DECISION INNOVATION SOLUTIONS

Prepared for:

Iowa Renewable Fuels Association

2024 Economic Contribution of the Renewable Fuels Industry to the Iowa Economy

April 2025

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1 Executive Summary

Despite weakness in the overall fuels market, the Iowa renewable fuels industry continues to grow and be a key part of the Iowa economy contributing more than $23.6 billion in output and providing more than 34,600 good-paying jobs in Iowa with the average being greater than $76,000 per year. In addition, the renewable fuels industry in Iowa adds more than $5.7 billion of value to Iowa's crop-based inputs that are transformed into fuels for cars, trucks, tractors, and off-road equipment. Iowa's ethanol facilities are the first point of processing for 62% of Iowa's corn production.

In 2024, the 41 ethanol facilities in Iowa produced 4.61 billion gallons of fuel ethanol, up slightly from 2023, and Iowa's 10 biodiesel plants produced 350 million gallons, virtually unchanged from 2023. The economic backdrop for this production was a U.S. economy that had real GDP growth of 2.8 percent and an inflation rate (2.9% for 2024) that continues to decline from the recent highs. U.S. average gasoline prices in 2024 were 6.1% lower than in 2023 with prices ending 3% lower in 2024 than at the end of 2023. The price of ethanol was down 25.7% in 2024 compared to 2023 and the price of ethanol co-products was also down in 2024 with Dried Distillers Grains (DDGs) down 29.5%, and Distillers Corn Oil (DCO) down 22% compared to 2023. On the input side, the price of corn going into ethanol plants was 26.8% lower than 2023, natural gas was down 7.3% and other operating costs were down 1.7%.

The total economic contribution of ethanol and biodiesel production in Iowa is substantial. In 2024, ethanol and biodiesel production contributed the following to Iowa's economy:

- **34,657** jobs (1.6% of the state's total)
- **$2.6 billion** in labor income
- **$5.7 billion** in value added (2.2% of state GDP)
- **$23.7 billion** in output (total sales)

Economic contributions of the sectors of the renewable fuels industries in Iowa are:

Economic Contribution of Iowa Ethanol and Biodiesel Production

	Employment	Labor Income ($ Million)	Value Added ($ Million)	Output ($ Million)
Ethanol	32,877	$ 2,503.5	$ 5,189.8	$ 21,368.6
Biodiesel	1,609	$ 123.3	$ 520.2	$ 2,243.7
Total	**34,657**	**$ 2,638.4**	**$ 5,732.7**	**$ 23,685.9**

Even though a variety of factors converged in 2024 that created stresses for the biofuels industry in Iowa and lowered the economic contributions of the industry to the Iowa economy compared to prior years, Iowa's renewable fuels industry set another record for fuel production. The ethanol industry in Iowa is the first processor of 62% of Iowa's corn crop. Adoption of technological advances in ethanol production is allowing more ethanol production from each bushel of corn being processed and provides more than 13 millions of tons of high-protein feed for livestock feeders in Iowa, surrounding states, and across the globe as well as millions of pounds of corn oil that is used in feeds and as a fuel stock for renewable diesel fuels. Jobs in the renewable energy industry in Iowa have average wages greater than $76,000 per year.

Note: The economic analysis methodology has changed from previous versions of this report, and the IMPLAN data used for this analysis had significant updates this year to its underlying production functions and employment coefficients. As a result, care should be taken when comparing directly to previous years' reports.

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2 Introduction

In 2024, there were 41 ethanol facilities producing fuel ethanol in Iowa (Figure 1). Five of these plants are wet mill plants producing 14.8% of the ethanol in Iowa and 36 are dry mill plants producing 85.2% of the ethanol in Iowa. An additional ethanol plant (Verbio in Nevada, Iowa) finished construction in 2024. Four of the ethanol plants in Iowa also produce approximately 20 million gallons of ethanol from cellulosic biomass.

