

## NITROGEN (FIXED)—AMMONIA

(Data in thousand metric tons of contained nitrogen unless otherwise noted)

**Domestic Production and Use:** Ammonia was produced by 16 companies at 35 plants in 16 States in the United States during 2021; 2 additional plants were idle for the entire year. About 60% of total U.S. ammonia production capacity was in Louisiana, Oklahoma, and Texas because of their large reserves of natural gas, the dominant domestic feedstock for ammonia. In 2021, U.S. producers operated at about 84% of rated capacity. The United States was one of the world's leading producers and consumers of ammonia. Urea, ammonium nitrate, nitric acid, ammonium phosphates, and ammonium sulfate were, in descending order of quantity produced, the major derivatives of ammonia produced in the United States.

Approximately 88% of apparent domestic ammonia consumption was for fertilizer use, including anhydrous ammonia for direct application, urea, ammonium nitrates, ammonium phosphates, and other nitrogen compounds. Ammonia also was used to produce explosives, plastics, synthetic fibers and resins, and numerous other chemical compounds.

**Salient Statistics—United States:**

	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021<sup>e</sup></u>
Production <sup>1</sup>	11,600	13,100	13,500	14,000	14,000
Imports for consumption	3,090	2,530	2,020	1,980	2,200
Exports	612	224	338	369	260
Consumption, apparent <sup>2</sup>	14,100	15,300	15,200	15,700	16,000
Stocks, producer, yearend	320	490	420	310	360
Price, average, free on board gulf coast, <sup>3</sup> dollars per short ton	247	281	232	223	510
Employment, plant, number <sup>e</sup>	1,500	1,600	1,600	1,600	1,600
Net import reliance <sup>4</sup> as a percentage of apparent consumption	18	14	11	11	12

**Recycling:** None.

**Import Sources (2017–20):** Trinidad and Tobago, 63%; Canada 34%; Venezuela, 2%; and other, 1%.

<u>Tariff:</u>	<u>Item</u>	<u>Number</u>	<u>Normal Trade Relations</u> <u>12–31–21</u>
	Ammonia, anhydrous	2814.10.0000	Free.
	Urea	3102.10.0000	Free.
	Ammonium sulfate	3102.21.0000	Free.
	Ammonium nitrate	3102.30.0000	Free.

**Depletion Allowance:** Not applicable.

**Government Stockpile:** None.

**Events, Trends, and Issues:** The Henry Hub spot natural gas price ranged between \$2.36 and \$6.23 per million British thermal units for most of the year, with an average of about \$4.12 per million British thermal units. Natural gas prices in 2021 were higher than those in 2020—a result of below average storage levels of natural gas and strong demand for U.S. liquified natural gas. The U.S. Department of Energy, Energy Information Administration, projected that Henry Hub natural gas spot prices would average around \$4.00 per million British thermal units in 2022.

The weekly average gulf coast ammonia price was \$245 per short ton at the beginning of 2021 and increased to \$603 per short ton in late October. The average ammonia price for 2021 was estimated to be \$510 per short ton. In 2021, high natural gas prices resulted in higher ammonia prices.

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A long period of stable and low natural gas prices in the United States made it economical for companies to upgrade existing ammonia plants and construct new nitrogen facilities. The additional capacity has reduced ammonia imports. Expansion in the ammonia industry took place throughout the past 5 years; however, no additional U.S. ammonia capacity increases have been announced.

Global ammonia capacity is expected to increase by a total of 4% during the next 4 years. Capacity additions are expected in Africa, eastern Europe, and south Asia. As part of the capacity increase several decarbonized ammonia projects are being proposed. Demand for ammonia is expected to increase by 1% per year with the largest increases expected in Latin America and south Asia.

Large corn plantings maintain the continued demand for nitrogen fertilizers. According to the U.S. Department of Agriculture, U.S. corn growers planted 37.4 million hectares of corn in crop-year 2021 (July 1, 2020, through June 30, 2021), which was 3% greater than the area planted in crop-year 2020. Corn acreage in crop-year 2022 is expected to increase because of anticipated higher returns for corn compared with those of other crops.

### World Ammonia Production and Reserves:

	Plant production		Reserves <sup>5</sup>
	<u>2020</u>	<u>2021<sup>e</sup></u>	
United States	14,000	14,000	Available atmospheric nitrogen and sources of natural gas for production of ammonia are considered adequate for all listed countries.
Algeria	2,200	2,200	
Australia	1,600	1,600	
Canada	3,900	3,900	
China	39,000	39,000	
Egypt	4,200	4,200	
Germany	2,330	2,200	
India	12,200	12,000	
Indonesia	5,900	5,900	
Iran	3,600	3,600	
Malaysia	1,300	1,300	
Netherlands	2,100	2,000	
Oman	1,730	1,700	
Pakistan	3,300	3,300	
Poland	2,260	2,200	
Qatar	3,300	3,300	
Russia	16,100	16,000	
Saudi Arabia	4,300	4,300	
Trinidad and Tobago	4,170	4,200	
Ukraine	2,300	2,300	
Uzbekistan	1,100	1,100	
Vietnam	1,150	1,200	
Other countries	<u>15,400</u>	<u>15,000</u>	
World total (rounded)	147,000	150,000	

**World Resources:**<sup>5</sup> The availability of nitrogen from the atmosphere for fixed nitrogen production is unlimited. Mineralized occurrences of sodium and potassium nitrates, such as those found in the Atacama Desert of Chile, contribute minimally to the global nitrogen supply.

**Substitutes:** Nitrogen is an essential plant nutrient that has no substitute. No practical substitutes for nitrogen explosives and blasting agents are known.

<sup>e</sup>Estimated.

<sup>1</sup>Source: The Fertilizer Institute; data adjusted by the U.S. Geological Survey.

<sup>2</sup>Defined as production + imports – exports + adjustments for industry stock changes.

<sup>3</sup>Source: Green Markets.

<sup>4</sup>Defined as imports – exports + adjustments for industry stock changes.

<sup>5</sup>See Appendix C for resource and reserve definitions and information concerning data sources.