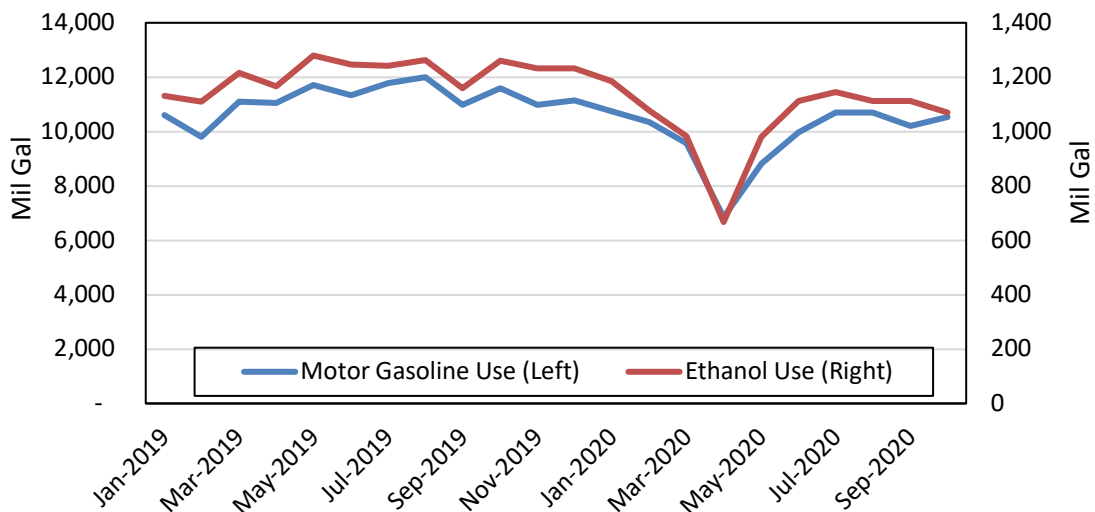


**CONTRIBUTION OF THE ETHANOL INDUSTRY TO  
 THE ECONOMY OF THE UNITED STATES IN 2020**

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The U.S. ethanol industry was slammed by the COVID-19 pandemic in 2020. The impact of the pandemic overshadowed most other issues facing the industry during the year. The widespread shelter-at-home orders in the Spring essentially shut the U.S. economy down, people stopped driving and both gasoline and ethanol demand fell sharply. As illustrated in Figure 1, the low point in demand was reached in April 2020 as motor gasoline and domestic ethanol demand fell by 38 and 42 percent from year earlier levels, respectively.

Figure 1  
 U.S. Motor Gasoline and Domestic Ethanol Demand



Source: EIA

As the economy slowly reopened in the second half of the year demand picked up but didn't recover to pre-pandemic levels and remained about 12 percent below year ago through October.

Ethanol producers responded to the collapse in demand by reducing operating rates, shutting plants, and idling capacity. According to the Renewable Fuels Association 45 percent of industry capacity was idled in April and May 2020. By year end roughly two dozen facilities were idle, and the industry was operating on an approximately 85 percent capacity utilization rate.

The weak and unsettled demand conditions undercut investment in the industry in 2020. While total capacity increased as capital expenditures in 2019 came online, relatively little new expenditures for expansion were made during 2020. Additionally, biofuels research and development activities were curtailed by COVID-related closures both in the public and private sectors.

The two other major factors impacting the ethanol industry in 2020 were weak export demand and regulatory issues. Both were overshadowed by the pandemic but nonetheless acted as a drag on the ethanol industry.

- Ethanol exports dropped sharply during the second half of the year as COVID affected motor fuel use in importing countries. Exports to the two largest U.S. markets – Canada and Brazil – fell with the largest decline posted by Brazil. Year-to-date exports of ethanol were 7 percent below 2019 levels through November and are projected to decline about 10 percent for the full year. The decline in volume was somewhat offset by higher export prices but the net impact was still adverse.
- On the regulatory front, the use of Small Refinery Exemptions (SREs) continued to be an impediment to increasing demand. Under the Trump Administration, refiners were relieved of 4 billion gallons of RFS blending obligations for compliance years 2016-2018, a sixfold increase over the volume exempted during the previous three years.<sup>1</sup> This resulted in a

<sup>1</sup> Ethanol-equivalent gallons, or RINs, for exemptions granted through Dec. 2020. Does not include an additional 2018 exemption and two 2019 exemptions (of the 32 pending for 2019) granted in Jan. 2021. <https://www.epa.gov/fuels-registration-reporting-and-compliance-help/rfs-small-refinery-exemptions>

massive expansion of inventories of renewable identification numbers (RINs), the credits used to demonstrate compliance with the RFS, which refiners could use instead of blending physical gallons of biofuels.

