2019 Minerals Yearbook

NITROGEN [ADVANCE RELEASE]

U.S. Department of the Interior
U.S. Geological Survey

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Nitrogen

By Lori E. Apodaca

In 2019, U.S. anhydrous ammonia production contained 13.5 million metric tons (Mt) of nitrogen, 3% more than production in 2018, and apparent consumption decreased slightly from that in 2018 (table 1). According to the U.S. Census Bureau, exports of ammonia increased by 51% compared with those in 2018, and imports decreased by 20% from those in 2018 (tables 1, 8, 9). Export quantities of contained nitrogen in ammonia in 2019 were 338,000 metric tons compared with 2.02 Mt of imports. Most (99%) of the imports in 2019 were from Canada and Trinidad and Tobago. About 88% of the domestically produced and imported ammonia consumed in the United States was used in fertilizer applications. Global ammonia production in 2019, which was estimated to contain 142 Mt of nitrogen, was about the same as that in 2018 (table 12). China, Russia, the United States, and India, in descending order of tonnage, were the leading producers, together accounting for about 55% of the total production. In the United States, the increased supply of shale gas lowered prices for domestic natural gas, which is an essential feedstock for nitrogen production, and over the past few years resulted in the development of new nitrogen capacity to replace higher cost imports.

Nitrogen is an essential element of life and a part of all plant and animal proteins. Some crops, such as alfalfa, garden peas, peanuts, and soybeans, can convert atmospheric nitrogen into a usable form in a process called fixation. Most nitrogen available for crop production, however, comes from decomposing animal and plant waste or from commercially produced fertilizers.

All commercial fertilizers contain nitrogen in the form of ammonium and (or) nitrate or in a form that is quickly converted to these after the fertilizer is applied to the soil. Commercial production of anhydrous ammonia is based on reacting nitrogen with hydrogen under high temperatures and pressures. The source of nitrogen is air, which is almost 80% nitrogen. Hydrogen can be derived from a variety of raw materials, including water, and crude oil or coal, but most often comes from natural gas. Other nitrogen fertilizers are produced from ammonia feedstock through a variety of chemical processes.

Legislation and Government Programs

On May 31, 2019, the U.S. Environmental Protection Agency (EPA) Administrator signed the final action to remove the key regulatory barrier to using gasoline blended with up to 15% ethanol (E15) during the summer driving season and reform the renewable identification number compliance system to increase transparency and deter price manipulation. Broader sales of E15 in the summer months expanded the market for ethanol in transportation fuels (U.S. Environmental Protection Agency, 2019a). In the United States, corn is the main feedstock for ethanol and ammonia is one of the most efficient and widely used sources of nitrogen fertilizer for growing crops such as corn.

On October 22, 2019, the EPA and the Department of the Army published a final rule to repeal the 2015 "Clean Water Rule: Definition of 'Waters of the United States'" (2015 Rule), which broadly defined the types of waters governed by the Clean Water Act. The final rule to repeal the 2015 Rule was to become effective on December 23, 2019. The main changes to the 2015 Rule were a new definition of "ephemeral streams," and narrowing of the interpretation of jurisdictional ditches, lakes, ponds, and wetlands. In addition, the term "interstate waters"—as an independent jurisdictional category—was eliminated (Green Markets, 2019b). The Clean Water Act regulates discharge of nonpoint and point source pollutants, such as fertilizers, into the U.S. waters.

Production and Stocks

Industry statistics for anhydrous ammonia and derivative products from 2015 through 2019 were developed by The Fertilizer Institute and adjusted by the U.S. Geological Survey. In 2019, production of anhydrous ammonia (82.2% nitrogen) increased by 3% to 13.5 Mt of contained nitrogen compared with 13.1 Mt in 2018 (table 1). Of the total produced, 88% was used as fertilizer and 12% was used in other chemical and industrial sectors (table 2).

The United States was a leading producer and consumer of elemental and fixed types of nitrogen. In decreasing order of contained nitrogen, the major downstream products derived from domestic and imported ammonia in the United States were urea, ammonium nitrate, nitric acid, ammonium phosphates [diammonium phosphate (DAP) and monoammonium phosphate (MAP)], and ammonium sulfate. Their combined production was 10.3 Mt of contained nitrogen; urea accounted for 43% of the total production; ammonium nitrate, 27%; nitric acid, 15%; ammonium phosphates, 8%; and ammonium sulfate, 6% (table 3).

Ammonia producers in the United States operated at about 82% of design capacity in 2019; this percentage included capacities at plants that operated during any part of the year but did not include plants that were idle for all of 2019. More than 70% of U.S. anhydrous ammonia production capacity was concentrated in Louisiana (32%), Oklahoma (15%), Iowa (13%), Texas (9%), and Georgia (4%), where large reserves of feedstock natural gas were present or near major natural gas pipeline routes. CF Industries Holdings, Inc.; Nutrien Ltd.; Koch Fertilizer, LLC; and Dyno Nobel Inc. (includes Dyno Nobel Louisiana Ammonia, LLC), in descending order of production capacity, accounted for 72% of total U.S. ammonia production capacity (table 4).

