



2015 Minerals Yearbook

NITROGEN [ADVANCE RELEASE]

NITROGEN

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The world production table was prepared by Glenn J. Wallace, international data coordinator.

In 2015, U.S. ammonia production contained 9.59 million metric tons (Mt) of nitrogen, 3% more than production in 2014, and apparent consumption increased by 3% from that in 2014 (table 1). According to the U.S. Census Bureau, exports of ammonia decreased by 17% from those in 2014, and imports increased by 4% from those of 2014 (tables 8, 9). Export quantities were very small at 93,000 metric tons (t) of contained nitrogen compared with 4.32 Mt of imports. Most of the imports in 2015 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 2015, which was estimated to contain 145 Mt of nitrogen, was 3% higher than that in 2014. China, India, Russia, and the United States were the leading producers, together accounting for about 57% of the total. In the United States, the increased supply of shale gas has lowered prices for domestic natural gas, which is an essential feedstock for nitrogen production, and has prompted 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 it most often comes from natural gas hydrocarbons. Other nitrogen fertilizers are produced from ammonia feedstock through a variety of chemical processes.

Legislation and Government Programs

On February 2, 2015, the Agricultural Realtors Association and The Fertilizer Institute announced the formation of the Fertilizer Safety and Health Partners (FSHP) Alliance. The FSHP was a new initiative to promote fertilizer safety in partnership with the U.S. Environmental Protection Agency, the Occupational Safety and Health Administration, and several other associations. The main goal of the alliance was to improve communication between agricultural retailers and first responders regarding workplace hazards and the safe handling of fertilizers (Green Markets, 2015c).

On December 18, 2015, the President of the United States signed into law the Surface Transportation Board Reauthorization Act of 2015 (Public Law 114–110), which was intended to promote greater competition between railroads and other modes of transportation and improve the efficiency and effectiveness of

the Surface Transportation Board (STB). The law removes the STB from under the Department of Transportation and establishes the STB as an independent agency. The law was important to the fertilizer industry because railroads are an essential link in the fertilizer distribution chain (Green Markets, 2015d).

Production

Industry statistics for anhydrous ammonia and derivative products, including the third and fourth quarters of 2011 and all of 2012, 2013, 2014, and 2015 were developed by The Fertilizer Institute and adjusted by the U.S. Geological Survey. A summary of the production of principal inorganic fertilizers prior to the third quarter of 2011 was reported in the U.S. Census Bureau's series MQ325B, which ceased at that time. In 2015, production of anhydrous ammonia (82.2% nitrogen) increased by 3% to 9.59 Mt of contained nitrogen compared with 9.33 Mt in 2014 (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, urea, ammonium nitrate, nitric acid, ammonium phosphates [diammonium phosphate (DAP) and monoammonium phosphate (MAP)], and ammonium sulfate were the major downstream products derived from domestic and imported ammonia in the United States. Their combined estimated production was 8.28 Mt of contained nitrogen, with urea and ammonium nitrate each accounting for about 30% of the total production; nitric acid, 18%; ammonium phosphates, 14%; and ammonium sulfate, 8% (table 3).

Ammonia producers in the United States operated at about 80% of design capacity in 2015; this percentage included capacities at plants that operated during any part of the year and did not include plants that were idle for all of 2015. More than 55% of U.S. ammonia production capacity was concentrated in Louisiana (29%), Oklahoma (20%), and Texas (6%), where large reserves of feedstock natural gas occur. CF Industries Holdings, Inc.; PCS Nitrogen, Inc.; Koch Nitrogen Co., LLC; and Agrium Inc., in descending order, accounted for 76% of total U.S. ammonia production capacity (table 4).

Investimus Foris (Lithuania) announced plans to invest \$265 million to convert an idle biofuels refinery in Grant Parish, LA, into an ammonia-manufacturing facility. The plant would produce 450,000 metric tons per year (t/yr) of ammonia. Construction was expected to begin in the second quarter of 2016 and be completed by the third quarter of 2018 (Louisiana Economic Development, 2015).

Yara International ASA and BASF SE began construction at their ammonia plant in Freeport, TX. The joint venture was 68% owned by Yara and 32% by BASF. The project included a new ammonia tank at the BASF facility and a new terminal

and pipeline for ammonia exports. The 750,000-t/yr ammonia plant, built at a cost of \$600 million, would use hydrogen as feedstock and was expected to be completed by 2017 (Nitrogen + Syngas, 2015f).

