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Nitrogen

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In 2014, U.S. ammonia production contained 9.33 million metric tons (Mt) of nitrogen, slightly more than production in 2013, and apparent consumption decreased by 4% from that in 2013 (table 1). According to the U.S. Census Bureau, exports of ammonia decreased by 43% from those in 2013, and imports decreased by 16% from those of 2013 (tables 8, 9). Export amounts were very small at 111,000 metric tons (t) compared with 4.15 Mt of imports. Most of the imports in 2014 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 2014, which was estimated to contain 145 Mt of nitrogen, was slightly higher than that in 2013. China, India, Russia, and the United States were the leading producers, together accounting for about 55% of the total. In the United States, the increased supply of shale gas has lowered prices for domestic natural gas, which resulted in significant interest in 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 crop plants, such as alfalfa, soybeans, garden peas, and peanuts, 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 their nitrogen in the ammonium and (or) nitrate form or in a form that is quickly converted to these forms 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 is derived from a variety of raw materials, including water and crude oil, coal, or natural gas hydrocarbons. Other nitrogen fertilizers are produced from ammonia feedstock through a variety of chemical processes.

Legislation and Government Programs

The Agricultural Act of 2014 (2014 Farm Act) was signed into law by the President of the United States on February 7, 2014, and will remain in effect through 2018. This is the primary legal framework for agriculture policy. The 2014 Farm Act made major changes in commodity programs, added new crop insurance options, streamlined conservation programs, modified key provisions of the Supplemental Nutrition Assistance Program, and expanded programs for specialty crops, organic farmers, bioenergy, rural development, and beginning farmers and ranchers.

The 2014 Farm Act replaced direct payment farm subsidies with a two-tiered crop insurance program. An estimated $18 billion in savings over 10 years would come through the crop subsidy reform, which eliminated direct payments to farmers whether they grow crops or not. The new crop insurance program was to be expanded by $7 billion over the next decade. This program creates an Agricultural Risk Coverage and a Supplemental Coverage option, which were designed to compensate famers only if they have agricultural losses related to disasters (U.S. Department of Agriculture, Economic Research Service, 2014).

On December 18, 2014, the President signed into law the Protecting and Securing Chemical Facilities from Terrorist Attacks Act of 2014 (CFATS Act of 2014), which recodified and reauthorized the CFATS program for 4 years. The CFATS Act of 2014 added new provisions while preserving existing regulations and also established an expedited approval program for approving site security plans more quickly. Some of the chemicals of concern included ammonium nitrate, anhydrous ammonia, aqua ammonia, potassium nitrate, and sodium nitrate (U.S. Department of Homeland Security, 2014).

Production

Industry statistics for anhydrous ammonia and derivative products, including the third and fourth quarters of 2011 and all of 2012, 2013, and 2014, 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 2014, production of anhydrous ammonia (82.2% nitrogen) increased slightly to 9.33 Mt of contained nitrogen compared with 9.17 Mt in 2013 (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, ammonium nitrate, urea, 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 8.39 Mt of contained nitrogen, with ammonium nitrate and urea each accounting for about 29% of the total production; nitric acid, 17%; ammonium phosphates, 17%; and ammonium sulfate, 8% (table 3).

Ammonia producers in the United States operated at about 80% of design capacity in 2014; 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 2014. More than 55% of U.S. ammonia production capacity was concentrated in Louisiana (29%), Oklahoma (20%), and Texas (6%), where there are large reserves of feedstock natural gas. 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).

Agrium awarded KBR, Inc. two engineering, procurement, and construction (EPC) contracts, one for a new greenfield urea plant and one to increase the ammonia capacity for Agrium's Lone Star Project in Borger, TX, at a cost of $720 million. The facility would add new urea production of approximately 610,000 metric tons per year (t/yr) and increase the ammonia capacity to 635,000 t/yr. Construction of the expansion began in March 2014 and was expected to be completed by the second half of 2015 (Green Markets, 2014a).

EuroChem Group AG purchased land near Carville in Iberville Parish, LA, as a potential site for its new $1.5 billion, 800,000-t/yr ammonia-urea complex. EuroChem planned to begin construction in 2015 and complete the ammonia-urea complex by 2019 (Nitrogen + Syngas, 2014f).

