ADVANCING AMERICA'S

Agriculture

The Value of Natural Gas to U.S. Agriculture and Agrochemicals

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AGA
American Gas Association

Table of Contents

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Letter from the President and CEO

Our nation's natural gas industry delivers affordable and reliable energy to millions of Americans and businesses every day, driving down emissions and helping to achieve our nation's energy and environmental goals. As the preferred source of home heating, a fundamental component for manufacturing, and the largest source of electric power generation in the United States, natural gas is an essential part of our energy sector and economy. Still, far too few people realize just how critical this clean and affordable fuel is to our daily lives.

This report, the first in AGA's *Advancing America* series, examines how natural gas is essential for a thriving agriculture sector, based on data sourced from the U.S. Energy Information Administration and the IMPLAN economic model. Simply put, food fuels our lives and natural gas is vital to our farming communities. The American farmer relies on domestic natural gas for the fertilizer in their fields, the fuel to run their equipment, and energy to process, store and transport our nation's food supply to feed 330 million Americans and countless individuals abroad, who depend on U.S. agricultural exports (valued at $177 billion in 2021 according to the USDA).[1]

America's farms and ranches are key beneficiaries of the growth in U.S. natural gas production, which means all of us who rely on a strong domestic agriculture sector are benefiting. We may not think about everything that goes into the price we pay for a loaf of bread or a gallon of milk, but you can directly connect the availability of low-cost natural gas to the cost of food on grocery store shelves globally.

Global agricultural production is becoming more energy intensive,[2] thus the need for secure and affordable natural gas supplies is greater than ever. Natural gas is a critical domestic feedstock for the agriculture industry, allowing the United States to produce critical fertilizers and other agricultural needs at competitive prices, shielding our farmers from supply-chain bottlenecks, ensuring bountiful crop yields, and buttressing global food security.

You can draw a direct line from the availability of low-cost natural gas to the cost of food on grocery store shelves globally.

Did You Know?

In New Mexico, natural gas plays an essential role in drying and processing the state's world famous green chiles.

"Without natural gas, there's just no other way that we could dry the product."

Duane Gillis
Manager, Mesilla Valley Chili Company

[1] "As a result, U.S. agricultural exports have grown steadily over the past quarter century – reaching $177 billion in 2021, up from $66.5 billion in 1996," https://www.ers.usda.gov/topics/international-markets-u-s-trade/u-s-agricultural-trade/u-s-agricultural-trade-at-a-glance/

[2] "The report highlights how global food systems are becoming more energy intensive, reflecting trends in retail, packaging, transport and processing," https://news.un.org/en/story/2021/03/1086822

The U.S. agricultural chemicals sector is a major economic engine, supporting 344,000 jobs and $50.8 billion in U.S. GDP[3], and benefits our highest-producing agricultural states in the Midwest like Iowa, Missouri, and Nebraska.

As of 2021, China and Russia were the world's largest producers of ammonia (the main ingredient in fertilizer) – with the United States ranked third. Agrichemical security means global food security, underscoring why domestic ammonia production is so vital and why U.S. natural gas is critical to national security. Recent events in Europe demonstrate that the absence of domestic energy supplies contributes to economic uncertainty and insecurity. For example, natural gas prices in Europe have soared compared to those in the United States the past year.

China and Russia were the world's two largest ammonia producers in 2021, underscoring why domestic ammonia production – which relies on natural gas – is **critical to American agriculture and our national security.**

Our advantage extends to America's reputation of driving environmental progress, ensuring that local crops and livestock have a lower emissions intensity with cleaner fertilizer. The United States is also innovating by turning farm waste into renewable natural gas ("RNG") to produce low-carbon energy. Capturing methane emitted by our farming community and blending it into our pipeline system will enable lower emissions in our food supply ecosystem. RNG exemplifies how natural gas utilities provide innovative solutions that will help lead our nation and world to a cleaner energy future.

Despite the benefits natural gas provides our farmers, as well as our nation's economic and environmental progress, certain policymakers and activist groups are pushing for ideologically driven bans on this affordable and reliable energy. Restricting the development and use of natural gas would mean higher costs for farmers, driving up food prices and costs for families and businesses across the country. We must ensure that farmers and American manufacturers have competitive and secure supplies of fertilizers and affordable energy to produce the food our nation depends on.

State and federal policymakers must recognize the critical role of natural gas infrastructure in keeping costs low for both the American farmer and the American families who are already struggling to put food on their tables. The world's population will increase by two billion people by 2050, which means our farmers and our natural gas industry will be vital to meeting the growing demand for food and avoiding destabilizing food insecurity.

Karen Harbert
President and CEO, American Gas Association

[3] IMPLAN model data for calendar year 2021

Executive Summary

The American Gas Association ("AGA") engaged FTI Consulting, Inc. ("FTI") to analyze the natural gas consumption and economic impact of U.S. crops, livestock, food processors, and agrochemical sectors on the U.S. economy. The findings in this analysis are based on data from the U.S. Energy Information Administration and federal economic data (such as from the U.S. Bureau of Economic Analysis) imbedded in the IMPLAN economic model.

- The U.S. agriculture sector (defined to include crops, livestock, and food processors) is connected to many other sectors across the economy. The U.S. agriculture sector is a major consumer of natural gas, and the availability of abundant natural gas resources – an important feedstock for many key agricultural inputs, most critically ammonia to produce nitrogenous fertilizers – has directly benefitted the sector. Those benefits extend beyond farms, ranches, and industry to every state through jobs, output, and tax revenues. America's extensive natural gas infrastructure plays an essential role in delivering these benefits across the country.
- Natural gas helps the U.S. economy produce agrochemicals, the most important of which is the fertilizer used to increase crop yields. The security value of a strong U.S. agrochemical industry is hard to overstate, especially considering that the two largest producers of ammonia – a key component of fertilizer – outside the U.S. are China and Russia.[4] The expansion of domestic gas production over the past 15 years has allowed the U.S. to increase its ammonia production capacity and, with it, the capability of producing agrochemicals domestically. Put differently, the benefits of natural gas to U.S. agriculture include reduced reliance on autocratic regimes.

Here are some of the most important figures from the analysis:

- The U.S. agriculture sector is a major part of the economy. It provides 5 million direct jobs and directly contributes $437 billion to U.S. gross domestic product ("GDP").
- Accounting for indirect suppliers and induced expenditures, the U.S. agriculture sector supports 17.2 million jobs and approximately $1.75 trillion in U.S. GDP. This is roughly equivalent to the GDP of Texas, the second-largest state economy after California.
  - States with the largest shares of their economies supported by the U.S. agricultural sector include Nebraska, Iowa, South Dakota, North Dakota, Idaho, Kansas, Arkansas, Kentucky, Wisconsin, Montana, and Missouri.

[4] https://www.eia.gov/naturalgas/weekly/archivenew_ngwu/2021/04_01/

- U.S. agriculture is one of the largest consumers of natural gas. When including direct use and use throughout the industrial supply chain, the U.S. agriculture sector consumes roughly 1.7 trillion cubic feet ("Tcf") of natural gas – equivalent to almost 15% of all U.S. commercial and industrial consumption of natural gas based on 2021 data.
- In six states – Nebraska, Iowa, South Dakota, North Dakota, Idaho, and Kansas – agricultural consumption represents over 30% of commercial and industrial gas demand. States known for their agriculture and food processing sectors – such as those in the Midwest, California, Texas, and Louisiana – have comparatively high use of gas in agriculture.

- Just five of the many agricultural subsectors consumed 2.06 Tcf of natural gas in 2021, nearly equivalent to the total consumption of California, which is the second largest natural gas consuming state.

- The U.S. agrochemical sector produces fertilizers and other agricultural chemicals, such as critical herbicides and pesticides, for use on farms. The U.S. agrochemical sector would be at risk if it were to lose its access to gas for direct use, as feedstock for its production, or for intermediate production of its suppliers through the chemical supply chain.
  - In 2021, U.S. production of nitrogenous fertilizers and other agrochemicals required the consumption of approximately 95 billion cubic feet (Bcf) of natural gas throughout the supply chain.
  - States with the largest consumption of natural gas related to the production or the supply chain of agrochemicals include Texas, Louisiana, Iowa, California, Ohio, Indiana, Alabama, Illinois, Oklahoma, Wisconsin, and Mississippi.

[5] Includes peas, beans, rice, barley, broomcorn, buckwheat, milo, oat, rye, sorghum, and wild rice farming
[6] Includes canola, flaxseed, mustard seed, rapeseed, safflower, sesame, and sunflower farming

- Losing secure access to ample gas supplies would put the U.S. agrochemical sector in a precarious position relative to competitors. If the industry were to become suddenly uncompetitive relative to foreign producers, then the U.S. would need to import more of its ammonia feedstock and finished fertilizer products.
- The U.S. agrochemical sector also has a significant impact on the U.S. economy:
  - It supports 344,000 U.S. jobs and $51 billion in U.S. GDP
  - California, Florida, New York, and Texas have the largest number of jobs supported by the agrochemical manufacturing sector. In California, this natural gas-dependent sector supports 38,000 jobs. Other notable state job impacts include 13,800 in Illinois; 12,400 in Pennsylvania; 7,200 in Wisconsin; and 5,900 in Colorado.

Introduction and Context

The American Gas Association engaged FTI Consulting, Inc. to describe the value natural gas provides to the U.S. agriculture sector, defined in this report as crop cultivation, livestock production, and food processing. Using this definition, the U.S. agriculture sector is one of the largest of the U.S. economy with five million direct jobs and $437 billion in direct U.S. GDP supported.[7]

Natural gas is essential to maintaining and growing the U.S. agriculture sector. Direct use of gas by agriculture includes heat for buildings and structures, the drying of grains, and process heat for food processors. Natural gas production also benefits propane production and consumption. Propane is a natural gas liquid ("NGL") often produced alongside natural gas, allowing for similar direct use. This report conservatively excludes the benefits to the U.S. agriculture sector from the development and consumption of propane, though it would be a factor.

Beyond significant direct use by the U.S. agricultural sector, natural gas is also a salient component of preproduction and postproduction phases of agricultural output through "indirect" uses.[8] During the preproduction phase, farmers rely on the creation of agrochemicals such as herbicides, fungicides, pesticides, rodenticides, and fertilizers. Other secondary uses of natural gas related to agriculture include refinement, distribution, and transportation.[9]

Fertilizer and other agrochemical production is the most significant consumer of natural gas in the agriculture supply chain. Natural gas is required to produce nitrogen, one of the three main fertilizer components, alongside phosphate and potash. Natural gas is a key component of ammonia synthesis in the Haber-Bosch process, which enables the mass production of fertilizers and increased crop yields. Between 70% and 80% of all energy used to produce the fertilizers critical to the increased domestic production of crops such as wheat, soybeans, corn, rice, and oats comes from natural gas.[10]

This report examines the full scope and scale of the U.S. agriculture sector and its supply chain, the direct use of natural gas by the agricultural sector and highlights the value of natural gas to agrochemical production and the importance of modern agrochemicals to increasing agricultural output. It begins by describing the natural gas demand implied by federal economic and energy-related data.

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[7] IMPLAN model data for calendar year 2021

[8] "Indirect" use is the use of natural gas in the supply chain supporting agriculture including the direct use of natural gas by suppliers (e.g., primary metals) or the use of gas as feedstock (e.g., chemicals)

[9] https://farmandenergyinitiative.org/wp-content/uploads/2020/08/Energy-Use-in-Agriculture.pdf

[10] Ibid.

Natural Gas Consumption and the U.S. Agriculture Sector

The U.S. agriculture sector is a major part of the economy. The sector provides 5 million direct jobs along with contributing $437 billion to U.S. gross domestic product ("GDP").[11] Those millions of jobs, that level of economic activity, and the extensive industrial supply chain behind them require gas inputs at all steps in production. This is especially true with agrochemicals like fertilizers, rodenticides, pesticides, and herbicides. This section shows how much natural gas is consumed by the U.S. agriculture sector and its supporting supply chain for it to play its part in the economy.

Methodology and Approach

The consumption of natural gas associated with the U.S. agriculture sector was estimated using a combination of IMPLAN data and data pertaining to gas consumption from the U.S. Energy Information Administration ("EIA").[12] The following summarizes the analysis process:

- IMPLAN provided the following datapoints:
  - Output by economic sector (all 546 in the IMPLAN database) and by state (the 50 states and including the District of Columbia, a *de facto* state economy)
  - Share of output dedicated to natural gas consumption from the IO table
- Output by sector and state was multiplied by the IO coefficient for natural gas demand to estimate the dollars expended by sector and state on natural gas inputs
- Commercial (wholesale, retail, and all services) and industrial sectors (natural resources, utilities, construction, and manufacturers) were grouped together
- Using this data, FTI determined each IMPLAN sector's share of commercial OR industrial expenditures on natural gas made in each of the 51 regions
- FTI compiled historical gas consumption by month by residential, commercial, industrial, and transportation customers based on EIA data[13]
- FTI allocated the commercial and industrial consumption between IMPLAN sectors based on the estimated share of expenditures using the output and IO data
- FTI compared this result to the output by sector and region to generate an effective rate of gas consumption (in MMcf) associated with a dollar of direct sales output
- FTI ran IMPLAN to determine the economic impact of the U.S. agriculture and agrochemical sectors and used the effective rates to estimate the impact on gas demand
- This estimate is the underlying data for the tables and maps in the next two subsections about gas demand and the U.S. agriculture sector and agrochemical sector

[11] IMPLAN model data for calendar year 2021
[12] https://www.eia.gov/
[13] https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm

Natural Gas Consumption

When including the direct use of gas and gas use throughout the supply chain, the U.S. agriculture sector consumes roughly 1,700 Bcf of gas – equivalent to almost 15% of all U.S. commercial and industrial gas consumption based on the monthly 2021 data.[14] In six states (Nebraska, Iowa, South Dakota, North Dakota, Idaho, and Kansas) this is over 30% of commercial and industrial gas demand. Other states known for significant agriculture and food processing sectors, such as other states in the Midwest, California, Texas, and Louisiana – also have a high percentage of commercial and industrial gas consumption.