CF Industries' new 1.16-million-metric-ton-per-year (Mt/yr) urea plant at the Donaldsonville Nitrogen Complex in Louisiana began operation in December 2015. This was the first new grassroots urea plant built in the United States since 1988. CF Industries expected the associated upstream 1.1-Mt/yr ammonia unit to come online in mid-2016. The Donaldsonville expansions would make the site the largest nitrogen-producing facility in the world (Nitrogen + Syngas, 2016).

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 spawned 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 in 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 (km²) 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 (Virginia Institute of Marine Science, 2016).

The Mississippi River/Gulf of Mexico Hypoxia Task Force (HTF) announced that it was devising new strategies to speed up the reduction of nutrient levels in the Mississippi River Basin. The HTF was 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. The HTF extended the target date from 2015 to 2025 in order to decrease the size of the dead zone in the Gulf of Mexico from the current average size of about 9,700 km² to 5,200 km². Also by 2025, the HTF was aiming to reduce nutrient loads from the Mississippi River into the Gulf of Mexico by 20% (Green Markets, 2015a).

Consumption

In 2014, U.S. apparent consumption of ammonia was 13.7 Mt of contained nitrogen, a 3% increase from that of 2014. 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 2015 crop-year (ending June 30, 2015) is listed in table 5. Consumption of fertilizers was estimated to be 11.4 Mt of contained nitrogen, which was about the same as that of 2014. Anhydrous ammonia and nitrogen solutions, mostly urea-ammonium nitrate (UAN) solutions containing 29.8%

to 29.9% nitrogen, were the principal nitrogen fertilizer products, representing 24% and 28% of fertilizer consumption, respectively. Urea (45.9% nitrogen) constituted 23% of the nitrogen fertilizer consumption during the 2015 crop-year. Ammonium nitrate (33.9% nitrogen) constituted 2% and ammonium sulfate constituted 3% of 2015 nitrogen fertilizer consumption. The remaining 20% consisted of multiple-nutrient (various combinations of nitrogen, phosphate, and potassium) and other nitrogen fertilizers. The leading nitrogen-consuming States in the 2015 crop-year were, in descending order, Iowa, Illinois, Nebraska, North Dakota, Minnesota, and Kansas, accounting for about 50% of total fertilizer consumption (J.V. Slater, Association of American Plant Food Control Officials Inc., written commun., November 16, 2016).

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 Mt/yr of ammonia, with a storage capacity of more than 1 Mt. In 2015, about 1.3 Mt of ammonia was shipped through the Gulf Central ammonia pipeline (NuStar Energy L.P., 2016, p. 6).

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 t/yr (Magellan Midstream Partners, L.P., 2016, p. 1). 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 and Stocks

Midyear and yearend prices for nitrogen materials are listed in table 6. According to Green Markets, the average Gulf Coast ammonia price began 2015 at \$565 per short ton (the high for the year) and remained at this price through early June; at yearend, the price was \$420 per short ton, a 26% decrease in yearend price from that of 2014.

The average Gulf Coast granular urea price fluctuated throughout 2015, beginning the year at \$338 per short ton. The average price reached a high of \$363 per short ton in mid-June. At yearend, the average urea price was \$228 per short ton.

The average ammonium nitrate price, which began 2015 at \$355 per short ton, fluctuated throughout most of the year. The average price rose to \$360 per short ton by late January and then declined to \$290 per short ton by yearend.

Typically, ammonium sulfate prices do not follow the same trend as other nitrogen products, which correlate to natural gas prices, mainly because a substantial amount 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 began 2015 at about \$300 per short ton. The ammonium sulfate average price fluctuated throughout the year. By yearend, the price averaged \$278 per short ton.

In 2015, the annual average price paid index for all types of fertilizers decreased by 9% from the 2014 index (U.S. Department of Agriculture, Economic Research Service, 2016a). Fertilizer prices decreased as a result of decreased feedstock prices, which led to increased supply and lower global cost of nitrogen fertilizers.

Stocks of ammonia at yearend 2015 were estimated to be 420,000 t, a 50% increase from comparable stocks at yearend 2014 (table 7).

Foreign Trade

Ammonia exports decreased by 16% compared with those in 2014 (table 8). Belgium, Chile, Mexico, and the Netherlands were the leading destinations for United States exports of ammonia accounting for 98% of the total value.