According to the Renewable Fuels Association (RFA), at year's end the ethanol industry's 209 plants had a total capacity of 17.4 billion gallons. However, due to the factors discussed above, ethanol production for 2020 is estimated at 13.85 billion gallons, 12.2 percent below 2019 levels. Conventional feedstocks (e.g., corn and sorghum) accounted for the vast majority of ethanol production.

Despite these challenges, the ethanol industry continues to make a substantial positive contribution to the American economy. This study estimates the contribution of the ethanol industry to the American economy in 2020 in terms of employment, income, and Gross Domestic Product (GDP) directly and indirectly supported by the industry.

## **Expenditures by the Ethanol Industry in 2020**

Ethanol producers are part of a manufacturing sector that adds substantial value to agricultural commodities produced in the United States and makes a significant contribution to the American economy.

Expenditures by the ethanol industry for raw materials, other goods, and services represent the purchase of output of other industries. The spending for these purchases circulates through the local and national economy, generating additional value-added output, household income, and employment in all sectors of the economy.<sup>2</sup> Ethanol industry expenditures can be broken into three major categories: construction of new production facilities, ongoing production operations, and research and development.

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<sup>2</sup> Expenditures for feedstock and energy were estimated using year-to-date 2020 calendar year average prices. Revenues were estimated using 2019 calendar year average prices for ethanol, Distiller's grains, and Distillers' corn oil. Prices were provided by USDA/ERS and AMS, and EIA.

## 1. Construction

Industry capacity during 2020 expanded by about 500 million gallons largely as a result of capital expenditures made in the prior year. COVID-related closures and reduced operating rates reduced capital expenditures to an estimated \$222 million in 2020, representing about 127 million gallons of capacity.

## 2. Ongoing production operations

The industry spent \$21.4 billion on raw materials, other inputs, and goods and services to produce ethanol during 2020, nearly 19 percent less than a year ago. The decline in production costs reflected by lower production and feed stock use and lower feedstock (corn) and energy prices. Production costs were based on a model of dry mill ethanol production maintained by the author of this report. These estimates are consistent with generic dry mill ethanol costs, such as those published by Iowa State University.<sup>3</sup> Table 1 details the expenditures by the ethanol industry in 2020.

Table 1  
Estimated Ethanol Production Expenditures, 2020

Operating Costs	2019 Mil \$	2020 Mil \$	% CHG
Feedstock (corn)	\$20,215	\$16,405	-18.8%
Enzymes, yeast and chemicals	\$1,199	\$1,053	-12.2%
Denaturant	\$350	\$213	-39.1%
Natural Gas, electricity, water	\$2,761	\$2,050	-25.8%
Direct labor	\$599	\$565	-5.7%
Maintenance & Repairs	\$502	\$449	-10.6%
Transportation	\$145	\$130	-10.3%
GS&A	\$598	\$535	-10.5%
Total Operating Costs	\$26,369	\$21,400	-18.8%
\$/Gallon	\$1.67	\$1.55	-7.6%

<sup>3</sup> See the Ethanol profitability spreadsheet maintained by Don Hofstrand "AgDecision Maker D1-10 Ethanol Profitability" available at <http://www.extension.iastate.edu/agdm/energy/xls/d1-10ethanolprofitability.xlsx>

The largest share of spending was for corn and other feedstocks used as raw material to make ethanol. The ethanol industry used 4.8 billion bushels of corn (and corn equivalent) on a gross basis in 2020, valued at \$16.4 billion. Reflecting this, the ethanol industry continues to be a major source of support for agricultural output and farm income. Together, feedstock and energy accounts for about 85 percent of ethanol production costs.

