

**Economic Impact Analysis  
of  
the Ethanol Industry in Ohio  
for the**

***Ohio Ethanol Producers Association***

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# Ethanol Production in Ohio

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## **Executive Summary**

In 2010, the Department of Energy released a report on the status of the ethanol industry in the U.S. claiming that the ethanol industry is “one of the most significant success stories in American manufacturing over the past quarter-century.” The industry had grown from 170 million gallons produced in 1980 to a peak capacity of nearly 13 billion gallons in 2010. Today, over 200 plants are producing almost 15 billion gallons nationwide.

State and federal renewable energy standards have spurred growth in the industry. In July 2008, the Ohio legislature enacted Senate Bill 221 outlining renewable standards to encourage increased ethanol production as well as other alternative and renewable energy development. The six ethanol facilities currently in production in Ohio were constructed since 2008.

This study estimates the impact of the ethanol industry in Ohio using IMPLAN, an economic input-output (I-O) model to measure overall economic impact. The model captures indirect and induced impacts that occur from an initial direct investment using 2010 IMPLAN data (the most recent available). The analysis is based on the premise that sectors are linked; a change in one sector will create change in others. This study analyzes the two separate events listed below that account for total economic impact of the ethanol industry in Ohio.

1. New construction and additional upgrades of six ethanol facilities using a capital investment indicator of \$825 million.
2. Ongoing operation of six ethanol facilities using an employment indicator of 273 annual average full time equivalent (FTE) jobs and annual payroll of \$9.6 million per year.

The total estimated economic contribution of the ethanol industry to the Ohio economy is summarized in Table 1 below. Figures presented represent the sum of the direct, indirect and induced impact for construction and operations. Employment and labor income are obvious indicators for assessing economic impact. Study estimates indicate that construction of ethanol production facilities account for the majority of contributions to overall employment (**88% of 12,975 jobs**) and labor income (**83% of \$607 million**). Overall output contributions are somewhat more balanced between construction (**\$683 million**) and operations (**\$433 million**).

**Table 1. Total Estimated Economic Contribution of the Ethanol Industry in Ohio**

<b>Activity</b>	<b>Total Output</b>	<b>Employment</b>	<b>Total Income</b>
Ethanol construction	\$683 M	11,413	\$504 M
Ethanol operations	\$433 M	1,562	\$103 M
<b>Total</b>	<b>\$1.1 B</b>	<b>12,975</b>	<b>\$607 M</b>

## ***I. Introduction***

There are currently six ethanol production facilities in Ohio. These ventures employ salaried and wage staff as well as purchase goods and services. Their construction also employed salaried and wage staff as well as significant investment in materials.

These construction and operations investments are significant. Such investment contributes to additional economic activity in a variety of other sectors that comprise the larger economy well beyond the economic activity of the processing facilities themselves. Using input/output modeling, we can estimate the extent to which the construction and operation of Ohio's ethanol processing facilities contribute to other employment (measured in FTEs) and income (measured in dollars).

Some of this investment goes toward the purchase of goods and services production. Additionally, some of the spending goes toward the payment of employee wages and benefits. These dollars represent the **direct effect** of the construction and operation of Ohio's ethanol processing facilities. Other ethanol processing facilities-related spending has no additional impact beyond the initial round of spending because those dollars do not stay within the study area (in this case, Ohio). This spending 'leaks' from the study area economy in order to purchase goods and services production elsewhere. Such spending on these goods and services production beyond the study area has a reduced impact within the study area.

A breakdown of this impact is illustrated in the following:

- The direct effect is felt when dollars used to build ethanol facilities and operate them are spent within the study area (Ohio).
- The indirect effect occurs as Ohio businesses provide goods and services used by ethanol plant builders and plant operators, and when these businesses, in turn, make additional purchases from Ohio businesses.
- The induced effect occurs as workers in the directly and indirectly affected industries receive income that they then use to purchase consumer goods and services from other businesses in Ohio.
- The total effect of ethanol plants' construction and operations is the sum of the direct, indirect, and induced effects.

## ***II. Economic Impact - Construction***

### **Economic Value Added**

The total economic value added attributable to construction realized within the Ohio economy is estimated to be over **\$683 million**. The most significant impact is felt in the Construction sector at \$345,692,170. The top 20 sectors (they are accountable for approximately 80% of the impact of construction) are listed in Table 2 below:

**Table 2: Construction Value-Added**

<b>NAICS</b>	<b>Top Twenty Sectors</b>	
35	Construction of new nonresidential manufacturing structures	\$ 345,692,170
361	Imputed rental activity for owner-occupied dwellings	\$ 37,077,166
319	Wholesale trade businesses	\$ 29,636,536
360	Real estate establishments	\$ 20,331,655
394	Offices of physicians, dentists, and other health practitioners	\$ 13,688,059
369	Architectural, engineering, and related services	\$ 13,671,944
413	Food services and drinking places	\$ 11,105,820
367	Legal services	\$ 10,842,781
397	Private hospitals	\$ 10,697,590
354	Monetary authorities and depository credit activities	\$ 10,032,177
357	Insurance carriers	\$ 9,307,558
351	Telecommunications	\$ 9,234,114
355	Non-depository credit intermediation and related activities	\$ 7,867,279
368	Accounting, tax preparation, bookkeeping, and payroll services	\$ 6,579,750
31	Electric power generation, transmission, and distribution	\$ 6,355,501
381	Management of companies and enterprises	\$ 4,836,383
382	Employment services	\$ 4,515,121
329	Retail Stores - General merchandise	\$ 4,450,605
		<b>\$ 555,922,207</b>

## Employment

It is estimated that the ethanol plants' construction supported over 11,400 jobs in Ohio. The top 20 sectors (accountable for 82% of the employment impact of construction) are listed in Table 3 below:

**Table 3: Construction Employment**

<b>NAICS</b>	<b>Top Twenty Sectors</b>	
35	Construction of new nonresidential manufacturing structures	6,801
413	Food services and drinking places	425
319	Wholesale trade businesses	233
369	Architectural, engineering, and related services	207
360	Real estate establishments	201
394	Offices of physicians, dentists, and other health practitioners	168
397	Private hospitals	161
382	Employment services	157
398	Nursing and residential care facilities	123
329	Retail Stores - General merchandise	117
324	Retail Stores - Food and beverage	115
355	Non-depository credit intermediation and related activities	111
367	Legal services	104
388	Services to buildings and dwellings	101
425	Civic, social, professional, and similar organizations	94
368	Accounting, tax preparation, bookkeeping, and payroll services	86
356	Securities, commodity contracts, investments, and related	77
320	Retail Stores - Motor vehicle and parts	69
		<b>9,351</b>

## Employee Compensation

The total estimated Employee Compensation (i.e. payroll cost of the employee paid by the employer including: wage and salary, all health and retirement benefits and employer-paid payroll taxes) attributable to the ethanol plants' construction realized within the Ohio economy is estimated to be over **\$504 million**. The most significant impact is felt in the Construction sector at \$304,759,047. The top 20 sectors (they are accountable for approximately 83% of the impact of construction) are listed in Table 4 below:

**Table 4: Construction Employee Compensation**

<b>NAICS</b>	<b>Top Twenty Sectors</b>	
35	Construction of new nonresidential manufacturing structures	\$ 304,759,047
319	Wholesale trade businesses	\$ 16,690,917
369	Architectural, engineering, and related services	\$ 13,450,060
394	Offices of physicians, dentists, and other health practitioners	\$ 13,255,538
397	Private hospitals	\$ 9,796,726
413	Food services and drinking places	\$ 7,129,850
367	Legal services	\$ 7,090,035
355	Non-depository credit intermediation and related activities	\$ 7,075,196
368	Accounting, tax preparation, bookkeeping, and payroll services	\$ 4,948,892
381	Management of companies and enterprises	\$ 4,215,198
382	Employment services	\$ 4,192,444
398	Nursing and residential care facilities	\$ 3,814,107
354	Monetary authorities and depository credit activities	\$ 3,457,331
357	Insurance carriers	\$ 3,268,336
335	Transport by truck	\$ 3,189,308
320	Retail Stores - Motor vehicle and parts	\$ 3,158,877
414	Automotive repair and maintenance, except car washes	\$ 3,107,927
324	Retail Stores - Food and beverage	\$ 2,966,004
		<b>\$ 415,565,791</b>

## III. Economic Impact – Operations

### Economic Value Added

The total economic value added attributable to operations realized within the Ohio economy is estimated to be almost **\$165 million**. The most significant impact is felt in the other basic organic chemical manufacturing industry at almost \$60 million (\$59,663,932). The top 20 sectors (accountable for approximately 80% of the impact of operations) are listed in Table 5 below:

**Table 5: Operations Value Added**

<b>NAICS</b>	<b>Top Twenty Sectors</b>	
126	Other basic organic chemical manufacturing	\$ 59,663,932
319	Wholesale trade businesses	\$ 11,103,910
361	Imputed rental activity for owner-occupied dwellings	\$ 7,566,414