Pacific Coast Fertilizer, LLC planned to build a 1,500-metric-ton-per-day (t/d) anhydrous ammonia plant near Longview, WA, at a cost of $1 billion. Construction was scheduled to begin in 2020 with completion of the plant scheduled for late 2022 or early 2023 (Green Markets, 2019d).

Stocks of ammonia at yearend 2019 were estimated to be 420,000 t, a 14% decrease from comparable stocks at yearend 2018 (table 7).

Environment

Hypoxia, or oxygen depletion, is caused by excess nutrients in bodies of water. The nutrients can come from many sources including fertilizers, soil erosion, sewage discharge, and deposition of atmospheric nitrogen. Hypoxia has become a controversial environmental concern for the fertilizer industry and an issue that has spurred significant research efforts to determine its cause. Hypoxia occurs where water near the bottom of an affected area of a large body of water, such as the Gulf of Mexico, contains less than 2 parts per million dissolved oxygen. Hypoxia can cause stress or death of bottom-dwelling organisms that cannot move out of the hypoxic or "dead" zone.

Dead zones in coastal oceans have been reported in more than 400 ecosystems, affecting a total area of more than 245,000 square kilometers (km^2) worldwide. The number of dead zones has approximately doubled each decade since the 1960s. More recently, dead zones have developed in continental seas, such as the Baltic Sea, Black Sea, East China Sea, Gulf of Mexico, and Kattegat. The largest dead zone in the United States is at the mouth of the Mississippi River, which covers more than 22,000 km^2 (Virginia Institute of Marine Science, 2020).

The Mississippi River/Gulf of Mexico Hypoxia Task Force (HTF) was established in 1997 as a partnership among five Federal agencies; Tribes; and environmental quality, agricultural, and conservation agencies working together to address the issue of nutrient pollution and the dead zone in the Gulf of Mexico. On August 22, 2019, the EPA announced that it was providing $1.2 million to the 12 State members of the HTF to help implement State plans to reduce excess nutrients in the Mississippi River/Atchafalaya River Basin (MARB) tributaries (U.S. Environmental Protection Agency, 2019b). In October, the HTF released its second report that documented efforts of the 12 HTF States to reduce point-source nutrient loads to the MARB. The report highlighted the increased efforts in monitoring requirements and discharge limits in permits for nutrients. The report also included an analysis that summarized nitrogen and phosphorous loads from all major sewage treatment plants in the 12 HTF States discharging into the MARB (U.S. Environmental Protection Agency, 2019c).

In 2019, the Gulf of Mexico dead zone was 18,005 km^2. The 2019 dead zone was the eighth largest area mapped since 1985 and more than three times larger than the HTF goal of 5,000 km^2. Researchers suggested that the abnormally high amounts of spring rainfall in many parts of the Mississippi watershed led to record high river flows and larger than normal nutrient loading in the Gulf of Mexico (U.S. Environmental Protection Agency, 2020).

Consumption

In 2019, U.S. apparent consumption of ammonia was 15.2 Mt of contained nitrogen, a slight decrease from that in 2018 (table 1). Apparent consumption is calculated as production plus imports minus exports, adjusted to reflect any changes in stocks.

Consumption of nitrogen fertilizers in the United States for the 2018 and 2019 crop-years is listed in table 5. In the 2019 crop-year (July 1, 2018, to June 30, 2019), consumption of fertilizers was estimated to be 12.4 Mt of contained nitrogen, which was slightly less than that in the 2018 crop-year (July 1, 2017, to June 30, 2018). Nitrogen solutions [mostly urea ammonium nitrate (UAN) solutions containing 29.8% to 29.9% nitrogen], urea (45.9% nitrogen), and anhydrous ammonia (82% nitrogen) were the principal nitrogen fertilizer products, representing 26%, 25%, and 25% of fertilizer consumption, respectively. Ammonium nitrate (33.9% nitrogen) and ammonium sulfate each constituted 3% of 2019 nitrogen fertilizer consumption. The remaining 18% consisted of multiple-nutrient (various combinations of nitrogen, phosphate, and potassium) and other nitrogen fertilizers. The leading nitrogen-consuming States in the 2019 crop-year were, in descending order, Iowa, Illinois, Nebraska, North Dakota, Kansas, Minnesota, and Texas, accounting for about 50% of total fertilizer consumption (J.V. Slater, Association of American Plant Food Control Officials Inc., written commun., May 14, 2020).

Transportation

Ammonia was transported by refrigerated barge, rail car, pipeline, and tank truck. Three companies served 11 States with 5,090 kilometers (km) of pipelines and 4,800 km of river barge transport; rail and truck were used primarily for interstate or local delivery.