The U.S. agriculture sector requires inputs from other sectors. These other sectors in the supply chain -- such as paper, metals, machinery – are also considerable users of natural gas, which further underscores the importance of natural gas throughout the industrial supply chain.

Table 1 – U.S. commercial and industrial gas consumption supported by agriculture and food processing[15]

Economic Sector	Units	Direct Impact	Indirect Impact	Direct + Indirect	U.S. Sector Demand (%)
Commercial[16]	Bcf	0.0	128.1	128.1	4.0%
Industrial[17]	Bcf	1,037.2	519.3	1,556.5	19.1%
C + I[18]	Bcf	1,037.2	647.4	1,684.5	14.9%

Figures 1 and 2 represent consumption data on a state level. Figure 1 shows the states with the highest amount of gas consumption associated with the U.S. agriculture sector, and Figure 2 shows states with the highest share of commercial and industrial gas demand being supported by either the U.S. agriculture sector or the industrial supply chain supporting it.

The darker states in Figure 1 include those with large manufacturing and food processing sectors, such as Texas, California, and Louisiana. Other states with significant agriculture and supply chain gas demand include states in the Midwest, such as Iowa (106 Bcf of consumption), Illinois (76 Bcf of consumption), Indiana (68 Bcf of consumption), and their neighboring states.

Figure 2 shows agriculture and industrial supply chain gas demand as a share of total commercial and industrial demand. The darkest states in Figure 2 move away from large state economies like California

[14] FTI calculations
[15] FTI calculations
[16] https://www.eia.gov/tools/glossary/index.php?id=Commercial%20sector
[17] https://www.eia.gov/tools/glossary/index.php?id=Industrial%20sector
[18] Commercial plus industrial

and Texas to the Great Plains and states like Nebraska, Iowa, and South Dakota. Agriculture-related natural gas demand makes up as much as 40% of commercial and industrial demand in these states.

Figure 1 – State commercial and industrial gas consumption supported by agriculture and food processing (MMcf)

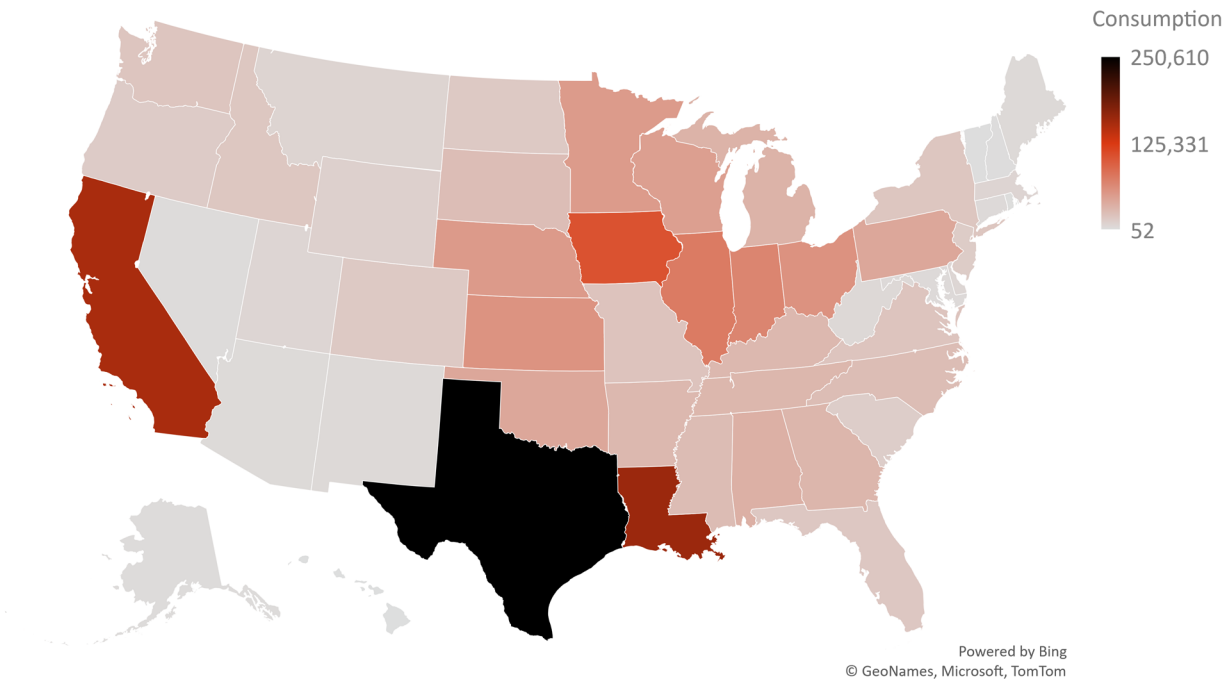


Figure 2 – State agriculture and food processing share of total commercial and industrial gas consumption (%)

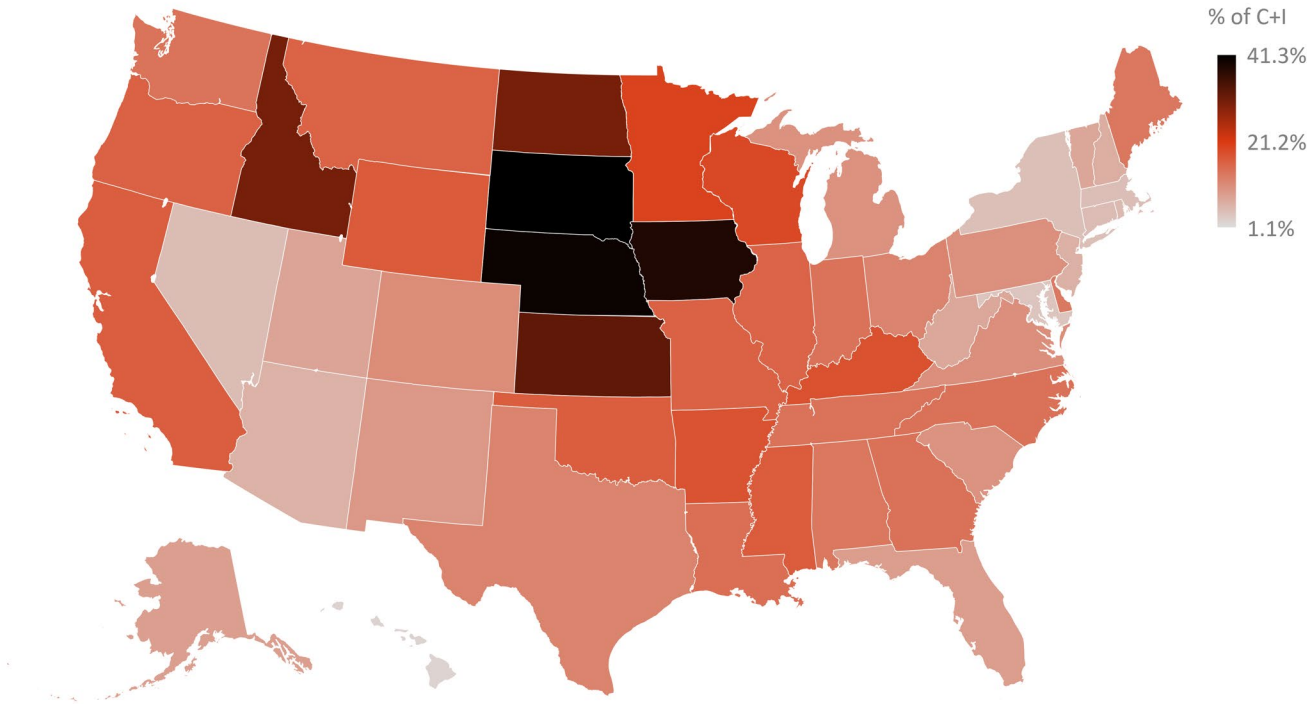


Table 2 shows the economic sectors with the largest amount of gas consumption associated with the U.S. agriculture sector. These mostly include manufacturing sectors like petrochemicals (which is an important part of the plastics supply chain to produce plastics for equipment and materials and for packaging food products), other basic organic chemicals, and transportation and planning (which has sectors related to shipping raw materials and finished food products).

The paper, primary metals, nonmetallic minerals, basic inorganic chemicals, and other chemical sectors also share strong supply-chain linkages with the U.S. agriculture sector.

Table 2 – Natural gas consumed by agriculture and food processor suppliers (MMcf)[19]

Rank	Economic Sector	Indirect Gas
1	Petrochemical manufacturing	163,886
2	Other basic organic chemical manufacturing	96,133
3	Transportation and Logistics	88,999
4	Paper Products	53,130
5	Primary Metals	36,206
6	Nonmetallic Mineral Products	32,703
7	Other basic inorganic chemical manufacturing	24,434
8	Other Chemicals	22,309
9	Construction	19,642
10	Natural Resources	18,895
11	Pesticide and other agricultural chemical manufacturing	14,545
12	Government	11,994
13	Nitrogenous fertilizer manufacturing	8,902
14	Plastics	8,381
15	F.I.R.E.[20]	8,292
	ALL OTHERS	38,917
	TOTAL >>	647,369

[19] FTI calculations
[20] Finance; Insurance; and Real Estate

Natural Gas Consumption and the U.S. Agrochemical Sector

One of the most important gas consumers within the U.S. agriculture sector's supply chain is the sector manufacturing agrochemicals. Agrochemicals include nitrogenous and phosphatic fertilizers, other fertilizers and fertilizer mixers, herbicides, rodenticides, and pesticides. Agrochemicals rely heavily on natural gas as a feedstock for chemicals and for process heat and steam needs, accounting for up to 80 percent of its energy needs.[21]

Between 70% and 80%

of the energy needs of the U.S. agrochemical sector comes from natural gas.

Ammonia is the most crucial feedstock for the manufacture of nitrogenous fertilizers. The U.S. is the third-largest producer of ammonia after China and Russia.[22] The expansion of, and security offered by, domestic natural gas production over the past 15 years has allowed the U.S. to increase its ability to produce ammonia and, with it, the ability to produce agrochemicals domestically for the domestic farming sector as well as the farming sectors of our allies. The alternative is relying on a volatile global market with a high degree of dependence on autocratic regimes.

This section provides additional information about the economic impact of agrochemicals and the sector's relationship to natural gas, including the gas consumption it supports.

Table 3 shows the size and scope of the direct U.S. agrochemical sector according to IMPLAN data and using the sector hierarchy in IMPLAN. The U.S. agrochemical sector supports 38,800 jobs, produces $43.6 billion in output, and directly supports $13.0 billion in U.S. GDP.[23]

[21] https://farmandenergyinitiative.org/wp-content/uploads/2020/08/Energy-Use-in-Agriculture.pdf
[22] https://www.eia.gov/naturalgas/weekly/archivenew_ngwu/2021/04_01/
[23] IMPLAN model data for calendar year 2021

Table 3 – Direct economic impact of U.S. agrochemical sector[24]

Economic Sector	Employment (thousands)	Output (2022 $ billions)	GDP (2022 $ billions)	Labor Income (2022 $ billions)
Nitrogenous fertilizer manufacturing	9.2	$12.2	$3.8	$1.5
Phosphatic fertilizer manufacturing	6.0	$5.0	$1.6	$0.8
Fertilizer mixing	9.5	$5.4	$1.8	$0.9
Pesticide and other agricultural chemical manufacturing	14.2	$21.0	$5.8	$1.9
TOTAL >>	38.8	$43.6	$13.0	$5.2

Table 4 shows direct, indirect, and induced economic impacts of U.S. agrochemicals. The direct impact considers the agrochemical sector's own employees, production, and operations, while indirect effects show its linkages to the industrial and commercial supply chain. The induced effects include the impact of household expenditures from the wages and salaries paid by the U.S. agrochemical sector and its supply chain.

The U.S. agrochemical sector supports 344,100 jobs, $118.5 billion in sales output, and $50.8 billion in U.S. GDP.[25] For context, this amount of GDP is close to the GDP of Wyoming. Much of the impact is concentrated in the indirect and induced effects, which is common to high-productivity manufacturing sectors with complex supply needs and supply chains.