Ammonia imports increased by 4% compared with those in 2014 and dwarfed the quantity of exports. The average value of ammonia imports decreased to about \$488 per metric ton from \$551 per metric ton in 2014 (table 9). Trinidad and Tobago (63%) continued to be the leading import source. Canada (22%) and Russia (8%) were other significant import sources.

Tables 10 and 11 list trade data for other nitrogen materials and include information on principal destination or source countries. Exports of ammonium sulfate, anhydrous ammonia, DAP, and urea decreased in 2015, whereas those of ammonium nitrate and MAP increased. Imports of nitrogen materials in 2015 increased by 24% compared with those in 2014. Imports of ammonium sulfate, anhydrous ammonia, calcium nitrate, DAP, potassium nitrate, sodium nitrate, and urea increased.

World Review

Anhydrous ammonia and other nitrogen materials were produced in more than 60 countries. Global ammonia production in 2015, estimated to be 145 Mt, was 3% higher than that of 2014 (table 12). China, with 34% of total production, was the leading world producer of ammonia. Asia contributed 48% of total world ammonia production, and Eastern Europe produced 16% of the global total. North America produced 10% of the total; the Middle East, 10%; Western Europe, 7%; the Caribbean, Central America, and South America, 5%; and Africa and Oceania contributed the remaining 4%.

In 2015, world ammonia trade was 15.1 Mt of contained nitrogen, which decreased slightly compared with that in 2014. Russia and Trinidad and Tobago accounted for 44% of world exports. Asia (primarily India) imported about one-third of global ammonia trade, followed by North America and Western Europe (International Fertilizer Association, 2016).

Azerbaijan.—Socar, Azerbaijan's state-owned oil company, signed an agreement with Neste Jacobs Oy to provide project management and coordinate inspections for Socar's greenfield ammonia and urea fertilizer complex at Sumqayit. The fertilizer complex was designed to produce 1,200 metric tons per day (t/d)

of ammonia and 2,000 t/d of urea. The project was designed to meet domestic demand for fertilizers and export fertilizers to the global market. The plant was expected to be completed by 2017 (Green Markets, 2015b).

China.—In December 2015, the Government of China released its 2016 export tariff rates for many products, including anhydrous ammonia and urea. The main change from the 2015 export tariff rate for ammonia was that the rate was reduced to zero from RMB180 per metric ton. The export rate for urea would remain the same at RMB80 per metric ton (CRU Group, 2015).

India.—The Indian Farmers Fertilizer Cooperative signed a contract with Casale SA to revamp five ammonia-urea plants at Aonia, Phulpur, and Kaloi. The goal was to reduce energy consumption at these plants by an average of about 8% below current levels. This project was a major step in making fertilizer production in India more efficient. Site work at these plants was planned to begin in 2016 (Nitrogen + Syngas, 2015a).

Indonesia.—Surya Esa Perkasa, Tbk began construction of a 700,000-t/yr ammonia plant in Sulawesi at a cost of \$830 million. The plant would be operated by Panca Amara Utama and was expected to be completed by 2017 (Nitrogen + Syngas, 2015b).

Russia.—Euro Chem Group AG signed a memorandum of understanding (MOU) for an engineering, procurement, and construction contract with Marie Tecnimont SpA. Tecnimont was to construct a new 890,000-t/yr ammonia plant at Kingisepp. The \$660 million contract would be for the first of five fertilizer projects to be constructed under the MOU. No timetable for the construction of the plant was announced except that the plant was expected to be completed 36 months after construction commenced (Nitrogen + Syngas, 2015c).

Slovakia.—Technip S.A. and Duslo a.s. of Slovakia signed a contract with Haldor Topsoe A/S to design and construct a 1,600-t/d ammonia plant adjacent to an existing fertilizer complex in Sal'a, 65 km from Bratislava. Haldor Topsoe would supply licensing and basic engineering as well as the proprietary catalyst and equipment for the plant that was expected to begin operation in 2018 (Nitrogen + Syngas, 2015d).

Tanzania.—The state-owned Tanzania Petroleum Development Corp. and German company Ferrostaal GmbH entered into a joint venture to construct a new world-scale fertilizer complex at a cost of \$1 billion. This 1.3-Mt/yr urea plant would be the first fertilizer plant in Tanzania. The ammonia-urea complex would be operational in 2020 (Nitrogen + Syngas, 2015e).

