NITROGEN

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Nitrogen (N) is an essential element of life and a part of all plant and animal proteins. Crop plants cultivated for human consumption and as animal feed require nitrogen for proper nutrition and maturation. Some crops, 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 once 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 feedstocks through a variety of chemical processes. Small quantities of nitrates are produced from mineral resources principally in Bolivia and Chile.

In 1998, ammonia was produced by 26 companies at 42 plants in the United States. U.S. ammonia production totaled 14.7 million metric tons (Mt) of contained N, a 10% increase from that of 1997. Apparent consumption of nitrogen also increased. About 85% of the ammonia was used in fertilizer applications. Completion of two new plants in Trinidad and Tobago, adding about 1 Mt of annual capacity, led to increased U.S. imports from this country.

In 1998, world production of ammonia was about 106 Mt of contained N, with China and the United States continuing as the principal producers. World urea production increased by about 5%, to 45.7 Mt contained N in 1998, but world exports continued to decrease and declined by 6% to 9.6 Mt N. China and India accounted for 46% of 1998 world production; production in China and India increased by 15% and 10%, respectively, compared with those of 1997. China continued to ban imports of urea and supplied its needs with domestic production.

The Asian economic crisis had a significant effect on world demand for nitrogen. Asia has had the largest growth in demand in the past several years, but financial problems have curtailed imports into this area. The decrease in demand kept world ammonia and urea prices low throughout 1998. In addition, the Asian crisis slowed new plant construction in the area as lending institutions became more cautious in financing these new plants. In Russia, economic problems led to a decline in nitrogen production. A redirection of exports because of the Chinese import ban on urea, new capacity additions around the world, and a lower-than-average demand from India also led to a reduction in Russian production. Massive flooding in China during the spring and summer, after the seasonal fertilizer application, destroyed millions of hectares of arable land. The effect of this flooding has yet to be seen in world markets.

Legislation and Government Programs

At the request of the U.S. Senate, the International Trade Commission (ITC) investigated the global trade in ammonium nitrate. The request for an investigation stemmed from U.S. industry's concerns that imports of ammonium nitrate into the United States from Russia had increased resulting from an antidumping order imposition against Russia by the European Union (EU) in 1995 and that Russian material was entering the United States at less than the cost of production. The ITC held a hearing in June and prepared a report of the results of the hearing and other pertinent information in October. The ITC concluded that although production costs for ammonium nitrate differed among the United States, Russia, and the EU, these differences could be explained by factors other than dumping. For example, Government policies in all three geographical areas have affected production costs. Environmental regulations have tended to increase the cost of production for ammonium nitrate in the United States and the EU, and natural gas prices were subsidized in Russia, lowering production costs there. From 1993 to 1998, decreased grain and oilseed production in Russia led to a decline in domestic fertilizer use, making export markets more attractive (U.S. International Trade Commission, 1998, p. vii-xiv). After the investigation, several U.S. ammonium nitrate producers formed an ad hoc coalition, the Committee for Fair Ammonium Nitrate Trade, to monitor what they felt was unfairly traded ammonium nitrate imported into the United States (Green Markets, 1998g). In addition, misidentification of some ammonium nitrate imports as urea by the Bureau of the Census fueled the controversy about suspected dumping of Russian ammonium nitrate into the United States (Fertilizer Markets, 1998a).

The U.S. Court of Appeals unanimously upheld the 1996 dismissal of a civil suit filed by victims of the 1995 Oklahoma City bombing. The suit charged that ICI Explosives USA Inc. was the maker of the ammonium nitrate fertilizer used as an explosive in the bombing. Two similar suits remained in State courts in Oklahoma and Texas at yearend (Green Markets, 1998i). The Bureau of Alcohol, Tobacco, and Firearms contracted with the International Fertilizer Development Center (IFDC) to undertake a study to find a practical nontaggant identification system for fertilizer-grade ammonium nitrate. The IFDC will investigate using the inherent crystallographic, physical, and chemical characteristics of ammonium nitrate as a nondisruptive identification method (Fertilizer Markets, 1998b).

Production

Industry statistics for anhydrous ammonia and derivative products were developed by the Bureau of the Census. A summary of the production of principal inorganic fertilizers by quarter is reported in the series MQ28B, and industrial gases (including nitrogen) are reported in the quarterly report MQ28C. Final data for inorganic fertilizers are subsequently published in the companion annual report MA28B, and data for industrial gases are published in the annual report MA28C.

In 1998, production of anhydrous ammonia (82.2% N) increased by 10% to 14.7 Mt of contained N, compared with a revised figure of 13.3 Mt in 1997 (table 1). Of the total production, 85% was for use as a fertilizer; the remaining 15% was used in other chemical and industrial sectors (table 2). Because a significant portion of the ammonia production was estimated, the production figure reported by the Bureau of the Census is probably high. In a separate survey of the ammonia producers, The Fertilizer Institute reported that total U.S. production was 12.1 Mt of contained N, a slight decline from the 1997 figure of 12.3 Mt of contained N.

The United States remained the world's second largest producer and consumer of elemental and fixed types of nitrogen following China. In declining order, urea, ammonium phosphates, ammonium nitrate, nitric acid, and ammonium sulfate were the major downstream products produced from ammonia in the United States. Their combined production was 11.5 Mt of contained N, with urea accounting for about 32% of the production (table 3).

Ammonia producers in the United States operated at about 83% of design capacity. More than 57% of total U.S. ammonia production capacity was concentrated in the States of Louisiana (36%), Oklahoma (15%), and Texas (6%), owing to large indigenous reserves of feedstock natural gas. Farmland Industries Inc., PCS Nitrogen Inc., Terra International Inc., CF Industries Inc., and Union Chemical Co. (Unocal), in declining order, accounted for 58% of total U.S. ammonia capacity (table 4).

Btu Nitrogen LLC began construction of its nitrogen plant near Wallula, WA, in July. The plant will provide urea-based fertilizer to Montana, Washington, Idaho, Oregon, and northern California. Total cost for the project, which will produce 230,000 metric tons per year (t/yr) of ammonia and 370,000 t/yr of granular urea, is estimated at $207 million. Completion is expected in the third quarter of 2000 (Green Markets, 1998b).

J.R. Simplot Co. has decided against construction of a $480 million nitrogen complex in Wells, NV, because of changing economic conditions. According to a company spokesperson, the cost for natural gas and low global fertilizer prices substantially changed the feasibility of the Nevada location since the project was announced in 1997. In addition, unproven water supplies and the need for additional local electrical capacity had increased costs for the proposed project. The company will begin to consider other sites in the Western United States for its complex, which is expected to use 666,000 t/yr of ammonia to produce urea-ammonium nitrate (UAN) solution and ammonium nitrate (Green Markets, 1998f).

Farmland Industries opened its fertilizer plant expansion in March. The plant expansion increased the capacity at Fort Dodge, IA, from 800 to 1,100 metric tons per day (t/d) of ammonia and added a new UAN plant. The UAN plant has the capacity to produce 1,500 metric tons (t) of solution per day (Farmland Industries Inc., March 27, 1998, Farmland dedicates Fort Dodge, Iowa, fertilizer plant expansion, accessed April 24, 1998, at URL http://www.farmland.com/news/newsrel/ftdodge.htm).

In October, Apache Nitrogen Products Inc. and The Devco Companies announced plans to expand nitrogen production at Apache's plant near Benson, AZ. The Benson plant produces nitric acid and ammonium nitrate, and plans call for adding four new plants—anhydrous ammonia, urea solution, nitric acid, and UAN-32. Ammonia capacity would be 236,000 t/yr, and UAN capacity would be 270,000 t/yr. Further financing discussions for the $150 million project are expected to take 6 months to 1 year, and if negotiations are successful, then plant construction would take 2 years (Green Markets, 1998a).

Several companies announced plans to sell some of their nitrogen operations. Unocal announced that it planned to divest itself of its nitrogen facilities in Alaska, California, and Washington by spinning off assets through a stock offering, participating in a joint venture, or an outright sale. According to the company, the nitrogen facilities represent noncore businesses; Unocal is concentrating on global energy resources and project development. At yearend, no buyer was found for the facilities (Fertilizer Markets, 1998l). IMC Global Inc. (IMC) also planned to dispose of one of its business units—IMC AgriBusiness, its fertilizer marketing and distribution unit. IMC was believed to want a deal for the operation that includes a significant supply agreement for the potash, phosphate, and nitrogen raw materials to the new operation. The company was investigating a spinoff as an independent operation through a stock offering, an outright sale, or a sale with retention of a portion of IMC AgriBusiness' shares. IMC AgriBusiness includes an ammonia plant in Illinois (Fertilizer Markets, 1998d). By yearend, no decision had been made.