[24] IMPLAN model data for calendar year 2021
[25] FTI calculations

Table 4 – U.S. economic activity supported by agrochemical sector[26]

Impact	Units	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Employment	Thou (#)	38.8	160.9	144.4	344.1
Output	2022 $ B	$43.6	$48.9	$26.0	$118.5
GDP	2022 $ B	$13.0	$23.0	$14.8	$50.8
Labor Income	2022 $ B	$5.2	$13.6	$8.6	$27.4
Federal Taxes	2022 $ B	$1.6	$4.2	$2.4	$8.1
S&L Taxes	2022 $ B	$0.9	$3.3	$1.6	$5.9

Figure 3 shows the number of jobs supported by the U.S. agrochemical sector by state. States with the largest number of jobs supported include large state economies like California, Texas, Florida, and New York, and industrial states touching the Great Lakes such as Illinois, Ohio, and Pennsylvania. Some of the states in the South, such as North Carolina and Georgia, also feature.

Figure 4 shows the share of all jobs in each state economy supported by the U.S. agrochemical sector in percentage terms. Almost 1% (0.9%) of the Wyoming economy is supported by the U.S. agrochemical sector. Iowa and Louisiana are next in line at 0.8% each. Other states with the highest shares include agricultural states such as Idaho, Nebraska, Missouri, Alabama, and Ohio.

While some states have lower shares because their industry mix does not include agrochemicals or their supply chain, all states show at least some impact from the agrochemical sector. State economies are "open" to one another through interstate commuters, supply-chain purchases made across state lines, tourism, and uneven tax collections, transfer payments, and federal spending between states.

[26] FTI calculations

Figure 3 – State employment supported by agrochemicals (units)

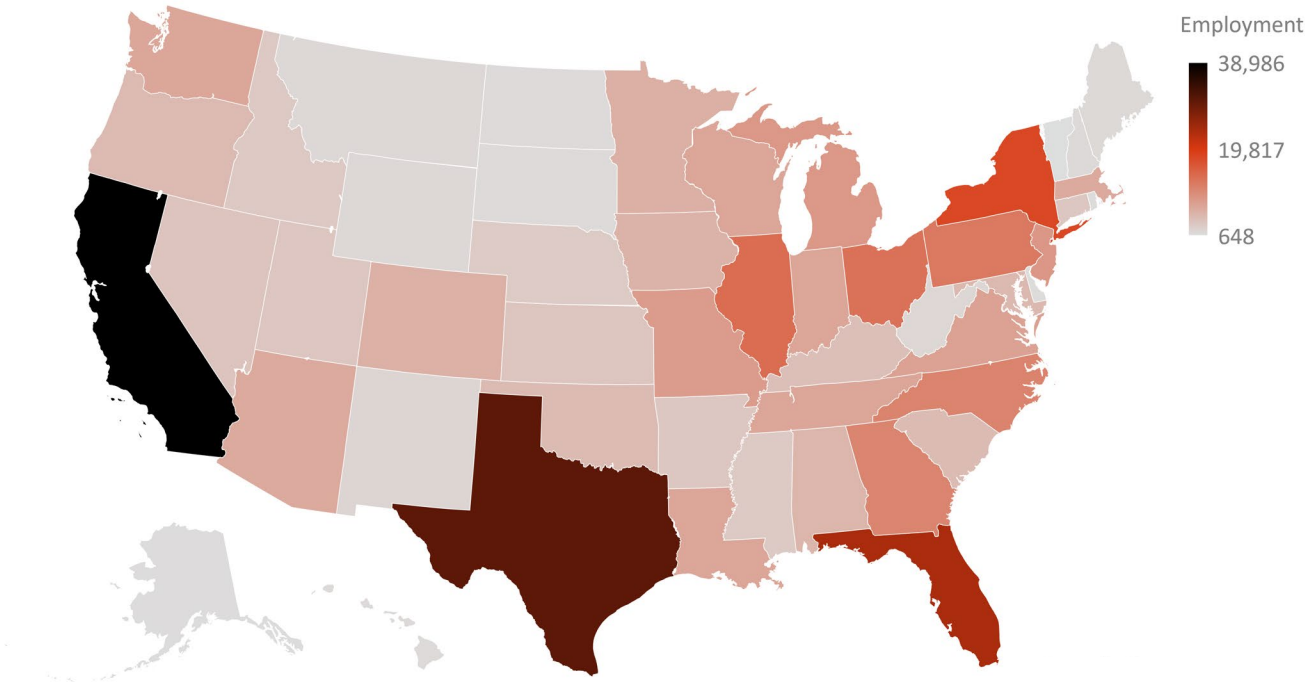
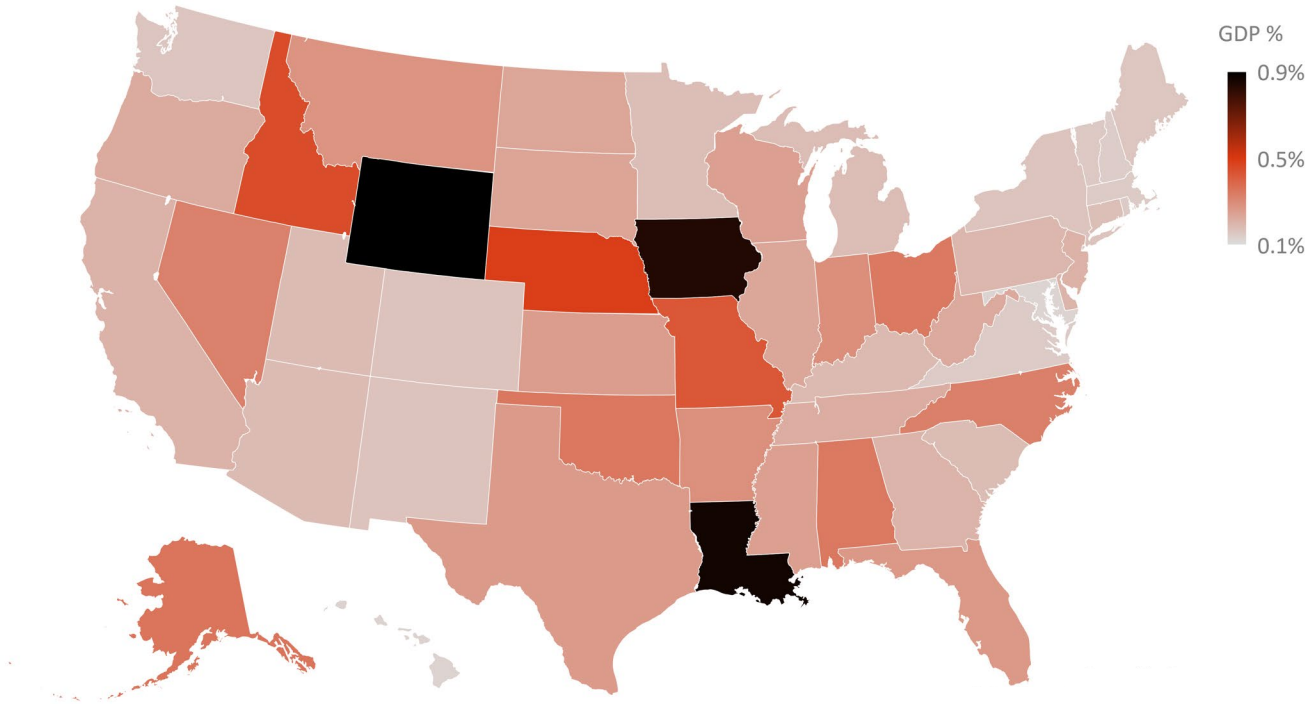


Figure 4 – Share of state GDP supported by agrochemicals (%)



Like Table 2, Table 5 shows the economic sectors associated with agrochemical production that have with the largest gas consumption. These include other manufacturing sectors in the industrial supply chain such as petrochemicals, basic organic chemicals, pesticide manufacturers, nitrogenous fertilizer manufactures, and basic inorganic chemicals. The 95 Bcf of gas demand in Table 5 underscores the importance of natural gas for the operations of this critical production sector.

Table 5 – Natural gas consumed by agrochemicals and its supply chain (MMcf)[27]

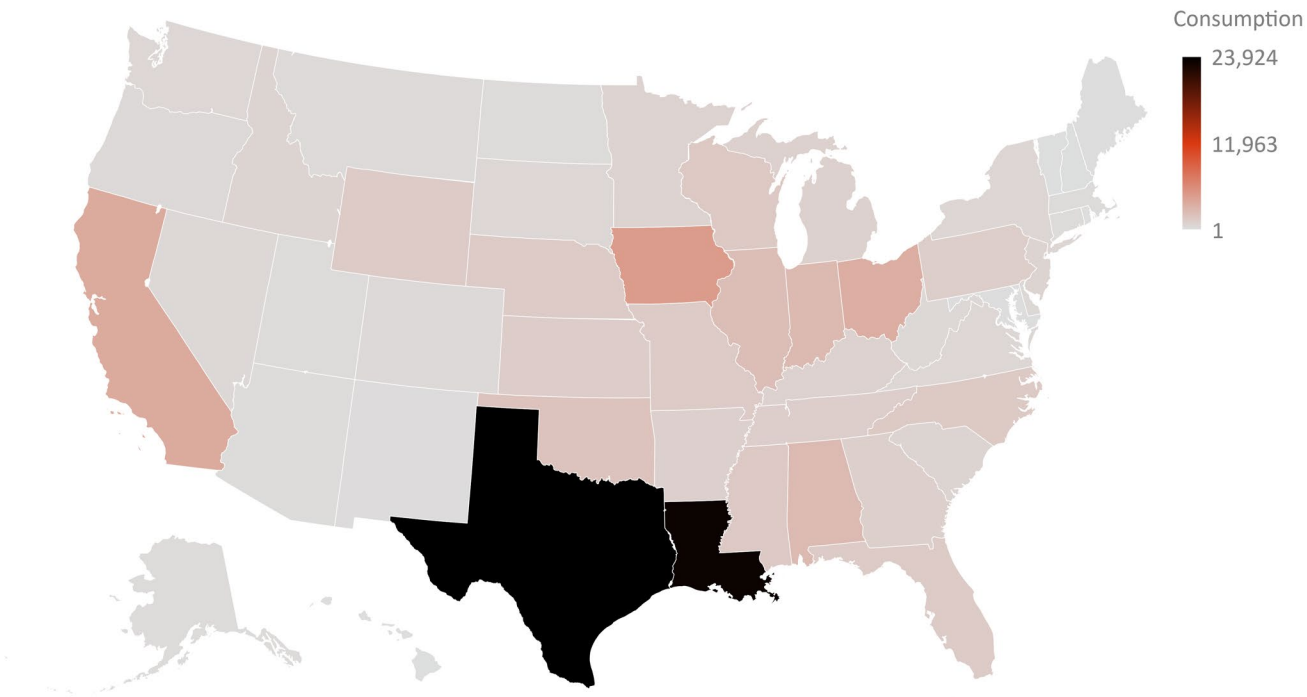
Rank	Economic Sector	Direct and Indirect Gas Demand
1	Petrochemical manufacturing	24,805
2	Other basic organic chemical manufacturing	20,406
3	Pesticide and other agricultural chemical manufacturing	14,859
4	Nitrogenous fertilizer manufacturing	9,464
5	Other basic inorganic chemical manufacturing	5,087
6	Natural Resources	3,179
7	Phosphatic fertilizer manufacturing	2,881
8	Fertilizer mixing	2,659
9	Transportation and Logistics	2,208
10	Industrial gas manufacturing	1,504
11	Primary Metals	1,302
12	Agriculture	1,211
13	Nonmetallic Mineral Products	1,064
14	Paper Products	1,041
15	Other Chemicals	895
	ALL OTHERS	3,334
	TOTAL >>	95,003

Figure 5 shows the share of state level commercial and industrial gas consumption supported by the U.S. agrochemical sector. Texas and Louisiana feature the most prominently because of their large

[27] FTI calculations

petrochemical, chemical, and manufacturing sectors, though some other states (e.g., California and Iowa) have notable agrochemical and industrial supply chain gas consumption.

Figure 5 – State commercial and industrial gas consumption supported by agrochemicals (MMcf)



The next few sections provide more information on the physical and operational footprint of the U.S. agriculture sector as well as its national and state level economic impact.

Overview of the U.S. Agriculture Sector

This research defines the U.S. agriculture sector as consisting of three broad categories: (1.) crops, (2.) livestock, and (3.) food processors. Forestry (e.g., lumber) and wild animals (e.g., seafood caught by the fishing sector) and distribution (e.g., food wholesalers) are not included.

Crops and livestock production create raw plant and animal products. Food processors transform raw products into food for animals and humans. The U.S. agricultural sector also produces raw materials used in other industries, such as leather products for clothing or furniture.

Table 6 summarizes the constituent parts of the U.S. agriculture sector for each subsector:

Table 6 – Subsectors comprising the U.S. agriculture sector

Subsector	Examples
Crops	*Oilseed farming; Grain farming; Vegetable and melon farming; Fruit farming; Tree nut farming; Greenhouse, nursery, and floriculture production; Tobacco farming; Cotton farming; Sugarcane and sugar beet farming; Other crops*
Livestock	*Beef cattle ranching and farming; Dairy cattle and milk production; Poultry and egg production; Animal production, except cattle and poultry and eggs*
Food Processing	*Animal food manufacturing; Grain and oilseed manufacturing; Sugar and confectionery product manufacturing; Fruit and vegetable preserving and specialty food manufacturing; Dairy product manufacturing; Animal slaughtering and processing; Seafood product preparation and packaging; Bakeries and tortilla manufacturing; Tobacco manufacturing; Other food*

Physical Footprint of the U.S. Agriculture Sector

Agriculture has a significant impact on the physical geography of the country and constituent states. For context, this subsection summarizes the U.S. agriculture sector's impact in terms of land-use and acreage; crop production; and grasslands, pastures, and rangelands ("GPR").