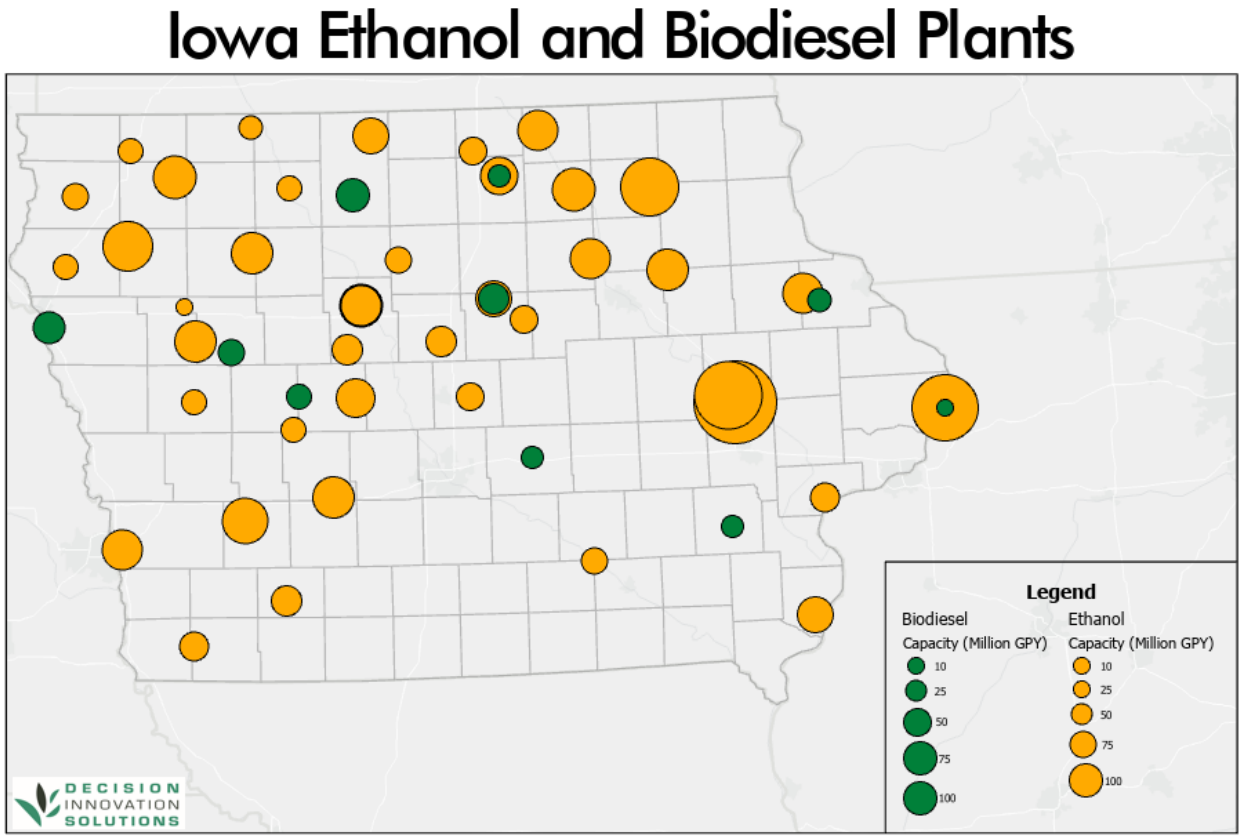

Figure 1. Ethanol and Biodiesel Plants in Iowa (2024), publicly listed capacity

Uncertainty in the regulatory and trade environment were concerns that the ethanol and biodiesel industries needed to deal with in 2024 and continue to raise concerns about future policy impacts and industry opportunities. While the Treasury Department rolled out guidance for the implementation of the 45Z tax credits, there is still a lot of uncertainty on how the rules might apply to the feedstocks for both ethanol and biodiesel.

Domestic policy regarding electric vehicles is also creating uncertainty as some of the incentives for EVs have been pulled back and that could slow the inclusion of EVs into the vehicle fleet and may slow the decline in gasoline demand (and associated domestic demand for ethanol) that the industry has been anticipating. On the other hand, increased sales of higher blends of ethanol continue to build with the

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total national blend rate of ethanol maintaining its recent high of 10.38% and providing support for 14.26 billion gallons of ethanol in the U.S., the highest level since 2019.

Progress was made regarding additional opportunities for the biofuel industry with the opening of the first Sustainable Aviation Fuel (SAF) facility that uses ethanol as a feedstock in the U.S. This new addition increases optimism that more plants will be developed that will use ethanol as a feedstock for SAF, although more progress will need to be made for U.S. ethanol to qualify as a feedstock.

Increasing the use of higher blends of ethanol outside of the Midwest will likely require federal legislation and opening up the market for SAF is dependent on policies that will enable ethanol producers to lower the carbon intensity of ethanol production. This is most easily achieved through environmentally friendly feedstock production practices and access to opportunities for carbon capture and sequestration of carbon dioxide from ethanol production.

Biodiesel producers in Iowa provide a significant market for the feedstocks that go into biodiesel (animal fats, vegetable oils, used cooking oil (UCO), and along with growth in renewable diesel production, a higher percentage of these materials are being reformed into higher-valued fuels. SAF can also be made from the same feedstocks as biodiesel and renewable diesel, so this is another area that biodiesel producers will be monitoring in the future. Nevertheless, new markets for biodiesel continue to be developed in several sectors including home heating oil, rail transport and ocean-going marine vessels where more environmentally fuels are being sought.

As shown in Figure 2, Iowa produced 4.61 billion gallons of ethanol in 2024 and continues to lead the United States in ethanol production, producing 28.4% of U.S. fuel ethanol.