This analysis estimates both the total production effect and the crop price (farm income) effects of ethanol production on agriculture based on a structural model of U.S. agriculture maintained by the author. The impact of demand for corn to produce ethanol on farm income was adjusted so as to not overstate the impact of ethanol demand on revenue for the corn sector.

The remainder of spending by the ethanol industry for ongoing operations is for a range of inputs such as enzymes, yeast and chemicals; electricity, natural gas, and water; labor; transportation; and services such as maintenance, insurance, and general overhead.

### 3. Research and Development

The renewable fuels industry is a significant engine for research and development (R&D) both in the public and private sectors. Much of the R&D activity in the biofuels industry is aimed at discovering and developing advanced biofuels feedstock and the technology needed to meet RFS2 targets for cellulosic and advanced biofuels. The primary public-sector agencies underwriting R&D in biofuels are the U.S. Departments of Energy (USDOE), Agriculture (USDA), and Defense (DOD). In addition to the federal government, many states are funding R&D in feedstock development as well as infrastructure. These public funds typically are leveraged by private sector firms undertaking research in a wide range of biofuels activities. The disruptions to economic activity caused by the pandemic have likely had an adverse impact of R&D spending during 2020. We have assumed that R&D spending on biofuels declined sharply during 2020. Reflecting this we estimated that industry R&D outlays totaled less than \$150 million in 2020

#### 4. Co-product value

Most ethanol is produced by dry mills that also produce valuable co-products in the form of distiller's dried grains DDGS and distiller's corn oil (DCO).<sup>4</sup> There is significant ongoing research directed at improving these co-products, notably DDGS, to increase inclusion rates in swine and poultry and enhancing suitability as a feed ingredient in markets such as aquaculture. The ethanol industry produced an estimated 32.2 million short tons of DDGS and nearly 3.2 billion pounds of DCO in 2020 with an aggregate market value of \$6.1 billion. Increases in DDGS and DCO prices in 2020 helped offset lower ethanol prices.

Spending associated with ethanol production, expansion and new construction activity, and R&D circulates and re-circulates throughout the entire economy several-fold, stimulating aggregate demand, and supporting jobs and household income. The economic activity associated with export activity adds to this impact. In addition, expanded economic activity generates tax revenue for government at all levels.

### **Methodology**

We estimate the impact of the ethanol industry on the American economy by applying expenditures by the relevant supplying industry to the appropriate final demand multipliers for value added output, earnings, and employment.

To understand how the economy is affected by an industry such as ethanol production, it is necessary to understand how different sectors or industries in the economy are linked. For example, in the renewable fuels production sector, the ethanol industry buys corn from the agriculture sector, which in turn, buys inputs from other suppliers such as fertilizer and pesticide producers that also purchase products from a range of other industries. These are referred to as backward linkages. For example, grain production is linked through both forward and backward linkages to other economic sectors in each state's economy.

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<sup>4</sup> DDGS and corn distillers oil production is reported monthly in the USDA Grain Crushings and Co-Products Production report. <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1899>

The household sector is linked to all sectors as it provides the labor and management resources. In turn, changes that affect incomes of the household sector typically have significant impacts compared to a change in the sales of other sectors. This is because households typically spend most of their income on both retail and service goods and this is a critical component of the national economy.

This study uses the IMPLAN (Impact Analysis for Planning) multiplier database to develop a model of the national economy, including sectors that support the ethanol industry, the links between them, and the level of national economic activity. IMPLAN is a commonly used economic input-output (I-O) model. I-O models are constructed based on the concept that all industries in an economy are linked together; and the output (i.e., sales) of one industry becomes the input of another industry until all final goods and services are produced. I-O models can be used both to analyze the structure of the economy and to estimate the total economic impact of projects or policies. For this analysis, a model for the U.S. economy was constructed using current IMPLAN software and data.

As in the past, we continue to treat industry earnings as an addition to the household sector since the income is paid to owners of operating ethanol plants. As a result, the impact of corporate earnings is estimated using multipliers for the household sector and incorporated into direct GDP.

IMPLAN models provide three economic measures that describe the economy: value added, income, and employment.