Land-Use and Acreage

The land area of the U.S. is nearly 2.3 billion acres – with 895 million acres (39% of total acreage) dedicated to over 2 million farms.[28] The distribution of agricultural land-use varies greatly across the country and depends on factors such as climate, soil qualities, and federal and state programs. The land allocated to agriculture can be subdivided into two broad categories:

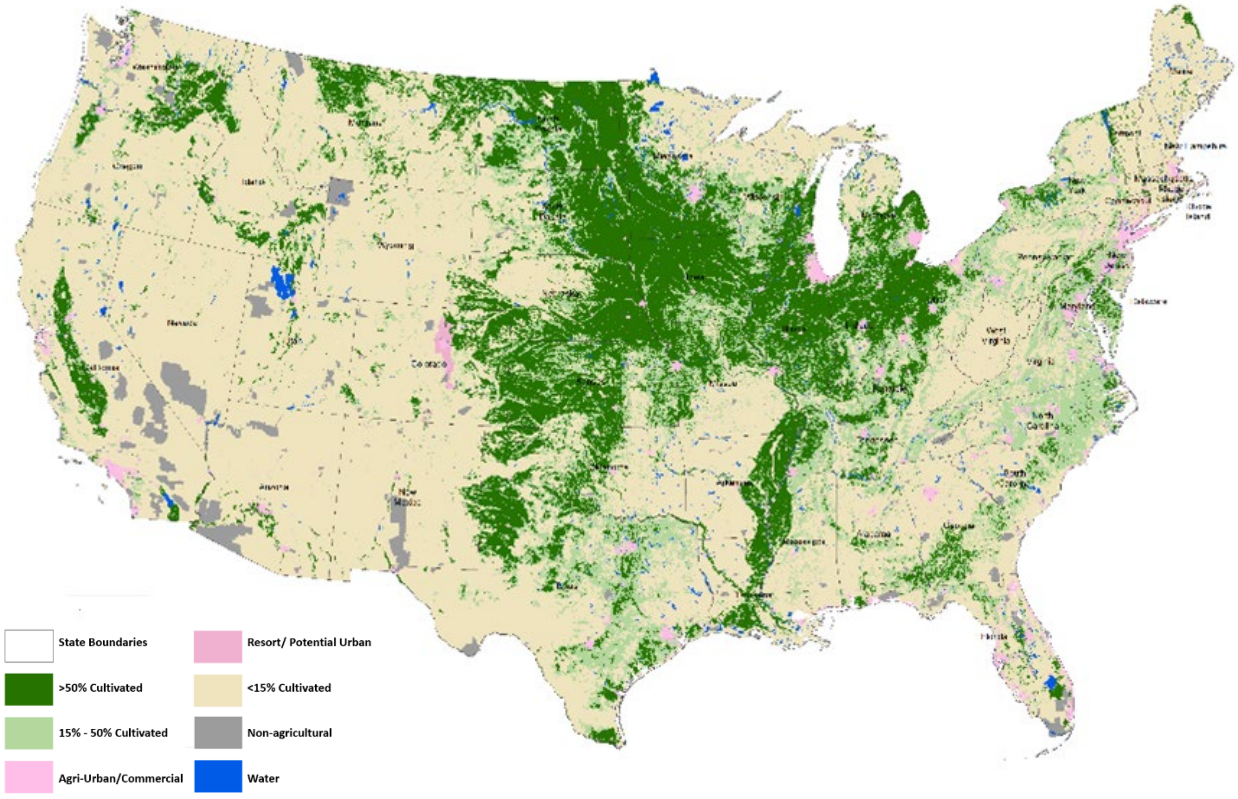
[28] https://www.nass.usda.gov/Publications/Todays_Reports/reports/fnlo0222.pdf

1. **Croplands** – Cultivated and uncultivated land in row crops or close-grown crops[29]
2. **GPR** – Land provided for the foraging of beef cattle, dairy cattle, sheep and goats, horses, and other types of domestic livestock[30]

While not part of the definition of the U.S. agriculture sector here, many of these acres provide the habitat for wildlife, such as elk in GPR or nesting songbirds in croplands. As of 2022, the land area of croplands is approximately 28% of total acreage and GPR is the other 72%.[31]

Agricultural activity occurs in every state of the U.S. but is especially common in the Midwest. Crops account for more than half the land-use of states in the Corn Belt and northern plains such as Iowa, Kansas, and North Dakota. GPR occupies a sizable portion of the land area of the West region and southern plains.[32] Figure 6 shows land-use across the U.S. as of 2022. The most highly cultivated parts of the country are shown in green with states like Iowa and Minnesota:

Figure 6 – Land-use map of the lower forty-eight states[33]

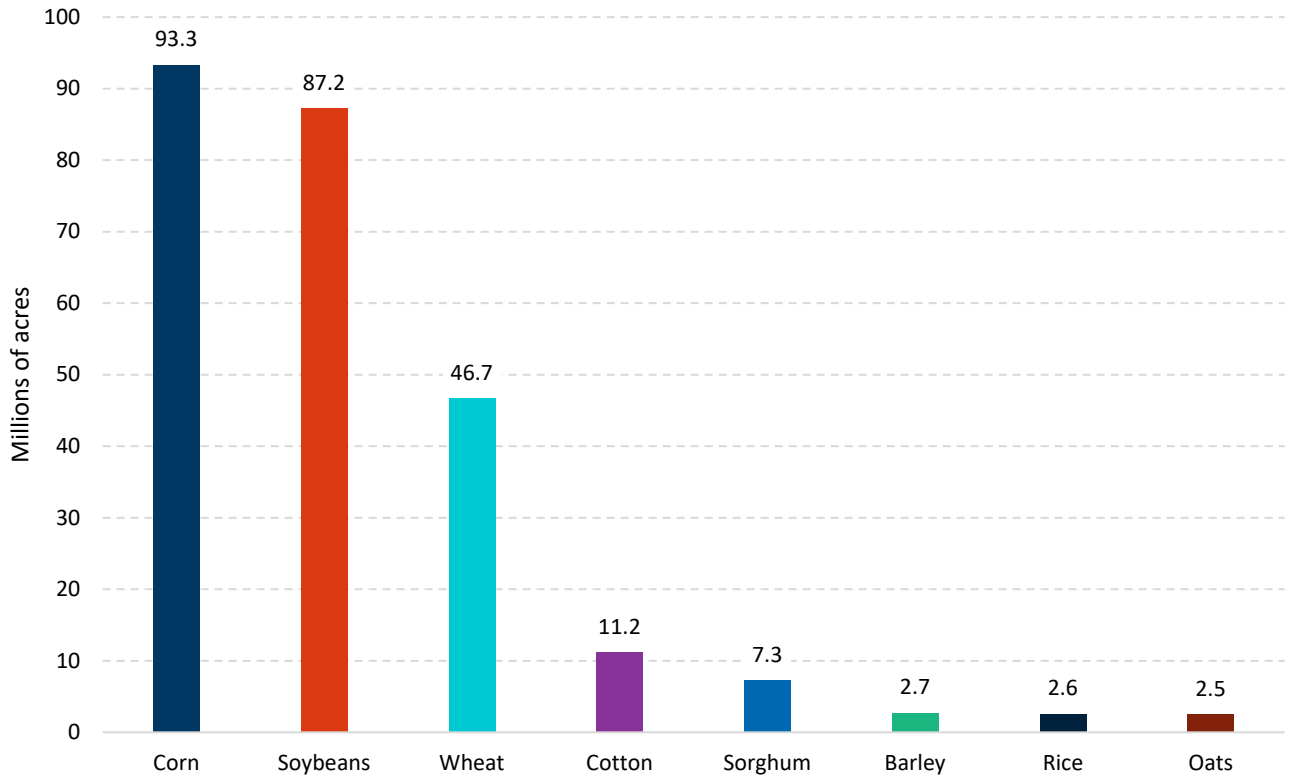


[29] https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/land/cropland
[30] https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/land/range-pasture
[31] https://www.fsa.usda.gov/news-room/efoia/electronic-reading-room/frequently-requested-information/crop-acreage-data/index
[32] https://www.ers.usda.gov/amber-waves/2017/december/a-primer-on-land-use-in-the-united-states/
[33] https://www.nass.usda.gov/Research_and_Science/web_stratamaps/US_Strata_and_no_state_labels.png

Croplands

Croplands produce much of the food and fiber consumed in the U.S. and exported to other countries. The U.S. is the world's largest corn producer and accounts for 30% of global production.[34] Corn is the most vital component of the global trade in feed – accounting for approximately 80% of total volume over the last decade. Besides corn, the U.S. is a leader in the production and export of soybeans. Soybeans account for 90% of U.S. oilseed production with the rest composed of peanuts, sunflower seeds, canola oil, and flax. Figure 7 shows the total cropland acreage planted according to USDA data with corn, soy, and wheat making up the top three of land-use.

Figure 7 – U.S. cropland acreage (2022)[35]



Livestock

The U.S. is the largest producer of cattle and of poultry meat in the world.[36] Cattle production is the most valuable agricultural sector in the U.S. economy, consistently accounting for the majority share of cash receipts. Figure 8 shows 2022 U.S. production of red meat and poultry in millions of pounds. Broiler chickens have the highest production in terms of weight (over four billion pounds) followed by beef, pork, and turkeys.

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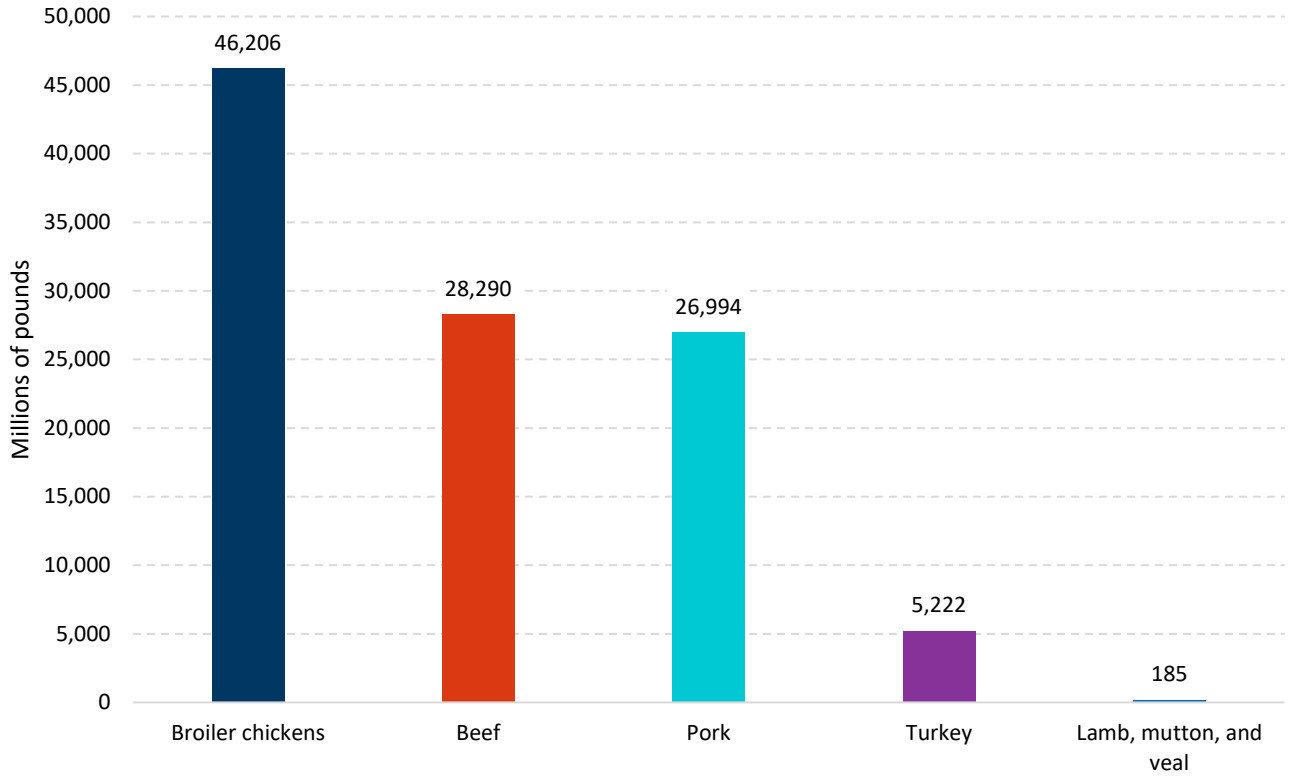
[34] https://apps.fas.usda.gov/psdonline/app/index.html#/app/home
[35] https://www.usda.gov/oce/commodity/wasde/wasde0323.pdf
[36] https://www.ers.usda.gov/topics/animal-products/

Figure 8 – U.S. red meat and poultry production (2022)[37]