Stamicarbon B.V. signed a license agreement with Dakota Gasification Co. for the construction of a brownfield urea melt, granulation, and diesel exhaust fluid (aqueous solution of 32.5% urea and de-ionized water) plant at its Great Plains Synfuels site at Beulah, ND. The urea melt and granulation plants would each have a capacity of 330,000 t/yr. The plants were planned to start up in early 2017 (Nitrogen + Syngas, 2014h).

Maire Tecnimont S.p.A. (Tecnimont) signed a memorandum of understanding with Pakistan's Fatima Group Principals and Midwest Fertilizer Corp. to build a large-scale, greenfield fertilizer complex in Mount Vernon, Posey County, IN, at a cost of $1.6 billion. The complex would consist of a 2,200-metric-ton-per-day (t/d) ammonia plant based on KBR technology, a 2,200-t/d urea synthesis plant, a 1,200-t/d urea granulation plant, a 4,300-t/d urea ammonium nitrate plant, and a 900-t/d diesel exhaust fluid plant based on Stamicarbon's technology. The project was expected to be completed by the fourth quarter of 2017 (Fertilizer Week, 2014c).

Egypt Kuwait Holding Co. planned to build a $2.3 billion fertilizer plant in Idaho. The site would produce 1.3 million metric tons per year (Mt/yr) of ammonia, urea, and urea-ammonium nitrate. Production at the plant was expected to begin in 2018 (Nitrogen + Syngas, 2014e).

JR Simplot Co. planned to build a new $300 million ammonia plant at its existing phosphate fertilizer complex in Rock Springs, WY. The 600-t/d ammonia unit would supply both the Rock Springs and Pocatello ammonium phosphate plants. Linde Engineering North America Inc. was awarded the contract to design and build the plant, which would use natural gas as the feedstock. Construction was expected to be completed by 2016 (Nitrogen + Syngas, 2014g).

Farmers cooperative CHS Inc. planned to build a $3 billion fertilizer complex near Jamestown, ND, using gas from North Dakota's tight oil production. The plant would produce 2,200 t/d of anhydrous ammonia as well as downstream nitrogen products. The nitrogen products would include urea, urea-ammonium nitrate, and diesel exhaust fluid. Plant construction was expected to begin in 2014 and would be operational by 2018 (Nitrogen + Syngas, 2014d).

KBR was awarded license and engineering contracts to perform front-end engineering and design for an expansion of The Mosaic Company's ammonia plant in St. James, LA. KBR would debottleneck the plant and increase ammonia production capacity by 20% (Nitrogen + Syngas, 2015b).

Tecnimont signed a memorandum of understanding with Cronus Chemicals LLC, which would later be converted to an EPC contract to build a 2,200-t/d ammonia and a 3,850-t/d urea plant in Tuscola, IL, at a cost of $1.5 billion. Ammonia technology would be licensed from KBR and the urea technology from Tecnimont. Project completion was expected to take 37 months after the EPC contract was implemented (Nitrogen + Syngas, 2015c).

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 (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 (Virginia Institute of Marine Science, 2015).

Consumption

In 2014, U.S. apparent consumption of ammonia was 13.3 Mt of contained nitrogen, a 4% decrease from that of 2013. Apparent consumption is calculated as production plus imports minus exports, adjusted to reflect any stock changes.

Consumption of nitrogen fertilizers in the United States for the 2014 crop year (ending June 30, 2014) is listed in table 5. Consumption of fertilizers was estimated to be 11.7 Mt of contained nitrogen, which was a slight decrease compared with that of 2013. 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 25% and 27% of fertilizer consumption, respectively. Urea (45.9% nitrogen) constituted 22% of the nitrogen fertilizer consumption during the 2014 crop year. Ammonium nitrate (33.9% nitrogen) and ammonium sulfate each constituted 2% of 2014 nitrogen fertilizer consumption. The remaining 22% consisted of multiple-nutrient (various combinations of nitrogen, phosphate, and potassium) and other nitrogen fertilizers. The leading nitrogen-consuming States in the 2014 crop year were, in descending order, Iowa, Illinois, North Dakota, Nebraska, Minnesota, California, and Kansas, accounting for about 50% of total fertilizer consumption (J.V. Slater, Association of American Plant Food Control Officials Inc., written commun., November 10, 2015).

