

Nutri-Facts

Agronomic information on nutrients for crops

Nutri-Facts #1

It's the Truth— Nitrogen Is Required by Plants

DID YOU KNOW that about 80 percent of the air you breathe is nitrogen (N)? It's true. In fact, every acre of land in the world is covered by about 75 million pounds of N...37 thousand tons. Not a pound of that N can be used by crop plants until it is changed by natural processes or by commercial fertilizer production.

Through various processes of 'fixation,' gaseous atmospheric N is changed to a plant-usable form... either ammonium or nitrate. It can be fixed by lightning and carried to the Earth's surface in rain or snow. It can be fixed by certain organisms in the soil and in nodules on legume roots. Industrial fixation supplies the millions of tons of commercially produced N fertilizers required to grow crops around the world.

Nitrogen in Crops

Nitrogen is required in greater quantities by crops than any of the other essential nutrients, except potassium (K). Some crops take up more K than N. **Table 1** shows how much N is required by several common crops.

Nitrogen in Soils

The amounts of N supplied by most soils is small. Very little is found in

Nitrogen is a quality nutrient because it is a part of the makeup of all plant and animal proteins. The nutritive value of the food we eat is largely dependent on the availability of N for plant and animal growth.

Table 1. Crops are big users of N.

Crop	Yield level	Pounds of N taken up in total crop
Alfalfa ¹	8 tons	450
Coastal bermudagrass	8 tons	368
Corn	160 bu	213
Cotton	1,500 lb lint	180
Grain sorghum	7,500 lb	222
Oranges	540 cwt	265
Peanuts	4,000 lb	240
Rice	7,000 lb	112
Soybeans	60 bu	315
Tomatoes	40 tons	232
Wheat	60 bu	113

¹Legumes get most of their N from air.

rocks and minerals; most soil N comes from organic matter. Organic matter releases N slowly, the rate being controlled by such factors as soil temperature, moisture and texture.

In general, about 20 to 30 pounds of N per acre are released each year for each one percent organic matter contained in the soil. One of the products of organic decomposition (mineralization) is ammonium, which can be held by the soil, taken up by crop plants or converted to nitrate. The nitrate can be used by plants, leached out of the root zone or converted to gaseous N and lost back into the atmosphere. The relationship between plant unavailable N (organic matter) and plant-available N (ammonium and nitrate) is illustrated in **Figure 1**.

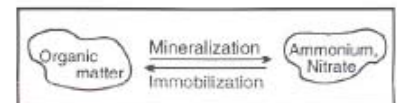


Figure 1. More than 90 percent of soil N is contained in organic matter, not readily available for plant use.

Choosing a Nitrogen Fertilizer Source

Since most soils cannot provide sufficient levels of N to support economic crop growth, commercial fertilizers are widely used to meet crop needs. Manure, sewage sludge and other wastes are acceptable sources of N as well...when they are available. However, those sources are

difficult to manage and cannot be economically transported long distances.

Choosing the correct N source should be based on several factors, including availability, price, crop being fertilized, timing and methods of application, tillage systems and others. From a nutrient efficiency standpoint, however, a pound of N is a pound of N...assuming other management decisions are properly made for the source selected. Further, all N sources, if not properly managed, pose a potential source for nitrate accumulation in groundwater and surface water.

Nitrogen Deficiency Symptoms

Adequate N produces a dark green color in leaves, caused by a high level of chlorophyll. A deficiency results in a yellowing (chlorosis) of the leaves because of declining chlorophyll. Deficiency symptoms appear first on older leaves, then develop on younger ones as the condition becomes more severe. Other symptoms of N deficiency include:

- Stunted, spindly plants
- Less tillering in small grains

- Low protein content...in seed and vegetative parts
- Fewer leaves
- Higher susceptibility to weather stress, pests and diseases

Crop Response to Nitrogen

Crop needs for N fertilization are more common than for any other essential nutrient. **Table 2** shows how corn yields were increased with N and high population. Nitrogen fertilization is always more profitable...and environmentally friendly...when used with other best management practices.

Table 2. Higher corn population and N interact to increase yield and N use efficiency.

Population, plants/A	Yield, bu/A at various N rates, lb/A			Response to N, bu/A
	80	160	240	
12,000	118	138	155	37
24,000	151	178	202	51
36,000	164	210	231	67
Response to population, bu/A	46	72	76	

Florida

Because crops are so responsive to N, the optimum rate of N fertilization is changed very little by price, either crop or fertilizer. This is true as long as the crop continues to be responsive. The concept is illustrated in **Table 3**.

Table 3. Optimum N rates change little with corn and fertilizer price changes.

Corn price, \$/bu	Optimum N rates on corn, lb/A		
	Price of N, cents/lb		
	12	18	24
2.00	182	174	166
2.50	189	180	172
3.00	192	184	176

Nitrogen management can optimize crop yields and returns while avoiding any potential negative effects on the environment. It's the truth. ■

For further information contact:



POTASH & PHOSPHATE INSTITUTE
Suite 110
655 Engineering Drive
Norcross, Georgia, U.S.A.
30092-2837
Phone: (770) 447-0335



POTASH & PHOSPHATE INSTITUTE of CANADA
Suite 704-CN Tower
Midtown Plaza
Saskatoon, Saskatchewan
S7K 1J5 Canada
Phone: (306) 652-3535



FOUNDATION FOR AGRONOMIC RESEARCH
Suite 110
655 Engineering Drive
Norcross, Georgia, U.S.A.
30092-2837
Phone: (770) 447-0335