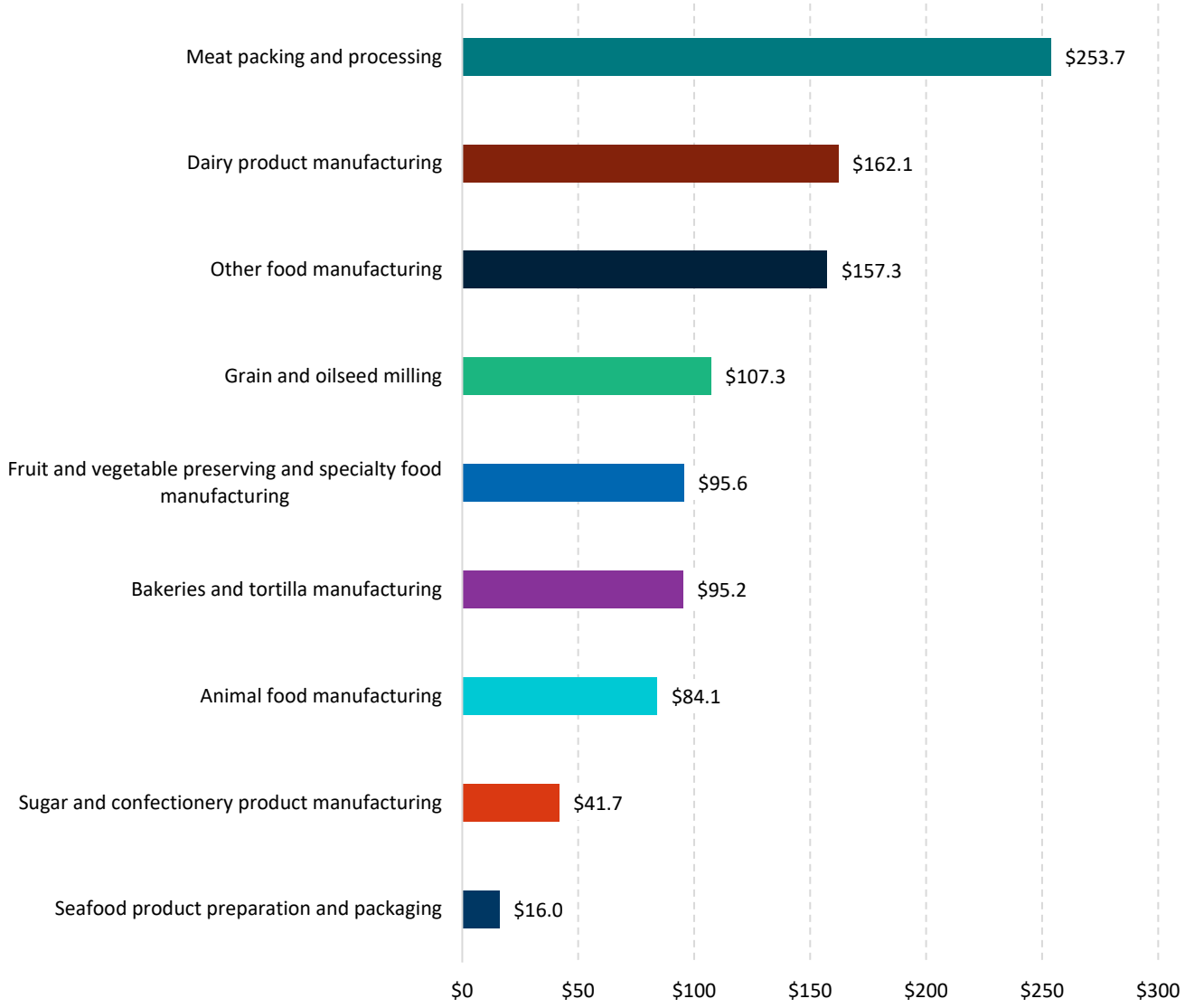
Food Processing

Food factories use input materials, labor, capital, energy, and technical knowledge to transform raw plant and animal products into intermediate or end-use products.[38] Those products notably include food products but also useful materials for the industrial supply chain. Figure 9 shows 2021 U.S. food production by the value of shipments in billions of dollars (from IMPLAN).

Meat packing and dairy product manufacturing constitute the two-largest subsectors of food processors. The "other food manufacturing" subsector includes a diversity of smaller food sectors, such as nuts, coffee, tea, flavoring syrups, concentrates, condiments, and spices. The remaining subsectors mostly consist of plant-based products, such as grain and oilseed mills, fruits and vegetable processors, industry-scale bakeries, sugary and confectionary-based products, and other food products.

[37] https://www.usda.gov/oce/commodity/wasde/wasde0323.pdf
[38] https://www.ers.usda.gov/topics/food-markets-prices/processing-marketing/manufacturing/

Figure 9 – Output by U.S. food processing subsector (2022 $ billions)



Source: IMPLAN

Economic Footprint of the U.S. Agriculture Sector

The U.S. agriculture sector represents a significant part of the U.S. economy as measured by jobs, output, labor income, and gross domestic product ("GDP"). Additionally, the sector contributes to federal and state and local tax revenues through this economic activity.

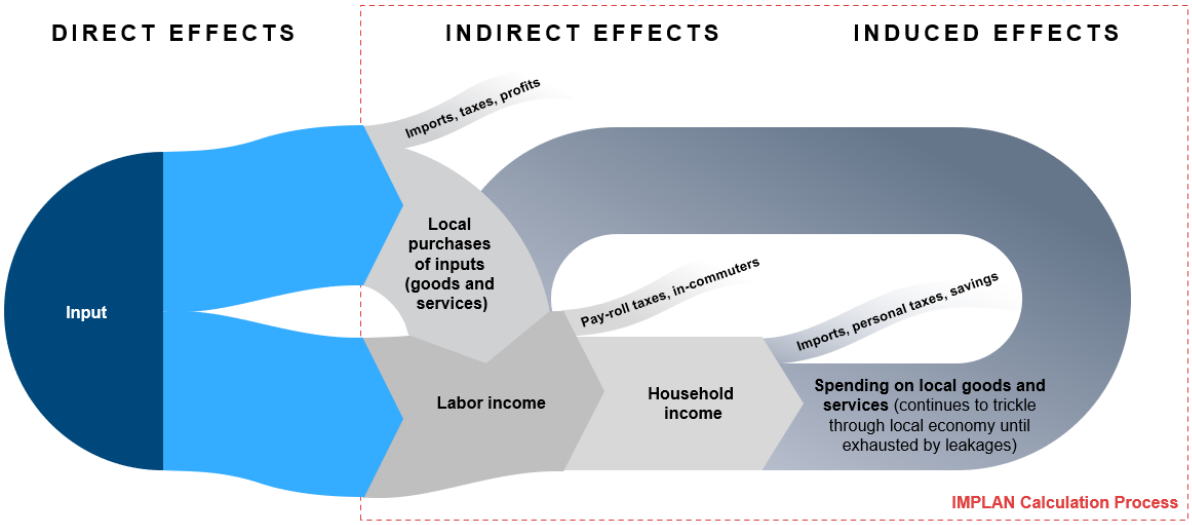
FTI used IMPLAN to estimate the full impact of the U.S. agriculture sector by accounting for the "indirect" and "induced" parts of the U.S. economy supported by agriculture. IMPLAN is an "input-output" (or "IO") model of national and regional economies used to show the contributions of an economic sector, specific enterprise, or policy to the economy. The underlying IO methodology to IMPLAN was awarded the Nobel Prize for Economic Science in 1973.[39]

IMPLAN works by transforming the initial (or "direct") employment or expenditures into their direct impacts and induced impacts. Indirect and induced as defined as the following:

- Indirect – The effect of the direct impact on suppliers, such as the agriculture sector creating demand for agrochemicals to support agricultural production.
- Induced – The direct economic sector and its suppliers compensate employees for their labor and proprietors and creditors (such as a bank) for their ownership, which in turn stimulates consumer spending when households take this income and spend it.

Figure 10 shows the calculation process for IMPLAN, including indirect and induced effects:

Figure 10 – IMPLAN calculation process



For an example of direct, indirect, and induced working in concert, imagine a city in the Midwest with its economy built around the food processing sector. The food processing cluster would be the center of

[39] https://www.nobelprize.org/prizes/economic-sciences/1973/leontief/facts/

the regional economy and the direct impact in IMPLAN. The cluster would be supported by indirect suppliers, such as equipment or materials manufacturers and farmers or service providers catering to the sector's needs, such as attorneys specializing in relevant legal subfields.

This direct/indirect cluster would support most of the household income in the region, which would then contribute to the induced effect. Sectors supported by the induced effect would include retail, healthcare, education, and personal services. Household income would also form the tax base for the region supporting various public services and the operations of government.

Based on the IMPLAN modeling undertaken by FTI, the results in Table 7 summarize the contribution from the U.S. agriculture sector to the U.S. economy overall. This includes the direct impact based on IMPLAN data as well as the calculated indirect and induced impacts. The total impact in the rightmost column is the sum of the direct impact, indirect impact, and induced impact.

Table 7 – U.S. economic activity supported by agriculture and food processing[40]

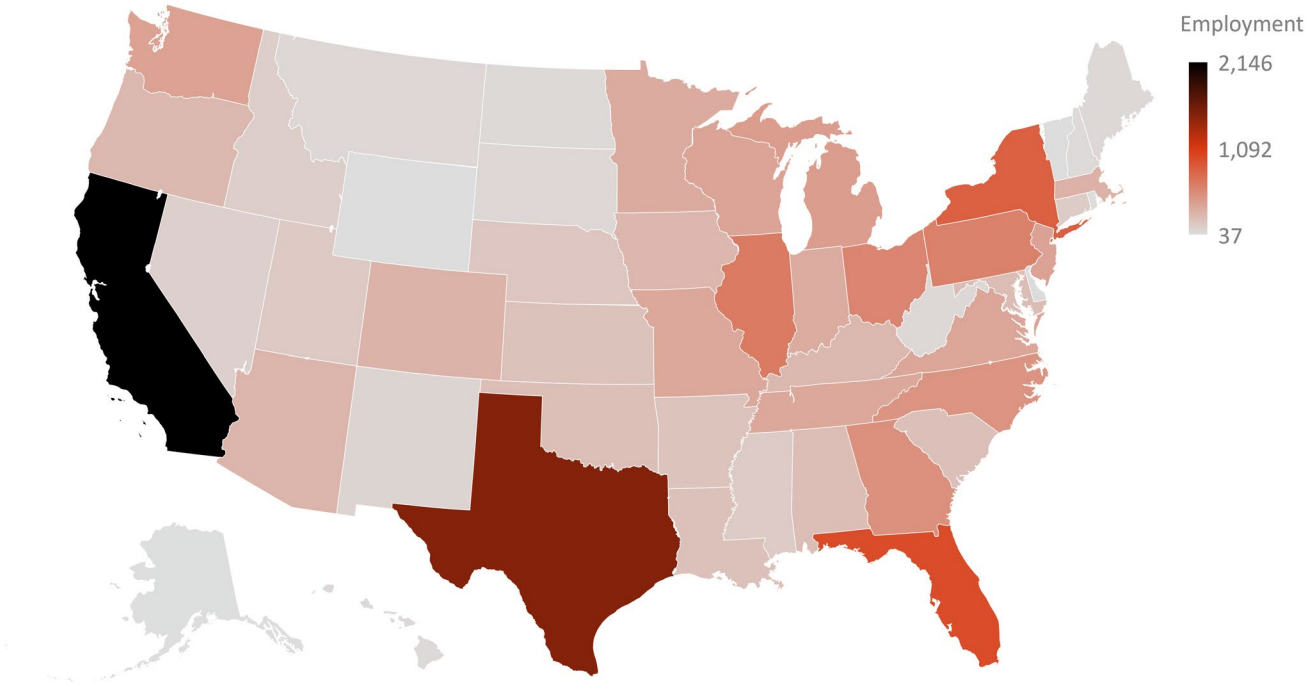
Impact	Units	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Employment	Million (#)	5.0	6.2	6.0	17.2
Output[41]	2022 $ B	$1,583	$1,367	$1,059	$4,009
GDP[42]	2022 $ B	$437	$690	$621	$1,748
Labor Income	2022 $ B	$238	$439	$364	$1,041
Federal Taxes	2022 $ B	$102	$148	$104	$354
S&L[43] Taxes	2022 $ B	$123	$81	$71	$275

The direct impact of the agriculture sector includes five million U.S. jobs, $1.6 trillion in sales output, $437 million in GDP contributions, and $238 billion in labor income. With the indirect and induced included, these impacts increase to 17.2 million jobs, $4.0 trillion in sales output, $1.75 trillion in GDP, and $1.04 trillion in labor income. The GDP supported is about equal to that of Texas.[44]

[40] FTI calculations
[41] A measure of the value of all transactions throughout the economy even for items bought and sold more than once (e.g., tires bought by an automobile manufacturer before purchase again by the customer)
[42] Net new economic activity, the same as sales output but adjusting out the value of intermediate inputs
[43] State and local government
[44] IMPLAN model data for calendar year 2021

As shown in Figure 11, the total employment impacts of the agriculture are concentrated in the most populous states (e.g., California, Texas, Florida, and New York) and those known for their significant food processing sectors (e.g., California and Texas). The agriculture supply chain stretches across all states through interstate trade and interstate commuter and income flows.