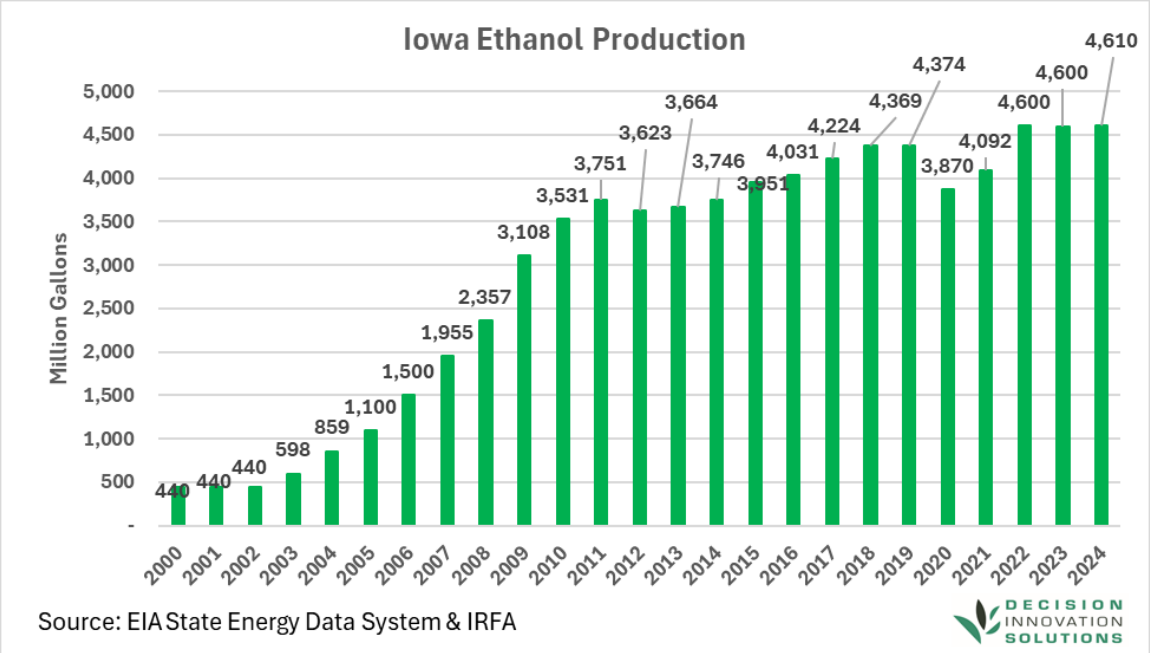

Figure 2. Iowa Ethanol Production

Ethanol plants in Iowa provided a market for 1.56 billion bushels of corn, 59.3% of Iowa's 2024 corn production (Figure 3) which produced high protein feeds, fuel and distillers corn oil .

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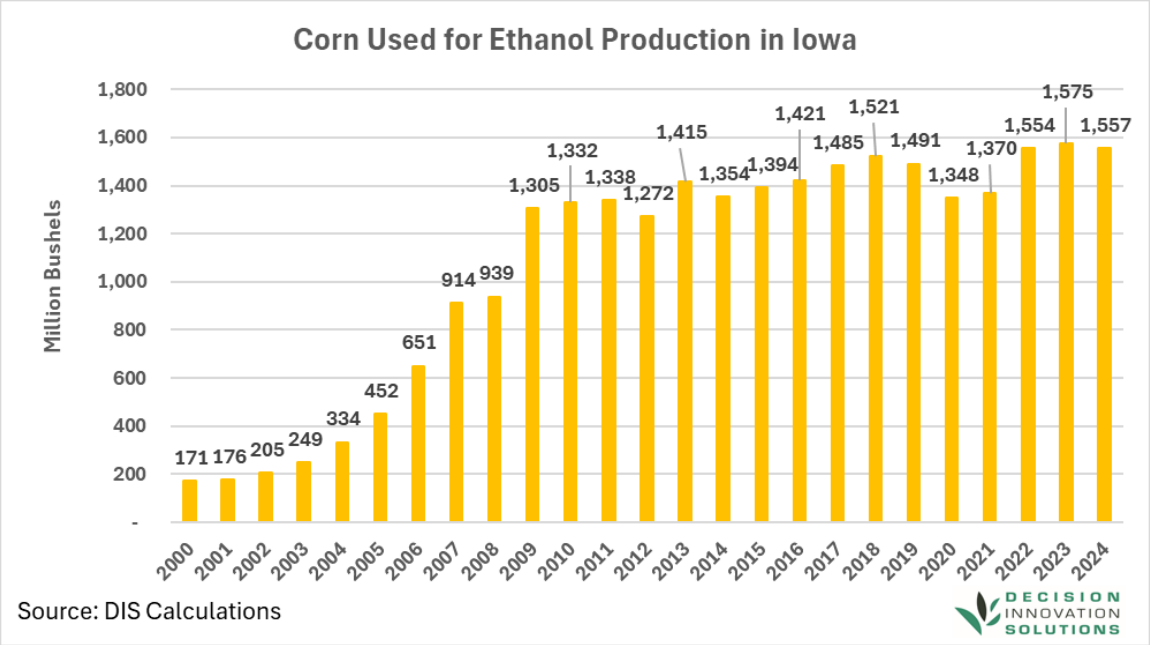

Figure 3. Corn Used for Ethanol Production in Iowa

In addition to ethanol production the dry mill ethanol plants produce valuable co-products, mainly DDGs (wet and dry) and Distillers Corn Oil (DCO). In 2024, there were nearly 10.6 million tons of these co-products produced by the dry mills in Iowa (Figure 4).

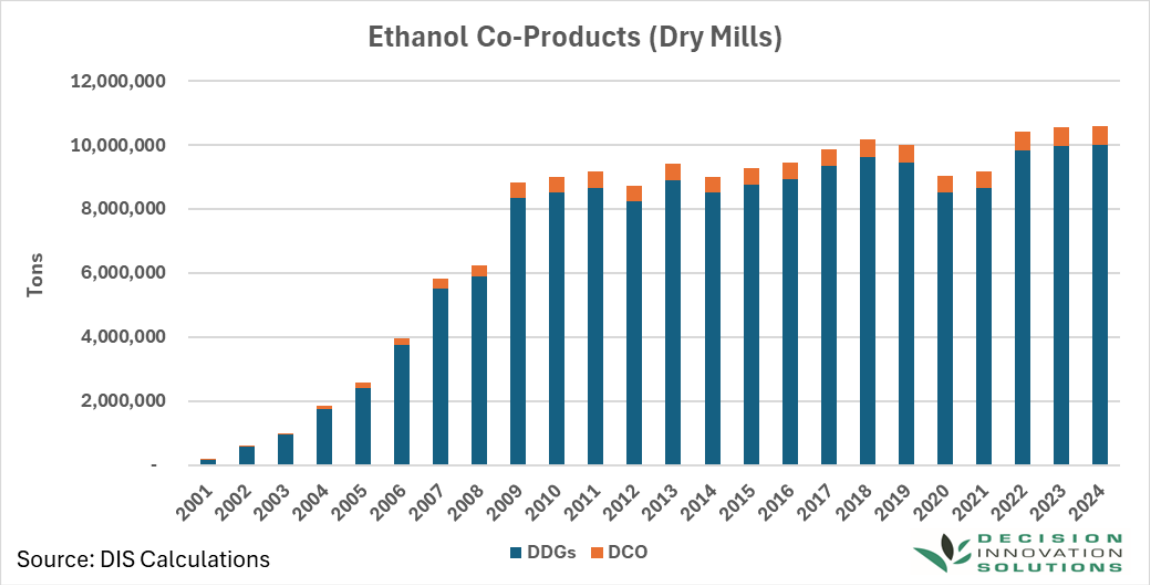

Figure 4. Ethanol Co-Products (Dry Mills)

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Wet mill plants in Iowa produced approximately 4 million tons of feed ingredient co-products (Figure 5).