NuStar Energy L.P. continued to operate an ammonia pipeline. The 3,200-km ammonia pipeline originated in the Louisiana Delta, where it had access to three marine terminals and three anhydrous ammonia plants on the Mississippi River. The capacity of this pipeline was about 2 million metric tons per year of ammonia, with a storage capacity of more than 1 Mt. In 2019, about 1 Mt of ammonia was shipped through the Gulf Central ammonia pipeline (NuStar Energy L.P., 2020, p. 8).

Magellan Midstream Partners, L.P. owned a common carrier ammonia pipeline system. The 1,770-km pipeline system, which transported and distributed ammonia from production facilities in Oklahoma and Texas to various distribution plants in the Midwest, had a delivery capacity of about 820,000 metric tons per year (t/yr) (Magellan Midstream Partners, L.P., 2018, p. 1). On January 31, 2019, Magellan announced that it planned to discontinue commercial operations of the ammonia pipeline in late 2019 because of the system's low profitability and the expected decline in anhydrous ammonia production (Magellan Midstream Partners, L.P., 2019). Magellan started decommissioning the ammonia pipeline in the fourth quarter of 2019.

Tampa Pipeline Corp. operated the 135-km Tampa Bay pipeline system, which moved ammonium phosphate and nitrogen compounds for fertilizer producers in Hillsborough and Polk Counties, FL.

Prices

Midyear and yearend prices for nitrogen materials are listed in table 6. According to Green Markets, the average Gulf Coast ammonia price began 2019 at $259 per short ton and remained

at this price through the end of January when prices increased to $304 per short ton. Ammonia prices then decreased and reached a low of $200 per short ton in mid-March that continued through the end of August. At yearend, the price was $220 per short ton, a 25% decrease in yearend price from that in 2018 and 24% less than the yearend price in 2017.

The average Gulf Coast granular urea price fluctuated throughout 2019, beginning the year at $269 per short ton. The average price reached a low of $200 per short ton in early December and finished the year with a price of $217 per short ton.

The average ammonium nitrate price, which began 2019 at $265 per short ton, increased to $278 per short ton from mid-May through late June. The average price then decreased to $245 per short ton in early November through yearend, 8% less than the yearend prices in 2018 and 2017, when yearend prices were $265 per short ton.

Ammonium sulfate prices do not necessarily follow the same trend as other nitrogen products, which correlate to natural gas prices, mainly because a substantial amount of ammonium sulfate is produced as a byproduct of caprolactam production. Caprolactam, an organic compound, is the precursor to Nylon 6, a widely used synthetic polymer. The average price of ammonium sulfate, which began 2019 at about $260 per short ton, fluctuated throughout the year. By yearend, the price averaged $235 per short ton.

In 2019, the annual average price paid index for all types of fertilizers decreased by 4% from the 2018 index (U.S. Department of Agriculture, Economic Research Service, 2020a). Fertilizer prices decreased as a result of a decreased demand for ammonia and new marketable production capacity in the United States, Russia, and Indonesia, which resulted in supply outpacing demand throughout most of 2019 (Nutrien Ltd., 2020, p. 37).

In 2019, the average natural gas price was $2.56 per million British thermal units (Btu) compared with $3.15 per million Btu in 2018 and $2.99 per million Btu in 2017. Although natural gas prices in the United States typically had been higher than those in the rest of the world, lower natural gas prices in 2019 made U.S. ammonia production more competitive with offshore imports. Depending on its price, natural gas accounted for 70% to 85% of the U.S. cash cost of producing ammonia. Lower natural gas prices continued to provide North American producers with a delivered-cost advantage to domestic markets over most offshore suppliers, prompting the announcement of several regional expansions and new nitrogen projects over the past few years.

Foreign Trade

Ammonia exports increased by 51% compared with those in 2018 (table 8). Chile and Mexico were the leading destinations for United States exports of ammonia, accounting for 73% of the total quantity.

Ammonia imports decreased by 20% compared with those in 2018 (table 9). The average unit value of ammonia imports decreased to $300 per metric ton from $337 per metric ton in 2018. Trinidad and Tobago (61%) continued to be the leading import source. Canada (38%) was another significant import source. The decline in U.S. imports of anhydrous ammonia was the result of increased U.S. ammonia production (table 1).

Tables 10 and 11 list trade data for other nitrogen materials and include information on principal destination or source countries. Exports of ammonium sulfate and urea decreased in 2019, whereas those of ammonium nitrate, anhydrous ammonia, DAP, and MAP increased. Imports of one-half the nitrogen materials in 2019 decreased compared with those in 2018. However, imports of some nitrogen compounds (ammonium sulfate, calcium nitrate, DAP, MAP, nitrogen solutions, and potassium nitrate) increased.