Uzbekistan.—Navoiyazat JSC awarded the engineering, procurement, and construction contract for its new gas-based ammonia-urea fertilizer plant at Navoiy to Mitsubishi Heavy Industries Ltd. and Mitsubishi Corp. The plant would produce 2,000 t/d of ammonia and 1,750 t/d of granulated urea, with a surplus of about 1,000 t/d of ammonia. No timetable for completion of the plant was announced (Nitrogen + Syngas, 2015g).

Outlook

Large corn plantings increase the demand for nitrogen fertilizers. According to the U.S. Department of Agriculture (USDA), U.S. corn growers intend to plant 37.9 million hectares

(Mha) of corn for all purposes in the 2016 crop-year, a 6% increase from that in 2015. This would be the third highest planted acreage of corn in the United States since 1944. Corn acreage utilization is projected to increase in Illinois, Iowa, Kansas, and North Dakota (U.S. Department of Agriculture, National Agricultural Statistics Service, 2016, p. 30).

According to long-term projections from the USDA, plantings for the eight major field crops (barley, corn, oats, rice, sorghum, soybeans, upland cotton, and wheat) in the United States are expected to decrease slightly in the next few years. During the remainder of the projection period (2015–25), plantings are expected to remain near 100 Mha, down from about 105 Mha in 2014. Corn, soybeans, and wheat are expected to account for about 90% of acreage utilization for the eight major field crops during this 10-year period, and the amount of acreage planted in corn is expected to remain high. Soybean planting likely will increase during the projection period because growth in domestic and foreign demand keeps prices high, which could result in higher profits for producers. Wheat plantings are likely to remain stable as gains in food use are balanced with declines in feed use.

Domestic corn-based ethanol production is projected to decrease slightly, owing to the decrease in U.S. gasoline consumption and little to no growth in the use of 15% or 85% percent ethanol blended gasoline. Most U.S. ethanol production used corn as a feedstock, about 34% of total corn produced is expected to go to ethanol production through 2025. No gains for corn-based ethanol are projected during the 10-year period compared with those of past years (U.S. Department of Agriculture, Economic Research Service, 2016b, p. 19).

In 2015, as a result of strong gains in domestic shale gas production, natural gas prices were about \$2.62 per million British thermal units compared with \$4.37 per million British thermal units in 2014 and \$3.73 per million British thermal units in 2013. Natural gas prices in the United States have typically been higher than those in the rest of the world, and lower natural gas prices made U.S. ammonia production more competitive with offshore imports. Depending on its price, natural gas can account for approximately 70% to 85% of the U.S. cash cost of producing ammonia. Favorable 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 greenfield nitrogen projects. In addition to the United States, the Middle East, North Africa, and Russia have large supplies of lower-cost natural gas compared with other countries, which give them a cost advantage in producing and exporting ammonia. China, Ukraine, and Western Europe have experienced rising natural gas prices; thus, producers in these regions were higher cost suppliers and played an important role in setting prices in the world marketplace (Potash Corp. of Saskatchewan Inc., 2016, p. 61). The U.S. Department of Energy projected that the Henry Hub natural gas spot price in the United States, in dollars per million British thermal units, would average \$2.65 in 2016, about the same as the 2015 average, and would increase to an average of \$3.22 in 2017 (U.S. Energy Information Administration, 2016, p. 10).

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 leading importer of ammonia and the second-ranked consumer. Recent low prices for natural gas in the United States have prompted some companies to upgrade existing U.S. plants and other companies to begin construction of new U.S. nitrogen projects. Most of the projects were expected to be commissioned in 2016 and 2017. 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 and the potential for increased exports of urea and UAN (Prud'homme, 2016).

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TABLE 1
SALIENT AMMONIA STATISTICS^{1,2}

(Thousand metric tons of contained nitrogen unless otherwise specified)

	2011	2012	2013	2014	2015	
United States:						
Production	9,350 ³	8,730 ⁴	9,170 ⁴	9,330 ⁴	9,590 ⁴	
Exports	26	31	196	111	93	
Imports for consumption	5,600	5,170	4,960	4,150	4,320	
Consumption, apparent ⁵	14,900	13,900	13,900	13,300	13,700	
Stocks, December 31, producers	178 ^c	180 ^c	240 ^c	280	420	
Average annual price, free on board gulf coast ⁶	dollars per short ton	531	579	541	531	481
Net import reliance ⁷	percent of apparent consumption	37	37	34	30	30
Natural gas price, wellhead, average price ⁸	dollars per million British thermal units	4.00	2.75	3.73	4.37 ^r	2.62
World:						
Production ^c	138,000 ^r	138,000 ^r	144,000	140,000 ^r	145,000	
Trade ⁹	16,000	15,500	15,000	15,100	15,100	

^cEstimated. ^rRevised.