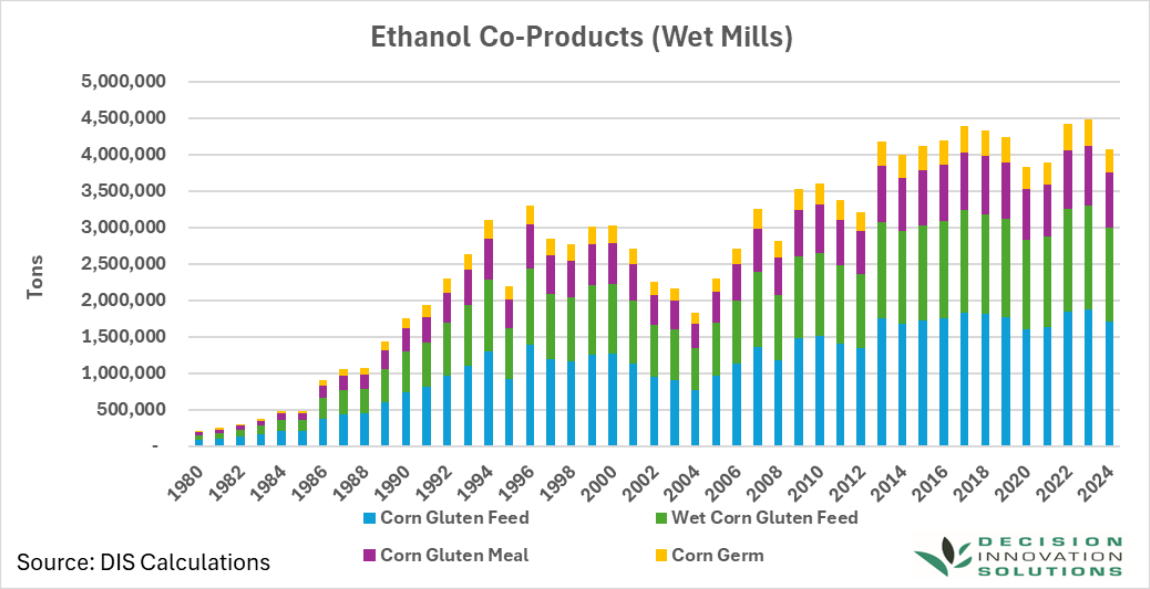

Figure 5. Ethanol Co-Products (Wet Mills)

The economic backdrop for this production was a U.S. economy that had real GDP growth of 2.8 percent and an inflation rate (2.9% for 2024) that continues to decline from the recent highs.

Figure 6 shows that U.S. average gasoline prices in 2024 were 6.1% lower than in 2023 with prices ending 3% lower in 2024 than at the end of 2023.

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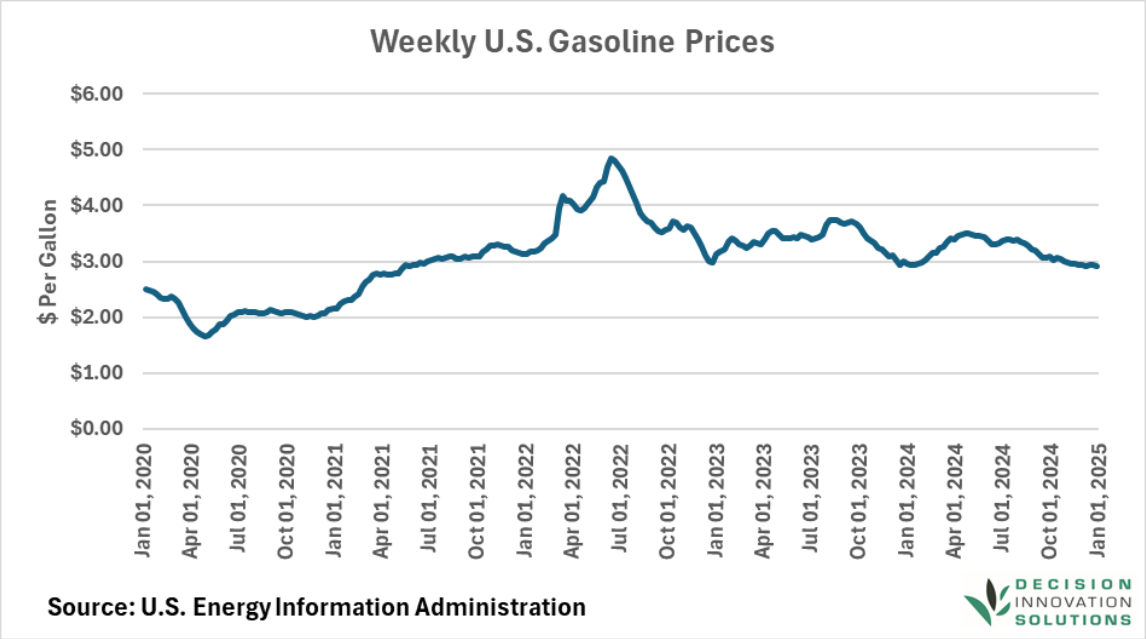

Figure 6. Weekly U.S. Gasoline Prices

Iowa average ethanol price declined 25.7% to $1.60/gallon in 2024 compared with the previous year ($2.15/gallon). Ethanol price is estimated as the sum of per-gallon returns over operating costs plus net cost of corn (corn cost less distillers grain value). Note that since November 2016 the distillers corn oil is part of the calculations and other operating costs (including the cost of natural gas) (see Figure 7).