World Review

Anhydrous ammonia and other nitrogen materials were produced in more than 60 countries. Global ammonia production in 2019, estimated to be 142 Mt, was about the same as that in 2018 (table 12). China, with 27% of total production, was the leading world producer of ammonia. By region, Asia contributed 43% of total world ammonia production, Eastern Europe, 14%; North America, 12%; the Middle East, 10%; Africa and Oceania 7%; Western Europe, 6%; and the Caribbean, Central America, Central Europe, and South America, 4% each.

In 2019, world ammonia trade was 16.1 Mt of contained nitrogen, which decreased slightly compared with that in 2018. Russia and Trinidad and Tobago accounted for 47% of world exports. Asia (primarily India) imported about one-third of global ammonia trade, followed by Western Europe and North America (International Fertilizer Association, 2020).

Angola.—Uralchem JSC signed a memorandum of understanding (MOU) with Grupo Opaia SA for the development of a joint-venture 1.2-t/yr ammonia-urea complex at a cost of $1.2 billion to $1.3 billion. Uralchem would be responsible for the design and construction of the plant and sale of the fertilizer products. Grupo Opaia would be responsible for approvals and documentation, securing a gas supply, and locating a suitable site. The plant was expected to be completed by 2023 (Nitrogen + Syngas, 2020).

Australia.—Perdaman Chemicals and Fertilisers Pty Ltd. selected Haldor Topsoe Inc. to provide ammonia technology for its planned 3,500-t/d ammonia plant, which was to be the world's largest single-line ammonia plant. Perdaman planned to build a $2.7 billion ammonia-urea plant in Karratha, Western Australia. The 3-year construction phase was to begin in summer 2020 (Green Markets, 2019e).

China.—The Government of China announced that it would not impose export duties on fertilizers for 2019, making all grades of fertilizers more appealing to purchase. Although imported ammonia was duty free, it was subject to a value added tax of 16% (Green Markets, 2019a).

Egypt.—El-Nasr Fertilizers Co. signed an MOU with Benchmark Power International (BPI) to build a new 1,200-t/d ammonia plant at an estimated cost of $600 million, with the potential for a second ammonia train. BPI was to provide the knowledge and information technology and El-Nasr was to provide the location for the plant. No timetable for the completion of the plant was announced (Nitrogen + Syngas, 2019a).

Russia.—Shchekinoazot selected Haldor Topsoe as the licensor of ammonia technology for the construction of a new ammonia and urea plant. The plant would have a capacity of 1,500 t/d of ammonia and 2,000 t/d of urea. China National Chemical Engineering Co. Ltd. would construct the plant. No timetable for the completion of the plant was announced (Nitrogen + Syngas, 2019b).

Trinidad and Tobago.—Yara International ASA planned to close its 270,000-t/yr ammonia plant in Point Lisas by December 31, 2019. This was Yara's smallest ammonia plant, and the profitability of the plant had been negatively affected by lower ammonia prices. In addition, natural gas availability had become an issue, and an agreement could not be reached with The National Gas Company of Trinidad and Tobago Ltd. to sustain plant operations (Green Markets, 2019f).

Uzbekistan.—Uzkimyosanoat JSC and Samsung Engineering Co., Ltd. planned to build a $600 million ammonia and urea plant in Yangier. The production capacity would be 400,000 t/yr of ammonia and 600,000 t/yr of urea. No timetable for the completion of the plant was announced (Green Markets, 2019c).

Outlook

Large corn plantings increase the demand for nitrogen fertilizers. According to the U.S. Department of Agriculture, U.S. corn growers intend to plant 37.2 million hectares of corn for multiple purposes in the 2020 crop-year, a 3% increase from that in 2019 (U.S. Department of Agriculture, National Agricultural Statistics Service, 2020a, p. 1). Corn acreage utilization is expected to increase or remain unchanged across most of the major corn-producing States with the exceptions of Connecticut and Rhode Island, which are expecting a decrease in acreage from that in 2019 (U.S. Department of Agriculture, National Agricultural Statistics Service, 2020b, p. 29).

Domestic corn-based ethanol production is projected to increase by 5% over the projection period of 2019 through 2029. Ethanol exports are assumed to account for the increase in use with imports remaining constant. Some growth in the E15 market is likely to take place with the approval of year-round blending, but infrastructure and other constraints will limit growth. Most U.S. ethanol production used corn as a feedstock; about one-third of total corn produced is expected to be used for ethanol production through 2029 (U.S. Department of Agriculture, Economic Research Service, 2020b, p. 5).

The U.S. Energy Information Administration projected that the Henry Hub natural gas spot price in the United States would average $2.07 per million Btu in 2020, a decrease of $0.49 per million Btu from 2019 levels, and above $3.00 per million Btu in 2021 (U.S. Energy Information Administration, 2020, p. 2).