Minorco S.A., the London-based 57%-owner of Terra Industries Inc., planned to sell its stake in the company by March 1999. The determination to sell the Terra Industries shares resulted from a merger between Minorco and its South African sister firm, Anglo American Corp. The new firm, Anglo American PLC, wants to divest itself of its nonmining assets, which were considered to be noncore businesses. No strategy was determined for the method of divestiture (Fertilizer Markets, 1998g).

Environment

The ammonium and nitrate forms of N are highly soluble in water and are readily available for crop plant uptake. Ammonium is held by soil particles and, therefore, is not subject to movement down through the soil during periods of rainfall or irrigation. Nitrates, however, do move downward with soil water. This leaching process can lead to nitrate accumulation in ground water. As soils are warmed during the growing season, the ammonium form of nitrogen is subject to conversion to nitrate in a process called "nitrification." Most of the ammonium not used by the crop is eventually converted to nitrate. Nitrogen stabilizers and nitrification inhibitors can slow the conversion of soil ammonium to nitrate. Best management practices to increase nitrogen use efficiency and to reduce nitrate leaching include application of fertilizer close to the time of actual crop use, multiple applications, terracing, grass waterways, and strip cropping.

Hypoxia in the Gulf of Mexico recently has become a controversial environmental concern for the fertilizer industry and an issue that has spawned significant research efforts to determine its cause. "Hypoxia in the Gulf of Mexico" refers to an area along the Louisiana-Texas coast in which water near the bottom of the Gulf contains less than 2 parts per million of dissolved oxygen. Hypoxia can cause stress or death in bottom-dwelling organisms that cannot move out of the hypoxic zone. Some scientific evidence indicates that hypoxia in the Gulf of Mexico is caused by nutrients, particularly nitrogen, discharged from the Mississippi River Basin. The inflow of nutrients is typically highest in the spring and summer when streamflow is highest. Nutrient-rich river water flows into the Gulf and stimulates the growth of algae in the near-surface waters. The algae and fecal material from organisms that feed on the algae eventually settle into the bottom waters of the Gulf. Here, bacteria consume the organic material and deplete the dissolved oxygen. To help determine the causes of hypoxia, the U.S. Geological Survey (USGS) operates streamflow and water-quality monitoring stations throughout the Mississippi River Basin. Current and historical data from these stations were being used by USGS scientists as part of a science assessment to understand better the causes and consequences of hypoxia in the Gulf. The science assessment was being conducted by the Committee on Environment and Natural Resources. Specifically, the USGS through its Toxics Program and National Stream Quality Accounting Network Program was addressing two questions—what are the loads and sources of nutrients delivered to the Gulf of Mexico? and what is the relative importance of specific human activities, such as agriculture, atmospheric deposition, and point source discharges, in contributing these nutrients? (U.S. Geological Survey, December 29, 1998, Hypoxia in the Gulf of Mexico, accessed June 17, 1999, at URL http://wwwrcolka.cr.usgs.gov/midconherb/hypbrief3.html). Research personnel from other institutions have proposed causes for hypoxia other than nitrogen, such as a greater-than-average influx of fresh water from the Mississippi River into the Gulf.

The USGS also was monitoring the nitrate concentration in ground water as part of its National Water-Quality Assessment Program, and was investigating nitrogen accumulation in the Chesapeake Bay. The USGS began the Program in 1991 to assess the status and trends in the quality of the Nation's streams and ground water. The similar design and consistent methodology of each study allows comparisons on regional and national scales. This information was and will be used to guide policy and to manage water resources at national, State, and local levels (Nolan and Ruddy, 1996). The USGS, in cooperation with the Maryland Department of the Environment, the Metropolitan Washington Council of Governments, and the Virginia Department of Environmental Quality, was studying the amount of nutrient pollution that enters the Chesapeake Bay annually from its major tributaries. Results of the study will be used to determine whether steps taken to reduce the amount of pollution entering the Bay are working. Water samples were collected from the Bay's nine largest tributaries to evaluate pollution-reduction strategies and to determine whether the goal of a 40% reduction in nitrogen and phosphorus was being met. The water samples were analyzed to determine the concentrations of nitrogen and phosphorus in each river. These concentration data were used along with continuous streamflow data collected at USGS stream-gaging stations on each tributary to estimate the total amounts of nitrogen and phosphorus transported each year to the Bay. Continuous monitoring will provide a method to identify changes in concentrations and amounts of nutrients that have occurred over the years in response to pollution-reduction programs (U.S. Geological Survey, October 11, 1995, Chesapeake Bay—Measuring pollution reduction, accessed June 17, 1999, at URL http://water.usgs.gov/wid/html/chesbay.html).

Consumption

Apparent consumption of ammonia increased to 18.1 Mt of contained N, an increase of 14% compared with that of 1997. Apparent consumption is calculated as the production plus imports minus exports, adjusted to reflect any changes in stocks. Because of the change in the source of data for ammonia stocks from 1997 to 1998, the change in stocks may be artificially high, and, as a result, may be skewing the calculated apparent consumption figure higher than it should be.

Consumption of nitrogen fertilizers in the United States for the 1998 crop year (ending June 30, 1998) is listed in table 5. Consumption decreased slightly from 1997 values to 11.2 Mt of contained N. Anhydrous ammonia was the principal fertilizer product, representing 29% of fertilizer consumption.

Urea and UAN solutions constituted 41% of fertilizer consumption during the 1998 crop season. Urea is typically 45.9% N, and UAN solutions are typically 29.8% to 29.9% N. In the industrial sector, urea is used extensively as a protein supplement in ruminant animal feeds, for the production of urea-formaldehyde adhesives, and for the synthesis of plastics and resins.

Ammonium nitrate was used primarily in solid and liquid fertilizers, in industrial explosives, and as blasting agents. Total production of ammonium nitrate in 1998 was 2.7 Mt of contained N. After World War II, ammonium nitrate became the leading solid nitrogen fertilizer in the United States and worldwide, and remained so until about 1975 when its use was surpassed by synthetic urea. In 1998, approximately 23% of ammonium nitrate production was used in fertilizers. Ammonium nitrate containing 33.9% N constituted 5% of 1998 nitrogen fertilizer consumption.

Ammonium sulfate was used mostly as a fertilizer material, valued for its nitrogen content (21.2% N) and its readily available sulfur content (24.3% sulfur). It is commonly produced as a byproduct of caprolactam production, an intermediate in nylon manufacture. Since the introduction of ammonium nitrate and urea as fertilizer materials, the relative importance of ammonium sulfate worldwide has steadily decreased. In the 1998 crop year, fertilizer consumption of ammonium sulfate, based on nitrogen content, was 2% of the total nitrogen-based fertilizer market. Nonfertilizer uses constitute approximately 40% of the total ammonium sulfate market (on a contained N basis), including food processing, fire control, tanning, and cattle feed.

Nitric acid production is shown in table 3. Nitric acid is used in salt formation reactions to produce metal nitrates and in metal degreasing, treating, and pickling for graphic and galvanic industries. Nitration reactions with benzene, phenol, and toluene produce dyestuffs, pharmaceutical products, trinitrotoluene (TNT) explosives, and disinfectants. Esterification reactions with glycol, glycerol, and cellulose produce nitroglycerine explosives (dynamite), celluloid, and nitrocellulose lacquers. Oxidation reactions with toluene, p-xylene, and cyclohexanone produce polyurethanes and polyester fibers (nylon).

Other uses of ammonia are for the production of amines, cyanides, and methyl methacrylate polymers (plexiglass); in liquid home and industrial cleaners; in pulp and paper products; in industrial refrigeration; in metallurgy; and as a propellant in vehicular air bags.

Elemental nitrogen is used extensively by the electronics, metals, food, and aerospace industries because of its inert and cryogenic properties. Nitrogen can be used to prevent fires and explosions, as a purging agent for cleaning and processing equipment, and as a controlling atmosphere for annealing and heat treating and other metal preparation processes where oxygenation is a concern.

Stocks

Total yearend 1998 stock data are not directly comparable to those of 1997 because stocks of nitrogen solutions and ammonium nitrate were withheld by the Bureau of the Census (table 6). Stocks of ammonia, however, dropped significantly from the high level in 1997. Because the source of the data changed between 1997 and 1998, this apparent drop in stocks may simply be a result of the change in data source.

