriculture and Food Production to the Ohio Economy," which concluded that "value added is the correct value for measuring the contribution of a sector or cluster to an economy."

Economic Contribution – Corn and Wheat Industries Combined

The combined corn and wheat industries (Table 3) supported over 30,000 jobs, \$733.4 million in labor income, and \$1.3 billion in value added to Ohio’s economy. Results from this analysis also produced the top ten sectors impacted by both industries in 2017. Figures 5-7 demonstrate how the two industries affect other sectors of the economy by employment, labor income, and value added.

Table 3. Combined Corn and Wheat Industry Impact Summary

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	15,885	\$ 46,271,172	\$ 70,384,733	\$ 2,124,467,000
Indirect Effect	11,122	\$ 528,450,819	\$ 944,030,719	\$ 1,549,466,633
Induced Effect	3,529	\$ 158,741,078	\$ 284,277,605	\$ 486,281,869
Total Effect	30,536	\$ 733,463,069	\$ 1,298,693,057	\$ 4,160,215,502

For employment (Figure 5), the support activities for agriculture sector benefited the greatest with 4,762 jobs supported, followed by 1,364 jobs in real estate, and 857 in the wholesale trade sector. Other sectors positively affected include building construction and maintenance (325 jobs), truck transportation (263 jobs), employment services (251 jobs), insurance carriers (241 jobs), and restaurants (total of 468 jobs supported).

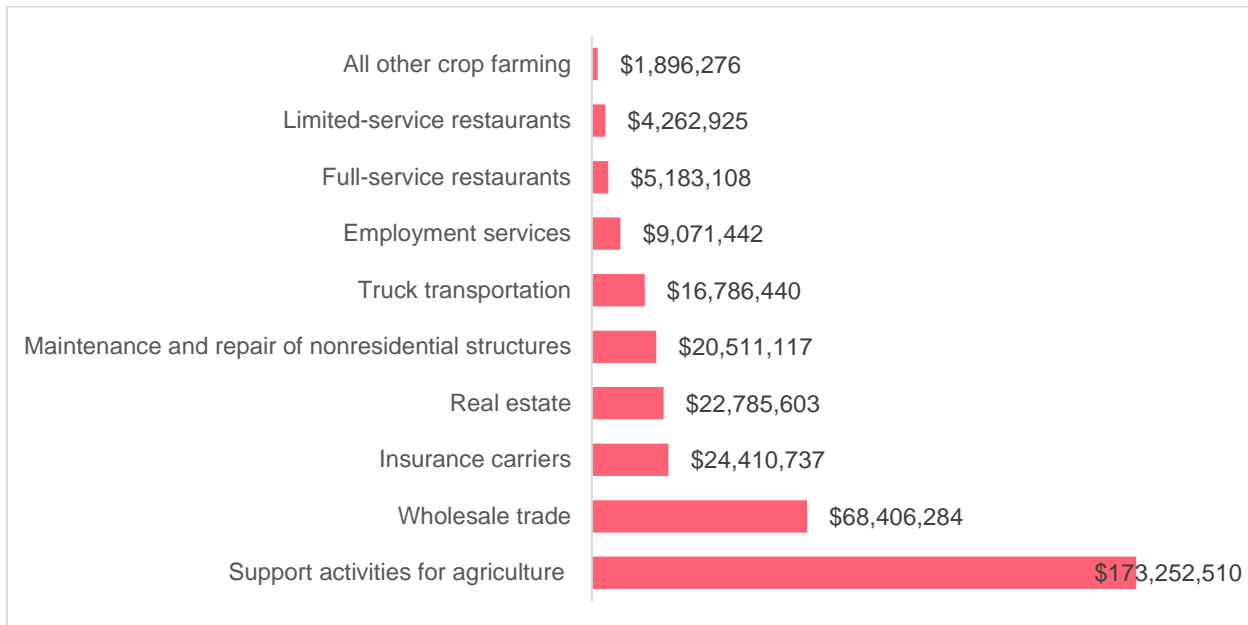
Figure 5. Top Ten Sectors Affected by both the Corn and Wheat Industry for Employment



Source: IMPLAN

Figures 6 and 7 list the same ten sectors that are the most affected by production of corn and wheat, but with a change in placement for a few sectors. For instance, the insurance sector is only seventh of ten in the top sectors for employment accounting for 241 jobs, but is one of the top three sectors by labor income, reflecting a higher average wage rate for insurance carriers.