- Value added is the total value of the goods and services produced by businesses in the country and is generally referred to as GDP
- Labor income is the sum of employee compensation (including all payroll and benefits) and proprietor income (income for self-employed work). In the case of this analysis, demand for corn and other feedstock to produce ethanol supports farm income through higher crop receipts than would be the case without ethanol production.
- Employment represents the annual average number of employees, whether full or part-time, of businesses producing output. It is expressed in full-time equivalent jobs. Value added including labor income and employment represent the net economic benefits that accrue to the nation because of increased economic output.

There are three types of effects measured with a multiplier: direct, indirect, and induced effects. Direct effects are the known or predicted changes in the economy associated with the industry directly involved (in this case, ethanol). Indirect effects are the business-to-business transactions required to produce direct effects (i.e., increased output from businesses providing intermediate inputs). Finally, induced effects are derived from spending on goods and services by people working to satisfy direct and indirect effects (i.e., increased household spending resulting from higher personal income).

We also continue to reflect the additional value of output of co-products (DDGS and DCO) in the analysis. Since these are co-products the backward linkages for their production are accounted for in the expenditures for ethanol production. Consequently, the value of DDGS and DCO was treated as income and value added only, and we applied income multipliers to the employee compensation portion to avoid double counting.

As was the case in our previous studies, we incorporated the explicit impact of ethanol and DDGS exports in the economic impact analysis. The methodology for estimating the impact of trade differs from that used for industry output.<sup>5</sup> We estimated the impact of ethanol and DDGS exports by applying USDA Agricultural Trade multipliers for output and employment to the estimated value of exports for 2020 reported in the USITC trade databases. Since ethanol and DDGS are outputs of the organic chemical industry we used the USDA trade multipliers for the other organic chemicals industry. The USDA multipliers have three major components (or margins): production, transportation and warehousing, and wholesale/retail trade. Since IMPLAN already incorporates the impact of ethanol and DDGS production, to avoid double counting impacts we only applied the margins for transportation and trade to the value of exports. This represents the post-production (or ex-plant) impacts from exports.

## Results

Table 2 summarizes the impact of ethanol industry production and exports on the U.S. economy in 2020. The full impact of the spending for annual operations of ethanol production, co-product output, exports, and R&D is estimated to have contributed nearly \$35 billion to the nation's GDP in 2020, 19 percent less than in 2019. The primary reason for the lower GDP impact can be traced to reduced

<sup>5</sup> <https://www.ers.usda.gov/data-products/agricultural-trade-multipliers.aspx>



spending associated with reduced output. Agriculture remains a significant source of industry economic impact. This reflects the importance of ethanol demand to total corn utilization, the aggregate value of crop production, and crop receipts and farm income. The manufacturing activity of ethanol production alone contributed \$9.5 billion to the U.S. economy.

Table 2  
Economic Impact of the Ethanol Industry: 2020

	<b>GDP (Mil 2020\$)</b>	<b>Jobs FTEs</b>	<b>Income (Mil 2020\$)</b>
<b>Ethanol Production</b>	<b>\$9,548</b>	<b>71,010</b>	<b>\$5,096</b>
Direct	\$3,055	8,303	\$1,321
Indirect	\$3,387	23,489	\$1,749
Induced	\$3,106	39,218	\$2,026
<b>Construction</b>	<b>\$319</b>	<b>3,367</b>	<b>\$212</b>
Direct	\$118	1,473	\$96
Indirect	\$81	668	\$49
Induced	\$120	1,227	\$68
<b>Agriculture</b>	<b>\$18,759</b>	<b>213,550</b>	<b>\$10,056</b>
Direct	\$3,238	51,936	\$1,559
Indirect	\$9,799	98,289	\$5,269
Induced	\$5,722	63,325	\$3,229
<b>R&amp;D Expenditures</b>	<b>\$205</b>	<b>1,742</b>	<b>\$132</b>
<b>Exports (Total)</b>	<b>\$5,834</b>	<b>15,110</b>	<b>\$3,092</b>
<b>Total Ethanol</b>	<b>\$34,665</b>	<b>304,780</b>	<b>\$18,588</b>
Direct	\$6,487	62,180	\$3,029
Indirect	\$19,156	138,070	\$10,195
Induced	\$9,022	104,530	\$5,364

## Employment

Jobs are created from the economic activity supported by ethanol production. The ethanol production is not a labor-intensive industry (accounting for fewer than 10,000 full time equivalent direct jobs nationwide)<sup>6</sup>. However, the economic activity of supporting industries generates a substantial number of jobs in all sectors of the national economy. When the direct, indirect and induced jobs supported by ethanol production, construction activity, agriculture, exports, and R&D are included, the ethanol industry supported nearly 305,000 jobs in 2020.