The future of U.S. ammonia production depends on the variability in natural gas prices and construction costs. The United States is the world's second leading importer of ammonia despite a significant increase in domestic capacity and the second-ranked consumer. Beginning in 2014, low natural gas prices in the United States prompted some companies to upgrade existing U.S. plants and other companies to construct new domestic nitrogen projects. After the planned increases in ammonia capacity through 2018, no new ammonia capacity is expected within the next 5 years; however, a few new nitrogen projects are being considered. The increase in U.S. ammonia capacity is expected to change the supply structure and flows of ammonia and nitrogen products in the United States, which would translate into lower U.S. imports of nitrogen products (such as ammonia, urea, and some UAN) and the potential for increased exports of these nitrogen products (Simonova, 2020, p. 14).

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TABLE 1
SALIENT AMMONIA STATISTICS[1]

(Thousand metric tons, nitrogen content, unless otherwise specified)

		2015	2016	2017	2018	2019
United States:						
Production[2]		9,590	10,200	11,600	13,100	13,500
Exports[3]		92 r	183	612	224 r	338
Imports for consumption[3]		4,320	3,840	3,090	2,530	2,020
Consumption, apparent[4]		13,700	13,800	14,100	15,300 r	15,200
Stocks, December 31, producers		420	400	320	490	420
Average annual price, free on board Gulf Coast[5]	dollars per short ton	481	267	247	281	232
Net import reliance[6]	percent of apparent consumption	30	26	18	14	12
Natural gas price, wellhead, average price[7]	dollars per million British thermal units	2.62	2.52	2.99	3.15 r	2.56
World:						
Production[e]		142,000	144,000 r	141,000	141,000 r	142,000
Trade[8]		15,100	15,200	15,500	16,400	16,100

[e]Estimated. [r]Revised.

[1]Table includes data available through October 22, 2020. Data are rounded to no more than three significant digits.

[2]Source: The Fertilizer Institute; data adjusted by the U.S. Geological Survey.

[3]Source: U.S. Census Bureau.

[4]Defined as production plus imports minus exports plus or minus adjustments for industry stock changes.

[5]Source: Green Markets.

[6]Defined as imports minus exports plus or minus adjustments for industry stock changes.

[7]Source: Natural Gas Monthly, U.S. Energy Information Administration.

[8]Source: International Fertilizer Association Statistics, World Anhydrous Ammonia Trade.

TABLE 2

ANHYDROUS AMMONIA SUPPLY AND DEMAND IN THE UNITED STATES[1]

(Thousand metric tons, nitrogen content)

	2017	2018	2019
Production:[2]			
Fertilizer:			
January–June	4,880	5,570	6,060
July–December	5,290	6,030	5,820
Total	10,200	11,600	11,900
Nonfertilizer:			
January–June	665	713	803
July–December	721	823	771
Total	1,390	1,540	1,570
Grand total	11,600	13,100	13,500
Exports:[3]			
January–June	203	95	131
July–December	409	129 r	207
Total	612	224 r	338
Imports for consumption:[3]			
January–June	1,770	1,360	1,020
July–December	1,330	1,180	1,000
Total	3,090	2,530	2,020
Stocks, end of period:[2]			
January–June	420	380	410
July–December	320	490	420
Apparent consumption:[4]			
January–June	7,090	7,480	7,830
July–December	7,020	7,790 r	7,380
Total	14,100	15,300 r	15,200

[r]Revised.

[1]Table includes data available through October 22, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Source: The Fertilizer Institute; data adjusted by the U.S. Geological Survey.

[3]Source: U.S. Census Bureau.

[4]Defined as production plus imports minus exports plus adjusted for industry stock changes.

TABLE 3

MAJOR DOWNSTREAM NITROGEN COMPOUNDS PRODUCED IN THE UNITED STATES[1]

(Thousand metric tons)

	2018						2019					
	January–June		July–December		Total		January–June		July–December		Total	
	Gross weight	Nitrogen content	Gross weight	Nitrogen content	Gross weight	Nitrogen content	Gross weight	Nitrogen content	Gross weight	Nitrogen content	Gross weight	Nitrogen content
Ammonium nitrate[e]	4,090	1,390	4,040	1,370	8,130	2,760	4,140	1,400	4,100	1,390	8,240	2,790
Ammonium phosphates[2]	3,350	450	3,380	455	6,730	904	3,490	473	2,870	385	6,360	858
Ammonium sulfate[3]	1,410	300	1,390	294	2,800 r	593	1,490	315	1,350	287	2,840	602
Nitric acid[e]	3,580	787	3,550	780	7,130	1,570	3,620	795	3,580	788	7,200	1,580
Urea[e]	4,850	2,230	4,430	2,040	9,290	4,260	5,050	2,320	4,610	2,120	9,660	4,430

[e]Estimated. [r]Revised.

[1]Table includes data available through October 22, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Diammonium phosphate and monoammonium phosphate.

[3]Excludes coke plant ammonium sulfate.

Source: The Fertilizer Institute; data adjusted by the U.S. Geological Survey.