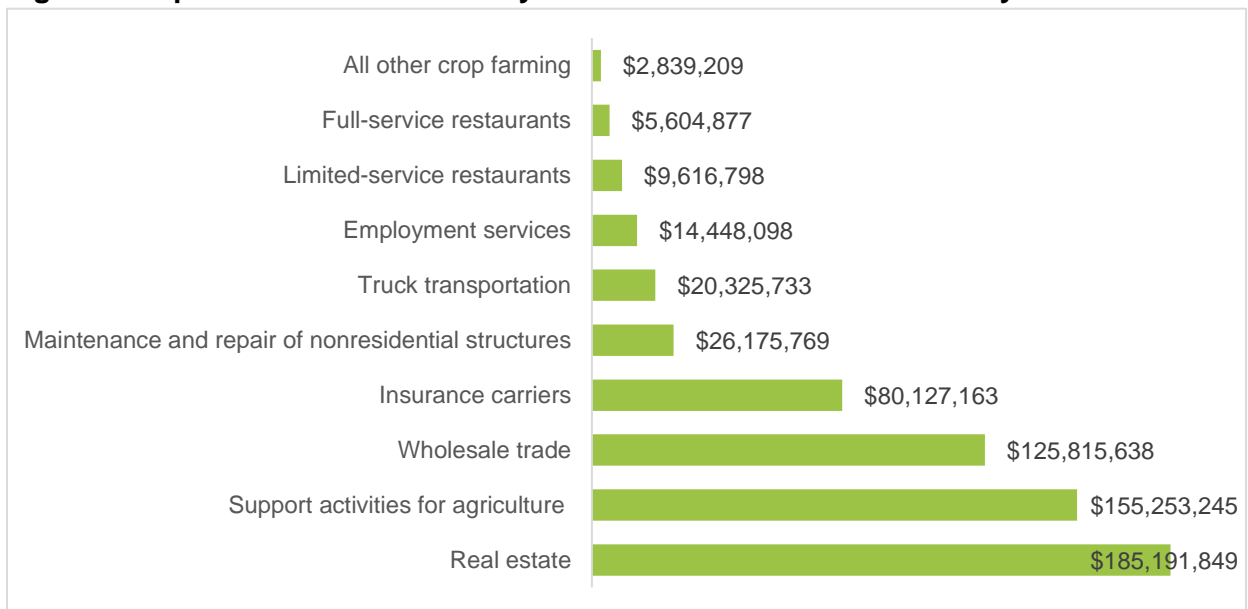
Figure 6. Top Ten Sectors Affected by both the Corn and Wheat Industries for Labor Income



Source: IMPLAN

Value added (Figure 7), which includes labor income, also demonstrates the higher ranking of the insurance carrier sector. Ranking the highest, even higher than support activities for agriculture, is the real estate sector, with over \$185 million in supported value added economic activity. This is likely due to the sector's (including wheat sector) sizeable value added driven primarily by Other Property Type Income (OPTI), which includes rental profits.

Figure 7. Top Ten Sectors Affected by both the Corn and Wheat Industry for Value Added



