

NITROGEN (FIXED)—AMMONIA

(Data in thousand metric tons 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 2022; 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 2022, U.S. producers operated at about 86% 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>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022^e</u>
Production ¹	13,100	13,500	14,000	12,700	13,000
Imports for consumption	2,530	2,020	1,990	2,080	2,100
Exports	224	338	369	231	700
Consumption, apparent ²	15,300	15,200	15,700	14,600	14,000
Stocks, producer, yearend	490	420	310	270	390
Price, average, free on board gulf coast, ³ dollars per short ton	281	232	213	578	1,100
Employment, plant, number ^e	1,600	1,600	1,600	1,600	1,600
Net import reliance ⁴ as a percentage of apparent consumption	14	11	11	13	9

Recycling: None.

Import Sources (2018–21): Trinidad and Tobago, 58%; Canada 40%; Venezuela, 1%; and other, 1%.

<u>Tariff:</u>	<u>Item</u>	<u>Number</u>	<u>Normal Trade Relations</u> <u>12–31–22</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 \$3.58 and \$9.85 per million British thermal units for most of the year, with an average of about \$6.63 per million British thermal units. Natural gas prices in 2022 were higher than those in 2021—a result of below-average storage levels of natural gas and strong demand for U.S. liquefied natural gas. The Energy Information Administration, U.S. Department of Energy, projected that Henry Hub natural gas spot prices would average around \$6.00 per million British thermal units in 2023.

The weekly average gulf coast ammonia price was \$1,030 per short ton at the beginning of 2022 and increased to \$1,150 per short ton in late October. The average ammonia price for 2022 was estimated to be \$1,100 per short ton. In 2022, 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. About one-third of the capacity additions were expected to take place in Russia and Belarus. As part of the capacity increase, several countries have proposed decarbonized ammonia plants. Consumption of ammonia for fertilizer is expected to increase by 1% per year depending on availability and cost with the largest increases expected in Latin America.

Large corn plantings maintain the continued demand for nitrogen fertilizers in the United States. According to the U.S. Department of Agriculture, U.S. corn growers planted 36.2 million hectares of corn in crop-year 2022 (July 1, 2021, through June 30, 2022), which was 4% less than the area planted in crop-year 2021. Corn acreage in crop-year 2023 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 ⁵
	<u>2021</u>	<u>2022^e</u>	
United States	12,700	13,000	Available atmospheric nitrogen and sources of natural gas for production of ammonia were considered adequate for all listed countries.
Algeria	2,600	2,600	
Australia	1,700	1,700	
Canada	3,760	3,800	
China	42,000	42,000	
Egypt	4,000	4,000	
Germany	2,290	2,000	
India	12,100	12,000	
Indonesia	6,000	6,000	
Iran	4,000	4,000	
Malaysia	1,400	1,400	
Netherlands	2,000	2,000	
Nigeria	1,100	1,100	
Oman	1,730	1,700	
Pakistan	3,400	3,400	
Poland	2,100	2,100	
Qatar	3,270	3,300	
Russia	16,300	16,000	
Saudi Arabia	4,300	4,300	
Trinidad and Tobago	4,050	4,200	
Ukraine	2,170	2,000	
Uzbekistan	1,200	1,100	
Vietnam	1,050	1,200	
Other countries	<u>14,500</u>	<u>13,000</u>	
World total (rounded)	150,000	150,000	

World Resources:⁵ 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.

^eEstimated.

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

²Defined as production + imports – exports ± adjustments for industry stock changes.

³Source: Green Markets.

⁴Defined as imports – exports ± adjustments for industry stock changes.

⁵See Appendix C for resource and reserve definitions and information concerning data sources.