Transportation

Ammonia was transported by refrigerated barge, rail, pipeline, and truck. Three companies serve 11 States with pipelines 4,900 kilometers (km) in length, with 4,800 km of river barge transport, and by rail and truck used primarily for interstate or local delivery.

Koch Industries Inc. operated the Gulf Central ammonia pipeline from the Gulf of Mexico (Louisiana) to the Midwest as far north as Iowa, covering 3,070 km, and to the east to Huntington, OH. The annual capacity of this pipeline was about 2 Mt, with a storage capacity of more than 1 Mt.

The Williams Companies Inc. pipeline and that of its subsidiary, Mid-America Pipeline Co., extended from Borger in northern Texas to Mankato in southern Minnesota, covering 1,700 km. The pipeline has an annual capacity of more than 1 Mt and about 500,000 t of ammonia storage capacity. In March, Williams completed the acquisition of MAPCO Inc., which had owned the pipelines. The acquisition is valued at $3.1 billion on the basis of a fixed exchange ratio of 1.665 shares of Williams stock for each share of MAPCO stock (The Williams Companies Inc., March 30, 1998, Williams, MAPCO merger complete, accessed June 4, 1999, at http://www.williams.com/news/rel174.html).

CF Industries and Cargill Fertilizer Inc. jointly operated the 135-km long Tampa Bay Pipeline (TBP) system. TBP moved nitrogen compounds and ammonium phosphate for fertilizer producers in Hillsborough and Polk Counties, FL.

Capacities for trucks and railcars are usually 20 t and 100 t, respectively. Depending on the product loaded and the volume of the container, barges can accommodate from 400 to 2,000 t.

Ammonium nitrate is transported by rail, road, and water, but its transportation on U.S. navigable waterways is restricted. Urea is shipped either in bulk or as bagged material.

Prices

Except for a brief upturn in late April and early May, prices for nitrogen compounds continued to decline (table 7; figures 1-4.) A wet spring in the Midwest delayed planting until late April, and as a result, all the planting was done at about the same time. This caused a surge in demand for fertilizers, driving up the price of the raw materials. The continued absence of China from the urea market helped keep prices for ammonia and urea at low levels throughout the year.

Foreign Trade

Ammonia exports increased by about 55% from those of 1997 (table 8). The Republic of Korea remained the principal destination, accounting for 76% of total U.S. exports of ammonia. Imports of anhydrous ammonia decreased by about 2% (table 9). Trinidad and Tobago (47%), Canada (24%), and Russia (20%) were the primary sources. With the startup of the two new ammonia production plants in Trinidad and Tobago in 1998, imports from this country into the United States increased. This increase was offset by declines in imports from Canada, Mexico, and Russia. Tables 10 and 11 list trade of other nitrogen materials.

World Review

Anhydrous ammonia and other nitrogen materials were produced in more than 80 countries. Global ammonia production in 1998 increased by about 2% from that of 1997 (table 12). In 1998, total ammonia production was 106 Mt contained N, according to data reported to the USGS. China, with 25% of total production, was the largest world producer of ammonia. Asia contributed 44% of total world ammonia production, and the United States and Canada represented 18% of the global total. Countries in the former U.S.S.R. produced 11% of the total; Western Europe, 10%; Middle East, 7%; Latin America, 5%; and Africa, Eastern Europe, and Oceania contributed the less than 5% each.

In 1998, world ammonia exports declined slightly to 11.3 Mt of contained N, compared with those of 1997. Russia (19%), Trinidad and Tobago (18%), Ukraine (13%), and Canada (6%) accounted for 56% of the world total. The United States imported 32% of global ammonia trade, followed by Western Europe (31%) and Asia (18%) (International Fertilizer Industry

Association, 1998a).

In 1998, world urea production increased by about 5% to 45.7 Mt of contained N, but exports continued to drop and declined by 6% to 9.6 Mt of contained N. China and India accounted for 46% of world production; production in China and India increased by 15% and 10%, respectively, compared with those of 1997. The United States and Canada produced about 12% of the total. Exports from most geographic areas declined, with the exception of a 28% increase in the Middle East and a 4% increase in Western Europe. The Middle East exported the largest quantity of urea with 27% of the total. Russia and Ukraine accounted for 23% of total exports; Asia, 12%; Western Europe, 10%; Canada and the United States, 9%; Latin America, 7%; Eastern Europe, 4%; and Africa and Oceania shipped less than 4% each. Asia accounted for 32% of global urea imports; Latin America, 20%; Western Europe, 16%; and North America, 14% (International Fertilizer Industry Association, 1998b).

Argentina.—By August, the Profertil S.A. joint venture signed a commitment with a consortium of banks for project financing of its planned 1-million-metric-ton-per-year (Mt/yr) urea plant in Cangrejales, Bahia Blanca. The Chase Manhattan Bank, Société Generale de Belgique, and Mediocredito Centrale SpA agreed to provide $630 million in financing, although the project was estimated to cost only $600 million. The joint venture also completed a gas supply agreement in August, and started civil engineering work on the plant in May (Fertilizer Markets, 1998j). In December, one of the three joint-venture partners withdrew from the project—Petroquímica Argentina S.A. The remaining partners, Yacimentos Petroliferos Fiscales S.A. and Canada's Agrium Inc. each increased their stake in the project to 50%. In spite of the withdrawal, Profertil expected that the plant will be operating on schedule by July 2000 (Fertilizer Week, 1998k).

Australia.—Westfarmers CSBP began construction of a 215,000-t/yr ammonia plant in Kwinana in May. The $95 million plant was scheduled to be commissioned in the third quarter of 1999, with commercial production to begin in 2000. When the new plant is running, Westfarmers will close its existing 100,000-t/yr ammonia plant (Fertilizer Week, 1998d).

In June, BHP Petroleum and Incitec Ltd. began a feasibility study of a 735,000-t/yr urea plant near Geelong using natural gas from southwestern Victoria as a feedstock. Production from the proposed plant would replace urea imports, which are estimated to average 800,000 t/yr. The study is expected to take 12 to 18 months to complete at a cost of $15 million (Green Markets, 1998h). The only other urea plant in Australia is a 250,000-t/yr plant in Brisbane owned by Incitec; the plant was undergoing a $27 million upgrade to replace the urea prilling tower with a granulation plant.

Brazil.—Petroleo Brasileiro S.A. (Petrobras) upgraded its Laranjeiras, Sergipe, nitrogen complex in the third quarter of 1998 to increase production capacity of ammonia by 14% and urea by 24%. With the $24 million upgrade, ammonia and urea capacities at the complex were increased to 425,000 t/yr and 612,000 t/yr, respectively. Petrobras also planned an upgrade of its Camacari, Bahia, nitrogen facility in July 1999 at an estimated cost of $19 million. Annual ammonia capacity will be increased from 280,000 to 510,000 t, and annual urea capacity will be increased from 370,000 to 510,000 t (Fertilizer Week, 1998l).

Bulgaria.—The Bulgarian Government was examining options for improving costs and efficiency in its fertilizer industry, including closing parts of some plants and reducing the price of natural gas. Bulgaria has been trying to privatize its State-owned fertilizer companies—Chimco, Neochim, Argopolychim, and Agrobiochim—for several years, but the companies' debts and uncertainty over feedstock costs has limited investor interest (Fertilizer Week, 1998b). Norsk Hydro A/S, however, agreed to the purchase of 60% of Agropolychim in November, but the investment needed to upgrade the plant was still being negotiated. The plant should benefit from a reduction in natural gas prices, from $109 to $103 per thousand cubic meters, announced by Bulgargas on November 1 (Fertilizer Week, 1998q).

Burma (Myanmar).—Nissho Iwai Co. Ltd. of Japan is upgrading three urea plants in Burma. Upgrading of the first plant, the State-owned enterprise at Kyawzwa, was completed in October. Machinery and equipment installed in the $7 million upgrade should allow the plant to operate at its rated capacity of 600 t/d. Nissho Iwai also was under contract to upgrade the 465-t/d plant at Sale and the 207-t/d plant at Kyun Chung at a total cost of $13.1 million. Upgrade work on these two plants was scheduled to begin in the first quarter of 1999 (Fertilizer Week Asia, 1998b).

Canada.—Simplot Canada Ltd. began operating its expanded anhydrous ammonia plant in Brandon, Manitoba, on September 11, but a hydrogen leak caused a fire that closed the plant on September 15. The ammonia plant was expanded by the addition of a plant that was brought to Canada from Sicily and reassembled. The expansion more than doubled the original ammonia production capacity to 1,250 t/d from 600 t/d. Because of the increased ammonia production, granular urea production capacity could be increased to 275 t/d. The plant restarted operations in October (Green Markets, 1998e).