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 the Gulf Central 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 2014, about 1.3 Mt of ammonia was shipped through the Gulf Central ammonia pipeline (NuStar Energy L.P., 2015, 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., 2015). 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 2014 at $450 per short ton ($496 per metric ton) and reached the high for the year of $580 per short ton ($639 per metric ton) in early April; at yearend, the price was $565 per short ton ($623 per metric ton), a 26% increase in yearend price from that of 2013.

The average granular urea price fluctuated throughout 2014, beginning the year at $347 per short ton ($382 per metric ton). The average price reached a high of $428 per short ton ($472 per metric ton) in early March. At yearend, the average urea price was $328 per short ton ($362 per metric ton).

The average ammonium nitrate price, which began 2014 at $335 per short ton ($369 per metric ton), fluctuated throughout most of the year. The average price rose to $410 per short ton ($452 per metric ton) by late May and then declined to $355 per short ton ($391 per metric 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 portion of the material 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 2014 at about $270 per short ton ($298 per metric ton), which was the lowest average price for the year. The ammonium sulfate average price fluctuated throughout the year. By yearend, the price averaged $300 per short ton ($331 per metric ton).

In 2014, the annual average price paid index for all types of fertilizers decreased slightly from the 2013 index (U.S. Department of Agriculture, Economic Research Service, 2015a). Fertilizer prices decreased as a result of the increase in available supply and not as a result of decreased demand for fertilizers.

Stocks of ammonia at yearend 2014 were estimated to be 280,000 t, a 17% increase from comparable stocks at yearend 2013 (table 7).

Foreign Trade

Ammonia exports decreased by 43% compared with those in 2013 (table 8). Canada, Chile, and the Republic of Korea were the leading destinations for U.S. exports of ammonia, accounting for 98% of the total.

Ammonia imports decreased by 16% compared with those in 2013 and dwarfed the quantity of exports. The average value of ammonia imports decreased to about $551 per metric ton from $588 per metric ton in 2013 (table 9). Trinidad and Tobago (67%) continued to be the leading import source. Canada (18%), Venezuela (6%), and Russia (4%) 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 anhydrous ammonia and DAP decreased in 2014, and exports of ammonium nitrate, ammonium sulfate, MAP, and urea increased. Imports of nitrogen materials in 2014 decreased compared with those in 2013 for about one-half of the nitrogen compounds. Imports of ammonium sulfate, calcium nitrate, DAP, MAP, potassium nitrate, potassium nitrate/sodium nitrate mixtures, and sodium nitrate increased.

World Review

Anhydrous ammonia and other nitrogen materials were produced in more than 60 countries. Global ammonia production in 2014, estimated to be 145 Mt, increased slightly compared with that of 2013 (table 12). China, with 33% of total production, was the leading world producer of ammonia. Asia contributed 48% of total world ammonia production, and the Commonwealth of Independent States (CIS), Estonia, and Lithuania produced 16% of the global total. North America produced 10% of the total; the Middle East, 8%; Western Europe, 8%; the Caribbean, Central America, and South America, 5%; and Africa, Eastern Europe, and Oceania the remaining 5%.

In 2014, world ammonia exports, estimated to be 15.0 Mt of contained nitrogen, increased slightly compared with those in 2013. Russia, Saudi Arabia, and Trinidad and Tobago accounted for about one-half of world exports. Asia (primarily India) imported about one-third of global ammonia trade, followed by North America and Western Europe (International Fertilizer Industry Association, 2015).

Brazil.—Toyo Engineering Corp., in cooperation with SOG-Óleo e Gás S.A., was awarded a contract from Petróleo Brasileiro S.A. to construct a new ammonia plant in Uberaba, Minas Gerais State, in southeastern Brazil. The plant capacity was expected to be 1,500 t/d of ammonia using natural gas as the feedstock. The plant was scheduled to be completed in the first half of 2017 (Toyo Engineering Corp., 2014).

Canada.—IFFCO Ltd. received permission from the government of Quebec to build a 1.6-Mt/yr urea plant and a 760,000-t/yr diesel exhaust fluid plant in Becancour near Montreal. The project was expected to cost $1.6 billion and was scheduled to be operational by 2017 (Fertilizer Week, 2014b).