TABLE 4
DOMESTIC PRODUCERS OF ANHYDROUS AMMONIA IN 2019[1]

(Thousand metric tons per year of ammonia)

Company	Location	Capacity[2]
AdvanSix Inc.	Hopewell, VA	530
CF Industries Holdings, Inc.	Donaldsonville, LA (5 plants)	3,900
Do.	Port Neal, IA	1,090
Do.	Verdigris, OK (2 plants)	1,020
Do.	Woodward, OK	435
Do.	Yazoo City, MS	508
Coffeyville Resources Nitrogen Fertilizers, LLC	Coffeyville, KS	375
Dakota Gasification Co.	Beulah, ND	355
Dyno Nobel Inc.	Cheyenne, WY	178
Do.	St. Helens, OR	101
Dyno Nobel Louisiana Ammonia, LLC	Waggaman, LA	800
East Dubuque Nitrogen Fertilizers, LLC	East Dubuque, IL	337
Fortigen Geneva, LLC	Geneva, NE	31
Green Valley Chemical Corp.	Creston, IA	32
Iowa Fertilizer Co.	Wever, IA	770
J.R. Simplot Co.	Rock Springs, WY	185
Koch Fertilizer, LLC	Beatrice, NE	265
Do.	Dodge City, KS	280
Do.	Enid, OK	930
Do.	Fort Dodge, IA	350
LSB Industries, Inc.	Cherokee, AL	163
Do.	El Dorado, AR	400
Do.	Pryor, OK	210
Mosaic Company, The	Faustina (Donaldsonville), LA	508
Nutrien Ltd.	Augusta, GA	785
Do.	Borger, TX	490
Do.	Geismar, LA	450
Do.	Kenai, AK[3]	280
Do.	Kennewick, WA[3]	180
Do.	Lima, OH	612
OCI Partners LP	Beaumont, TX	331
Yara Freeport LLC	Freeport, TX	750
Total		17,600

Do. Ditto.

[1]Table includes data available through October 22, 2020. Data are rounded to no more than three significant digits; may not add to total shown.

[2]Engineering design capacity adjusted for 340 days per year of effective production capability.

[3]Idle.

TABLE 5

ESTIMATED U.S. NITROGEN FERTILIZER CONSUMPTION, BY PRODUCT TYPE[1, 2]

(Thousand metric tons, nitrogen content)

Fertilizer material[3]	2018[r]	2019
Single-nutrient:		
Anhydrous ammonia	3,080	3,130
Nitrogen solutions[4]	3,240	3,270
Urea	3,260	3,130
Ammonium nitrate	242	266
Ammonium sulfate	375	349
Aqua ammonia	48	48
Other[5]	396	400
Total	10,600	10,600
Multiple-nutrient[6]	1,830	1,850
Grand total	12,500	12,400

[r]Revised.

[1]Table includes data available through October 22, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Fertilizer crop-years ending June 30 of the year shown.

[3]Ranked in relative order of importance by product type.

[4]Principally urea-ammonium nitrate solutions, 29.8% to 29.9% nitrogen.

[5]Includes other single-nutrient nitrogen materials, all natural organics, and statistical discrepancies.

[6]Various combinations of nitrogen (N), phosphate (P), and potassium (K): N-P-K, N-P, and N-K.

Source: J.V. Slater, Association of American Plant Food Control Officials Inc., written commun., May 14, 2020.

TABLE 6

AVERAGE PRICE QUOTATIONS FOR MAJOR NITROGEN COMPOUNDS AT END OF PERIOD[1]

(Dollars per short ton)

Compound	2018		2019	
	June	December	June	December
Ammonium nitrate, free on board (f.o.b.) Corn Belt[2]	270	265	265	245
Ammonium sulfate, f.o.b. Corn Belt[2]	258	263	250	235
Anhydrous ammonia:				
F.o.b. Corn Belt[2]	365	523	370	385
F.o.b. Gulf Coast[3]	254	295	200	220
Diammonium phosphate, f.o.b. central Florida	395	415	335	295
Urea:				
F.o.b. Corn Belt,[2] prilled and granular	280	310	308	255
F.o.b. Gulf Coast, granular[3]	250	261	254	217

[1]Table includes data available through October 22, 2020.

[2]Illinois, Indiana, Iowa, Missouri, Nebraska, and Ohio.

[3]Barge, New Orleans, LA.

Source: Bloomberg Green Markets.

TABLE 7
U.S. PRODUCER STOCKS OF FIXED NITROGEN
COMPOUNDS AT END OF PERIOD[1]

(Thousand metric tons, nitrogen content)

Material[2]	2018	2019
Ammonia:		
January–June	380	410
July–December	490	420
Nitrogen solutions:[3]		
January–June	320	650
July–December	450	570
Urea:		
January–June	NA	NA
July–December	NA	NA
Ammonium phosphates:[4]		
January–June	32	30
July–December	34	30
Ammonium nitrate:		
January–June	NA	NA
July–December	NA	NA
Ammonium sulfate:		
January–June	33	21
July–December	36	45
Yearend total[5]	1,010	1,070

NA Not available.
[1]Table includes data available through October 22, 2020.
[2]Ranked in relative order of importance.
[3]Urea-ammonium nitrate and ammoniacal solutions.
[4]Diammonium and monoammonium phosphates.
[5]Calendar year ending December 31.