Source: IMPLAN

Economic Contribution – Corn Industry

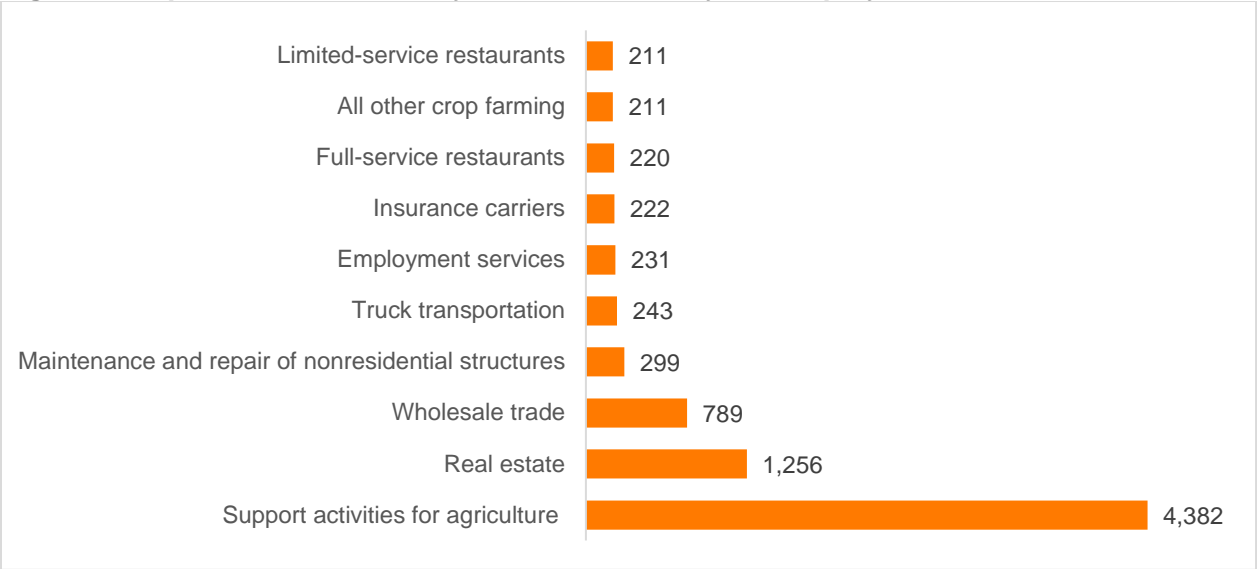
Table 4 shows that the corn industry alone supported 28,207 jobs in sectors throughout the economy, or 93.4% of the total employment supported by both the corn and wheat industries. In addition, the corn industry supported \$676.7 million in labor income and almost \$1.2 billion in value added.

Table 4. Corn Industry Impact Summary

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	14,706	\$ 42,835,770	\$ 65,159,020	\$ 1,966,736,000
Indirect Effect	10,246	\$ 487,423,768	\$ 870,959,491	\$ 1,431,243,551
Induced Effect	3,255	\$ 146,418,348	\$ 262,209,685	\$ 448,533,023
Total Effect	28,207	\$ 676,677,886	\$1,198,328,196	\$ 3,846,512,574

Figures 8-10 rank the top ten sectors affected by the corn industry from the lowest to the highest value. Support activities for agriculture, wholesale trade, real estate, maintenance and repair of nonresidential structures, and insurance carriers consistently rank highest for all three, employment, labor income and value added.

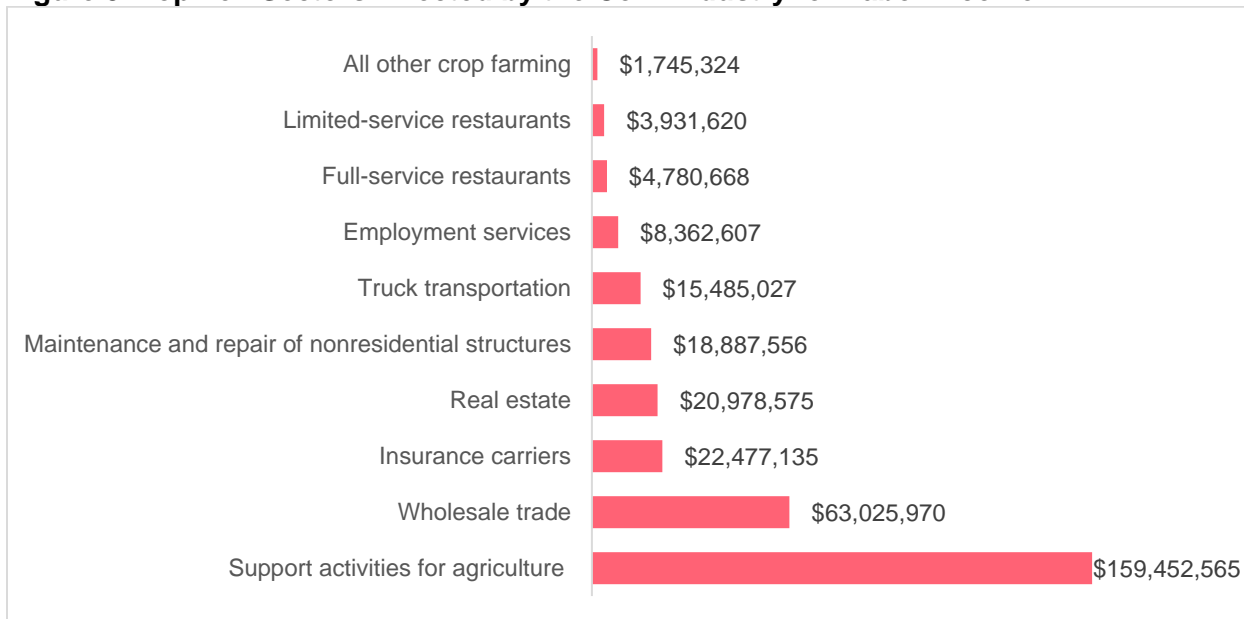
Figure 8. Top Sectors Affected by the Corn Industry for Employment