Tecnimont was awarded an open book design and supply cost estimate by Ganotec Inc. initially as a phased contract that would be converted to a full EPC contract for a new fertilizer plant in Becancour Waterfront Industrial Park in Quebec. The fertilizer plant would include a 2,200-t/d ammonia plant based on KBR technology and a 3,850-t/d granular urea plant based on Tecnimont's Stamicarbon technology. No timetable for the building of the new fertilizer plant was announced (Nitrogen + Syngas, 2014b).

Farmers of North America (FNA) Fertilizer LLP planned to build a $1.7 billion nitrogen complex near Belle Plaine, Saskatchewan. The capacity would be 2,400 t/d of ammonia, 3,425 t/d of urea, and 1,215 t/d of UAN. The nitrogen complex would supply fertilizers to farmers in western Canada. No timetable for the building of the nitrogen complex was announced (Nitrogen + Syngas, 2014a).

China.—In December 2014, the Government of China released its 2015 export tariff rates for many products, including anhydrous ammonia and urea. The main change from the 2014 export tariff rates was that the taxation rate for the full year would be flat; there would be no high or low season adjustments. The export tariff rate for ammonia would be at RMB180 per metric ton and for urea would be at RMB80 per metric ton (Fertilizer Week, 2014a).

India.—Coal India Ltd. entered into two joint ventures with the Gas Association of India Ltd. (GAIL), Fertilizer Corporation of India, Ltd. (FCIL), and Rashtriya Chemicals and Fertilizers Ltd. (RCF) for an integrated coal gasification fertilizer and ammonium nitrate complex at Talcher, Odisha. The first joint venture would be handled by GAIL for the upstream coal gasification and gas purification production of synthetic gas (syngas) at a cost of $480 million. The second joint venture (Talcher Chemicals & Fertilizer Ltd., RCF, and FCIL) would develop the ammonia, urea, nitric acid, and ammonia nitrate plants at an estimated cost of $480 million. Capacities at the complex would be 2,700 t/d of ammonia, 3,850 t/d of urea, 850 t/d of nitric acid, and 1,000 t/d of ammonium nitrate. Construction was to begin in 2015 and was expected to be completed by 2019 (Nitrogen + Syngas, 2015a).

Nigeria.—Brass Fertilizer Co. Ltd. and a Danish consortium led by Haldor Topsøe A/S announced that they had signed an agreement to design and construct a $3.5 billion urea, methanol, and gas processing plant on Brass Island, Bayelsa State. The plant was expected to be operational by 2018 and would produce 3,850 t/d of urea and 5,000 t/d of methanol (Green Markets, 2014c).

Russia.—Haldor Topsøe was to construct a new methanol ammonia plant for the petrochemical company Shchekinoazot, LLC. The plant would be built in the Tula region of Russia and would be the world's first methanol ammonia plant using Haldor Topsøe's integrated methanol and ammonia production technology. Capacity of the plant would be 1,350 t/d of methanol and 415 t/d of ammonia. Basic design was scheduled to be completed in 2014 and the plant was expected to be operational by 2017 (Haldor Topsøe A/S, 2014).

Turkmenistan.—Mitsubishi Heavy Industries, Ltd. and Haldor Topsøe were selected to design a new ammonia-urea plant for Turkmenhimiya State Concern. The plant would be built in Garabogaz on the coast of the Caspian Sea. The plant would become the largest ammonia-urea plant in Turkmenistan and was scheduled to be operational by June 2018. Capacity would be 2,000 t/d of ammonia and 3,500 t/d of urea (Nitrogen + Syngas, 2014c).

Venezuela.—Petroquimica de Venezuela S.A., Brazil's Braskem S.A., and construction company Norberto Odebrecht S.A. announced that they would build a $1.4 billion ammonia and urea complex at the Jose Antonio Anzoategui Petrochemical Complex in eastern Venezuela. The project, called Fertisur, would produce 1.55 Mt/yr of granular urea. Construction of the complex was expected to begin in 2015 and be completed by late 2018 (Green Markets, 2014b).