¹Data are rounded to no more than three significant digits.

²Synthetic anhydrous ammonia, excluding coke oven byproduct; data are for calendar year and are from the U.S. Census Bureau unless otherwise noted.

³Source: U.S. Census Bureau and The Fertilizer Institute; data adjusted by the U.S. Geological Survey.

⁴Source: The Fertilizer Institute; data adjusted by the U.S. Geological Survey.

⁵Calculated from production plus imports minus exports and industry stock changes.

⁶Source: Green Markets.

⁷Defined as imports minus exports; adjusted for industry stock changes.

⁸Source: Natural Gas Monthly, U.S. Energy Information Administration.

⁹Source: International Fertilizer Industry Association Statistics, World Anhydrous Ammonia Trade.

TABLE 2
ANHYDROUS AMMONIA SUPPLY AND DEMAND IN THE UNITED STATES¹

(Thousand metric tons of contained nitrogen)

	2013	2014	2015
Production:			
Fertilizer:			
January–June	4,000	4,170	4,220
July–December	4,070	4,030	4,220
Total	8,070	8,210	8,440
Nonfertilizer:			
January–June	546	569	576
July–December	555	550	575
Total	1,100	1,120	1,150
Grand total	9,170²	9,330²	9,590²
Exports:			
January–June	103	66	68
July–December	93	45	25
Total	196	111	93
Imports for consumption:			
January–June	2,760	2,040	2,330
July–December	2,200	2,110	1,980
Total	4,960	4,150	4,320
Stocks, end of period:			
January–June	220 ^c	190	320
July–December	240 ^c	280	420
Apparent consumption:³			
January–June	7,170	6,770	7,020
July–December	6,710	6,560	6,650
Total	13,900	13,300	13,700

^cEstimated.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

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

³Calculated from production plus imports minus exports and industry stock changes.

Source: U.S. Census Bureau.

TABLE 3
MAJOR DOWNSTREAM NITROGEN COMPOUNDS PRODUCED IN THE UNITED STATES^{1,2}

(Thousand metric tons)

	2014						2015					
	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
Urea ^c	2,730	1,250	2,500	1,150	5,230	2,400	2,890	1,330	2,640	1,210	5,540	2,540
Ammonium nitrate ^c	3,680	1,250	3,640	1,230	7,320	2,480	3,640	1,230	3,600	1,220	7,240	2,450
Ammonium phosphates ³	4,740	702	4,880	705	9,620	1,410	4,120	573	4,160	580	8,280	1,150
Nitric acid ^c	3,240	714	3,210	707	6,460	1,420	3,340	735	3,310	728	6,650	1,460
Ammonium sulfate ⁴	1,650	351	1,560	330	3,210	681	1,590	338	1,550	328	3,140	666

^cEstimated.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Ranked in relative order of importance by nitrogen content.

³Diammonium phosphate and monoammonium phosphate.

⁴Excludes coke plant ammonium sulfate.

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

TABLE 4
DOMESTIC PRODUCERS OF ANHYDROUS AMMONIA IN 2015¹

(Thousand metric tons per year of ammonia)

Company	Location	Capacity ²
Agrium Inc.	Borger, TX	490
Do.	Kenai, AK ³	280
Do.	Kennewick, WA ³	180
CF Industries Holdings, Inc.	Donaldsonville, LA	2,710
Do.	Port Neal, IA	345
Do.	Verdigris, OK	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
Green Valley Chemical Corp.	Creston, IA	32
Honeywell International Inc.	Hopewell, VA	530
Koch Nitrogen Co., LLC	Beatrice, NE	265
Do.	Dodge City, KS	280
Do.	Enid, OK	930
Do.	Fort Dodge, IA	350
LSB Industries, Inc.	Cherokee, AL	159
Do.	Pryor, OK	210
Mosaic Company, The	Faustina (Donaldsonville), LA	508
OCI Partners LP	Beaumont, TX	331
PCS Nitrogen, Inc.	Augusta, GA	785
Do.	Geismar, LA	450
Do.	Lima, OH	612
Rentech Energy Midwest Corp.	East Dubuque, IL	337
Total		12,800

Do. Ditto.