Source: The Fertilizer Institute; data adjusted by the U.S. Geological Survey.

TABLE 8

U.S. EXPORTS OF ANHYDROUS AMMONIA, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons of ammonia and thousand dollars)

Country or locality	2018		2019	
	Gross weight	Value[2]	Gross weight	Value[2]
Belgium	(3)	1,640	16	3,290
Brazil	15	3,860	(3)	4
Canada	4	1,970	(3)	445
Chile	76	9,280	153	18,700
China	19	4,880	(3)	181
Korea, Republic of	55	14,700	38	8,460
Mexico	98 r	36,800	148	52,400
Morocco	--	--	56	6,160
Taiwan	3	855	--	--
Other	(3)	2,140	(3)	2,850
Total	272 r	76,100	411	92,500

[r]Revised. -- Zero.

[1]Table includes data available through July 7, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Cost, insurance, and freight value.

[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 9

U.S. IMPORTS OF ANHYDROUS AMMONIA, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons of ammonia and thousand dollars)

Country or locality	2018		2019	
	Gross weight	Value[2]	Gross weight	Value[2]
Canada	959	404,000	942	37,700
Trinidad and Tobago	1,980	590,000 r	1,510	357,000
Venezuela	99	31,900	--	--
Other	39	11,600	8	3,120
Total	3,080	1,040,000 r	2,460	738,000

[r]Revised. -- Zero.

[1]Table includes data available through July 7, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Cost, insurance, and freight value.

Source: U.S. Census Bureau.

TABLE 10
U.S. EXPORTS OF MAJOR NITROGEN COMPOUNDS[1]

(Thousand metric tons)

Compound	2018 Gross weight	2018 Nitrogen content	2019 Gross weight	2019 Nitrogen content	Principal destinations in 2019, by gross weight
Ammonium nitrate[2]	295	100	407	138	Canada, 67%; Mexico, 28%.
Ammonium sulfate[2]	739	157	686	145	Brazil, 27%; Peru, 21%; Canada, 19%.
Anhydrous ammonia	272 r	224 r	411	338	Chile, 37%; Mexico, 36%; Morocco, 14%.
Diammonium phosphate	1,030	185	1,240	223	India, 23%; Mexico, 19%; Peru, 10%; Canada, 9%.
Monoammonium phosphate	2,270	250	2,550	280	Canada, 46%; Brazil, 28%.
Urea	743	341	559	257	Chile, 39%; Canada, 38%; Mexico, 9%.
Total	5,350 r	1,260 r	5,850	1,380	

[r]Revised.
[1]Table includes data available through July 7, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes industrial chemical products.

Source: U.S. Census Bureau.

TABLE 11
U.S. IMPORTS OF MAJOR NITROGEN COMPOUNDS[1]

(Thousand metric tons and thousand dollars)

Compound	2018 Gross weight	2018 Nitrogen content	2018 Value[2]	2019 Gross weight	2019 Nitrogen content	2019 Value[2]	Principal sources in 2019, by gross weight
Ammonium nitrate[3]	484	164	117,000	447	152	109,000	Canada, 60%; Russia, 38%.
Ammonium nitrate and limestone mixtures	59	16	12,300	44	12	12,400	Netherlands, 78%; Canada, 19%.
Ammonium sulfate[3]	404	86	81,700	493	105	109,000	Canada, 45%; Belgium, 21%; Russia, 14%.
Anhydrous ammonia[4]	3,080	2,530	1,040,000 r	2,460	2,020	738,000	Trinidad and Tobago, 61%; Canada, 38%.
Calcium nitrate	79	13	10,500	83	14	11,700	Norway, 91%; China, 3%.
Diammonium phosphate	1,120	202	492,000	1,160	208	458,000	Morocco, 60%; Russia, 26%.
Monoammonium phosphate	1,650 r	182 r	746,000 r	1,770	194	670,000	Morocco, 59%; Russia, 25%.
Nitrogen solutions	2,400	716	471,000	2,870	857	552,000	Russia, 54%; Trinidad and Tobago, 30%; Canada, 14%.
Potassium nitrate	91	13	55,500	111	16	74,900	Chile, 73%; Germany, 13%; China, 8%.
Potassium nitrate and sodium nitrate mixtures	3	(5)	1,320	1	(5)	1,530	Canada, 57%; Chile, 33%.
Sodium nitrate	35	6	21,200 r	33	5	22,800	Chile, 67%; Germany, 16%; India, 15%.
Urea	5,110	2,350	1,510,000	4,410	2,020	1,350,000	Qatar, 34%; Canada, 13%; Russia, 13%; Saudi Arabia, 11%.
Total	14,500	6,270	4,550,000	13,900	5,610	4,110,000	