China.—In spite of its continued absence from the world urea market because of the ban on urea imports instituted in April 1997, China has slowed new urea plant construction because of financing problems. Two nitrogen projects, one on Hainan Island and one in Xinjiang Province, totaling a $2 billion investment and 4 Mt/yr of urea production were delayed in 1997, and a 525,000-t/yr plant in Sichuan Province and a 300,000-t/yr plant in Ningxia also have been delayed (Nitrogen & Methanol, 1998e).

Massive flooding in the late spring and early summer severely affected China's agricultural sector. News reports indicated that 21.2 million hectares of arable land was damaged by the floods, of which 13.1 million hectares could not be recovered for farming during the year. The floods began after the seasonal fertilizer application was completed and affected farmland in 21 provinces. An additional 5.8 Mt of nitrogen, phosphorus, and potassium may be necessary to cultivate the flooded farmland (Fertilizer Week, 1998c).

Jilin Chemical Industrial Group announced plans to begin construction of a 300,000-t/yr ammonia plant in the fourth quarter of 1999 at Jilin. The German firm Linde Group was awarded the $120 million contract for engineering and construction of the new plant, which will use the Texaco gasification process. When the plant is completed, which was scheduled for the second half of 2001, production will replace that from an existing plant at the same site. Ammonia produced at the new plant will be used to feed Jilin's 470,000-t/yr urea and ammonium nitrate plant (Fertilizer Week, 1998h).

***Egypt.*—**In December, the Egyptian Fertilizer Co. reported that it had secured financing for its new nitrogen complex at Suez. A $210 million loan package from the Arab Petroleum Investment Corp. will be the source of the financing. The contractor Krupp Uhde GmbH began work on the project, which will have the capacity to produce 1,200 t/d of ammonia and 1,925 t/d of granular urea, in the first quarter of 1998. Output from the plant, scheduled to be completed in the fourth quarter of 2000, was expected to be targeted at the Asian export market (Fertilizer Week, 1998e).

***France.*—**Norsk Hydro planned to upgrade its 330,000-t/yr ammonia plant in LeHavre by the third quarter of 1999 and to add 35,000 t/yr of capacity. Most of the additional capacity will be targeted at the export market. Total cost of the upgrade was estimated to be $54.3 million (Fertilizer Markets, 1998h). Grande Paroisse SA announced that it was expanding its ammonia, urea, and nitric acid capacities. Most of the additional production of 50,000 t/yr will be used to feed the urea derivatives plants of its parent company Elf Atochem S.A. (Fertilizer Week, 1998n).

***India.*—**India's Hanumantha Rao Committee submitted its report to the chemical and fertilizers minister in April. The report proposed that the Government replace the existing Retention Pricing System for urea, which guarantees prices based on return on investment no matter how inefficient the plant is, with a uniform pricing system. The proposed system would guarantee a flat subsidy rate per metric ton, which would force the highest cost plants (those operating on high-cost feedstocks such as naptha) to close. The fertilizer industry is opposed to the new subsidy system, but whatever system is decided upon, implementation should not be imminent (Nitrogen & Methanol, 1998b). Because of this report, a number of new urea plants and expansions to existing plants have been delayed.

***Indonesia.*—**The Asian economic crisis has delayed construction and financing of several planned ammonia and urea projects. Financing for PT Kaltim Parna Industri's 495,000-t/yr ammonia-urea complex in Bontang was put on hold because the Japanese investors were waiting for the economy to stabilize before committing to the $240 million project. PT Pupuk Kujang's 660,000-t/yr nitrogen complex in Cikampek was $100 million short of its $300 million funding, and this project also was pushed back indefinitely (Nitrogen & Methanol, 1998a). In spite of the economic crisis, Indonesian State-owned urea producer PT Pupuk Kalimantan Timur's 570,000-t/yr granular urea plant in Bontang was commissioned in early 1999. The company however, put plans to build two additional ammonia-urea units on hold (Fertilizer Week Asia, 1998a).

***Mexico.*—**After most of the country's ammonia upgrading plants closed in the third quarter of 1998 because of high ammonia prices, Petroleos Mexicanos (Pemex), working with upgraders and the Government, adjusted the ammonia price formula, which was implemented in the first quarter of 1998. As a result, the fertilizer producers and nitrogen upgraders restarted operations in February and March 1999 (Fertilizer Markets, 1998e).

Through a debottlenecking process, Pemex's subsidiary, Petroquimica Cosoleacaque SA de CV (Pecosa), planned to increase ammonia production capacity at its Pajaritos complex by 20%, or 420,000 t/yr. The project was expected to be completed by the end of 1999, and the increased capacity was expected to supply growth in domestic demand through 2003. Ammonia production capacity at the five plants in the complex totals 2.1 Mt/yr (Fertilizer Markets, 1998i).

Agro Nitrogenados de Mexico (Agromex) announced that it would become Mexico's sole urea producer after it received clearance in June from Mexico's competition authorities to integrate Grupo Ferquimex-Fertimina-Seimex into its assets. With the additional plants, Agromex will be able to produce 1.7 Mt/yr of urea and 400,000 t/yr of ammonium nitrate (Fertilizer Markets, 1998f). Agromex also began legal action in December against Pemex in an attempt to change Pemex's ammonia pricing formula. This move resulted in suspension of ammonia deliveries by Pecosa. In addition to not being able to produce urea and ammonium nitrate profitably because of high ammonia prices, Agromex cited high levels of low-valued urea imports as a contributor to its financial difficulties (Fertilizer Week, 1998a). Acting on the complaints of Agromex, the Mexican Government began an antidumping investigation of imports of urea from the United States and Russia from May 1, 1997, to April 30, 1998. Under Mexican regulations, the antidumping duty investigation must be completed within 4 months of the initiation date, which, in this instance, was December 13. Unocal was the only U.S. producer cited in the complaint (Fertilizer Markets, 1998m).

In June, Grupo Fertinal began operating its new 400,000-t/yr ammonium sulfate plant at Lázaro Cardenas, with limited production for the domestic market. Full-scale production of ammonium sulfate and single superphosphate began in August for the export market, although the plant was expected to run at one-half capacity for the rest of 1998 (Fertilizer Week, 1998g).

***Netherlands.*—**Kemira Oy planned to invest $27.7 million to upgrade is ammonia production plant in Rotterdam. Work on the project began in the third quarter of 1998, with completion scheduled for the third quarter of 2000. When the upgrade is completed, capacity at the plant will be increased to 2,200 t/d from 1,800 t/d (Fertilizer Week, 1998i).

***Oman.*—**One of the export guarantee agencies for the Oman-India Fertilizer Co. (OFIC) reportedly had difficulty assessing the creditworthiness of several of the Indian firms that were expected to buy output from OFIC's proposed 1.4-Mt/yr nitrogen complex in Sur. As a result, OFIC could not secure credit insurance for the $1.1 million project. The need to conduct further investigations will delay the plant's financing until the first quarter of 1999; financing was originally scheduled to be completed by the end of 1998, and the plant was to be completed by 2001 (Fertilizer International, 1998b).

***Pakistan.*—**Three facilities in Pakistan began operating new or expanded capacity at the end of 1998, adding 1 Mt/yr of urea production capacity and 600,000 t/yr of ammonia production capacity. The Pak American Fertilizer Ltd. facility at Dhaukel began trial production of ammonia in August and urea in September, with full-scale production beginning in November; production capacity at this plant was 600 t/d of ammonia and 1,050 t/d of urea. In October, Engro Chemical Pakistan Ltd.

commissioned an expansion at its existing urea plant in Daharki, increasing capacity to 850,000 t/yr from 750,000 t/yr. The new FFC-Jordan Fertiliser Co. nitrogen complex began operating in December at Port Qasim, with a total annual capacity of 419,000 t of ammonia, 551,000 t of urea, and 445,000 t of diammonium phosphate; this plant was Pakistan's first indigenous diammonium phosphate facility. These three plants were originally scheduled to open in mid-1998 (Fertilizer International, 1998a).

Peru.**—**Explosivos SA (EXSA) planned to develop a 200,000-t/yr explosives-grade ammonium nitrate facility in the southern part of the country. The start of construction was planned for early 1999, with plant completion scheduled for 2001. Much of the plant's production was expected to be used by the local mining sector, but small quantities of fertilizer-grade material may be available for local farmers. The ammonia feed for the plant has not been secured. EXSA was considering either an import terminal or construction of an ammonia plant with enough capacity to have ammonia available for export (Nitrogen & Methanol, 1998d).