Source: IMPLAN

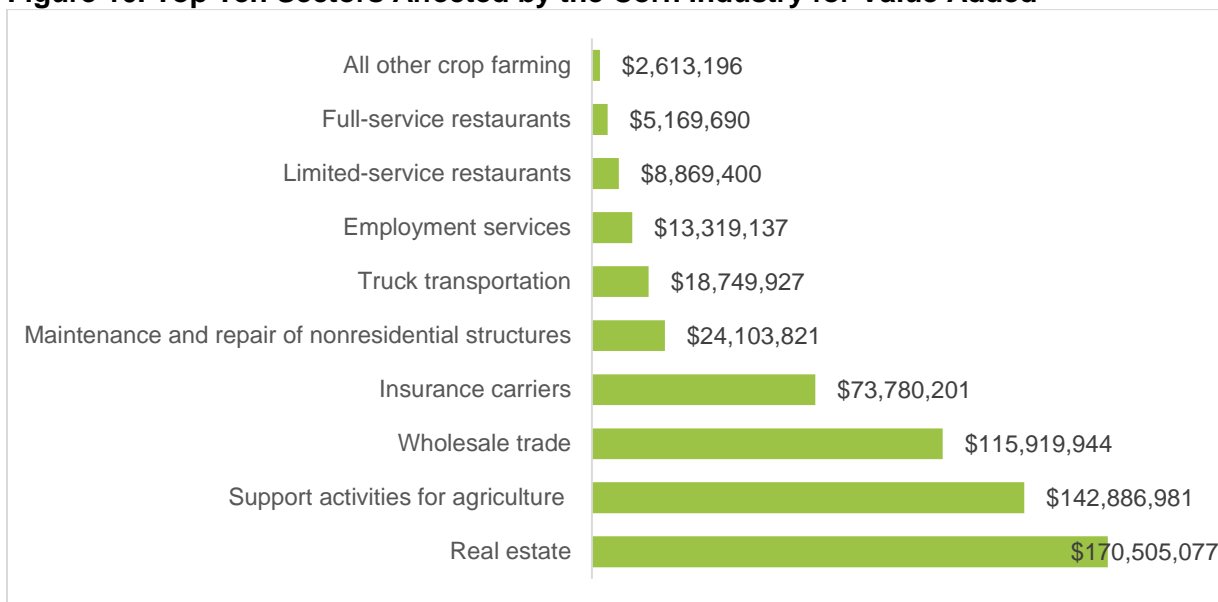
Support activities for agriculture represents 15.5% of the total employment affected by the corn sector (Table 4), followed by real estate which represents just under 5% and wholesale trade at 3%. Employees included within the support activities sector are agricultural equipment operators and farmworkers and laborers, who make up the large percentage of the workers within the industry.