¹Data are rounded to no more than three significant digits; may not add to total shown.

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

³Idle.

TABLE 5
U.S. NITROGEN FERTILIZER CONSUMPTION, BY PRODUCT TYPE^{1,2}

(Thousand metric tons of contained nitrogen)

Fertilizer material ³	2014 ^p	2015 ^c
Single-nutrient:		
Anhydrous ammonia	2,770	2,760
Nitrogen solutions ⁴	3,170	3,150
Urea	2,570	2,560
Ammonium nitrate	238	237
Ammonium sulfate	287	286
Aqua ammonia	2	2
Other ⁵	427	425
Total	9,470	9,420
Multiple-nutrient ⁶	1,960	1,950
Grand total	11,400	11,400

^cEstimated. ^pPreliminary.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Fertilizer years ending June 30.

³Ranked in relative order of importance by product type.

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

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

⁶Various 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., November 15, 2016.

TABLE 6
PRICE QUOTATIONS FOR MAJOR NITROGEN COMPOUNDS AT END OF PERIOD

(Dollars per short ton)

Compound	2014		2015	
	June	December	June	December
Ammonium nitrate, free on board (f.o.b.) Corn Belt ¹	400–405	350–360	335–340	285–295
Ammonium sulfate, f.o.b. Corn Belt ¹	280–305	290–310	300–325	265–290
Anhydrous ammonia:				
F.o.b. Corn Belt ¹	570–650	570–640	505–590	445–470
F.o.b. Gulf Coast ²	540	565	460	420
Diammonium phosphate, f.o.b. central Florida	430–440	425–435	430	380–390
Urea:				
F.o.b. Corn Belt, ¹ prilled and granular	380–420	360–385	380–415	265–295
F.o.b. Gulf Coast, granular ²	350–395	322–333	290–360	225–230

¹Illinois, Indiana, Iowa, Missouri, Nebraska, and Ohio.

²Barge, New Orleans, LA.

Source: Green Markets.

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

(Thousand metric tons of contained nitrogen)

Material ¹	2014	2015
Ammonia:		
January–June	190	320
July–December	280	420
Nitrogen solutions: ²		
January–June	270	460
July–December	410	470
Urea:		
January–June	NA	NA
July–December	NA	NA
Ammonium phosphates: ³		
January–June	38	42
July–December	50	42
Ammonium nitrate:		
January–June	NA	NA
July–December	NA	NA
Ammonium sulfate:		
January–June	33	27
July–December	41	49
Yearend total ⁴	780	980

NA Not available.

¹Ranked in relative order of importance.

²Urea-ammonium nitrate and ammoniacal solutions.

³Diammonium and monoammonium phosphates.

⁴Calendar 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 COUNTRY¹

(Thousand metric tons of ammonia and thousand dollars)

Country	2014		2015	
	Gross weight	Value ²	Gross weight	Value ²
Belgium	(3)	1,160	34	14,200
Canada	84	5,530	2	1,140
Chile	10	6,180	49	19,300
Korea, Republic of	38	19,800	(3)	1,660
Mexico	2	90	17	12,000
Netherlands	(3)	28	11	3,160
Other	(3)	1,540 ³	(3)	1,480
Total	135	34,400	113	53,000

¹Revised.

²Data are rounded to no more than three significant digits; may not add to totals shown.

³Cost, insurance, and freight value.

⁴Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 9
U.S. IMPORTS OF ANHYDROUS AMMONIA, BY COUNTRY¹

(Thousand metric tons of ammonia and thousand dollars)

Country	2014		2015	
	Gross weight	Value ²	Gross weight	Value ²
Canada	917	640,000	1,130	717,000
Russia	205	116,000	438	200,000
Trinidad and Tobago	3,370	1,720,000	3,280	1,460,000
Ukraine	136	71,100	165	79,900
Venezuela	294	159,000	153	69,300
Other	124 ^r	71,700 ^r	79	36,500
Total	5,050	2,780,000	5,250	2,560,000

^rRevised.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Cost, insurance, and freight value.

Source: U.S. Census Bureau.