Figure 11 – Total state jobs supported by agriculture and food processing (thousands)



Source: FTI analysis

When examining not the absolute number of jobs supported by the U.S. agricultural sector but rather the share of state GDP supported, the Midwest dominates. That central region's states tend to have the highest shares of their economies supported by agriculture. The states with economies most dependent on agriculture include Nebraska, Iowa, South Dakota, North Dakota, Idaho, Kansas, Arkansas, Kentucky, Wisconsin, and Montana. Table 8 shows further detail.

Table 8 – GDP supported and share of state GDP supported by agriculture

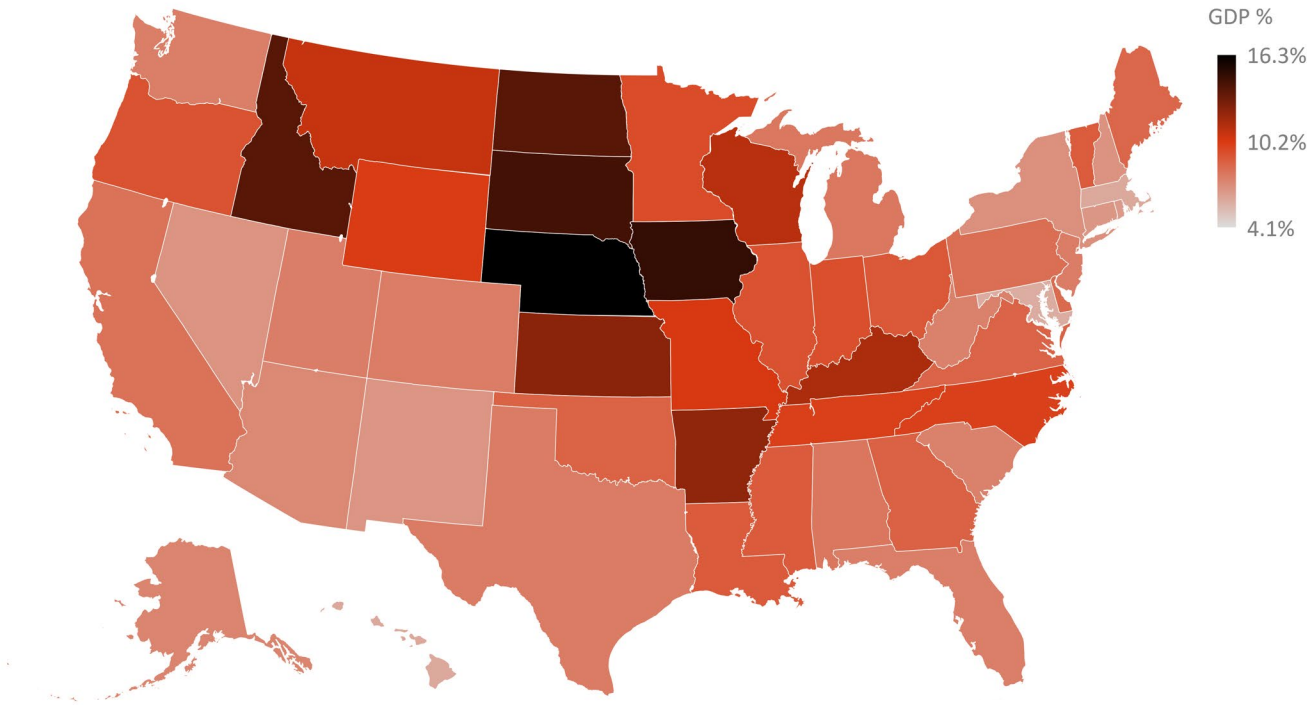
Rank	State	GDP supported (2022 $ billions)	Share of GDP[45] (%)
1	Nebraska	$21.8	16.3%
2	Iowa	$28.9	14.9%
3	South Dakota	$8.0	14.4%
4	North Dakota	$7.7	13.9%
5	Idaho	$11.7	13.8%
6	Kansas	$22.0	12.4%
7	Arkansas	$16.3	12.3%
8	Kentucky	$25.0	11.5%
9	Wisconsin	$37.9	11.2%
10	Montana	$5.6	10.8%

Source: FTI analysis

Figure 12 shows a heat map of the share of state GDP supported by agriculture. Even the states with small agricultural sectors, such as the mostly urban states on the East Coast, have impacts from agriculture through interstate supply chains and provision of services.

[45] Numerator based on IMPLAN data

Figure 12 – Total share of state GDP supported by agriculture and food processing (%)



Source: FTI analysis

Table 9 identifies the extent to which the U.S. agriculture sector supports other, non-agriculture and non-food processing sectors. These are the sectors needed to provide the input equipment, materials, parts, and expertise to make the U.S. agriculture sector work, and they range from other types of natural resources to utilities, manufacturers, transportation and organization, and business and professional services. Other sectors like real estate, wholesale trade, and truck transportation collectively rely on agriculture to generate $323 billion of their sales output each year.

Table 9 – Sectors with the strongest financial linkages to the U.S. agriculture sector (2022 $ billions)[46]

Rank	Economic Sector	Indirect Output
1	Commercial and industrial real estate	$126.0
2	Other consumable goods merchant (wholesale)	$106.2
3	Truck transportation	$91.0
4	Grocery and related products (wholesale)	$70.4
5	Management of companies and enterprises	$57.3
6	Paperboard container manufacturing	$29.9
7	Support activities for agriculture and forestry[47]	$27.9
8	Electric power transmission and distribution	$25.9
9	Commercial banking	$25.8
10	Insurance carriers, except direct life	$21.9
11	Petroleum refineries	$21.9
12	Pesticide and other agricultural chemical manufacturing	$20.6
13	Rail transportation	$20.4
14	Machinery, equipment, and supplies (wholesale)[48]	$18.1
15	Insurance agencies, brokerages, and related activities	$17.8
	ALL OTHERS	$686.0
	TOTAL >>	$1,367.0

[46] FTI calculations
[47] Includes agricultural equipment operators, farmworkers and laborers, supervisors of farmworkers and laborers, and graders and sorters of agricultural products
[48] Includes agricultural machinery but also other types of machinery

Appendix

U.S. Agriculture Sector

Table 10 – Employment supported by agriculture and food processing (units)

State	Direct	Indirect	Induced	Total
AL	81,000	84,300	76,800	242,100
AK	11,800	13,500	12,000	37,300
AZ	59,200	118,000	124,500	301,700
AR	104,200	60,800	47,700	212,700
CA	538,700	878,600	728,700	2,146,000
CO	89,600	111,000	113,000	313,600
CT	24,800	57,200	71,700	153,700
DE	14,400	15,500	18,900	48,800
DC	1,300	14,900	24,800	41,000
FL	158,200	405,700	409,400	973,300
GA	138,400	204,800	192,200	535,400
HI	21,000	22,500	24,800	68,300
ID	65,600	41,700	31,000	138,300
IL	177,200	253,300	240,400	670,900
IN	114,600	124,000	117,300	355,900
IA	156,000	77,300	57,300	290,600
KS	103,900	62,400	52,700	219,000
KY	121,900	84,800	72,500	279,200
LA	57,900	83,500	79,600	221,000
ME	21,500	25,700	25,400	72,600
MD	46,700	89,800	108,800	245,300
MA	52,000	113,600	151,300	316,900
MI	124,000	165,000	163,900	452,900
MN	133,400	113,500	113,200	360,100
MS	65,400	50,100	45,400	160,900
MO	148,500	120,900	113,300	382,700
MT	36,400	24,300	20,000	80,700
NE	97,900	52,300	37,900	188,100

State	Direct	Indirect	Induced	Total
NV	16,000	50,100	57,500	123,600
NH	12,100	23,400	27,200	62,700
NJ	71,200	169,100	171,600	411,900
NM	38,800	28,600	30,600	98,000
NY	145,100	297,800	401,900	844,800
NC	145,800	185,700	180,600	512,100
ND	34,700	21,900	15,500	72,100
OH	168,900	222,200	212,100	603,200
OK	101,400	71,400	65,100	237,900
OR	111,800	92,800	76,100	280,700
PA	169,300	220,800	243,600	633,700
RI	6,800	16,100	20,200	43,100
SC	55,700	87,600	83,600	226,900
SD	43,700	21,400	17,600	82,700
TN	124,500	132,200	128,500	385,200
TX	428,100	552,900	528,400	1,509,400
UT	44,800	62,300	64,000	171,100
VT	17,500	11,200	12,600	41,300
VA	102,000	139,900	151,300	393,200
WA	147,300	145,100	131,200	423,600
WV	28,000	23,700	25,500	77,200
WI	175,500	123,600	107,500	406,600
WY	17,000	15,000	10,600	42,600

Table 11 – Output supported by agriculture and food processing (2022 $ millions)

State	Direct	Indirect	Induced	Total
AL	$20,327	$19,937	$12,178	$52,442
AK	$4,330	$2,824	$2,083	$9,237
AZ	$16,038	$22,586	$20,288	$58,912
AR	$30,464	$12,986	$7,411	$50,861
CA	$168,941	$171,732	$141,618	$482,291
CO	$27,432	$22,012	$19,036	$68,479
CT	$6,654	$14,208	$14,172	$35,034
DE	$5,185	$4,112	$3,783	$13,080
DC	$339	$3,813	$5,238	$9,389
FL	$38,099	$72,262	$62,379	$172,740
GA	$46,147	$44,512	$31,909	$122,567
HI	$3,592	$3,927	$4,113	$11,633
ID	$22,258	$7,087	$4,506	$33,851
IL	$82,892	$62,556	$44,890	$190,338
IN	$43,607	$30,220	$20,774	$94,602
IA	$75,174	$18,569	$9,585	$103,328
KS	$44,723	$13,752	$8,844	$67,319
KY	$31,798	$18,515	$11,854	$62,167
LA	$15,597	$27,167	$13,266	$56,030
ME	$5,213	$4,304	$3,872	$13,389
MD	$14,842	$18,255	$18,523	$51,620
MA	$15,334	$26,513	$28,431	$70,278
MI	$36,731	$36,429	$27,606	$100,766
MN	$52,067	$25,448	$19,452	$96,966
MS	$14,813	$10,374	$6,701	$31,888
MO	$45,319	$27,682	$18,199	$91,199
MT	$6,449	$4,197	$2,909	$13,555
NE	$51,098	$11,473	$6,563	$69,134
NV	$5,126	$9,657	$8,904	$23,687
NH	$2,996	$4,674	$4,590	$12,259
NJ	$23,288	$40,287	$32,452	$96,028
NM	$7,880	$5,633	$4,695	$18,208

State	Direct	Indirect	Induced	Total
NY	$46,888	$79,100	$84,655	$210,643
NC	$63,768	$40,086	$29,654	$133,507
ND	$11,669	$4,561	$2,610	$18,840
OH	$57,938	$55,715	$36,542	$150,195
OK	$19,367	$15,376	$10,266	$45,009
OR	$24,068	$16,950	$12,206	$53,225
PA	$55,921	$50,998	$41,648	$148,566
RI	$1,801	$3,431	$3,329	$8,561
SC	$13,273	$19,623	$13,193	$46,088
SD	$18,243	$3,923	$2,924	$25,090
TN	$36,739	$29,345	$20,963	$87,047
TX	$98,356	$134,734	$90,207	$323,297
UT	$14,412	$12,676	$10,468	$37,556
VT	$5,475	$1,947	$1,854	$9,277
VA	$38,568	$29,910	$25,561	$94,039
WA	$36,658	$30,706	$28,144	$95,508
WV	$2,660	$6,797	$4,217	$13,674
WI	$69,890	$29,289	$18,110	$117,289
WY	$2,282	$4,158	$1,808	$8,247

Table 12 – GDP supported by agriculture and food processing (2022 $ millions)

State	Direct	Indirect	Induced	Total
AL	$3,780	$8,492	$6,272	$18,544
AK	$883	$1,686	$1,266	$3,835
AZ	$4,658	$11,206	$11,541	$27,404
AR	$6,467	$5,949	$3,877	$16,293
CA	$57,438	$99,578	$89,091	$246,106
CO	$7,314	$11,234	$10,950	$29,498
CT	$2,174	$7,850	$9,033	$19,057
DE	$1,486	$2,348	$2,433	$6,267
DC	$80	$2,528	$3,663	$6,271
FL	$11,664	$36,284	$35,130	$83,079
GA	$13,359	$22,375	$18,427	$54,161
HI	$868	$1,997	$2,491	$5,356
ID	$5,998	$3,302	$2,361	$11,661
IL	$21,278	$32,001	$26,718	$79,997
IN	$11,512	$13,312	$11,045	$35,868
IA	$15,040	$8,480	$5,357	$28,876
KS	$10,428	$6,844	$4,768	$22,040
KY	$10,633	$8,167	$6,152	$24,952
LA	$3,539	$10,972	$6,814	$21,324
ME	$1,584	$2,082	$2,203	$5,869
MD	$4,176	$9,891	$11,315	$25,381
MA	$3,975	$14,749	$18,004	$36,729
MI	$9,335	$16,805	$14,942	$41,082
MN	$11,593	$13,009	$11,278	$35,880
MS	$2,922	$4,058	$3,284	$10,265
MO	$11,672	$12,518	$10,008	$34,198
MT	$2,154	$1,950	$1,493	$5,597
NE	$11,995	$6,020	$3,760	$21,775
NV	$1,307	$5,014	$5,328	$11,650
NH	$906	$2,501	$2,793	$6,200
NJ	$6,399	$21,868	$19,827	$48,093
NM	$1,948	$2,720	$2,520	$7,189