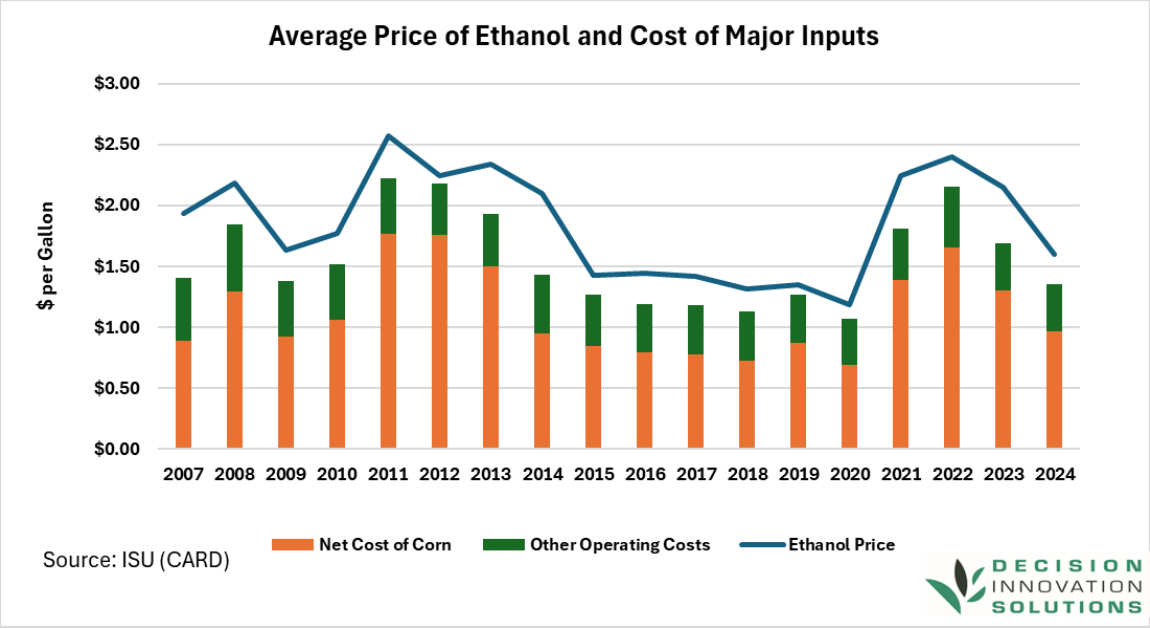

Figure 7. Price of Ethanol and the Cost of Major Inputs

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Export markets continue to play a key role for the Iowa and U.S. ethanol and co-product markets. In 2024, U.S. ethanol exports increased to a new record high of 1.91 billion gallons, up 36.4% from 2023 (Figure 8). The U.S. exported more than 12 million metric tons of DDGs in 2024, an increase of 13.3% from 2023 (Figure 9).