Since ethanol production is more capital intensive than labor intensive, the number of direct jobs supported by the ethanol industry is relatively small and is concentrated primarily in manufacturing and agriculture. Most agriculture jobs supported by the ethanol industry are jobs in support activities related to crop production, ranging from farm advisors, producers and distributors of crop protection products, fertilizer, and farm equipment, and other service providers. In addition, jobs supported by income generated and spent by employees supports a significant number of jobs in seemingly unrelated sectors such as retailers and service sectors. In general, as the impact of the direct spending by the ethanol industry expands throughout the economy, the employment impact expands significantly and is spread over a large number of sectors.

## Income

Economic activity and associated jobs produce income for American households. The economic activities of the ethanol industry put nearly \$19 billion into the pockets of Americans in 2020. As is the case with employment, the direct impact on income by the ethanol industry is largely concentrated in manufacturing and services. In many respects, this mirrors the employment structure of the American economy. The most significant impact of the ethanol industry continues to be increased income to farmers who benefit from the demand for feedstock, which leads to both increased production and increased prices, as well as earnings from locally owned ethanol plants.

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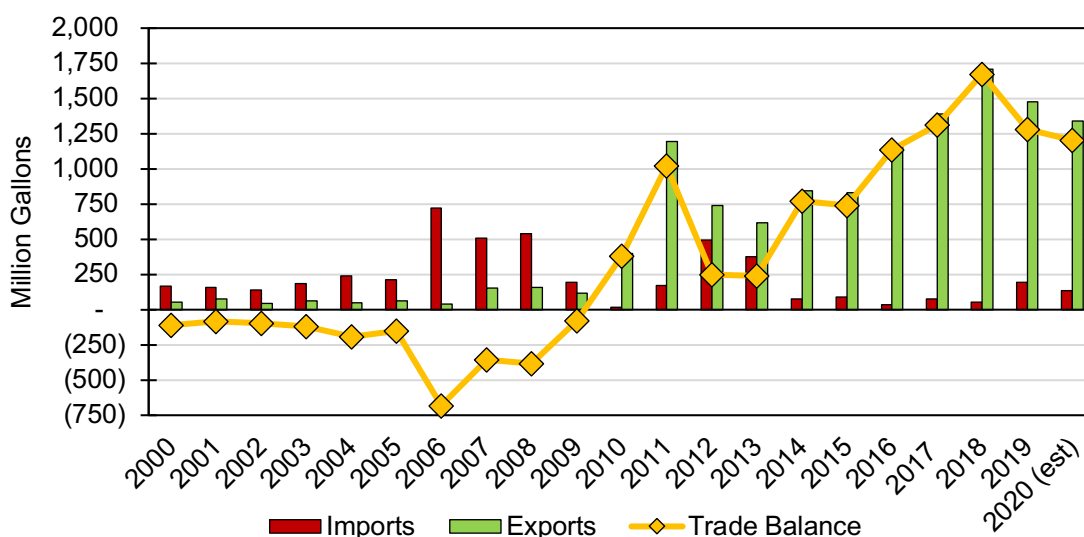
<sup>6</sup> The Census Bureau does not report employment in ethanol production. This analysis conservatively assumes the average ethanol plant employs approximately 50 full-time equivalent employees.

## Exports

Ethanol exports dropped sharply during the second half of the year as COVID affected motor fuel use in importing countries. Exports to the two largest U.S. markets – Canada and Brazil – fell 6 percent and 34 percent, respectively. Year-to-date exports of ethanol were 10 percent below 2019 levels through October. The decline in volume was offset by higher export prices for both ethanol and DDGS.