381	Management of companies and enterprises	\$ 6,543,083
31	Electric power generation, transmission, and distribution	\$ 4,891,175
360	Real estate establishments	\$ 4,364,867
394	Offices of physicians, dentists, and other health practitioners	\$ 2,798,237
376	Scientific research and development services	\$ 2,627,865
32	Natural gas distribution	\$ 2,551,575
413	Food services and drinking places	\$ 2,521,077
335	Transport by truck	\$ 2,257,634
115	Petroleum refineries	\$ 2,228,781
397	Private hospitals	\$ 2,187,277
354	Monetary authorities and depository credit activities	\$ 2,160,101
357	Insurance carriers	\$ 2,077,994
355	Nondepository credit intermediation and related activities	\$ 2,066,005
351	Telecommunications	\$ 1,850,626
366	Lessors of nonfinancial intangible assets	\$ 1,828,493
	Maintenance and repair construction of nonresidential	
39	structures	\$ 1,743,524
388	Services to buildings and dwellings	\$ 1,612,325
367	Legal services	\$ 1,541,030
		<u>\$126,185,924</u>

## Labor Income

The total estimated Labor Income (employee compensation plus proprietor income) attributable to the ethanol plants' operation realized within the Ohio economy is estimated to be over **\$100 million (\$103,069,568)**. The most significant impact is felt in the organic chemical manufacturing sector at \$40,682,634. The distribution of income gains within the top 20 sectors, representing over 75% of the total labor income, are listed in Table 6 below:

**Table 6: Operations Labor Income**

NAICS	Top Twenty Sectors	
126	Other basic organic chemical manufacturing	\$ 40,682,635
319	Wholesale trade businesses	\$ 6,253,580
381	Management of companies and enterprises	\$ 5,702,689
394	Offices of physicians, dentists, and other health practitioners	\$ 2,709,817
376	Scientific research and development services	\$ 2,626,405
397	Private hospitals	\$ 2,003,082
335	Transport by truck	\$ 1,874,339
355	Nondepository credit intermediation and related activities	\$ 1,857,998
413	Food services and drinking places	\$ 1,618,512
39	Maintenance and repair construction of nonresidential structures	\$ 1,454,135
369	Architectural, engineering, and related services	\$ 1,257,291
31	Electric power generation, transmission, and distribution	\$ 1,248,794
388	Services to buildings and dwellings	\$ 1,222,083
367	Legal services	\$ 1,007,671
432	Other state and local government enterprises	\$ 988,173
414	Automotive repair and maintenance, except car washes	\$ 963,071

374	Management, scientific, and technical consulting services	\$ 909,553
320	Retail Stores - Motor vehicle and parts	\$ 890,529
382	Employment services	\$ 866,886
32	Natural gas distribution	\$ 805,179
368	Accounting, tax preparation, bookkeeping, and payroll services	\$ <u>783,320</u>
		\$ 77,725,742

Annual ethanol industry operations are generating over \$100M in income annually for Ohio households. The distribution of income gains is summarized in Table 6, showing widespread impact in services and retail sectors unrelated to construction or manufacturing.

## Employment

It is estimated that the ethanol plants' operation supported over 1,562 jobs in Ohio. The top 20 sectors (accountable for 65% of the employment impact of the annual operations of the six ethanol plants in Ohio) are listed in Table 7 below:

**Table 7: Operations Employment**

NAICS	Top Twenty Sectors	
126	Other basic organic chemical manufacturing	280
413	Food services and drinking places	97
319	Wholesale trade businesses	87
381	Management of companies and enterprises	52
388	Services to buildings and dwellings	51
360	Real estate establishments	43
394	Offices of physicians, dentists, and other health practitioners	34
335	Transport by truck	34
397	Private hospitals	33
39	Maintenance and repair construction of nonresidential structures	33
382	Employment services	33
376	Scientific research and development services	30
329	Retail Stores - General merchandise	29
355	Nondepository credit intermediation and related activities	29
324	Retail Stores - Food and beverage	29
398	Nursing and residential care facilities	25
414	Automotive repair and maintenance, except car washes	21
320	Retail Stores - Motor vehicle and parts	19
369	Architectural, engineering, and related services	19
425	Civic, social, professional, and similar organizations	17
356	Securities, commodity contracts, investments, and related activities	16
		1,013

The ethanol industry is more capital than labor intensive. Although only 280 direct jobs were created by the combined six ethanol operations, the number of jobs supported by the industry operations accounts for 1,562, or almost six times that number. When adding in temporary construction jobs, the ethanol industry has supported nearly 13,000 jobs, representing an average of almost 150 jobs in each of the 88 counties in Ohio.



Distribution of employment supported by the ethanol industry is across the board, impacting at least 140 sectors of the economy. As would be expected, services jobs in restaurants, retail and wholesale trade businesses, management and real estate, hospitals and doctors' offices are among the top sectors impacted.

#### **IV. Top Ten Sectors Impacted**

Results from this analysis also produced the top ten sectors impacted by the combined construction and operations generated from the ethanol industry. Below are tables for the total output, income and employment listed by sector. The results reveal more detail on the complex interactions between the ethanol industry and the overall economy in Ohio.