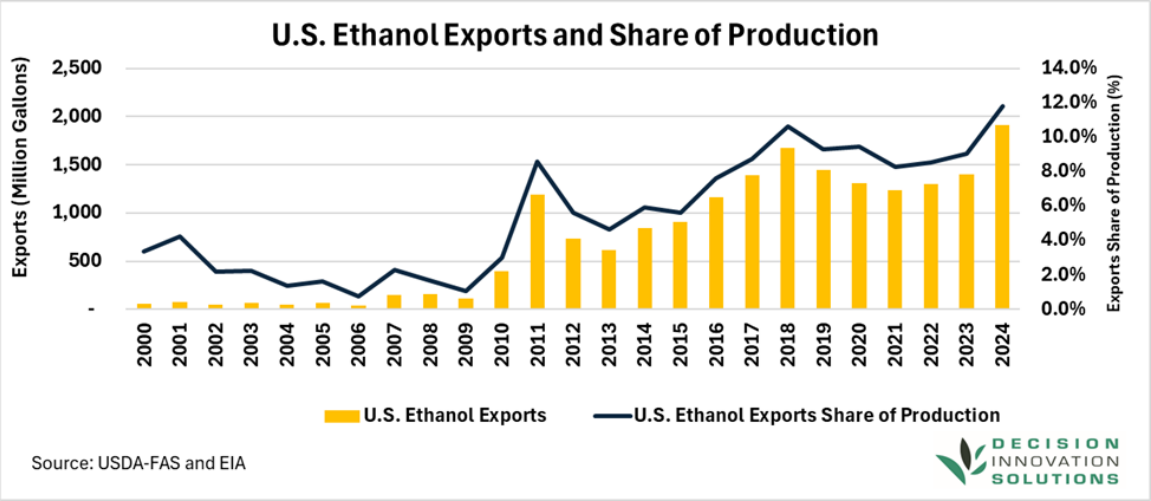

Figure 8. U.S. Ethanol Exports and Share of Production

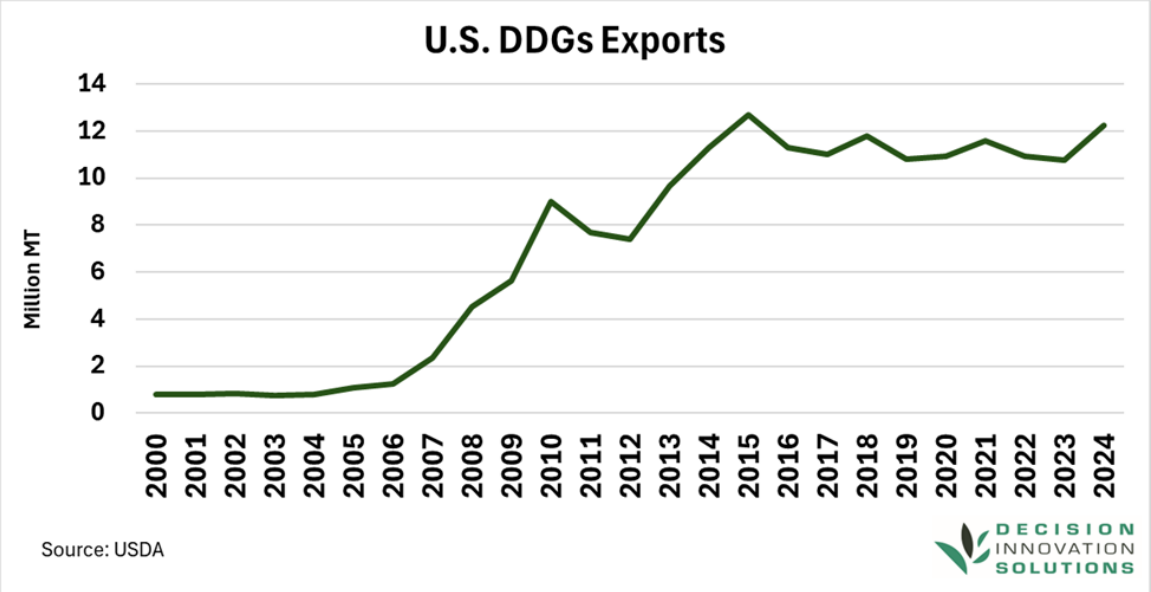

Figure 9. U.S. DDGs Exports

Biofuels plants purchase agricultural raw materials, other inputs, and a wide range of goods and services such as industrial chemicals; electricity, natural gas, water; labor, and services such as maintenance,

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insurance, and general overhead. The primary feedstock for ethanol produced in Iowa remains corn while the biodiesel industry uses a wide variety of fats and oils as feedstocks.

The 2 billion pounds of soybean oil used to produce biodiesel in Iowa were the equivalent of the oil from nearly 178 million bushels of soybeans, nearly 30 percent of Iowa's soybean crop. Iowa's biodiesel industry used an additional 600 million pounds of other feedstocks including distillers corn oil (a co-product of corn dry mill ethanol production), canola oil, animal fats, and used cooking oil (UCO).

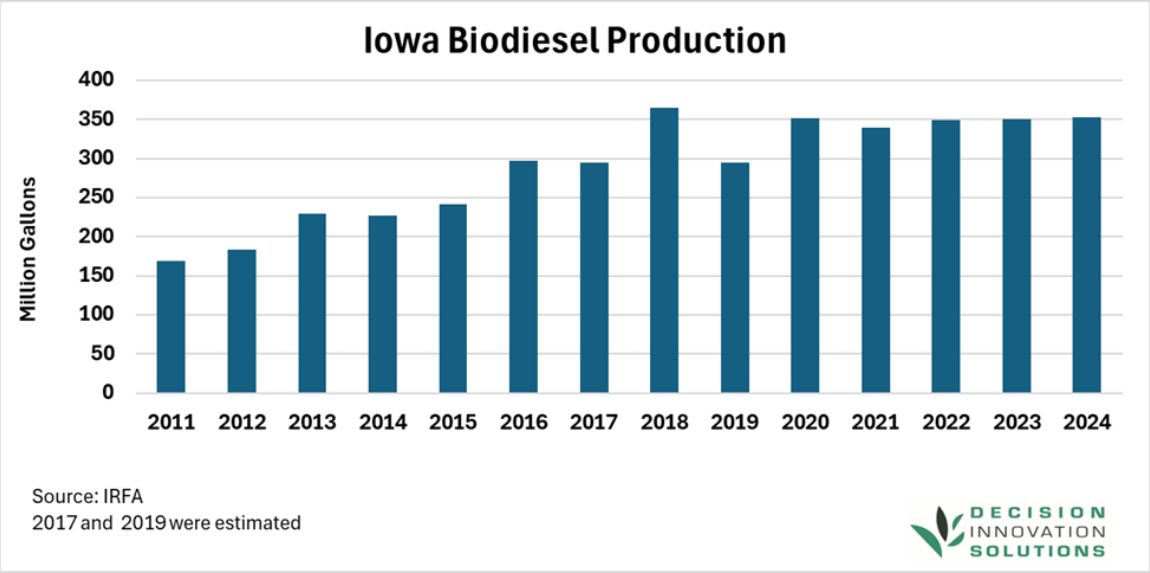

Figure 10. Iowa Biodiesel Production

Iowa biodiesel production accounted for 21% of the national production in 2024. Over the last five years the state has produced 20.5% of the national production on average. Based on EIA data, U.S. biodiesel production was estimated at 1.672 billion, down 1.5% from 1.697 billion in 2023.

According to data summarized by the Iowa Renewable Fuels Association (IRFA), Iowa biodiesel production increased less than 1% to 353 million gallons in 2024 from 350 million gallons in the previous year (see Figure 10).

The biodiesel blenders credit expired at the end of 2024 and with the expiration of that credit looming at the end of 2024 and rules for Section 45Z not yet published, there was a significant decline in biodiesel production during the fourth quarter of 2024. While the general framework for the Section 45Z Clean Fuel Production Credit was set, the specific rules and regulations were still being finalized in late 2024 and early 2025. New guidance has now been released for the new Section 45Z tax credits that came into effect as of January 1, 2025.