U.S. ethanol exports have expanded significantly over the last decade and continue to post a substantial trade surplus. Ethanol exports in 2020 are projected to total more than 1.3 billion gallons with an export value of \$2.1 billion. The projected 11 million metric tonnes of DDGS that are exported were valued at \$2.3 billion. Moreover, the ethanol industry continues to generate a trade surplus that helps reduce the nation’s trade deficit. Figure 2 illustrates the growth in ethanol exports, imports and trade balance.

Figure 2  
U.S. Ethanol Trade



Source: Foreign Agricultural Service. Global Agricultural Trade System (GATS)

Exports of ethanol and distillers’ grains generate economic activity largely through the requirements to transport output from plants to ports and final destinations. This largely involves truck, rail, barge, and ocean shipping. Additional impacts are generated by labor, administrative and financial requirements

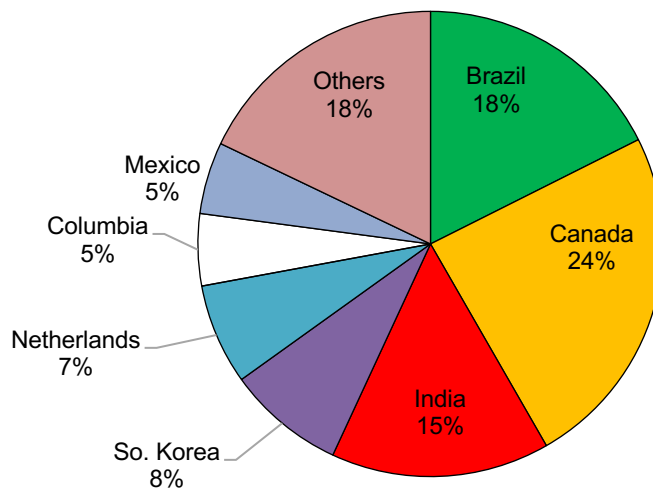
necessary to support export activity. These impacts are categorized as indirect since they are subordinate to production. Using the USDA Trade Multipliers suggests that the \$4.4 billion of export value added \$5.8 billion to GDP and supported 15,100 jobs in all sectors of the economy. Most of these jobs are concentrated in transportation and export trade related administrative and financial industries.

2020 was a difficult year for other major ethanol producers. A recent FAPRI forecast indicates that world ethanol production is projected to decline nearly 9 percent in 2020.<sup>7</sup> As indicated earlier production in the U.S., the world's largest producer, decreased 12.1 percent in 2020 while output in Brazil, the world's second largest producer, fell nearly 8 percent in 2020. Canada overtook Brazil as the leading export market for U.S. ethanol in 2020 accounting for 24 percent of U.S. exports. India was the third largest market for U.S. ethanol followed by South Korea, the Netherlands, Colombia and Mexico. Exports to China have dropped sharply over the past several years because of tariffs placed on U.S. ethanol and, as a result of the U.S. – China trade tensions, exports of ethanol to China in 2020 displayed little growth. As shown in Figure 3, seven markets account for more than 80 percent of total U.S. ethanol exports, although the U.S. shipped ethanol to roughly 90 countries in 2020.

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<sup>7</sup> FAPRI Baseline Review 2020. December 2020. Food & Agricultural Policy Research Institute, University of Missouri

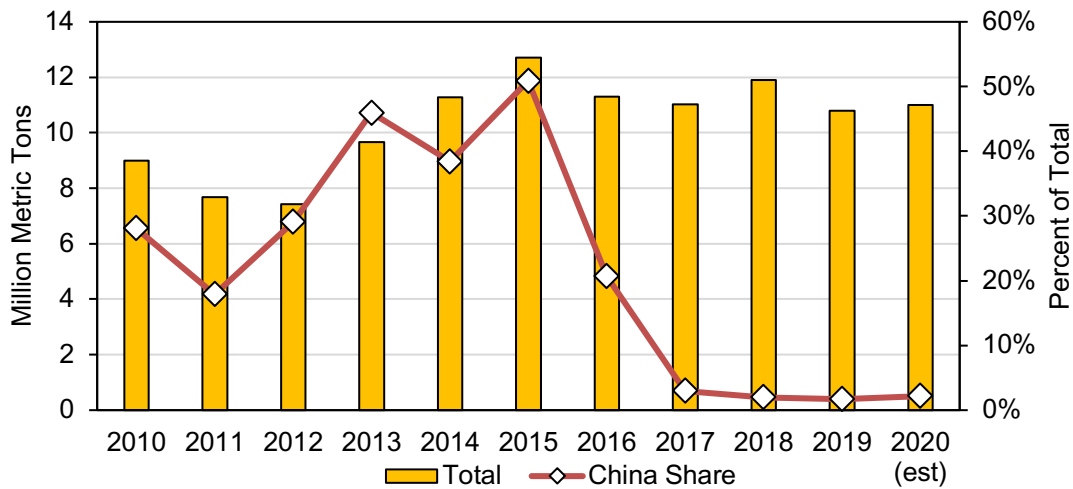
Figure 3  
U.S. Ethanol Exports, Jan-Oct 2020