Qatar.**—**Qatar Fertilizer Co. (Qafco) was investigating possible locations for construction of a fourth nitrogen complex, including Umm Said, Qafco's present site, and Ras Laffan. Qafco expected to complete a plant with the capacity to produce 3,200 t/d of urea by 2003; most of the plant's output will be marketed to Argentina, Australia, and South Africa (Fertilizer Markets, 1998o).

Russia.**—**In March, the EU established antidumping duties on ammonium nitrate imported from Russia. The antidumping duty, which was established at 23.6 European currency units (Ecu) per metric ton (about $28.40 per ton), replaced an existing minimum import price of 102.9 Ecu per ton (about $123.80 per ton). In particular, the duty was expected to benefit ammonium nitrate producers in France and the United Kingdom, which accounted for an estimated 85% of ammonium nitrate imports from Russia (Fertilizer Markets, 1998c).

Russia reportedly cut its ammonia and urea output during the first half of 1998 to about 50% of the country's total capacity. The Chinese import ban on urea, new capacity additions around the world, and a decreased demand from India were cited as the reasons for the cutback in production. Of the 13 major Russian nitrogen producers, 5 cut production to 50% of annual capacity, and 2 cut production to 25% of capacity. Only companies that were located near loading ports with favorable rates operated at more than 50% of installed capacity. This was the third year in a row that first-half production was curtailed (Fertilizer Markets, 1998k).

Togliatti Azot announced an agreement with the appropriate authorities to construct a new port on the Black Sea in the Krasnodarsk region near Novorossysk. The new port will serve as alternative to the Ukrainian port of Yuzhnyy for ammonia transport. No timetable was given for port construction; decisions on exact location and investment were planned for early 1999. When the new port is constructed, Togliatti will not have to pay tariffs to Ukraine and will not have to be concerned with the 100,000-metric-ton-per-month restriction on the volume of Russian ammonia allowed through the Ukranian pipeline (Fertilizer Week, 1998o).

Saudi Arabia.**—**Plans to construct a 1,500-t/d ammonia plant by United Jubail Fertilizer Co. were shelved late in 1998 because of low ammonia prices around the world. In late 1999, the company planned to reconsider the four contractors' construction bids that had been submitted in 1998 and to decide whether or not to proceed with construction; construction on the plant was originally scheduled to begin in early 1999 (Fertilizer Markets, 1998n).

South Africa.**—**AECI Ltd. announced that it would close its 330,000-t/yr ammonia and urea plant in Modderfontein by 2000. This announcement followed a buyout attempt by Sasol Chemical Industries Ltd. in October that was blocked by South African authorities. AECI was undergoing restructuring and, as such, was moving away from commodity chemicals; this was the principal reason cited for the closure. AECI also closed an associated calcium ammonium nitrate facility at the end of 1998 (Nitrogen & Methanol, 1999).

Syria.**—**The Syrian Government was soliciting bids from the private sector to construct a nitrogen complex at Palmyra, with the capacity to produce 1,000 t/d of ammonia and 1,750 t/d of urea. In addition, Syria was considering bids for a 500,000-t/yr triple superphosphate plant; total cost of the three plants was estimated to be $600 million. Syria was negotiating with the Japanese ministry for overseas aid to provide some funds for the complex. By yearend, no decision on funding had been made (Fertilizer International, 1998c).

Trinidad and Tobago.**—**Two ammonia projects were completed in Trinidad and Tobago in 1998. PCS Nitrogen's completed its 1,850-t/d ammonia plant in Point Lisas in January and also completed performance tests by April, more than 3 weeks ahead of schedule. The plant uses Kellogg Advanced Ammonia Process technology, which uses a noniron catalyst that can have activity up to 20 times that of a traditional iron catalyst. With this process, ammonia can be produced at lower capital and operating costs and with lower energy requirements than conventional technology (PR Newswire, July 28, 1998, First of a new generation grassroots KAAP ammonia plant successfully completes performance run for PCS Nitrogen, accessed July 28, 1998, at URL http://biz.yahoo.com/prnews/ 980728/tx_m_w_kel_1.html). In April, the joint-venture ammonia plant of Farmland Industries and Mississippi Chemical Corp. was completed, also in Point Lisas, with an annual capacity of 610,000 t. Together, these plants increase ammonia production capacity in Trinidad by 1.2 Mt. Most of both plants' outputs will be marketed in the United States.

CL Financial Ltd. reportedly shelved plans to build a $300 million, 500,000-t/yr ammonia plant because it could not reach an agreement with the Trinidad Government on a natural gas price. According to CL, neither the Ministry of Energy nor the National Gas Co. responded to CL's request for a floor price of $0.85 per million British thermal unit's for natural gas within 6 months (Green Markets, 1998c).

Turkmenistan.**—**In June, the Ministry of Energy issued an invitation to tender for a proposed 500,000-t/yr ammonia plant at Cahrdzhou to be constructed by 2001. A 400,000-t/yr nitrogen complex, already under construction at an existing ammonium nitrate facility in Mary, was scheduled to be completed in 1999. Much of the production from these plants was believed to be destined for the export market, because

Turkmenistan's domestic demand for urea was estimated to be only about 200,000 t annually (Nitrogen & Methanol, 1998c).

Ukraine.—Fedcominvest, a Russian trading firm, was in talks to build a 500,000-t/yr granular urea plant at Gorlovka by 1999; a source of financing, however, has not been established. If financing can be found, then the plant will be run as a joint venture between Fedcominvest and Stirol Gorlovka, a Ukranian nitrogen fertilizer producer (Fertilizer Week, 1998f).

As part of the conditions for receiving a loan from the International Monetary Fund (IMF), Ukraine has eliminated the monthly minimum indicative price system that it used to control export prices at Yuzhnyy. The IMF loan was expected to be used to meet foreign-held debt payments of about $1.6 billion due at the end of 1998. Price controls for urea, however, may remain in place (Fertilizer Week, 1998m).

Uzbekistan.—The French engineering firm, Krebs-Speichim, signed an agreement with the Uzbek Government to increase production and efficiency at the PO Chirchik Elektrochimprom 250,000-t/yr urea plant. The goal of the upgrade was to increase production capacity to 300,000 t/yr and reduce consumption of steam and carbon dioxide by 50% and 4%, respectively, for each metric ton of urea produced. No timetable was given for the project (Fertilizer Week, 1998j).

Venezuela.—Financing was completed for the Fertilizantes Nitrogenados de Venezuela (FertNitro) nitrogen plant when Citibank, NationsBank, and Mediocredito Centrale agreed to provide more than $900 million for the project in January. FertNitro instead will borrow $450 million from these banks and finance the remainder of the estimated $1.1 billion cost, which will include raising $250 million in secured bonds from institutional investors. Construction of the plant, jointly owned by Petroquimica de Venezuela SA, Koch Nitrogen Co., Snamprogetti, and Empresas Polar, was planned to be completed by the end of 2000. Total annual production capacity will be 1.3 Mt of ammonia and 1.5 Mt of urea (Green Markets, 1998d).

Zambia.—After offering Nitrogen Chemicals of Zambia for privatization, the plant was closed because no companies expressed interest. Potential investors, Norsk Hydro and Sasol, withdrew bids for the company in March 1998 (Fertilizer Week, 1998p).

Outlook

The U.S. Department of Agriculture projects large supplies of field crops for 1999 and 2000, with the exception of wheat. In the 1999-2000 crop year, soybean crops are expected to exceed 3 billion bushels for the first time; this is the only one of the three major crops (corn, soybeans, and wheat) that is projected to have an increase in planted acreage. The corn supply is expected to increase by about 1% in 1999-2000 and is projected to be the fourth largest ever. With large carryover stocks, however, planted acreage is projected to decrease by 2% from the 1998-99 crop year. Wheat plantings are expected to decrease as well (Hoffman, 1999). With the overall projected decline in planted acreage, domestic fertilizer consumption is not expected to change significantly.

Increases in world ammonia and urea production capacities are forecast to continue, although some of the projects in Asia have been delayed because of the financial crisis. The International Fertilizer Development Center projects an increase of nearly 9% in total world ammonia production capacity and an increase of 13% in urea production capacity by 2001. Latin America and Asia are the regions in which most of the ammonia and urea capacity expansion is predicted. With these capacity increases and slow growth in demand, the overcapacity situation that the nitrogen industry has been experiencing is likely to persist. The overcapacity probably will lead to continued low prices for nitrogen materials as well. If, however, the flooding in China prompts that country to begin importing urea again, then the overcapacity situation may ease somewhat.

