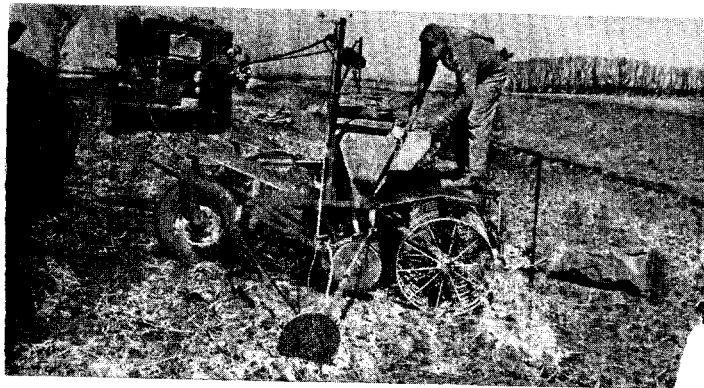
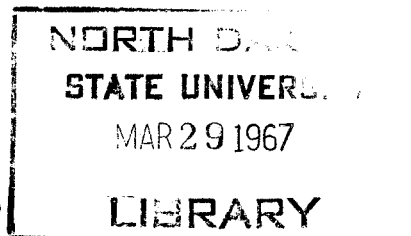


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# Forms of NITROGEN FERTILIZER

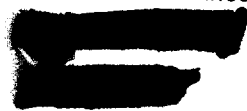


VIRGIL L. WEISER  
EXTENSION SOIL SPECIALIST



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EXTENSION SERVICE  
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## FORMS OF NITROGEN FERTILIZER

You can buy fertilizer nitrogen either as a gas, a liquid, or a solid. Each should boost crop yield as well as the others when compared on a nitrogen-equivalent basis.

While nitrogen from these three sources is considered equally effective, the forms differ in physical properties that require different handling and application methods.

Choose the form of nitrogen fertilizer you want to use by comparing price per pound of nitrogen plus application costs. Your choice may be limited because of special application methods needed to suit your own crop and soil conditions.

Properties of Different Forms of Nitrogen Fertilizers

Material	Actual Nitrogen	Pressures lbs./sq. in.	Application
<b>GAS</b> Anhydrous Ammonia (Liquid under pressure)	82%	75 lbs. at 50°F. 197 lbs. at 100°F.	Apply 4 to 6 inches below soil surface to prevent gas escape.
<b>LIQUIDS</b> (Low pressure) Free ammonia and ammonium nitrate or urea solutions in water	16-40%	1 to 17 lbs.	Apply one to two inches below soil surface to prevent drying losses.
(Non-pressure) Ammonium nitrate and urea solutions in water	20-32%	None	Spray* on soil surface or crop residues or apply in the soil.
<b>SOLIDS</b> Ammonium nitrate	33.5%	None	Broadcast* on soil surface or apply in the soil.
Ammonium sulfate	21%		
Urea	42-45%		
Mixed fertilizers containing nitrogen	2-25%		

\* Cover by tillage soon after spraying or broadcasting to reduce surface evaporation.

### ANHYDROUS AMMONIA

Ammonia is a gas at atmospheric pressure and temperatures higher than 28 degrees below zero F. At temperatures less than that, it is a liquid. At temperatures above minus 28 degrees F. it is compressed to form a liquid to facilitate storage and handling. When released from pressure it again becomes a gas. A gallon of liquid anhydrous ammonia weighs 5 pounds and contains 4.1 pounds of nitrogen. Concentrated ammonia gas has a stifling odor and can burn living tissue. You must be careful not to breathe it or allow it to come in contact with your skin, or eyes. Direct contact can also burn plant tissues.

You can lose much of the ammonia gas during field application unless it is released beneath the surface of the soil (4 to 6 inches) and then is well covered. Clay and organic matter absorb ammonia but it must be applied under the surface for highest absorption. You will also have losses if the soil is either too dry or too wet during application.

Good moisture conditions for tillage are good also for ammonia application. No good way has been developed to apply it to close seeded growing crops. It has been applied successfully to grass sods, between rows of wide spaced row crops, as a sidedressing, and as a preplanting application.