Figure 9. Top Ten Sectors Affected by the Corn Industry for Labor Income



Source: IMPLAN

Figure 10. Top Ten Sectors Affected by the Corn Industry for Value Added



Source: IMPLAN

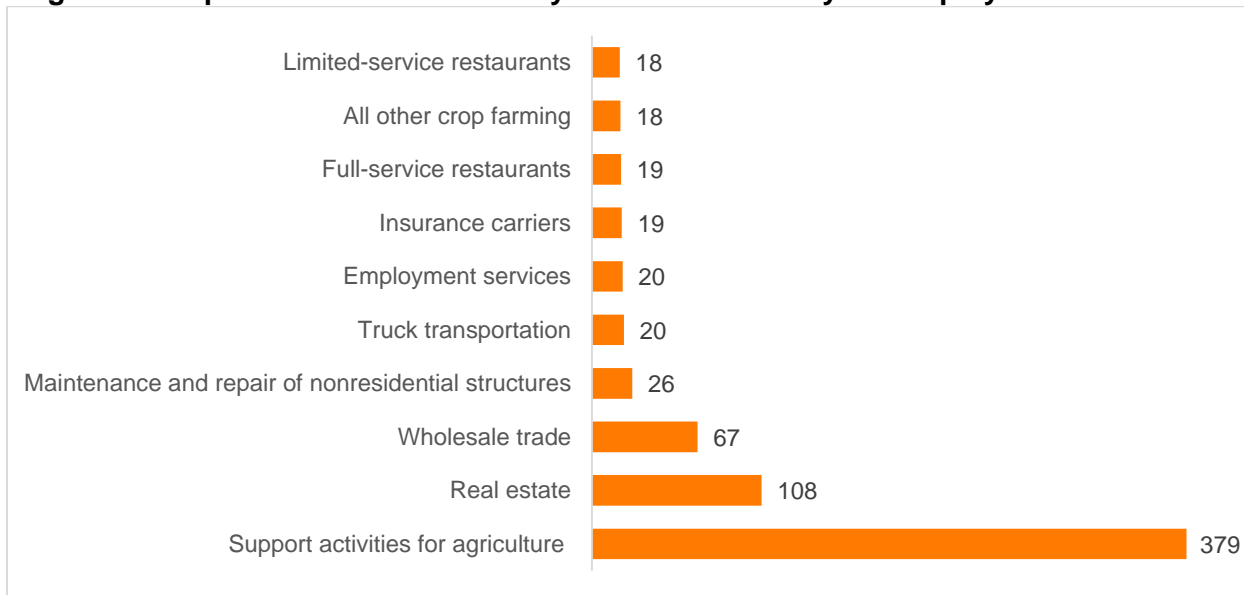
Economic Contribution – Wheat Industry

The wheat industry supports 2,329 jobs and \$56.8 million in labor income in Ohio. The value added to the economy is over \$100 million. Table 5 is a summary of the type of impacts by employment, labor income, value added, and output.

Table 5. Wheat Industry Impact Summary

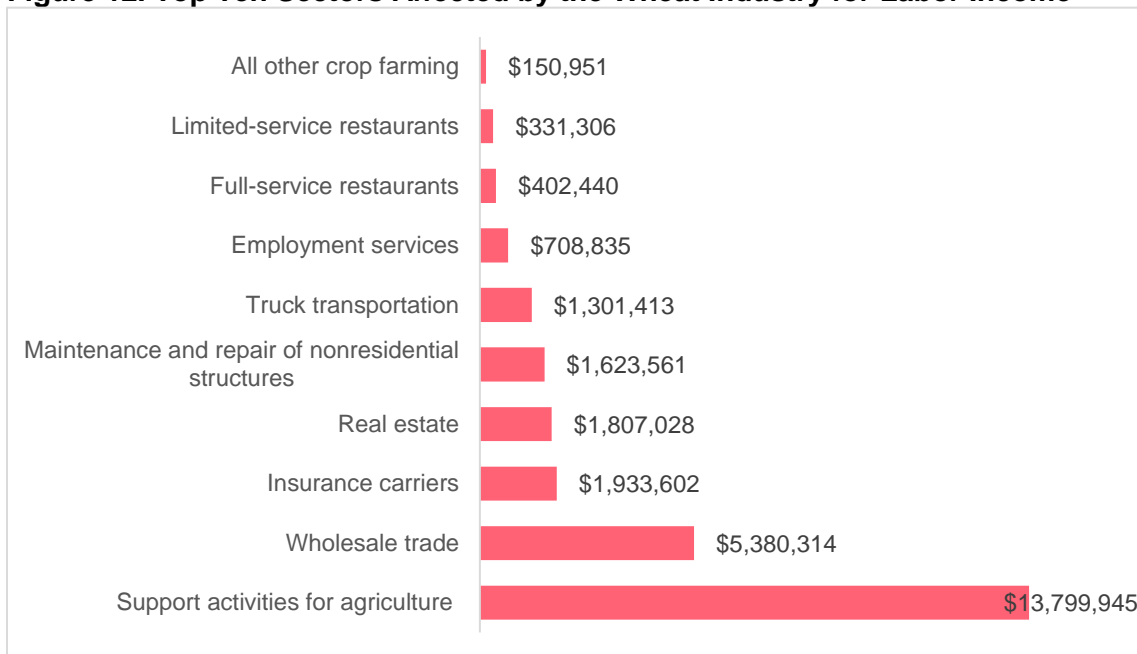
Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	1,179	\$ 3,435,402	\$ 5,225,713	\$ 157,731,000
Indirect Effect	876	\$ 41,027,051	\$ 73,071,228	\$ 118,223,083
Induced Effect	274	\$ 12,322,730	\$ 22,067,920	\$ 37,748,846
Total Effect	2,329	\$ 56,785,183	\$ 100,364,861	\$ 313,702,928