Vietnam.—Vietnam Oil and Gas Group (PetroVietnam) planned to invest $230 million in expanding ammonia production and moving into downstream nitrogen, phosphorus, and potassium (N-P-K) production at its existing ammonia plant in Phu My. Ammonia capacity would be increased from 450,000 t/yr to 540,000 t/yr and a new 250,000-t/yr N-P-K plant would be constructed at the site. The plant was scheduled to be operational by 2016 (Nitrogen + Syngas, 2014i).

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 36.1 million hectares (Mha) of corn for all purposes in the 2015 crop year, a 2% decrease from that in 2014, which would be the third consecutive year of an acreage decline and the lowest planted acreage of corn in the United States since 2010. Corn acreage utilization is projected to decrease in most of the Corn Belt with the exceptions of Minnesota and Wisconsin. Acreage in Nebraska is expected to be unchanged (U.S. Department of Agriculture, National Agricultural Statistics Service, 2015, 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 but, during the remainder of the projection period (2014–24), 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 decline as a result of weak demand, a trend that began in the early 1980s.

Continued high levels of domestic corn-based ethanol production and gains in exports were projected to keep demand for corn high. Most U.S. ethanol production used corn as a feedstock, with about 35% of total corn use expected to go to ethanol production through 2024. Almost no gains for corn-based ethanol are projected during the 10-year period compared with those of recent years (U.S. Department of Agriculture, Economic Research Service, 2015b, p. 53–72).

In 2014, Henry Hub natural gas prices were about $4.40 per million British thermal units (Btu) compared to $3.70 per million Btu in 2013 and $2.80 per million Btu in 2012 (U.S. Energy Information Administration, 2016). 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 potential greenfield nitrogen projects. The Middle East, North Africa, and Russia have large supplies of lower cost natural gas compared to other countries, which give them a cost advantage in producing and exporting ammonia. Western Europe, Ukraine, and China 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 global marketplace (Potash Corp. of Saskatchewan Inc., 2015, p. 55). The U.S. Department of Energy projected that the Henry Hub natural gas spot price in the United States would average $2.67 per million Btu in 2015, a decrease of $1.80 per million Btu from the 2014 average, and $2.88 per million Btu in 2016 (U.S. Energy Information Administration, 2015, p. 9).

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. U.S. ammonia capacity is expected to increase by about 30%, which would translate into lower U.S. imports of nitrogen production and the potential for increased exports of urea and UAN (Prud'homme, 2015).

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TABLE 1
SALIENT AMMONIA STATISTICS[1, 2]

(Thousand metric tons of contained nitrogen unless otherwise specified)

		2010	2011	2012	2013	2014
United States:						
Production		8,290	9,350 [3]	8,730 [4]	9,170 [4]	9,330 [4]
Exports		36	26	31	196	111
Imports for consumption		5,540	5,600	5,170	4,960	4,150
Consumption, apparent[5]		13,800	14,900	13,900	13,900	13,300
Stocks, December 31, producers		165	178 [e]	180 [e]	240 [e]	280
Average annual price, free on board gulf coast[6]	dollars per short ton	396	531	579	541	531
Net import reliance as a percentage of apparent consumption[7]		40	37	37	34	30
Natural gas price, wellhead, average price[8]	dollars per million Btu[9]	4.37	4.00	2.75	3.73	4.39
World:						
Production[e]		132,000 [r]	139,000 [r]	142,000	144,000	145,000
Trade[10]		16,000	16,000	15,500 [r]	15,000	15,100

[e]Estimated. [r]Revised.
[1]Data are rounded to no more than three significant digits.
[2]Synthetic anhydrous ammonia, excluding coke oven byproduct; data are for calendar year and are from the U.S. Census Bureau unless otherwise noted.
[3]Source: U.S. Census Bureau and The Fertilizer Institute; data adjusted by the U.S. Geological Survey.
[4]Source: The Fertilizer Institute; data adjusted by the U.S. Geological Survey.
[5]Calculated from production plus imports minus exports and industry stock changes.
[6]Source: Green Markets.
[7]Defined as imports minus exports; adjusted for industry stock changes.
[8]Source: Natural Gas Monthly, U.S. Energy Information Administration.
[9]British thermal unit.
[10]Source: International Fertilizer Industry Association Statistics, World Anhydrous Ammonia Trade.