Anhydrous ammonia is shipped in 10,000-gallon tank cars and stored in high pressure tanks. It is delivered to the farm in pressurized tank trucks or trailers and transferred to tanks on special field machines which apply it beneath the soil surface through knife-like blades. It can be applied through hoses beneath each furrow slice as a field is moldboard plowed.

is applied by custom machinery by the retailer of the material. Only large farm operations, where large amounts of the material are being used, can afford to own the expensive transportation, storage and application equipment needed.

High analysis of anhydrous ammonia keeps transportation and other costs per pound of nitrogen low. Retail price per pound of nitrogen in anhydrous ammonia is usually considerably less than the other forms, but the per-acre costs of applying it are usually higher. Its cost advantage becomes greater at higher per-acre rates of application.

## LOW PRESSURE LIQUIDS

These materials are water solutions of either ammonium nitrate or urea and some ammonia gas. They must be kept in airtight, low-pressure containers to prevent loss of ammonia gas in storage. They need to be applied in the soil, although it is not necessary to place them so deep or cover them as thoroughly as anhydrous ammonia. Low pressure liquids often are applied along with some tillage operation.

Price per pound of nitrogen contained is usually about the same as for solid and non-pressure liquid forms of nitrogen fertilizer.

## NON-PRESSURE LIQUIDS

Non-pressure liquid nitrogen fertilizers are usually made by dissolving ammonium nitrate, urea, or both of these in water.

Such solutions do not contain free ammonia gas that needs pressure to keep it from escaping immediately. You can store these solutions in open containers and spray them directly on the soil surface. However, an enzyme (urease) present in soil and crop residues breaks down urea to release ammonia gas. The speed at which this breakdown takes place depends on soil and air temperature.

Ammonium nitrate can react with lime in calcareous soils to release free ammonia. Because of this possible loss of ammonia gas, you should work these liquid materials into the soil by tillage within 1/2 to 2 days after surface application if possible. Tillage is not possible when you topdress grasslands or close-seeded growing crops, and unless rain falls soon to move the material into the soil some evaporation loss is possible. Non-pressure liquids are often applied through dribble

tubes attached to the cultivator, as a side dressing for row crops, or along with other machine tillage operations before planting.

Except with very light applications there is danger that non-pressure liquids applied to the foliage of growing crops can burn the leaves. Since these fertilizer solutions can corrode metals, tanks and spray equipment should be made of stainless steel or aluminum to resist corrosion. You can use weed sprayers made of other metals, but you must wash them thoroughly clean immediately after use to minimize corrosion.

## SOLID NITROGEN FORMS

Ammonium nitrate, urea, and ammonium sulfate in crystalline form are the more common dry salt forms of straight nitrogen fertilizer.

Dry forms can be applied on or beneath the soil surface, by drill or planter attachment at seeding time, or broadcast before planting and in growing crops. Whenever tillage is possible, you can keep losses from evaporating ammonia gas at minimum if you will cover surface broadcast applications within 1/2 to 2 days after broadcasting.

Dry forms of nitrogen fertilizers are available as bagged materials or in bulk in many areas. Many dealers offer custom spreading of bulk fertilizers. Others rent trailer spreaders so you can do your own spreading. Remember that dry salt forms of nitrogen fertilizer can take moisture from the air on humid days so that they cake or do not flow freely when you take them out of storage and apply them.

## MIXED AND COMBINATION FERTILIZERS CONTAIN NITROGEN

For many crops and conditions in North Dakota much of the nitrogen fertilizer is used as dry or liquid mixed fertilizer containing other nutrients or as a combination fertilizer such as ammonium phosphate, a single compound that contains both nitrogen and phosphorus.

Combining fertilizers in one application will likely continue where the phosphorus or potassium is to be applied through planter or drill attachment at seeding time and the amount of nitrogen to be applied to the crop is small. It is only where higher rates of nitrogen are to be used, or where there is no need for phosphorus or potassium, that the three forms of straight nitrogen fertilizer will be used.

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