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[1]Prior to January 1996, published by the U.S. Bureau of Mines.

TABLE 1
SALIENT AMMONIA STATISTICS 1/ 2/

(Thousand metric tons of contained nitrogen unless otherwise specified)

	1994	1995	1996	1997	1998 p/
United States:					
Production	13,300	13,000	13,400 r/	13,300 r/	14,700
Exports	215	319	435	395	614
Imports for consumption	3,450	2,630	3,390	3,530	3,460
Consumption, apparent 3/	16,500	15,300	16,400 r/	15,800 r/	18,100
Stocks, December 31; producers'	956	959	881	1,530	1,050 4/
Average annual price per ton product, f.o.b. gulf coast 5/	$211	$191	$190 r/	$173 r/	$121
Net import reliance 6/ as a percent of apparent consumption	19	15	19	16 r/	18
Natural gas price; wellhead 7/	$1.85	$1.55	$2.17	$2.32 r/	$1.96 e/
World:					
Production	93,600 r/	100,000 r/	103,000 r/	104,000 r/	106,000 e/
Trade 8/	10,000	10,800	10,900 r/	11,400	11,300

e/ Estimated. p/ Preliminary. r/ Revised.
1/ Data are rounded to three significant digits, except prices.
2/ Synthetic anhydrous ammonia, calendar year data, Bureau of the Census; excludes coke oven byproduct.
3/ Calculated from production, plus imports minus exports, and industry stock changes.
4/ Source: The Fertilizer Institute.
5/ Source: Green Markets, Fertilizer Market Intelligence Weekly.
6/ Defined as imports minus exports, adjusted for industry stock changes.
7/ Monthly Energy Review, U.S. Department of Energy. Average annual cost at wellhead in dollars per thousand cubic feet.
8/ Source: International Fertilizer Industry Association Statistics, World Anhydrous Ammonia Trade.

TABLE 2
FIXED NITROGEN PRODUCTION IN THE
UNITED STATES 1/

(Thousand metric tons of contained nitrogen)

	1997 r/	1998 p/
Anhydrous ammonia, synthetic:		
Fertilizer	11,400	12,500
Nonfertilizer	1,900	2,230
Total	13,300	14,700

p/ Preliminary. r/ Revised.
1/ Data are rounded to three significant digits; may not add to totals shown.

Sources: Bureau of the Census, Current Industrial Reports MA28B and MQ28B.

TABLE 3
MAJOR DOWNSTREAM NITROGEN COMPOUNDS
PRODUCED IN THE UNITED STATES 1/ 2/

(Thousand metric tons)

Compound	1997 r/	1998 p/
Urea:		
Gross weight	7,430	7,980
Nitrogen content	3,410	3,670
Ammonium phosphates: 3/		
Gross weight	17,500	16,900
Nitrogen content	2,980	2,790
Ammonium nitrate:		
Gross weight	7,810	7,820
Nitrogen content	2,650	2,650
Ammonium sulfate: 4/		
Gross weight	8,560	8,500
Nitrogen content	1,880	1,870
Nitric acid		
Gross weight	2,460	2,500
Nitrogen content	521	530

p/ Preliminary. r/ Revised.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Ranked in relative order of importance by nitrogen content.
3/ Diammonium phosphate, monoammonium phosphate, and other ammonium phosphates.
4/ Excludes coke plant ammonium sulfate.

Sources: Bureau of the Census, Current Industrial Reports MA28B and MQ28B.

TABLE 4
DOMESTIC PRODUCERS OF ANHYDROUS AMMONIA IN 1998 1/

(Thousand metric tons per year of ammonia)

Company	Location	Capacity 2/
Agrium Inc.	Borger, TX	448
Air Products and Chemicals Inc.	Pace Junction, FL	71
AlliedSignal Inc.	Hopewell, VA	409
Avondale Ammonia Co.	Fortier, LA	399
Borden Chemicals Inc.	Geismar, LA	364
CF Industries Inc.	Donaldsonville, LA	1,730
Coastal Chem, Inc.	Cheyenne, WY	174
Coastal St. Helens Chemical	St. Helens, OR	88
Dakota Gasification Co.	Beulah, ND	334
E.I. du Pont de Nemours & Co. Inc.	Beaumont, TX	451
Farmland Industries Inc.	Beatrice, NE	255
Do.	Dodge City, KS	263
Do.	Enid, OK	907
Do.	Fort Dodge, IA	339
Do.	Lawrence, KS	409
Do.	Pollock, LA	459
Green Valley Chemical Corp.	Creston, IA	32
IMC-Agrico Co.	Faustina (Donaldsonville), LA	508
IMC AgriBusiness	East Dubuque, IL	292
J.R. Simplot Co.	Pocatello, ID	93
Koch Industries Inc.	Sterlington, LA	1,110
LaRoche Industries Inc.	Cherokee, AL	159
Mississippi Chemical Corp.	Yazoo City, MS	644
Nitromite Fertilizer	Dumas, TX	128
PCS Nitrogen Inc.	Augusta, GA	622
Do.	Clinton, IA	237
Do.	Geismar, LA	476
Do.	LaPlatte, NE	182
Do.	Lima, OH	551
Do.	Woodstock, TN	356
Shoreline Chemical	Gordon, GA	31
Solutia Inc. 3/	Luling, LA	446
Terra International Inc.	Blytheville, AR	390
Do.	Port Neal, IA	319
Do.	Verdigris, OK	989
Do.	Woodward, OK	446
Triad Nitrogen Inc. 4/	Donaldsonville (Ampro), LA	509
Do.	Donaldsonville (Triad), LA	417
Union Chemical Co. (Unocal)	Finley, WA	150
Do.	Kenai, AK	1,180
Wil-Grow Fertilizer Co.	Pryor, OK	86
Do.	Pryor, OK (II)	247
Total		17,700

1/ Data are rounded to three significant digits; may not add to total shown.
2/ Engineering design capacity adjusted for 340 days per year of effective production capability.
3/ Solutia Inc. was formed as a spinoff of Monsanto Co.'s chemical business in September 1997.
4/ Wholly owned subsidiary of Mississippi Chemical Corp.

Sources: International Fertilizer Development Center; North American Fertilizer Capacity, Ammonia, February 1999.

TABLE 5

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

(Thousand metric tons nitrogen)

Fertilizer material 3/	1997	1998 p/
Single nutient:		
Anhydrous ammonia	3,610	3,290
Nitrogen solutions 4/	2,780 r/	2,690
Urea	1,600 r/	1,850
Ammonium nitrate	598	599
Ammonium sulfate	232 r/	223
Aqua ammonia	43 r/	51
Other 5/	251 r/	305
Total	9,110 r/	9,010
Multiple nutrient 6/	2,190 r/	2,170
Grand total	11,300 r/	11,200

p/ Preliminary. r/ Revised.
1/ Data are rounded to 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 (UAN) solutions, 29.9% N.
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: Commercial Fertilizers 1998. Prepared as a cooperative cooperative effort by The Fertilizer Institute and the Association of American Plant Food Control Officials.

TABLE 6

U.S. PRODUCER STOCKS OF FIXED NITROGEN COMPOUNDS AT YEAREND 1/ 2/

(Thousand metric tons nitrogen)

Material 3/	1997	1998 p/
Ammonia	1,530	1,530 4/
Nitrogen solutions 5/	385	W
Urea	108	115
Ammonium phosphates 6/	86 r/	68
Ammonium nitrate	67	W
Ammonium sulfate	51 r/	41
Total	2,220 r/	1,270

p/ Preliminary. r/ Revised. W Withheld to avoid disclosingcompany preoprietary data; not included in total.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Calendar year ending December 31.
3/ Ranked in relative order of importance.
4/ Source: The Fertilizer Institute.
5/ Urea-ammonium nitrate and ammoniacal solutions.
6/ Diammonium, monoammonium, and other ammonium phosphates.

Sources: Bureau of the Census, Current Industrial Reports MA28B and MQ28B, except where noted.

