

Ammonium Nitrate

Ammonium nitrate was the first solid nitrogen (N) fertilizer produced at a large scale. It is an efficient N source because it contains both nitrate and ammonium and it has a relatively high nutrient content.

Production

Production of ammonium nitrate is an endothermic process that results from the reaction of ammonia gas with nitric acid to form a concentrated ammonium nitrate liquid solution. Considerable heat is co-produced, which is mostly recovered as energy in the fertilizer plant. Solid finished fertilizers are then made via a prilling or granulation process. Granular forms of ammonium nitrate are preferred by farmers for their superior mechanical spreading performance at large widths.

Since ammonium nitrate attracts moisture from air, it is produced with a coating that prevents moisture absorption and reduces caking to keep the particles free flowing during handling and field application.

Ammonium nitrate is often the nitrogen (N) source for NPK compound fertilizers when it is combined with phosphorus (P) and potassium (K). It can be enriched with sulfate to produce fertilizer with an excellent N to sulfur ratio for crops. Ammonium nitrate is sometimes enhanced with limestone to produce calcium ammonium nitrate (CAN), which provides additional calcium and magnesium to the crop and reduces the need for lime to compensate for soil acidification.

Chemical Properties

Chemical formula:	NH_4NO_3
Composition:	33 to 34% N
Water solubility (20 °C):	1,900 g/L



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Granular ammonium nitrate provides equal amounts of nitrate-N and ammonium-N, and its application has been highly suited to vegetable or forage crops.

Agricultural Use

Since plant roots do not directly absorb the urea form of N to a large extent, ammonium nitrate is an efficient and immediate source of plant nutrition. It provides half of the N in the nitrate form and half in the ammonium form. The nitrate form is mobile in the soil water and immediately available for plant uptake. The ammonium fraction is taken up if roots grow nearby or after it is converted to nitrate by soil microorganisms during nitrification.

Many farmers prefer an immediately available nitrate source for plant nutrition and choose ammonium nitrate as their N fertilizer. It is popular for pasture and broad acre crops since almost no ammonia volatilization losses occur, compared to urea-based fertilizers. Some 37 million metric tons (MMt) of fertilizer grade ammonium nitrate are consumed worldwide annually in agriculture, of which about 14 MMt are used as CAN. Because of its high crop recovery, its ease of use, and its suitability for in-season top dressing, ammonium nitrate is widely used, especially in many European countries.

Management Practices

Ammonium nitrate is a popular N fertilizer due to its agronomic efficiency and relatively high nutrient content. It is very soluble in the soil and the nitrate portion can be easily taken up by the crops. The ammonium portion provides a delayed supply of N to the crop. It is often used for in season top-dressing of N according to crop demand. Because of its high density it can be evenly spread across wide distances. Spreading widths of up to 36 meters are possible when using quality products having a quite large granular median size. Ammonium nitrate requires no special management practices, but efforts should always be made to minimize the loss of any nutrients to the environment.

Non Agricultural Uses

Ammonium nitrate is manufactured in both high density and low density forms. The low density prills (technical grade) are more porous than high density fertilizer prills or granules. The low-density materials are manufactured especially for use as an explosive in the mining industry. The intentionally porous nature of the particles allows rapid adsorption of fuel oil (termed ANFO). Concerns over illegal use of nitrate-containing fertilizer for explosives have caused strict government regulation in many parts of the world.