TABLE 2

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

(Thousand metric tons of contained nitrogen)

	2012	2013	2014
Production:			
Fertilizer:			
January–June	3,860	4,000	4,170
July–December	3,740	4,070	4,030
Total	7,600	8,070	8,210
Nonfertilizer:			
January–June	568 e	546	569
July–December	567 e	555	550
Total	1,140 e	1,100	1,120
Grand total	8,730 [2]	9,170 [2]	9,330 [2]
Exports:			
January–June	19	103	66
July–December	12	93	45
Total	31	196	111
Imports for consumption:			
January–June	2,580	2,760	2,040
July–December	2,590	2,200	2,110
Total	5,170	4,960	4,150
Stocks, end of period:			
January–June	170 e	220 e	190
July–December	180 e	240 e	280
Apparent consumption:[3]			
January–June	6,980	7,170	6,770
July–December	6,880	6,710	6,560
Total	13,900	13,900	13,300

[e]Estimated.

[1]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]Calculated 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)

	2013						2014					
	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[e]	2,860	1,320	2,620	1,200	5,480	2,520	2,730	1,250	2,500	1,150	5,230	2,400
Ammonium nitrate[e]	3,670	1,240	3,630	1,230	7,290	2,470	3,680	1,250	3,640	1,230	7,320	2,480
Ammonium phosphates[3]	5,260	788	4,970	827	10,200	1,620	4,740	702	4,880	705	9,620	1,410
Nitric acid[e]	3,380	743	3,350	736	6,730	1,480	3,240	714	3,210	707	6,460	1,420
Ammonium sulfate[4]	1,570	333	1,590	336	3,160	669	1,650	351	1,560	330	3,210	681

[e]Estimated.

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

[2]Ranked in relative order of importance by nitrogen content.

[3]Diammonium phosphate and monoammonium phosphate.

[4]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 2014[1]

(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.

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

(Thousand metric tons of nitrogen)

Fertilizer material[3]	2013 [r, p]	2014[e]
Single-nutrient:		
Anhydrous ammonia	2,960	2,900
Nitrogen solutions[4]	3,170	3,110
Urea	2,680	2,630
Ammonium nitrate	260	255
Ammonium sulfate	285	279
Aqua ammonia	62	61
Other[5]	658	645
Total	10,100	9,880
Multiple-nutrient[6]	1,850	1,810
Grand total	11,900	11,700

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Fertilizer years ending June 30.
[3]Ranked in relative order of importance by product type.
[4]Principally urea-ammonium nitrate solutions, 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., November 10, 2015.

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

(Dollars per short ton)

	2013		2014	
Compound	June	December	June	December
Ammonium nitrate, free on board (f.o.b.) Corn Belt[1]	400–405	335	400–405	350–360
Ammonium sulfate, f.o.b. Corn Belt[1]	365–405	255–280	280–305	290–310
Anhydrous ammonia:				
F.o.b. Corn Belt[1]	560–720	510–550	570–650	570–640
F.o.b. Gulf Coast[2]	600	450	540	565
Diammonium phosphate, f.o.b. central Florida	435–450	345	430–440	425–435
Urea:				
F.o.b. Corn Belt,[1] prilled and granular	360–410	370–380	380–420	360–385
F.o.b. Gulf Coast, granular[2]	315–327	325–342	350–395	322–333

[1]Illinois, Indiana, Iowa, Missouri, Nebraska, and Ohio.
[2]Barge, 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]	2013	2014
Ammonia:		
January–June	220 [e]	190
July–December	240 [e]	280
Nitrogen solutions:[2]		
January–June	360	270
July–December	370	410
Urea:		
January–June	NA	NA
July–December	NA	NA
Ammonium phosphates:[3]		
January–June	42	38
July–December	58	50
Ammonium nitrate:		
January–June	NA	NA
July–December	NA	NA
Ammonium sulfate:		
January–June	49	33
July–December	63	41
Yearend total[4]	730	780

[e]Estimated. NA Not available.
[1]Ranked in relative order of importance.
[2]Urea-ammonium nitrate and ammoniacal solutions.
[3]Diammonium and monoammonium phosphates.
[4]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[1]

(Thousand metric tons of ammonia and thousand dollars)