In summary, even though a variety of factors converged in 2024 that created stresses for the biofuels industry in Iowa and lowered the economic contributions of the industry to the Iowa economy, Iowa's renewable fuels industry set another record for fuel production. Adoption of technological advances in ethanol production is allowing more ethanol production from each bushel of corn being processed and provides millions of tons of high-protein feed for livestock feeders in Iowa, around the U.S., and across the globe. Despite the record production of ethanol and the related demand for corn, prices for

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agricultural crop prices were substantially lower in 2024 compared to 2023 and prior years pressuring the overall economic contribution of the renewable fuels industry. The price of ethanol was down nearly 26% compared to 2023 while biodiesel was up 1% compared to the prior year but down nearly 10% from the average price in 2022.

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3 Methodology

3.1 Economic Contribution Methodology and Terms

The following economic contribution study was conducted using a combination of IMPLAN and Microsoft Excel. IMPLAN is an input-output model used to understand industry relationships and conduct economic assessments for specified local economies. IMPLAN datasets are constructed annually and are derived from many different sources, including the U.S. Bureau of Labor Statistics (BLS), the U.S. Bureau of Economic Analysis (BEA), the U.S. Bureau of Economic Analysis Benchmark Input-Output Account of the U.S., the BEA output estimates, the U.S. Census Bureau's economic censuses and surveys, the U.S. Department of Agriculture's census, and more.

Within IMPLAN, the effects of an economic impact or contribution event are expressed in terms of direct, indirect, and induced effects. These different effect types are defined as follows:

- **Direct Effects** – The economic activity directly attributable to the industry under analysis
- **Indirect Effects** – The effects of local inter-industry spending throughout the supply chain, for example, the seed, equipment, fertilizer, and other inputs used by a farmer to produce corn for an ethanol plant
- **Induced Effects** – The results of employees of the directly and indirectly affected industries spending their income throughout the local economy
- **Total Effect** – The sum of direct, indirect, and induced effects

The 2023 IMPLAN data package, which is the most recent data available, was used for this analysis. Using inflation factors inherent in the IMPLAN modeling system, all numbers within these sectors were brought forward from 2023 to 2024. The results of this analysis are presented using the following common economic modeling terms:

- **Output:** The broadest measure of economic activity – also commonly referred to as "sales." Output refers to the total value of all sales of an industry within a study area without any deductions for the cost or origination of inputs that were used in the production process.
- **Value Added:** A component of output, this measure includes the total sales minus the costs of inputs. Alternatively, value added is calculated as the sum of labor income (further defined below), taxes on production and imports, and other property-type income. An industry's value added is equivalent to its contribution to GDP.
- **Labor Income:** A subset of value added, includes the sum of employee compensation (i.e., wages and benefits) and proprietor income (i.e., income of self-employed workers).
- **Employment (Jobs):** A measure of part- and full-time job positions, including contract workers, without regard to their full-time equivalence. Since it is not representative solely of full-time positions or full-time equivalents, care must be made when drawing comparisons to other measures of employment.

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3.2 Economic Impact Study versus Economic Contribution Study

The term "Economic Impact Study" implies a change has taken place within a local economy. The change in a local economy typically comes from one of the following sources:

- Entrance/departure of a new business or industry
- Expansion/contraction of an existing business or industry

While estimating a change (economic impact study) such as the entrance or departure of industry activity is a worthwhile endeavor in many instances, this is not how the contribution of the biofuels sectors in this study were estimated. This study is an effort to evaluate the structure of existing industries within an existing economy. As a result, we believe that a different method of analysis is the most appropriate for this study. For that reason, this study is called an "economic contribution analysis"; in other words, we are interested in understanding what Iowa ethanol and biodiesel production currently contributes to the overall economy. This is a key difference from what is traditionally termed an "economic impact study". With a contribution analysis, the sum of individual industry estimates will never exceed the total of what actually exists in a given study area.

3.3 Model Inputs

The input values used for the economic contribution analysis in IMPLAN were derived from an Excel-based ethanol and biodiesel production model. These models were adapted from those used by John Urbanchuk in previous versions of this report. Prices used in these models were updated to 2024 values using a combination of U.S. Department of Agriculture Agricultural Marketing Service (USDA AMS), Energy Information Administration (EIA), and Iowa State University Extension Data. In some cases (wages, for example) prices were updated according to annual CPI inflation from 2023 to 2024.

Value of Iowa Renewable Fuels Production by Product				
	2024	2023	Difference	Pct Change
Value of Ethanol $Million	$7,237.70	$9,888.62	-$2,650.92	-27%
Value of DDGS $Million	$2,046.92	$2,610.87	-$563.95	-22%
Value of DCO $Million	$447.46	$614.70	-$167.24	-27%
Value of Biodiesel $Million	$1,637.92	$1,606.50	$31.42	2%
Source: DIS Calculatons				

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Renewable Fuel Product Prices & Major Inputs				
	2024	2023	Difference	Pct Change
Ethanol $/gal	$1.57	$2.15	-$0.58	-27%
Corn $/bu	$4.29	$5.89	-$1.60	-27%
DDGS $/ton	$154.10	$219.60	-$65.50	-30%
DCO $/cwt	$43.77	$60.26	-$16.49	-27%
Corn Gluten Meal $/ton	$442.98	$575.56	-$132.58	-23%
Corn Gluten Feed $/ton	$123.48	$175.46	-$51.98	-30%
IA Biodiesel $/gal	$4.64	$4.59	$0.05	1%
Soybean Oil $/cwt	$45.33	$62.37	-$17.04	-27%
Canola Oil $/cwt	$55.48	$68.78	-$13.30	-19%
Yellow Grease $/cwt	$34.70	$47.96	-$13.26	-28%
Choice White Grease $/cwt	$40.14	$53.58	-$13.44	-25%
Natural Gas $/1,000 cu ft	$5.45	$6.73	-$1.28	-19%
Source: Center for Agricultural and Rural Development (CARD), Iowa State University, USDA, EIA				