TABLE 7
PRICE QUOTATIONS FOR MAJOR NITROGEN COMPOUNDS
AT YEAREND

(Per short ton product)

Compound	1997	1998
Ammonium nitrate; f.o.b. Corn Belt 1/	$122-$125	$110-$115
Ammonium sulfate; f.o.b. Corn Belt 1/	124-130	118-128
Anhydrous ammonia:		
F.o.b. Corn Belt	181-195	131-141
F.o.b. Gulf Coast 2/	130	98
Diammonium phosphate; f.o.b. central Florida	174-175	172-175
Urea:		
F.o.b. Corn Belt, prilled and granular	125-135	110-125
F.o.b. Gulf Coast, granular 2/	102-103	82-85
F.o.b. Gulf Coast, prilled 2/	102-103	75-80

1/ Illinois, Indiana, Iowa, Missouri, Nebraska, and Ohio.
2/ Barge, New Orleans.

Source: Green Markets, Fertilizer Market Intelligence Weekly.

TABLE 8
U.S. EXPORTS OF ANHYDROUS AMMONIA,
BY COUNTRY 1/

(Thousand metric tons ammonia)

Country	1997	1998
Belgium	1	4
Brazil	--	19
Canada	13	27
Colombia	--	11
Costa Rica	--	11
Korea, Republic of	463	571
Morocco	--	19
Taiwan	1	82
Other	3 r/	3
Total	481	747

r/ Revised.
1/Value data suppressed by Bureau of the Census.

Source: Bureau of the Census.

TABLE 9
U.S. IMPORTS OF ANHYDROUS AMMONIA, BY COUNTRY 1/

(Thousand metric tons ammonia and thousand dollars)

Country	1997 Gross weight	1997 Value 2/	1998 Gross weight	1998 Value 2/
Algeria	--	--	8	1,060
Brazil	39	6,410	40	5,740
Canada	1,190	219,000	999	167,000
Colombia	6	1,340	31	4,200
France	2	440	1	382
Germany	--	--	(3/)	9
Indonesia	10	1,890	--	--
Japan	(3/)	46	(3/)	2
Latvia	--	--	8	1,390
Mexico	303	52,300	167	21,600
Netherlands	10	1,770	--	--
Russia 4/	1,200	100,000	853	53,800
Spain	13	2,200	--	--
Switzerland	--	--	94	14,500
Trinidad and Tobago	1,430	263,000	1,960	265,000
Ukraine	NA	58,400	NA	25,400
Venezuela	87	15,000	47	6,000
Total	4,300 r/	722,000	4,210	565,000

r/ Revised. NA Not available.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ C.i.f. value.
3/ Less than 1/2 unit.
4/ Quantity data from the Journal of Commerce Port Import/Export Reporting Service; may include imports from Ukraine.

Sources: Bureau of the Census, Journal of Commerce Port Import/Export Reporting Service.

TABLE 10
U.S. EXPORTS OF MAJOR NITROGEN COMPOUNDS 1/

(Thousand metric tons)

Compound	1997 Gross weight	1997 Nitrogen content	1998 Gross weight	1998 Nitrogen content
Ammonium nitrate 2/	45	15	55	19
Ammonium sulfate 2/	840	227	1,050	284
Anhydrous ammonia	481	395	747	614
Diammonium phosphate	8,500	1,530	9,870	1,780
Monoammonium phosphate	1,630	180	1,680	185
Urea	824	378	841	386
Mixed chemical fertilizers 3/	294	35	38	5
Other nitrogenous fertilizers 4/	169	50	172	51
Total	12,800 r/	2,810 r/	14,500	3,320

r/ Revised.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes industrial chemical products.
3/ Harmonized codes 3105.10.0000, 3105.20.0000, and 3105.51.0000.
4/ Harmonized codes 3101.00.0000, 3102.29.0000, 3102.60.0000, and 3102.90.0000.

Source: Bureau of the Census.

TABLE 11
U.S. IMPORTS OF MAJOR NITROGEN COMPOUNDS 1/

(Thousand metric tons and thousand dollars)

Compound	1997 Gross weight	1997 Nitrogen content	1997 Value 2/	1998 Gross weight	1998 Nitrogen content	1998 Value 2/
Ammonium nitrate 3/	708	240	104,000	759	257	99,900
Ammonium nitrate-limestone mixtures	27	7	3,670	25	7	2,470
Ammonium sulfate 3/	478	101	47,000	319	68	29,800
Anhydrous ammonia 4/	4,300	3,530	722,000	4,210	3,460	565,000
Calcium nitrate	(5/)	(5/)	13,100	(5/)	(5/)	16,500
Diammonium phosphate	57	10	14,500	44	8	11,100
Monoammonium phosphate	115	13	33,500	126	14	35,600
Nitrogen solutions	780	233	89,900	633	189	60,700
Potassium nitrate	19	3	6,190	24	3	6,910
Potassium nitrate-sodium nitrate mixtures	20	3	3,520	21	3	3,770
Sodium nitrate	114	19	22,600	125	21	23,800
Urea	2,530	1,160	425,000	3,320	1,530	520,000
Mixed chemical fertilizers 6/	354	42	71,100	324	39	67,000
Other nitrogenous fertilizers 7/	220	65	31,200	192	57	28,400
Total	9,720	5,430	1,590,000	10,100	5,650	1,470,000

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ C.i.f. value.
3/ Includes industrial chemical products.
4/ Includes industrial ammonia.
5/ Less than 1/2 unit.
6/ Harmonized codes 3105.10.0000, 3105.20.0000, 3105.51.0000, and 3105.90.0050.
7/ Harmonized codes 3101.00.0000, 3102.29.0000, 3102.60.0000, and 3102.90.0000.

Source: Bureau of the Census.

TABLE 12
AMMONIA: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Thousand metric tons of contained nitrogen)

Country	1994	1995	1996	1997	1998 e/
Afghanistan e/	15	10	5	5	5
Albania e/	15	15	15	10	10
Algeria	243	176	150	380 e/	350
Argentina	73	79	80	107 e/	86
Australia	413	433	446	432 e/	430 3/
Austria e/	400	400	450 r/	450 r/	450
Bahrain	338	358	323	356 e/	336
Bangladesh 4/	1,027	1,271	1,233	1,080	1,129
Belarus	650 e/	668	678	590 e/	685
Belgium	633	720	750	760	756 3/
Bosnia and Herzegovina e/	1	1	1	1	1
Brazil	939	993	977	1,019 r/	949
Bulgaria	995 e/	1,203	1,194 r/	808 r/	448
Burma	70	66	57	62	52
Canada	3,470	3,773	3,840	4,081 r/	3,900 3/
China e/	20,100	22,600	23,000	25,000 r/	26,500
Colombia	112	99	102	81 e/	100
Croatia	311	310 r/	307	331 e/	248
Cuba e/	130	135	135	135	135
Czech Republic	284	254	304	251 e/	258
Denmark e/	2	2	2	2	2
Egypt	1,021	1,096	1,126	1,060 e/	1,141 3/
Estonia	170 e/	170	167 r/	169	173
Finland	12	6	6 e/	6 e/	6
France	1,480	1,470	1,570 r/ e/	1,757 r/	1,570
Germany	2,170	2,518	2,485	2,470 e/	2,512 3/
Georgia	35 e/	52	77	84	64
Greece	45	65	90	83 e/	178 3/
Hungary	302	307	347	339 e/	288
Iceland	9	7	7	7	6 3/
India 5/	7,503	8,287	8,549	9,298 r/	10,037 3/
Indonesia	3,012	3,336	3,647	3,770 e/	3,600
Iran	696	715	882	880	1,034 3/
Iraq e/	220	220	220	220	220
Ireland	451	408	377	465 e/	458 3/
Israel 4/	46	70 r/	65 r/	57 r/	1
Italy	504	487	397	446 r/	409 3/
Japan	1,483	1,584	1,567	1,589 r/	1,580
Kazakhstan	100 e/	49	75	75 e/	--
Korea, North e/	600	600	600	600	600
Korea, Republic of	574	616	599	509	457
Kuwait	389	493	412	432 e/	452 3/
Libya	407	534	546	537 e/	535
Lithuania	277	442	461	384 r/	407
Malaysia	313	333	329	243 e/	351
Mexico	2,030	1,992	2,054	1,448 r/	1,449
Netherlands	2,479	2,580	2,652	2,480 r/ e/	2,350
New Zealand	81	79	68	80 e/	94 3/
Nigeria e/	200 r/	170	164	134	168
Norway	270	289	295	279	245 3/
Pakistan	1,505	1,493	1,606	1,549 r/	1,797
Peru	15 e/	24	18	15 e/	15
Poland	1,230	1,726 r/	1,713 r/	1,824 r/	1,683
Portugal	58	155	198 r/	196	204
Qatar	646	653	635	943	1,127 3/
Romania	1,182	1,487	1,513	781 e/	378
Russia	7,300	7,900	7,900	7,150	6,500
Saudi Arabia	1,340	1,327	1,386	1,405 r/	1,449 3/
Serbia and Montenegro	159	135	193 r/	193 r/	141
Slovakia	255	178	197	229 e/	234

See footnotes at end of table.