Figure 11. Top Ten Sectors Affected by the Wheat Industry for Employment



Source: IMPLAN

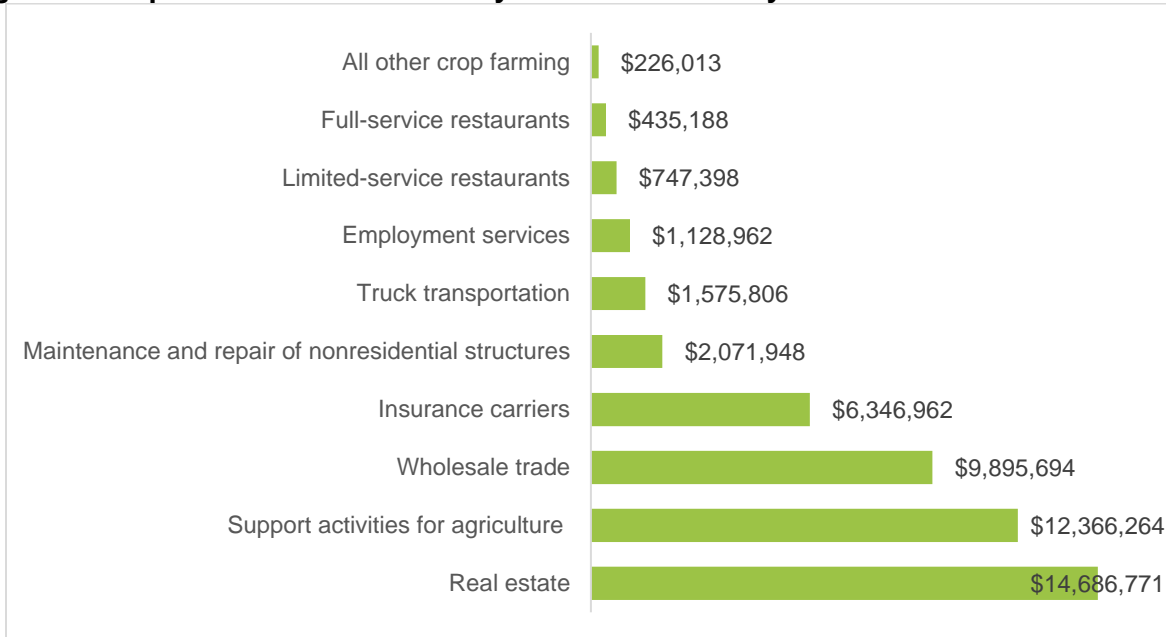
Figure 12. Top Ten Sectors Affected by the Wheat Industry for Labor Income



Source: IMPLAN

Consistent with results for the corn industry and the combined industries, the wheat industry, at \$14.7 million, supports a larger share of real estate value added, largely due to rental profits, than other top ten industry sectors (Figure 13).

Figure 13. Top Ten Sectors Affected by the Wheat Industry for Value Added



Source: IMPLAN

Conclusion

The corn and wheat industries support a significant number of jobs, labor income, and value added (GDP) for the state of Ohio. Sectors benefitting from the grain sector are in financial and support services across the spectrum, including support activities for agriculture, real estate, insurance, wholesale trade, and construction-related.

While external forces impact the demand for both corn and wheat worldwide, the current structure of these industries makes it difficult and slow for production to respond to changes. Expansion and diversification of market opportunities for these crops would be beneficial for long-term stability in these industries.

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