Once determined, these values for the Iowa ethanol and biodiesel industries were used as inputs for an economic contribution analysis in the IMPLAN modeling system. The "other basic organic chemical manufacturing" industry was used to model the economic contribution of biodiesel and dry mill ethanol production, and the "wet corn milling" industry was used for the economic contribution of wet mill ethanol production. In all three cases, the spending pattern of the relevant IMPLAN industry was modified to reflect the actual purchases required for ethanol/biodiesel production estimated by the Excel model.

The economic analysis methodology has changed from previous versions of this report, and the IMPLAN data used for this analysis had a significant update this year. Namely, the 2023 IMPLAN data incorporates the latest Bureau of Economic Analysis (BEA) Benchmark Input-Output tables. These tables are only updated once every five years, and they greatly inform IMPLAN's models. For example, the BEA Benchmark Tables set a baseline level of annual production for many industries and inform the rates at which industries purchase goods or services from each other, which is a key factor in the size of economic impact multipliers. As a result, care should be taken when comparing directly to previous years' reports.

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4 Results

4.1 Ethanol

Table 1 shows the estimated economic contribution of ethanol production in Iowa. Activity at ethanol plants directly contributes more than $1.0 billion in value added (GDP) and generates more than $184 million in labor income across more than 2,100 jobs. Ethanol production has a broad and substantial impact on the Iowa economy. After accounting for industry purchases (indirect effects) and employee spending (induced effects), ethanol production supports nearly 33,000 jobs and generates $2.5 billion in labor income, $5.2 billion in value added, and $21.4 billion in output (sales) throughout the state.

Table 1. Economic Contribution of Iowa Ethanol Production

Economic Contribution of Iowa Ethanol Production				
Effect Type	Employment	Labor Income ($ Million)	Value Added ($ Million)	Output ($ Million)
Direct	2,132	$ 184.4	$ 1,024.0	$ 9,732.1
Indirect	22,972	$ 1,914.5	$ 3,370.6	$ 10,327.8
Induced	7,773	$ 404.6	$ 795.2	$ 1,308.8
Total	**32,877**	**$ 2,503.5**	**$ 5,189.8**	**$ 21,368.6**

Table 2 shows the industries within IMPLAN with the highest output (sales) sourced in Iowa ethanol production. The large total contribution of the ethanol industry in Iowa is primarily due to its substantial purchases of corn, electricity, natural gas, transportation, and more. These purchases have significant upstream effects, such as grain farmers purchasing agricultural chemicals, equipment, and support services.

Table 2. Top Industries Impacted by Ethanol Production

Top Industries Impacted by Iowa Ethanol Production	
Industry	Total Output ($ Million)
Other basic organic chemical manufacturing	$ 8,307.0
Grain farming	$ 6,399.6
Wet corn milling	$ 1,447.4
Wholesale - Other nondurable goods merchant wholesalers	$ 560.6
Pesticide and other agricultural chemical manufacturing	$ 485.2
Electric power transmission and distribution	$ 342.7
Support activities for agriculture and forestry	$ 315.4
Maintenance and repair construction of nonresidential structures	$ 204.4
Other real estate	$ 196.5
Truck transportation	$ 175.2

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4.2 Biodiesel

The ten biodiesel plants in Iowa employ an estimated 305 workers making $20.5 million in labor income. These plants have direct sales of more than $1.6 billion and a value added (GDP) contribution of $307 million. In addition to the 305 jobs directly supported, biodiesel production is estimated to support an additional 1,304 jobs throughout the economy through its purchases of materials, energy, transportation, and services. After accounting for indirect and induced effects, the total contribution of biodiesel production to the Iowa economy is 1,609 jobs, $123.3 million in labor income, $520.2 million in value added, and more than $2.2 billion in output (Table 3).

Table 3. Economic Contribution of Iowa Biodiesel Production

Economic Contribution of Iowa Biodiesel Production				
Effect Type	Employment	Labor Income ($ Million)	Value Added ($ Million)	Output ($ Million)
Direct	305	$ 20.5	$ 307.1	$ 1,647.9
Indirect	924	$ 83.0	$ 174.2	$ 531.8
Induced	380	$ 19.8	$ 38.9	$ 64.0
Total	**1,609**	**$ 123.3**	**$ 520.2**	**$ 2,243.7**

Table 4 shows the industries within IMPLAN with the highest output derived from Iowa biodiesel production. Similar to ethanol production, industries that supply feedstock for biodiesel (oilseed production and farming, animal slaughter and rendering) are some of the most-impacted industries along with transportation, maintenance, and energy industries.

Table 4. Top Industries Impacted by Iowa Biodiesel Production

Top Industries Impacted by Iowa Biodiesel Production		
Industry		Total Output ($ Million)
Other basic organic chemical manufacturing	$	1,650.0
Soybean and other oilseed processing	$	215.4
Oilseed farming	$	65.4
Wholesale - Other nondurable goods merchant wholesalers	$	47.5
Truck transportation	$	44.9
Electric power transmission and distribution	$	17.7
Maintenance and repair construction of nonresidential structures	$	13.9
Rail transportation	$	11.2
Animal, except poultry, slaughtering	$	9.7
Owner-occupied housing	$	8.3

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