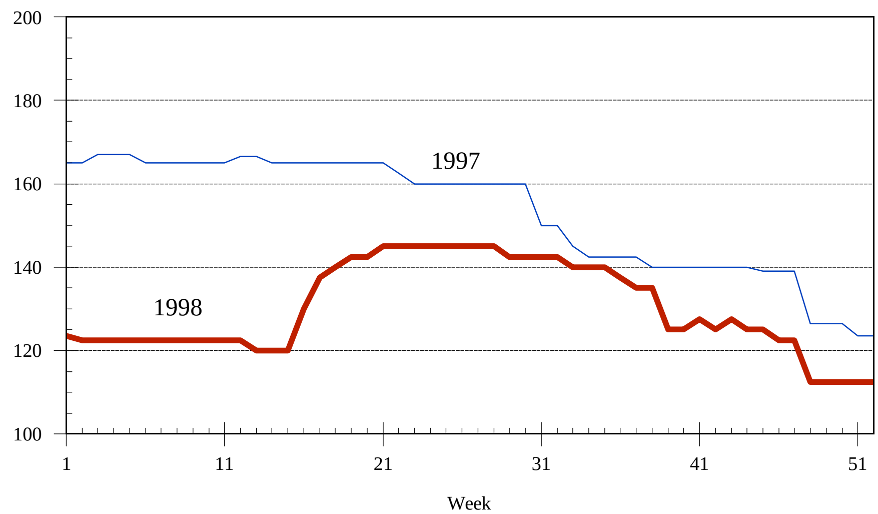
TABLE 12--Continued
AMMONIA: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons of contained nitrogen)

Country	1994	1995	1996	1997	1998 e/
South Africa	754	759	770	752	723
Spain	452	453	466	497	460 3/
Switzerland e/	30	30	32 r/	32 r/	31
Syria	93	64	80	84 e/	129
Taiwan	215	226	220 e/	245 r/ e/	220
Tajikistan e/	20 r/	15 r/	10 r/	10 r/	10
Trinidad and Tobago	1,649	1,696	1,801	1,772 r/	2,271
Turkey	350 e/	366	461 r/	513 r/ e/	314
Turkmenistan	50 e/	52 e/	70	61	75
Ukraine	3,000 e/	3,100	3,300	3,400 e/	3,300
United Arab Emirates	287	363	331	373	331 3/
United Kingdom	1,006	799	850	642	870 3/
United States 6/	13,300	13,000	13,400 r/	13,300 r/	14,700 3/
Uzbekistan	900 e/	906	950	950 r/	875
Venezuela	505	600	605	612 r/	522
Vietnam	54 r/	54 r/	54 r/	54 e/	33
Zambia	4	1	2	1 e/	--
Zimbabwe e/	70	43	61	64	57
Total	93,600 r/	100,000 r/	103,000 r/	104,000 r/	106,000

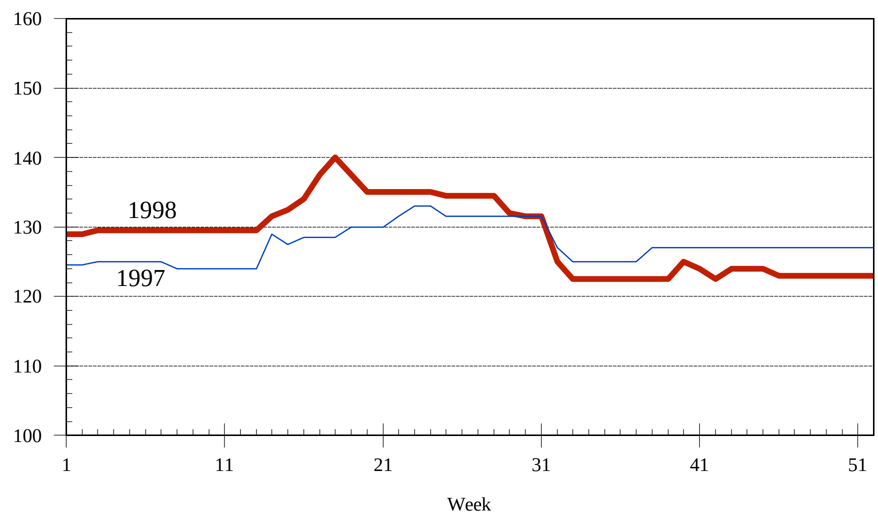
e/ Estimated. r/ Revised.
1/ World totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.
2/ Table includes data available through June 18, 1999.
3/ Reported figure.
4/ May include nitrogen content of urea.
5/ Data are for years beginning April 1 of that stated.
6/ Synthetic anhydrous ammonia; excludes coke oven byproduct ammonia.

Figure 1.--Average ammonium nitrate prices
(Dollars per short ton)



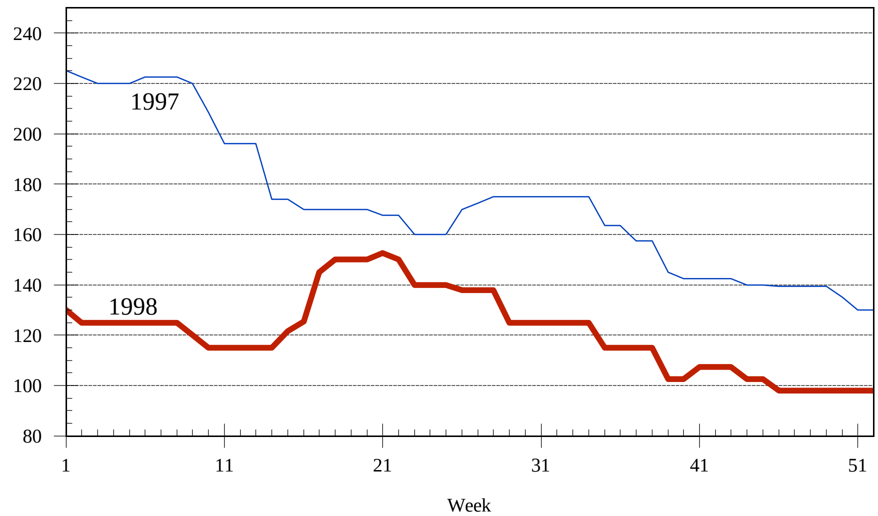
Source: Green Markets.

Figure 2.--Average ammonium sulfate prices
(Dollars per short ton)



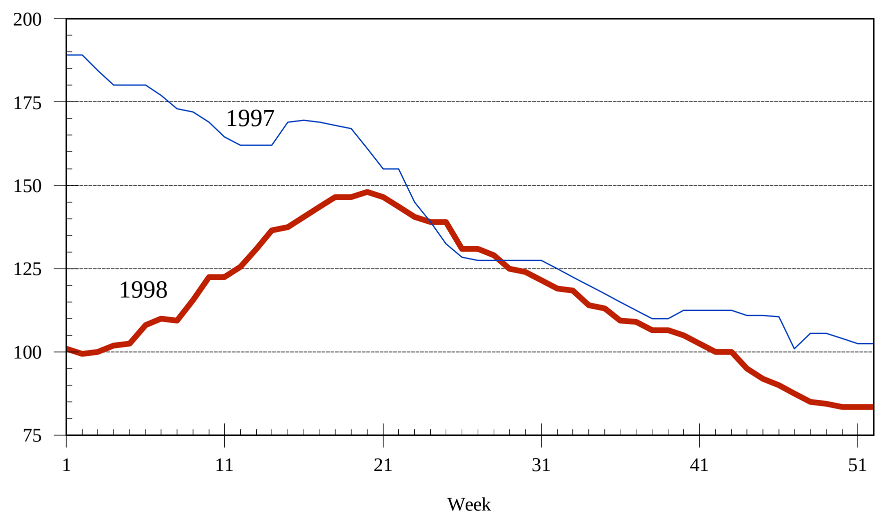
Source: Green Markets.

Figure 3.--Average Gulf Coast ammonia prices
(Dollars per short ton)



Source: Green Markets.

Figure 4.--Average annual Gulf Coast granular urea prices
(Dollars per short ton)



Source: Green Markets.