As demonstrated in the "Top Ten" tables below, wholesale trade businesses consistently land in the top two or three sectors benefiting most greatly from the direct investment and operation of ethanol plants. Wholesale businesses supply goods to build and operate the plants, including bulk quantities of corn or single units of big ticket items like heavy equipment and vehicles.

The largest share of wholesale spending by the ethanol industry is for corn used as the raw material to make ethanol. The ethanol industry in Ohio purchases at least 130 million bushels directly or indirectly (through wholesalers) from an estimated 3,000 farmers annually. The production of ethanol in Ohio is a major source of support for agricultural output and farm income.

**Table 8: Top Ten for Output**

<b>NACIS</b>	<b>Top Ten Sectors for Output</b>	
126	Other basic organic chemical manufacturing	\$ 356,014,304
115	Petroleum refineries	\$ 13,676,633
319	Wholesale trade businesses	\$ 13,267,301
381	Management of companies and enterprises	\$ 10,478,449
361	Imputed rental activity for owner-occupied dwellings	\$ 8,588,337
120	Petrochemical manufacturing	\$ 7,383,494
32	Natural gas distribution	\$ 7,356,661
31	Electric power generation, transmission, and distribution	\$ 5,479,433
360	Real estate establishments	\$ 5,030,753
413	Food services and drinking places	\$ 4,924,030
		<u>\$ 432,199,396</u>

**Table 9: Top Ten for Labor Income**

<b>NACIS</b>	<b>Top Ten Sectors for Labor Income</b>	
126	Other basic organic chemical manufacturing	\$ 40,682,634
319	Wholesale trade businesses	\$ 6,253,579
381	Management of companies and enterprises	\$ 5,702,688
394	Offices of physicians, dentists, and other health practitioners	\$ 2,709,817
376	Scientific research and development services	\$ 2,626,405
397	Private hospitals	\$ 2,003,082
335	Transport by truck	\$ 1,874,339

355	Nondepository credit intermediation and related activities	\$ 1,857,998
413	Food services and drinking places	\$ 1,618,512
39	Maintenance and repair of nonresidential structures	<u>\$ 1,454,135</u>
		\$ 66,783,192

**Table 10: Top Ten for Employment**

<b>NACIS</b>	<b>Top Ten Sectors for Employment</b>	
126	Other basic organic chemical manufacturing	279.9
413	Food services and drinking places	96.5
319	Wholesale trade businesses	87.4
381	Management of companies and enterprises	52.1
388	Services to buildings and dwellings	51.2
360	Real estate establishments	43.2
394	Offices of physicians, dentists, and other health practitioners	34.3
335	Transport by truck	34.1
397	Private hospitals	32.8
39	Maintenance and repair of nonresidential structures	<u>32.7</u>
		744.2

#### ***IV. Conclusion***

The ethanol industry contributes jobs, income, and economic output to the Ohio economy. After short term economic impact associated with initial construction, the greatest contributions are to the various sectors that comprise the agricultural economy. Innovation is creating new technologies that promise continued growth and productivity in an industry that contributes both economically and environmentally by producing a renewable, clean source of energy.

## **Appendix**

Glossary of terms below adapted from the IMPLAN Glossary at [http://implan.com/v3/index.php?option=com\\_glossary&Itemid=164](http://implan.com/v3/index.php?option=com_glossary&Itemid=164)

### **Employee Compensation**

Employee Compensation in IMPLAN is the total payroll cost of the employee paid by the employer. This includes, wage and salary, all benefits (e.g., health, retirement, etc) and employer- paid payroll taxes (e.g., employer side of social security, unemployment taxes, etc).

### **Full Time Equivalent Employment (FTE)**

Full-time equivalent employment is the number of full-time equivalent jobs, as determined by total hours worked divided by average annual hours worked in fulltime jobs.

### **GDP (or 'Value-added')**

GDP or 'value added' is the contribution of each private industry and of government to the nation's output, or GDP. It represents total output of an industry or establishment (which consists of sales or receipts and other operating income, commodity taxes, and inventory change) less the cost of its intermediate inputs (which consist of energy, raw materials, semi-finished goods, and services that are purchased from domestic industries or from foreign sources).

### **Output**

Output represents the value of industry production. In IMPLAN these are annual production estimates for the year of the data set and are in producer prices.

Manufacturing	output = sales +/- change in inventory
Service Sector	output = sales
Retail and wholesale trade	output = gross margin (not gross sales)

Labor Income = employee compensation + proprietor income

Other Property Type Income = property income - proprietor income (Other property type income includes corporate profits, capital consumption allowance, payments for rent, dividends, royalties and interest income.)