Source: FAS GATS

DDGS exports through October 2020 increased 0.6 percent from year earlier levels and are projected to total about 11 million metric tonnes for all of 2020. Higher world prices for DDGS led to an increase of about 2 percent in the value of exports. Exports of DDGS to Mexico, the largest market for U.S. DDGS fell 14 percent through October while exports to Canada, another major market, fell nearly 42 percent. The Chinese market for U.S. DDGS remains stagnant. Exports to China which had accounted for more than half of U.S. exports as recently as 2015 totaled about 206,000 metric tons through October 2020, or 2.2 percent of total U.S. exports. Figure 4 illustrates the level of U.S. DDGS exports and the share of market accounted for by China.

Figure 4  
U.S. DDGS Exports



Source: USDA Foreign Agricultural Service Global Agricultural Trade System (GATS).

## Tax revenue

The combination of GDP and household income supported by the ethanol industry contributed an estimated \$3.3 billion in tax revenue to the Federal Treasury in 2020. State and local governments also benefit from the economic activity supported by the ethanol industry, earning \$3 billion in 2020.

## Crude oil displacement

Ethanol also plays a positive role in reducing our dependence on imported oil, expands the supply of motor gasoline, reduces the U.S. trade deficit, and reduces greenhouse gas emissions relative to conventional gasoline.

Ethanol displaces crude oil needed to manufacture gasoline and expands the volume of motor gasoline available to consumers. According to the Energy Information Administration (EIA), U.S. dependence on imported oil and refined products has dramatically declined since peaking in 2005 and the U.S. became a net exporter of oil and refined products in 2020. The use of domestic biofuels (ethanol and biodiesel) continues to be a contributor to the nation's energy independence. The production of 13.8 billion gallons of ethanol displaced 465 million barrels of crude oil needed to produce gasoline in 2020. The value of

the crude oil displaced by ethanol is estimated more than \$17 billion in 2020.<sup>8</sup> This money stays in the American economy and, when combined with the GDP generated by ethanol production, is helping keep America strong.

## State Level Impacts of Ethanol Production

The ethanol industry has diversified geographically in recent years. At the end of 2020, RFA reports an aggregate industry capacity of 17.4 billion gallons with 209 operating plants producing nearly 13.9 billion gallons. Each of these plants is essentially a bio refinery that is an integral part of the other basic organic chemicals industry in the U.S. manufacturing sector. As such, the expenditures on feed grains and other feedstocks and inputs generates economic activity, income and supports job creation.

The calculation of state-level economic activity generated by ethanol production employed a different methodology than in previous years. The major change involved using state-specific economic impact multipliers for the Other Basic Organic Chemical Manufacturing industry (of which ethanol is a part) provided by the Bureau of Economic Analysis Regional RIMS II system. These replace the national average multipliers from IMPLAN used in previous years. The use of state-specific multipliers permits a more representative estimate of economic impacts at the individual state level. After identifying the multipliers for GDP, employment and income we estimated state-level output adjusted for idled capacity resulting from COVID impacts. This was accomplished using base year-end capacity and estimates of COVID related idled capacity provided by RFA. Expenditures were calculated by multiplying the national average per gallon cost of production adjusted output. Estimates of GDP, income and employment were calculated by multiplying the appropriate state-level RIMS II multipliers for the Other Basic Organic Chemical Manufacturing industry to the estimated operating expenditures by state. Since two different multiplier systems were used, the RIMS results were allocated over the national economic impacts based on state shares. The results represent only the impact of ethanol production and agriculture and exclude new construction activity, exports and R&D. The economic impacts are