	2013		2014	
Country	Gross weight	Value[2]	Gross weight	Value[2]
Belgium	62	8,870	(3)	1,160
Canada	57	10,600	84	5,530
Chile	25	9,880	10	6,180
Ireland	20	138	(3)	151
Israel	15	375	(3)	471
Korea, Republic of	1	1,880	38	19,800
Mexico	(3)	7	2	90
Morocco	57	23,200	--	--
Other	1	1,400 [r]	(3)	944
Total	238	56,300	135	34,400

[r]Revised. -- Zero.
[1]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[1]

(Thousand metric tons of ammonia and thousand dollars)

Country	2013 Gross weight	2013 Value[2]	2014 Gross weight	2014 Value[2]
Canada	1,210	912,000	917	640,000
Russia	430	255,000	205	116,000
Saudi Arabia	79	43,000	80	48,300
Trinidad and Tobago	3,460	1,840,000	3,370	1,720,000
Ukraine	460	271,000	136	71,100
Venezuela	156	82,500	294	159,000
Other	234	141,000	43	23,400
Total	6,030	3,550,000	5,050	2,780,000

[1]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	2013 Gross weight	2013 Nitrogen content	2014 Gross weight	2014 Nitrogen content	Principal destinations in 2014
Ammonium nitrate[2]	388	132	441	149	Canada, 64%; Mexico, 20%.
Ammonium sulfate[2]	1,160	247	1,260	267	Brazil, 48%; Peru, 9%; Mexico, 8%.
Anhydrous ammonia	238	196	135	111	Canada, 62%; Republic of Korea, 28%.
Diammonium phosphate	3,200	576 r	2,510	453	India, 24%; Brazil, 17%; Mexico, 9%; Peru, 7%.
Monoammonium phosphate	1,920	211	2,140	236	Canada, 36%; Brazil, 30%; Australia, 12%.
Urea	335 r	154 r	339	156	Canada, 85%; Mexico, 6%.
Total	7,240 r	1,520 r	6,830	1,370	

[r]Revised.
[1]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)

	2013			2014			
Compound	Gross weight	Nitrogen content	Value[2]	Gross weight	Nitrogen content	Value[2]	Principal sources in 2014
Ammonium nitrate[3]	646	219	197,000	598	203	186,000	Canada, 59%; Netherlands, 22%; Georgia, 15%.
Ammonium nitrate and limestone mixtures	68	18	19,400	66	18	17,500	Netherlands, 68%; Lithuania, 12%; Germany, 10%.
Ammonium sulfate[3]	300	64	91,400	461	98	128,000	Canada, 55%; China, 45%.
Anhydrous ammonia[4]	6,030	4,960	3,550,000	5,050	4,150	2,780,000	Trinidad and Tobago, 67%; Canada, 18%.
Calcium nitrate	53	9	9,890	64	11	10,200	Norway, 94%.
Diammonium phosphate	135	24	74,600	479	86	232,000	China, 69%; Morocco, 17%.
Monoammonium phosphate	669	74	353,000	921	101	471,000	Morocco, 36%; Russia, 30%; China, 25%.
Nitrogen solutions	3,160	945	1,020,000	3,120	934	871,000	Russia, 42%; Trinidad and Tobago, 25%; Canada, 12%.
Potassium nitrate	79	11	60,800	108	15	81,000	Chile, 84%; Germany, 13%.
Potassium nitrate and sodium nitrate mixtures	1	(5)	600	2	(5)	835	Canada, 78%; Israel, 16%.
Sodium nitrate	59 r	10	39,000 r	108	18	34,000	Chile, 84%; Germany, 11%.
Urea	6,470	2,970	2,620,000	3,510	1,610	1,250,000	Qatar, 22%; China, 21%; Canada, 12%.
Total	17,700	9,300	8,030,000	14,500	7,240	6,060,000	

[r]Revised.