TABLE 10
U.S. EXPORTS OF MAJOR NITROGEN COMPOUNDS¹

(Thousand metric tons)

Compound	2014		2015		Principal destinations in 2015
	Gross weight	Nitrogen content	Gross weight	Nitrogen content	
Ammonium nitrate ²	442 ^r	150 ^r	448	152	Canada, 60%; Mexico, 26%.
Ammonium sulfate ²	1,260	267	973	206	Brazil, 41%; Peru, 16%; Canada, 11%.
Anhydrous ammonia	135	111	113	93	Chile, 43%; Belgium, 30; Mexico, 15%.
Diammonium phosphate	2,520 ^r	453	2,120	381	India, 30%; Brazil, 12%; Mexico, 10%; Colombia, 6%.
Monoammonium phosphate	2,150 ^r	237 ^r	2,290	251	Canada, 36%; Brazil, 30%; Australia, 14%.
Urea	451 ^r	207 ^r	380	174	Canada, 90%; Mexico, 3%; Netherlands, 3%.
Total	6,960 ^r	1,430 ^r	6,320	1,260	

^rRevised.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes industrial chemical products.

Source: U.S. Census Bureau.

TABLE 11
U.S. IMPORTS OF MAJOR NITROGEN COMPOUNDS¹

(Thousand metric tons and thousand dollars)

Compound	2014			2015			Principal sources in 2015
	Gross weight	Nitrogen content	Value ²	Gross weight	Nitrogen content	Value ²	
Ammonium nitrate ³	598	203	186,000	494	167	145,000	Canada, 69%; Netherlands, 12%; Russia, 8%.
Ammonium nitrate and limestone mixtures	66	18	17,500	40	11	11,000	Netherlands, 77%; Lithuania, 13%; Germany, 7%.
Ammonium sulfate ³	461	98	128,000	545	116	113,000	China, 60%; Canada, 34%.
Anhydrous ammonia ⁴	5,050	4,150	2,780,000	5,250	4,320	2,560,000	Trinidad and Tobago, 63%; Canada, 22%.
Calcium nitrate	64	11	10,200	78	13	11,400	Norway, 94%.
Diammonium phosphate	546 ^r	98 ^r	263,000 ^r	599	108	290,000	Morocco, 37%; China, 32%.
Monoammonium phosphate	935 ^r	101	477,000 ^r	582	64	300,000	Morocco, 36%; Russia, 30%; China, 25%.
Nitrogen solutions	3,120	934	871,000	3,110	930	792,000	Russia, 39%; Trinidad and Tobago, 25%; Canada, 14%; China, 12%.
Potassium nitrate	108	15	81,000	122	17	92,000	Chile, 85%; Germany, 12%.
Potassium nitrate and sodium nitrate mixtures	2	(5)	835	2	(5)	563	Canada, 65%; Mexico, 22%.
Sodium nitrate	112 ^r	18	37,000 ^r	114	19	40,300	Chile, 54%; Germany, 17%.
Urea	3,510	1,610	1,250,000	7,190	3,300	2,390,000	Qatar, 20%; Canada, 12%; United Arab Emirates, 12%.
Total	14,600 ^r	7,260 ^r	6,100,000 ^r	18,100	9,060	6,750,000	

^rRevised.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Cost, insurance, and freight value.

³Includes industrial chemical products.

⁴Includes industrial ammonia.

⁵Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 12
AMMONIA: ESTIMATED WORLD PRODUCTION, BY COUNTRY^{1,2}

(Thousand metric tons of contained nitrogen)