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<sup>8</sup> Ethanol directly competes with and displaces gasoline as a motor fuel. According to the EIA, one 42-gallon barrel of crude oil produced 19.7 gallons of gasoline in 2020. Ethanol has a lower energy content (76,700 btu per gallon LHV) than gasoline (114,000 btu per gallon LHV), and thus it takes 1.48 gallons of ethanol to provide the same energy as one gallon of gasoline. Therefore, 15.8 billion gallons of ethanol are the equivalent of 10.4 billion gallons of gasoline. Since one barrel of crude produces 19.7 gallons of gasoline, it takes 465 million barrels of crude to produce 9 billion gallons of gasoline, the amount displaced by ethanol. This oil was valued at the 2020 year-to-date average composite acquisition cost of crude oil by refiners of \$37/bbl.

rough estimates for several reasons. Chief among these is that the state-level analyses used multipliers for only one industry, other basic organic chemicals, and does not reflect other supplying industries. As might be expected, the impact on a state's economy is generally proportional to ethanol production. Table 3 details these results for states with at least 100 million gallons of production capacity.

The results in Table 3 are generalized impacts. The impacts of comprehensive analysis of any individual state will differ from these results. The reason for this is complex. First, the structure of each state economy is unique, economic impact multipliers reflect this and will differ from national-level multipliers for any given industry. This analysis uses multipliers for only one industry, other basic chemicals manufacturing, and does not reflect other supplying industries. Additionally, there are regional differences in feedstock costs, ethanol and DDGS prices, and other input costs that have not been explicitly considered. Relatively few states procure all of their feedstock and other inputs locally. Consequently, the analysis does not factor in leakages (spending that takes place out-of-state for inputs imported from a neighboring state). This means, for example, that the impacts may be overstated for a corn-deficient state like California or Texas to the extent that the dollars spent for corn imported from other states represent income for farmers in supplying states and are not netted out of the analysis. Similarly, corporate and co-op income is generated by plants domiciled in a particular state and ownership varies from state-to-state. Finally, the analysis does not allocate construction and R&D expenditures or exports on a state-by state basis since these are not likely equally distributed over all states.



Table 3  
Contribution of Ethanol Production to Individual State Economies, 2020\*

State	Capacity (Mil gal)	Plants	GDP (Mil \$)	Earnings (Mil \$)	Employment Jobs
IA	4,601	44	\$6,571	\$3,555	68,483
NE	2,300	26	\$3,211	\$1,718	33,052
IL	1,858	14	\$3,753	\$1,975	32,657
MN	1,378	19	\$2,349	\$1,288	23,526
IN	1,336	15	\$2,235	\$1,212	23,818
SD	1,235	16	\$1,679	\$906	16,873
OH	676	7	\$1,446	\$779	15,579
KS	618	13	\$1,316	\$656	13,021
WI	603	9	\$934	\$514	10,528
ND	537	7	\$908	\$460	7,925
TX	375	4	\$486	\$258	4,301
MI	353	5	\$540	\$301	6,280
MO	296	6	\$523	\$263	5,712
TN	237	3	\$520	\$272	5,215
CA	217	5	\$384	\$218	3,432
NY	165	2	\$227	\$115	1,711
CO	142	4	\$280	\$154	2,870
GA	120	1	\$221	\$120	2,267
PA	120	1	\$240	\$128	2,140
Others	264	8	\$485	\$262	5,171
U.S.*	17,431	209	\$28,307	\$15,152	284,560

\*Excludes construction, exports and R&D

## Conclusion

Despite the disruptive effects of the COVID pandemic, economic and regulatory challenges in 2020, the ethanol industry continued to make a significant contribution to the economy in terms of job creation, generation of tax revenue, and displacement of crude oil and petroleum products. The importance of the ethanol industry to agriculture and rural economies is particularly notable. A return to growth and expansion of the ethanol industry through the application of new technologies and feedstocks will enhance the industry's position as the original creator of green jobs and will enable America to make further strides toward reducing greenhouse gas emissions and positively dealing with climate change.