[1]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: ESTIMATED WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons, contained nitrogen)

Country[3]	2010	2011	2012	2013	2014
Afghanistan	27 [4]	27	50	76	60
Algeria	600 [4]	593 [4]	713 [4]	509 [4]	500
Argentina	600	600	600	600	600
Australia	1,200	1,200	1,250	1,250	1,250
Austria	400	400	400	400	400
Bahrain[4]	357	380	341	378	380
Bangladesh[5]	700	700	700	700	700
Belarus[4]	891	927	950	967	1,064
Belgium	830	830	830	830	830
Brazil	950	950	950	950	950
Bulgaria	260	380	320	320	320
Burma	NA [r]	NA [r]	NA [r]	NA [r]	NA
Canada	3,620	3,946 [4]	3,942 [4]	3,942 [4]	3,940
China	40,870 [4]	43,250 [4]	45,520 [4]	47,310 [4]	47,300
Croatia[4]	361	368	342	343	376
Cuba	36 [4]	45 [4]	59 [4]	64	64
Czech Republic[4]	120	106	115	152	150
Egypt	3,000	3,500	2,924 [4]	2,655 [4]	2,660
Estonia	-- [r, 4]	-- [r, 4]	3,333 [r, 4]	3,000 [r]	3,000
Finland	78 [4]	72 [4]	78	78	78
France	3,517 [4]	3,500	2,644 [4]	2,600	2,600
Georgia	150	145	150	150	160
Germany	2,677 [4]	2,821 [4]	2,823 [4]	2,757 [4]	2,800
Greece	130	130	130	130	130
Hungary	260 [4]	250	300	300	300
India[6]	10,600 [r]	10,500 [r]	10,700 [r]	10,800 [r]	11,000
Indonesia	4,800	5,000	5,100	5,000	5,000
Iran	2,500	2,500	2,500	2,500	2,500
Iraq[4]	126	143	143	146	105
Italy	460	460	590 [r]	570 [r]	570
Japan[4]	968 [r]	995 [r]	867 [r]	828 [r]	787
Korea, North	100	100	100	100	100
Kuwait	500 [r]	520	490	540 [r]	540
Libya[4]	64 [r]	22 [r]	67 [r]	124 [r]	108
Lithuania[4]	434	870	918	693	815
Malaysia	950	950	1,000	1,000	1,000
Mexico	824 [4]	766 [4]	880 [4]	879	880
Netherlands	1,800	1,800	1,800	1,800	1,800
New Zealand	120	120	125	125	125
Norway	300 [4]	300	300	300	300
Oman	1,100	1,100	1,100	1,100	1,100
Pakistan	2,800 [r]	2,700 [r]	2,300 [r]	2,700 [r]	2,700
Peru	5	5	5	5	5
Poland	1,700 [4]	1,918 [4]	2,026 [4]	2,100	2,100
Portugal	NA [r]	NA [r]	NA [r]	NA [r]	NA
Qatar	1,883 [4]	1,919 [4]	2,665 [4]	2,985 [4]	2,990
Romania	80	160	115	85	85
Russia	10,902 [4]	11,418 [4]	11,345 [4]	11,836 [4]	11,800
Saudi Arabia	2,600 [r]	3,100 [r]	3,700 [4]	3,209 [r, 4]	3,200
Serbia	84	132	130	130	130
Slovakia	493 [4]	487 [r, 4]	486 [r, 4]	480 [r, 4]	486
South Africa	470	470	550	600	600
Spain	400	400	400	400	400
Switzerland	30	30	30	30	30
Syria	169 [4]	85 [4]	50	50	50
Trinidad and Tobago	5,553 [4]	5,444 [4]	4,466 [4]	4,640	4,730

See footnotes at end of table.

TABLE 12—Continued

AMMONIA: ESTIMATED WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons, contained nitrogen)

Country[3]	2010	2011	2012	2013	2014
Turkey	200 r	200 r	280 r	280 r	280
Turkmenistan	270	270	280	285	293
Ukraine	3,400	4,300	4,160	4,237 4	4,240
United Arab Emirates[4]	392	386	330	658	650
United Kingdom	1,100	1,100	1,100	1,100	1,100
United States[4, 7]	8,290	9,350	8,730	9,170	9,330
Uzbekistan	1,344 4	1,294 4	1,300	1,350	1,350
Venezuela	1,160	1,200	1,200	1,200	1,200
Vietnam	300	300	300	300	300
Zimbabwe	29	26	25	27	27
Total	132,000 r	139,000 r	142,000	144,000	145,000

[r]Revised. NA Not available. -- Zero.

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

[2]Includes data available through June 29, 2016.

[3]In addition to the countries listed, Taiwan and Tajikistan produced ammonia, but available information is inadequate to make reliable estimates of output levels.

[4]Reported figure.

[5]May include nitrogen content of urea.

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

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