State	Direct	Indirect	Induced	Total
NY	$14,761	$47,209	$56,910	$118,879
NC	$23,576	$19,013	$16,593	$59,182
ND	$4,047	$2,299	$1,375	$7,720
OH	$16,469	$25,350	$20,300	$62,119
OK	$4,509	$6,880	$5,281	$16,670
OR	$6,653	$8,966	$7,061	$22,680
PA	$13,920	$25,969	$24,335	$64,223
RI	$397	$1,750	$1,965	$4,113
SC	$3,138	$8,481	$6,890	$18,508
SD	$4,504	$1,870	$1,644	$8,019
TN	$12,307	$13,396	$11,497	$37,200
TX	$24,665	$63,408	$49,840	$137,912
UT	$3,425	$6,113	$5,708	$15,247
VT	$1,063	$901	$1,046	$3,010
VA	$17,221	$15,467	$15,154	$47,842
WA	$11,306	$17,114	$18,162	$46,581
WV	$585	$2,951	$2,220	$5,757
WI	$15,246	$12,736	$9,904	$37,886
WY	$741	$2,036	$920	$3,697

Table 13 – Labor income supported by agriculture and food processing (2022 $ millions)

State	Direct	Indirect	Induced	Total
AL	$2,687	$5,253	$3,661	$11,602
AK	$726	$772	$687	$2,185
AZ	$2,912	$7,121	$6,774	$16,806
AR	$4,579	$3,726	$2,216	$10,522
CA	$35,938	$66,058	$50,914	$152,910
CO	$4,065	$7,825	$6,579	$18,470
CT	$1,089	$4,976	$5,354	$11,419
DE	$1,149	$1,085	$1,167	$3,401
DC	$55	$1,802	$2,546	$4,403
FL	$7,377	$22,444	$20,223	$50,045
GA	$6,760	$13,486	$10,350	$30,597
HI	$656	$1,251	$1,367	$3,274
ID	$3,907	$2,325	$1,430	$7,662
IL	$10,707	$20,310	$15,508	$46,524
IN	$5,156	$8,565	$6,381	$20,102
IA	$12,560	$5,237	$2,863	$20,660
KS	$7,313	$4,339	$2,814	$14,466
KY	$4,469	$5,172	$3,690	$13,331
LA	$2,089	$5,414	$3,772	$11,275
ME	$746	$1,382	$1,293	$3,421
MD	$2,347	$6,314	$6,578	$15,238
MA	$2,706	$9,948	$11,352	$24,005
MI	$4,953	$11,246	$9,046	$25,245
MN	$7,964	$8,857	$6,990	$23,811
MS	$2,555	$2,532	$1,805	$6,891
MO	$6,045	$7,852	$5,955	$19,852
MT	$1,051	$1,262	$931	$3,244
NE	$6,430	$3,585	$2,046	$12,061
NV	$765	$3,017	$2,915	$6,697
NH	$437	$1,700	$1,727	$3,865
NJ	$4,001	$14,561	$12,183	$30,745
NM	$1,467	$1,510	$1,366	$4,342

State	Direct	Indirect	Induced	Total
NY	$7,547	$27,703	$32,806	$68,055
NC	$6,967	$11,733	$9,522	$28,223
ND	$1,826	$1,490	$828	$4,143
OH	$6,506	$15,837	$11,594	$33,937
OK	$2,934	$4,498	$3,173	$10,605
OR	$3,616	$6,314	$4,357	$14,287
PA	$7,923	$17,615	$15,377	$40,916
RI	$316	$1,131	$1,154	$2,600
SC	$1,826	$5,220	$3,937	$10,983
SD	$2,657	$1,196	$941	$4,794
TN	$4,136	$8,946	$7,557	$20,638
TX	$13,576	$40,237	$30,202	$84,015
UT	$2,028	$3,654	$3,238	$8,920
VT	$683	$593	$637	$1,913
VA	$3,438	$9,851	$8,689	$21,978
WA	$7,047	$10,778	$9,737	$27,563
WV	$202	$1,571	$1,272	$3,045
WI	$8,977	$8,495	$5,818	$23,289
WY	$341	$1,143	$499	$1,983

Table 14 – Federal taxes supported by agriculture and food processing (2022 $ millions)

State	Direct	Indirect	Induced	Total
AL	$1,190	$1,825	$1,280	$4,294
AK	$221	$319	$225	$765
AZ	$1,645	$2,441	$1,719	$5,805
AR	$1,059	$1,631	$1,142	$3,832
CA	$13,951	$19,962	$14,098	$48,010
CO	$1,770	$2,620	$1,844	$6,235
CT	$1,051	$1,476	$1,046	$3,572
DE	$338	$465	$331	$1,134
DC	$343	$480	$338	$1,160
FL	$5,040	$7,545	$5,312	$17,897
GA	$3,120	$4,499	$3,185	$10,803
HI	$334	$509	$358	$1,201
ID	$738	$1,119	$785	$2,642
IL	$4,482	$6,318	$4,478	$15,278
IN	$2,085	$3,008	$2,129	$7,222
IA	$1,819	$2,723	$1,904	$6,445
KS	$1,340	$1,976	$1,388	$4,704
KY	$1,476	$2,161	$1,530	$5,166
LA	$1,239	$1,787	$1,267	$4,293
ME	$361	$543	$383	$1,286
MD	$1,464	$2,120	$1,497	$5,081
MA	$2,099	$3,022	$2,129	$7,251
MI	$2,486	$3,694	$2,600	$8,780
MN	$2,172	$3,212	$2,256	$7,640
MS	$710	$1,133	$791	$2,634
MO	$2,065	$3,055	$2,155	$7,274
MT	$361	$559	$393	$1,313
NE	$1,242	$1,750	$1,242	$4,233
NV	$681	$996	$704	$2,382
NH	$364	$533	$376	$1,273
NJ	$2,736	$3,922	$2,766	$9,425
NM	$461	$709	$498	$1,667

State	Direct	Indirect	Induced	Total
NY	$6,316	$8,637	$6,146	$21,100
NC	$3,199	$4,404	$3,150	$10,753
ND	$436	$619	$440	$1,495
OH	$3,554	$5,088	$3,608	$12,249
OK	$1,098	$1,714	$1,200	$4,012
OR	$1,419	$2,157	$1,514	$5,090
PA	$3,799	$5,568	$3,920	$13,287
RI	$245	$362	$255	$862
SC	$1,145	$1,726	$1,215	$4,085
SD	$483	$708	$499	$1,689
TN	$2,164	$3,139	$2,222	$7,524
TX	$8,293	$12,291	$8,657	$29,240
UT	$918	$1,359	$959	$3,236
VT	$198	$306	$215	$719
VA	$2,518	$3,414	$2,450	$8,381
WA	$2,643	$3,780	$2,674	$9,097
WV	$357	$539	$381	$1,277
WI	$2,315	$3,427	$2,412	$8,154
WY	$219	$322	$228	$770

Table 15 – State and local taxes supported by agriculture and food processing (2022 $ millions)

State	Direct	Indirect	Induced	Total
AL	$1,315	$879	$768	$2,962
AK	$270	$177	$155	$602
AZ	$1,930	$1,275	$1,118	$4,324
AR	$1,160	$781	$680	$2,622
CA	$17,312	$11,415	$10,015	$38,742
CO	$2,083	$1,382	$1,210	$4,675
CT	$1,336	$875	$770	$2,981
DE	$438	$284	$251	$973
DC	$442	$295	$258	$995
FL	$5,845	$3,850	$3,381	$13,076
GA	$3,802	$2,485	$2,188	$8,475
HI	$377	$250	$219	$846
ID	$830	$558	$486	$1,874
IL	$5,626	$3,692	$3,246	$12,565
IN	$2,524	$1,655	$1,456	$5,635
IA	$2,075	$1,422	$1,229	$4,725
KS	$1,569	$1,056	$919	$3,544
KY	$1,751	$1,140	$1,006	$3,897
LA	$1,497	$974	$860	$3,331
ME	$413	$272	$239	$923
MD	$1,784	$1,172	$1,030	$3,986
MA	$2,590	$1,719	$1,504	$5,813
MI	$2,901	$1,923	$1,684	$6,509
MN	$2,549	$1,712	$1,491	$5,752
MS	$733	$497	$432	$1,662
MO	$2,412	$1,591	$1,396	$5,399
MT	$394	$260	$228	$882
NE	$1,538	$1,012	$889	$3,438
NV	$817	$534	$470	$1,822
NH	$436	$288	$253	$977
NJ	$3,389	$2,244	$1,966	$7,599
NM	$508	$337	$295	$1,140

State	Direct	Indirect	Induced	Total
NY	$8,311	$5,401	$4,766	$18,478
NC	$4,121	$2,636	$2,342	$9,099
ND	$541	$352	$311	$1,204
OH	$4,359	$2,841	$2,505	$9,705
OK	$1,183	$792	$691	$2,665
OR	$1,603	$1,066	$933	$3,602
PA	$4,538	$3,017	$2,638	$10,193
RI	$290	$192	$168	$650
SC	$1,306	$863	$757	$2,925
SD	$568	$378	$331	$1,277
TN	$2,611	$1,705	$1,502	$5,817
TX	$9,726	$6,433	$5,639	$21,798
UT	$1,074	$708	$621	$2,403
VT	$214	$144	$125	$483
VA	$3,318	$2,105	$1,877	$7,300
WA	$3,271	$2,145	$1,886	$7,302
WV	$404	$263	$232	$898
WI	$2,689	$1,795	$1,568	$6,052
WY	$259	$168	$149	$576

Table 16 – Gas consumption supported by agriculture and food processing (MMcf)

State	Direct	Indirect	Total
AL	17,095	17,944	35,038
AK	1,536	899	2,436
AZ	1,684	1,772	3,456
AR	19,540	9,660	29,200
CA	123,647	29,936	153,583
CO	11,908	4,152	16,060
CT	1,270	2,752	4,022
DE	3,542	2,877	6,419
DC	0	160	160
FL	10,470	6,834	17,304
GA	19,680	10,839	30,520
HI	11	41	52
ID	15,356	2,353	17,708
IL	53,032	22,499	75,531
IN	42,387	25,232	67,620
IA	91,019	15,692	106,712
KS	50,138	7,109	57,248
KY	19,417	9,538	28,954
LA	46,451	115,283	161,734
ME	2,727	1,451	4,178
MD	1,760	1,877	3,637
MA	3,520	3,908	7,428
MI	19,510	13,462	32,971
MN	41,003	9,801	50,805
MS	16,883	8,908	25,791
MO	12,792	7,701	20,493
MT	5,885	2,083	7,969
NE	44,217	7,214	51,431
NV	774	1,685	2,459
NH	840	443	1,284
NJ	4,611	9,264	13,875
NM	2,847	1,367	4,214

State	Direct	Indirect	Total
NY	8,904	9,651	18,555
NC	16,759	8,669	25,428
ND	14,210	1,665	15,876
OH	31,825	25,861	57,686
OK	29,420	12,526	41,946
OR	10,931	3,268	14,199
PA	24,899	16,780	41,679
RI	526	558	1,084
SC	5,336	7,551	12,887
SD	22,294	2,548	24,842
TN	18,336	11,648	29,984
TX	97,375	153,234	250,610
UT	3,898	2,878	6,776
VT	480	260	739
VA	11,841	7,760	19,601
WA	14,192	5,196	19,389
WV	1,087	3,590	4,677
WI	34,073	13,773	47,846
WY	5,217	5,213	10,430

U.S. Agrochemical Sector

Table 17 – Employment supported by agrochemical manufacturing (units)

State	Direct	Indirect	Induced	Total
AL	1,200	2,300	1,900	5,400
AK	0	600	300	900
AZ	700	3,000	2,900	6,600
AR	500	1,600	1,200	3,300
CA	2,800	18,800	17,400	39,000
CO	300	2,900	2,700	5,900
CT	100	1,500	1,700	3,300
DE	0	400	500	900
DC	0	400	600	1,000
FL	4,700	9,700	9,600	24,000
GA	1,200	5,200	4,600	11,000
HI	100	500	600	1,200
ID	900	1,400	800	3,100
IL	1,200	6,800	5,700	13,700
IN	1,000	3,400	2,800	7,200
IA	2,200	1,900	1,500	5,600
KS	500	1,800	1,300	3,600
KY	100	2,300	1,800	4,200
LA	2,600	2,600	1,900	7,100
ME	100	600	600	1,300
MD	200	2,200	2,600	5,000
MA	200	3,000	3,500	6,700
MI	400	4,400	3,900	8,700
MN	200	3,100	2,700	6,000
MS	600	1,300	1,100	3,000
MO	2,200	3,300	2,800	8,300
MT	100	700	500	1,300
NE	500	1,400	1,000	2,900
NV	100	2,300	1,300	3,700
NH	0	600	600	1,200