[r]Revised.
[1]Table includes data available through July 7, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Cost, insurance, and freight value.
[3]Includes industrial chemical products.
[4]Includes industrial ammonia.
[5]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 12

AMMONIA: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons, nitrogen content)

Country or locality[2]	2015	2016	2017	2018	2019
Afghanistan	44	48	48 e	48 e	48 e
Algeria	1,770	1,320 r	984 r	2,235 r	2,200 e
Argentina	500	500	700 r, e	520 r, e	610 e
Australia[e]	1,300	1,300	1,300	1,300	1,300
Austria	427 r	453 r	417 r	333 r	330 e
Bahrain	342	385	382	346	383
Bangladesh[3]	630	590 r	650	600 r	600 e
Belarus	1,060	1,040	1,050	1,051	857
Belgium[e]	860	760	920	800 r	870
Brazil	1,000	1,000 e	750 r, e	730 r, e	320 e
Bulgaria	390	410 e	400 e	300 r, e	230 e
Canada	4,004	4,133	3,745	3,832	3,937
China	47,603	46,922	40,656	37,907 r	38,000
Croatia	375	347	384	330 r, e	395 e
Czechia	180	170	180	140 r	130
Egypt[e]	1,800	2,800	3,700	4,100 r	4,200
Estonia	35	19 r, e	-- r	-- r	--
Finland	78	78 e	78 e	78 e	78 e
France	1,040	1,010	750	914 r	884
Georgia	184	150	170	190 r	200
Germany	2,370	2,500	2,580	2,580 r	2,420
Greece	119	75	130	120 r	110
Hungary[e]	330	370	430	360 r	370
India[4]	11,309	11,574	11,405	11,900 r	12,200
Indonesia[e]	5,000	5,000	5,000	5,000	5,000
Iran	2,642	3,000 e	3,400	3,700 r, e	3,500 e
Iraq	40 e	130	100	90 r	95
Italy[e]	570	570	570	570	570
Japan	790	725	717	673	694
Kazakhstan	152	172	179	173 r	170 e
Kuwait	535	556	546	270 r	--
Libya	266	219	205	177 r	100 e
Lithuania	876	753	927	780	865
Malaysia	990	990 e	990 e	990 e	990 e
Mexico	473	438	411	124	--
Netherlands	2,300	2,300	2,400 e	2,200 r, e	2,200 e
New Zealand[e]	125	125	125	125	125
Nigeria	150	340 e	790 e	850 r, e	850 e
Norway[e]	300	300	300	300	300
Oman[e]	1,700	1,700	1,700	1,700	1,700
Pakistan	3,100	3,300	3,100	3,000 r	3,100 e
Peru	5	5 e	--	--	--
Poland	2,200	2,237	2,367	2,172	2,200 e
Qatar	3,050	2,960	3,100	3,100 e	3,150 e
Romania	500	440	520	660 r	660 e
Russia	12,455	13,300	14,056	14,859	15,000 e
Saudi Arabia	3,040	3,684	4,000	4,300 r	4,000
Serbia	73	60	60 e	60 e	60 e
Slovakia	350 r	350 r	350 r	425 r	400
South Africa	480 r	450 r	500 r	470 r	460
Spain	400	410	400	440 r	440
Switzerland	34 r	34 r	34 r	14 r	14
Syria	--	--	20 e	270	270 e
Trinidad and Tobago	4,032	4,040	4,144	3,988	4,475

See footnotes at end of table.

TABLE 12—Continued

AMMONIA: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons, nitrogen content)

Country or locality[2]	2015	2016	2017	2018	2019
Turkey	560	380	302	550 r	390
Turkmenistan	480 r	490 r	530 r	490 r	600 e
Ukraine	2,168	1,678	979	801 r	1,502
United Arab Emirates[e]	900 r	900 r	900 r	1,000 r	920
United Kingdom	840	820	790 r	740 r	790
United States[5]	9,590	10,200	11,600	13,100	13,500
Uzbekistan	1,100	1,100	1,100 r	1,100 r	1,100
Venezuela	1,000 e	830	820	370 r	190
Vietnam	1,100	970 r	1,100	1,100	1,100 e
Zimbabwe[e]	23 r	4	12	10	10
Total	142,000	144,000 r	141,000	141,000 r	142,000

[e]Estimated. [r]Revised. -- Zero.

[1]Table includes data available through October 19, 2020. All data are reported unless otherwise noted. Totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]In addition to the countries and (or) localities listed, Taiwan and Tajikistan may have produced ammonia, but available information was inadequate to make reliable estimates of output.

[3]May include nitrogen content of urea.

[4]Production is based on fiscal year, with a starting date of April 1 of the year shown.

[5]Synthetic anhydrous ammonia; excludes coke oven byproduct ammonia.