Country ³	2011	2012	2013	2014	2015
Afghanistan	27	50	76	60	39
Algeria	593 ⁴	713 ⁴	580 ^{r,4}	1,130 ^r	1,130
Argentina	600	600	600	600	600
Australia	1,200	1,250	1,250	1,250	1,300
Austria	400	400	400	400	400
Bahrain ⁴	380	341	378	454 ^r	416
Bangladesh ⁵	700	700	700	700	700
Belarus ⁴	927	950	967	1,019 ^r	1,060
Belgium	830	830	830	830	830
Brazil	950	950	950	950	950
Bulgaria	380	269 ^r	300 ^r	313 ^r	313
Canada	3,946 ⁴	3,942 ⁴	3,942 ⁴	4,000 ^r	4,000
China ⁴	43,250	45,520	48,326 ^r	45,642 ^r	49,706
Croatia ⁴	368	342	343	376	375
Cuba	45 ⁴	59 ⁴	64 ⁴	59 ^r	59
Czech Republic	107 ^{r,4}	116 ^{r,4}	153 ^{r,4}	175 ^{r,4}	180
Egypt	3,500	2,924 ⁴	2,655 ⁴	2,200 ^r	1,800
Estonia	-- ⁴	14 ^{r,4}	99 ^r	30 ^r	35
Finland	72 ⁴	78	78	78	78
France	3,500	2,644 ⁴	2,640 ^r	2,600	2,600
Georgia	145	150	150	170 ^r	190
Germany	2,821 ⁴	2,823 ⁴	2,757 ⁴	2,540 ^{r,4}	2,500
Greece	130	130	130	130	130
Hungary	300 ^r	300	300	300	300
India ⁶	10,500	10,650 ^{r,4}	10,840 ^{r,4}	10,780 ^{r,4}	10,800
Indonesia	5,000	5,100	5,000	5,000	5,000
Iran	2,500	2,500	2,500	2,500	2,500
Iraq ⁴	143	143	146	182 ^r	165
Italy	460	590	570	570	570
Japan	995 ⁴	867 ⁴	828 ⁴	787 ⁴	790
Korea, North	217 ^r	219 ^r	231 ^r	230 ^r	243
Kuwait ⁴	521 ^r	451 ^r	552 ^r	542 ^r	450
Libya ⁴	22	67	124	208 ^r	266
Lithuania ⁴	870	918	693	815	876
Malaysia	950	1,000	1,000	1,000	1,000
Mexico	709 ^{r,4}	772 ^{r,4}	1,136 ^{r,4}	1,089 ^{r,4}	1,100
Netherlands	1,800	1,800	1,800	1,800	1,800
New Zealand	120	125	125	125	125
Norway	300	300	300	300	300
Oman	1,700 ^r	1,600 ^r	1,700 ^r	1,700 ^r	1,700
Pakistan	2,700	2,300	2,700	2,600 ^r	2,600
Peru	5	5	5	5	5
Poland	1,918 ⁴	2,026 ⁴	2,100	2,200 ^r	2,200
Qatar ⁴	1,885 ^r	2,619 ^r	2,986 ^r	2,972 ^r	3,048
Romania	160	115	85	100 ^r	28
Russia	11,418 ⁴	11,345 ⁴	11,836 ⁴	12,000 ^r	12,000
Saudi Arabia	3,100	3,250 ^{r,4}	3,185 ^{r,4}	3,600 ^r	4,100
Serbia ⁴	161 ^r	170 ^r	202 ^r	109 ^r	89
Slovakia ⁴	487	486	480	486	468
South Africa	620 ^r	620 ^r	620 ^r	620 ^r	620
Spain	400	400	400	400	400
Switzerland	30	30	30	30	30
Syria	85 ⁴	50	50	50	--
Trinidad and Tobago	5,444 ⁴	4,466 ⁴	4,640	4,730	4,905 ⁴
Turkey	200	280	280	300 ^r	300
Turkmenistan	270	280	285	293	309
Ukraine	4,300	4,160	4,237 ⁴	2,400 ^r	2,400
United Arab Emirates ⁴	386	330	658	988 ^r	980

See footnotes at end of table.

TABLE 12—Continued
 AMMONIA: ESTIMATED WORLD PRODUCTION, BY COUNTRY^{1,2}

(Thousand metric tons of contained nitrogen)

Country ³	2011	2012	2013	2014	2015
United Kingdom	600 ^r	800 ^r	800 ^r	800 ^r	800
United States ^{4,7}	9,350	8,730	9,170	9,330	9,590
Uzbekistan	1,294 ⁴	1,300	1,350	1,200 ^r	1,200
Venezuela	1,200	1,200	1,200	1,100 ^r	1,000
Vietnam	300	300	300	300	300
Zimbabwe	26	25	27	96 ^r	96
World total	138,000 ^r	138,000 ^r	144,000	140,000 ^r	145,000

^rRevised. -- Zero.

¹World totals, U.S. data, and estimated data have been rounded to no more than three significant digits; may not add to totals shown.

²Includes data available through February 10, 2017.

³In addition to the countries listed, Burma, Portugal, Taiwan, and Tajikistan produced ammonia, but available information was inadequate to make reliable estimates of output.

⁴Reported figure.

⁵May include nitrogen content of urea.

⁶Data are for years beginning April 1 of that stated.

⁷Synthetic anhydrous ammonia; excludes coke oven byproduct ammonia.