State	Direct	Indirect	Induced	Total
NJ	400	4,400	4,000	8,800
NM	100	900	700	1,700
NY	700	7,900	9,400	18,000
NC	2,300	4,600	4,300	11,200
ND	0	600	400	1,000
OH	1,900	6,200	5,100	13,200
OK	1,000	2,100	1,600	4,700
OR	600	2,400	1,900	4,900
PA	700	5,900	5,800	12,400
RI	0	400	500	900
SC	300	2,300	2,000	4,600
SD	100	600	400	1,100
TN	400	3,600	3,100	7,100
TX	2,900	15,300	12,600	30,800
UT	100	1,800	1,500	3,400
VT	100	300	300	700
VA	300	3,700	3,600	7,600
WA	600	3,300	3,200	7,100
WV	100	800	600	1,500
WI	1,200	3,300	2,700	7,200
WY	400	600	300	1,300

Table 18 – Output supported by agrochemical manufacturing (2022 $ millions)

State	Direct	Indirect	Induced	Total
AL	$1,407	$674	$301	$2,383
AK	$6	$280	$52	$338
AZ	$674	$722	$485	$1,881
AR	$535	$459	$201	$1,195
CA	$2,948	$5,811	$3,444	$12,203
CO	$203	$735	$467	$1,405
CT	$114	$498	$334	$946
DE	$32	$172	$93	$297
DC	$0	$137	$121	$259
FL	$3,665	$2,109	$1,480	$7,254
GA	$1,074	$1,292	$784	$3,150
HI	$49	$115	$99	$262
ID	$725	$356	$126	$1,206
IL	$1,598	$2,130	$1,112	$4,841
IN	$1,336	$1,023	$520	$2,878
IA	$3,327	$688	$286	$4,301
KS	$479	$567	$245	$1,291
KY	$138	$619	$306	$1,063
LA	$3,671	$1,545	$320	$5,535
ME	$67	$118	$95	$280
MD	$168	$513	$443	$1,124
MA	$176	$863	$672	$1,712
MI	$410	$1,203	$674	$2,288
MN	$146	$894	$498	$1,538
MS	$706	$370	$169	$1,244
MO	$3,009	$918	$462	$4,389
MT	$117	$202	$73	$392
NE	$727	$547	$196	$1,470
NV	$58	$828	$211	$1,097
NH	$7	$135	$109	$252
NJ	$557	$1,405	$774	$2,735
NM	$61	$245	$116	$422

State	Direct	Indirect	Induced	Total
NY	$798	$2,408	$2,004	$5,210
NC	$2,937	$1,155	$747	$4,839
ND	$65	$211	$70	$345
OH	$2,562	$1,994	$899	$5,455
OK	$1,181	$587	$255	$2,024
OR	$492	$575	$306	$1,373
PA	$484	$1,675	$1,018	$3,177
RI	$2	$105	$79	$186
SC	$250	$644	$318	$1,212
SD	$74	$199	$83	$357
TN	$600	$911	$520	$2,031
TX	$3,317	$6,492	$2,179	$11,988
UT	$82	$465	$256	$804
VT	$35	$58	$48	$141
VA	$246	$899	$629	$1,774
WA	$523	$922	$687	$2,131
WV	$128	$285	$100	$514
WI	$1,170	$932	$486	$2,588
WY	$439	$253	$44	$736

Table 19 – GDP supported by agrochemical manufacturing (2022 $ millions)

State	Direct	Indirect	Induced	Total
AL	$397	$261	$149	$806
AK	$1	$152	$30	$183
AZ	$95	$356	$272	$722
AR	$118	$176	$96	$389
CA	$1,078	$3,251	$2,120	$6,450
CO	$49	$364	$261	$673
CT	$40	$274	$211	$525
DE	$13	$85	$58	$156
DC	$0	$89	$85	$174
FL	$1,079	$1,059	$824	$2,962
GA	$221	$653	$440	$1,314
HI	$12	$54	$58	$124
ID	$146	$168	$61	$374
IL	$445	$984	$637	$2,066
IN	$453	$404	$266	$1,123
IA	$1,190	$242	$137	$1,569
KS	$120	$226	$120	$466
KY	$32	$244	$153	$429
LA	$1,297	$530	$160	$1,987
ME	$11	$54	$53	$117
MD	$42	$277	$266	$584
MA	$56	$478	$420	$954
MI	$106	$522	$355	$983
MN	$32	$401	$271	$705
MS	$96	$119	$79	$294
MO	$783	$379	$242	$1,404
MT	$22	$89	$37	$148
NE	$285	$256	$97	$639
NV	$10	$417	$125	$551
NH	$2	$70	$66	$138
NJ	$157	$727	$465	$1,349
NM	$11	$114	$60	$185

State	Direct	Indirect	Induced	Total
NY	$187	$1,430	$1,330	$2,948
NC	$1,014	$532	$407	$1,953
ND	$11	$90	$35	$136
OH	$1,021	$845	$485	$2,351
OK	$275	$264	$126	$666
OR	$105	$290	$170	$565
PA	$175	$838	$577	$1,590
RI	$0	$52	$46	$98
SC	$50	$253	$163	$466
SD	$23	$72	$42	$137
TN	$170	$394	$278	$842
TX	$977	$2,614	$1,177	$4,768
UT	$14	$232	$135	$382
VT	$3	$26	$25	$55
VA	$48	$459	$368	$874
WA	$125	$485	$431	$1,042
WV	$22	$105	$52	$178
WI	$253	$370	$244	$867
WY	$163	$132	$22	$317

Table 20 – Labor income supported by agrochemical manufacturing (2022 $ millions)

State	Direct	Indirect	Induced	Total
AL	$132	$152	$87	$370
AK	$0	$50	$17	$67
AZ	$57	$212	$160	$429
AR	$47	$105	$56	$207
CA	$289	$1,876	$1,216	$3,380
CO	$36	$270	$156	$461
CT	$26	$169	$125	$320
DE	$3	$36	$28	$68
DC	$0	$59	$59	$118
FL	$497	$620	$475	$1,592
GA	$99	$376	$246	$721
HI	$11	$33	$32	$76
ID	$122	$111	$37	$270
IL	$180	$587	$368	$1,135
IN	$123	$235	$152	$511
IA	$522	$157	$77	$756
KS	$62	$138	$72	$272
KY	$15	$144	$90	$249
LA	$424	$210	$89	$723
ME	$6	$34	$31	$71
MD	$17	$175	$154	$346
MA	$15	$309	$265	$589
MI	$48	$334	$214	$596
MN	$21	$271	$169	$461
MS	$58	$70	$44	$172
MO	$285	$231	$143	$659
MT	$10	$52	$23	$85
NE	$69	$144	$53	$265
NV	$5	$204	$68	$278
NH	$1	$46	$40	$88
NJ	$113	$455	$286	$854
NM	$7	$56	$33	$96

State	Direct	Indirect	Induced	Total
NY	$72	$841	$765	$1,678
NC	$328	$315	$227	$870
ND	$9	$49	$21	$79
OH	$362	$491	$274	$1,128
OK	$135	$187	$76	$398
OR	$63	$182	$105	$350
PA	$111	$555	$363	$1,030
RI	$0	$32	$27	$59
SC	$29	$148	$93	$269
SD	$14	$47	$24	$85
TN	$76	$252	$179	$507
TX	$354	$1,536	$712	$2,601
UT	$9	$121	$77	$207
VT	$3	$17	$15	$36
VA	$29	$284	$204	$518
WA	$51	$282	$232	$566
WV	$10	$55	$30	$94
WI	$129	$239	$143	$512
WY	$66	$82	$12	$160

Table 21 – Federal taxes supported by agrochemical manufacturing (2022 $ millions)

State	Direct	Indirect	Induced	Total
AL	$24	$64	$37	$125
AK	$4	$12	$7	$23
AZ	$26	$69	$40	$135
AR	$14	$35	$21	$69
CA	$183	$498	$287	$968
CO	$24	$65	$38	$127
CT	$16	$43	$25	$84
DE	$4	$11	$6	$22
DC	$5	$14	$8	$28
FL	$98	$260	$152	$510
GA	$44	$117	$68	$230
HI	$4	$12	$7	$23
ID	$14	$37	$21	$72
IL	$63	$169	$98	$331
IN	$33	$87	$50	$169
IA	$39	$104	$59	$203
KS	$16	$41	$24	$81
KY	$16	$42	$24	$82
LA	$46	$122	$69	$237
ME	$5	$12	$7	$24
MD	$20	$53	$31	$104
MA	$30	$81	$47	$159
MI	$35	$92	$54	$181
MN	$25	$66	$39	$130
MS	$12	$30	$18	$60
MO	$41	$108	$62	$211
MT	$5	$14	$8	$27
NE	$16	$43	$24	$83
NV	$16	$44	$25	$85
NH	$5	$13	$8	$26
NJ	$42	$114	$66	$222
NM	$6	$17	$10	$33

State	Direct	Indirect	Induced	Total
NY	$86	$233	$135	$454
NC	$54	$143	$83	$280
ND	$5	$12	$7	$24
OH	$65	$174	$100	$340
OK	$22	$58	$34	$114
OR	$20	$53	$31	$103
PA	$53	$144	$84	$281
RI	$3	$9	$5	$18
SC	$17	$45	$27	$89
SD	$5	$13	$7	$25
TN	$29	$78	$45	$152
TX	$146	$387	$224	$757
UT	$13	$35	$20	$68
VT	$2	$6	$4	$12
VA	$30	$80	$47	$157
WA	$31	$85	$49	$165
WV	$6	$16	$9	$31
WI	$31	$80	$47	$157
WY	$8	$22	$13	$43

Table 22 – State and local taxes supported by agrochemical manufacturing (2022 $ millions)

State	Direct	Indirect	Induced	Total
AL	$15	$52	$26	$93
AK	$3	$11	$6	$20
AZ	$14	$47	$24	$85
AR	$7	$25	$13	$46
CA	$118	$413	$207	$738
CO	$13	$45	$23	$80
CT	$10	$34	$17	$61
DE	$3	$10	$5	$17
DC	$3	$11	$6	$20
FL	$56	$192	$96	$344
GA	$25	$85	$43	$153
HI	$2	$8	$4	$15
ID	$8	$25	$13	$46
IL	$39	$134	$67	$240
IN	$21	$72	$36	$128
IA	$29	$100	$50	$180
KS	$9	$31	$15	$55
KY	$8	$28	$14	$50
LA	$36	$124	$62	$222
ME	$2	$8	$4	$14
MD	$11	$38	$19	$68
MA	$18	$62	$31	$111
MI	$19	$65	$32	$116
MN	$13	$47	$23	$84
MS	$6	$20	$10	$36
MO	$26	$90	$45	$162
MT	$3	$10	$5	$17
NE	$11	$40	$20	$72
NV	$10	$35	$18	$63
NH	$3	$9	$5	$16
NJ	$25	$89	$45	$159
NM	$3	$12	$6	$21

State	Direct	Indirect	Induced	Total
NY	$54	$190	$95	$340
NC	$36	$124	$62	$222
ND	$3	$9	$4	$16
OH	$43	$150	$75	$268
OK	$13	$44	$22	$79
OR	$11	$37	$19	$67
PA	$30	$105	$53	$188
RI	$2	$6	$3	$11
SC	$9	$31	$15	$55
SD	$3	$9	$5	$16
TN	$16	$55	$28	$99
TX	$90	$309	$155	$554
UT	$7	$25	$12	$44
VT	$1	$4	$2	$7
VA	$16	$57	$29	$102
WA	$19	$67	$34	$120
WV	$3	$12	$6	$21
WI	$17	$57	$29	$103
WY	$6	$20	$10	$36

Table 23 – Gas consumption supported by agrochemical manufacturing (MMcf)

State	Direct	Indirect	Total
AL	1,171	1,430	2,601
AK	2	245	247
AZ	63	90	153
AR	316	668	983
CA	1,720	2,006	3,726
CO	75	297	372
CT	23	190	213
DE	25	435	460
DC	0	5	5
FL	858	501	1,358
GA	453	578	1,031
HI	0	1	1
ID	324	409	733
IL	813	1,498	2,311
IN	1,035	1,579	2,613
IA	3,089	1,694	4,783
KS	408	826	1,233
KY	85	774	859
LA	7,606	15,657	23,263
ME	31	57	88
MD	19	68	87
MA	43	187	230
MI	181	768	948
MN	83	721	804
MS	685	810	1,495
MO	788	555	1,342
MT	58	235	293
NE	472	887	1,360
NV	8	427	435
NH	2	14	15
NJ	123	628	750
NM	16	104	120

State	Direct	Indirect	Total
NY	148	421	569
NC	946	509	1,454
ND	40	187	227
OH	1,283	2,186	3,469
OK	1,542	415	1,957
OR	179	189	368
PA	202	974	1,176
RI	1	22	22
SC	104	627	731
SD	57	440	496
TN	312	830	1,142
TX	3,093	20,831	23,924
UT	23	227	250
VT	3	7	10
VA	103	439	543
WA	156	317	472
WV	51	363	414
WI	530	989	1,519
WY	520	827	1,346