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Ammonium Sulfate
A Winning Combination

Written by the
The Agronomy Group

AMMONIUM SULFATE IS AN ECONOMICAL nitrogen-sulfur material because it contains two nutrients in plant-available form, which work together in the plant to produce the best crop possible. Ammonium nitrogen and sulfate sulfur is a combination that can increase yields and profits. You have many choices when it comes to nitrogen fertilizer and we know sulfur deficiencies are more frequent than ever before. But what's the best way to supply those nutrients?

Clean Air and Plant Nutrition

In recent years, sulfur (S) has become more of a limiting nutrient than in the past. According to the **U.S. Environmental Protection Agency and the National Atmospheric Deposition Program** *(maps on the right)*, total sulfur dioxide emissions in the U.S. have decreased 28% since 1980. In Wisconsin, sulfur dioxide emissions have decreased over 50% in the last 15 years. In many areas where atmospheric deposition formerly supplied adequate sulfur to crops, sulfur deficiencies are becoming common. Sulfur responses in crops are now being observed where sulfur was not needed in the past. Don't overlook sulfur needs in your crop nutrient program.

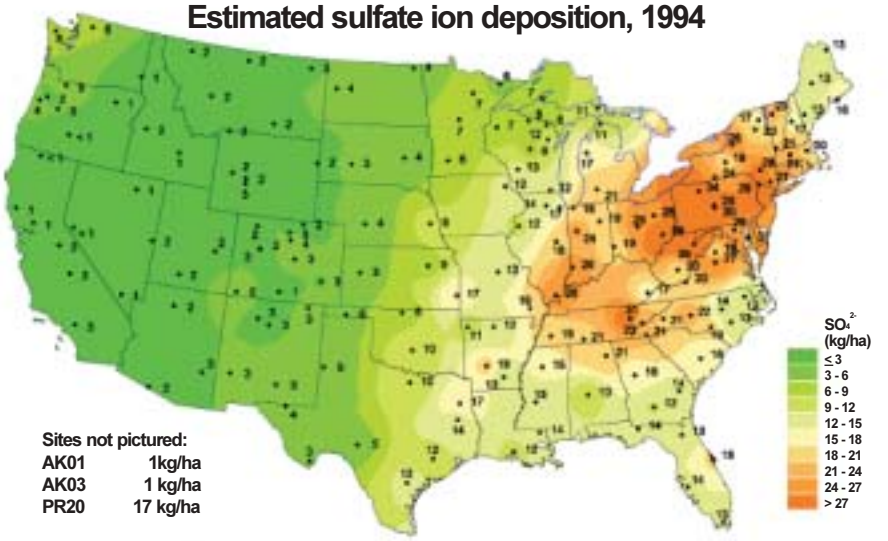
Sulfate
The Plant-Available Sulfur

Sulfur is considered the "fourth major nutrient" after N, P, and K. Sulfur is an

Sulfate deposition is declining in the Eastern United States

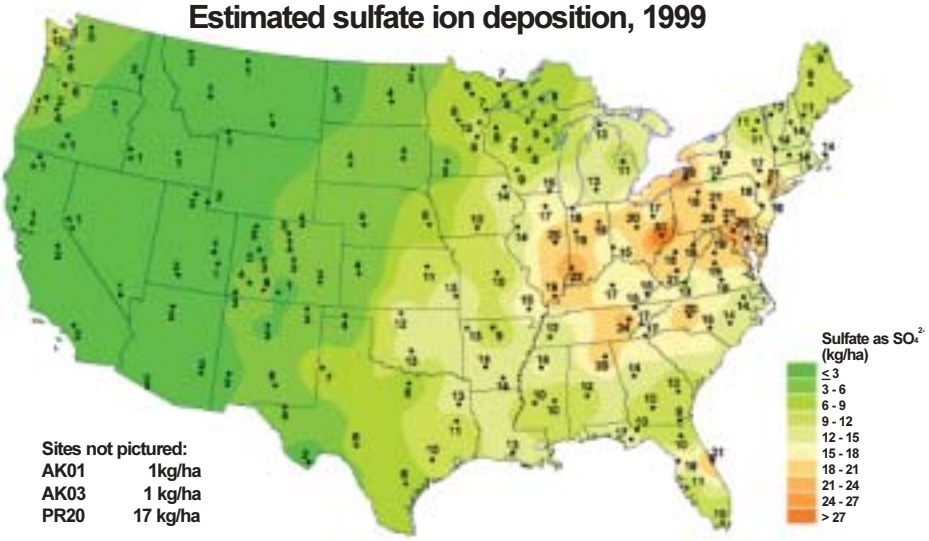
Note the decrease in the brown area of the map from 1994 to 1999.

Estimated sulfate ion deposition, 1994



National Atmospheric Deposition Program/National Trends Network
http://nadp.sws.uiuc.edu

Estimated sulfate ion deposition, 1999



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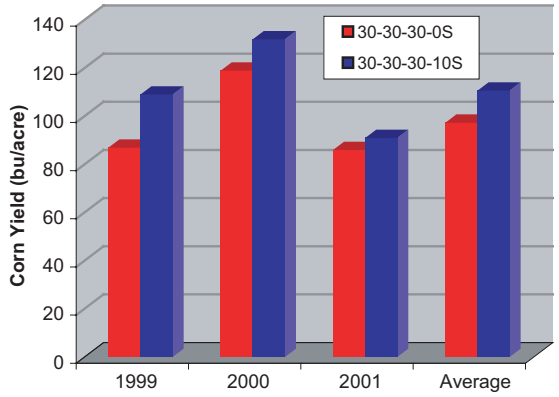
essential component of protein in all plants. It is necessary for proper utilization of nitrogen. Sulfur increases protein content of grains and forages. It also enhances the baking quality of wheat flour and increases oil content of oil seeds. It is sometimes called the quality nutrient.

Crop sulfur requirements are directly related to crop yield and the level of fertilization with N, P, and K. Higher yields in recent years mean greater crop sulfur demand. Researchers in many areas are observing greater frequency of crop response to S fertilization. No-till soils often respond to S, especially in starter fertilizer applications. These soils warm more slowly in the spring delaying the release of plant-available S from organic matter. Addition of S to starter fertilizers in Kansas has produced an average of 10 bu/acre more corn *(Fig. 2)*.

Most of the sulfur S in the soil is stored in organic forms that are not immediately available to plants. Sulfate is the only form of sulfur absorbed by plant roots. Sulfur from soil organic matter or elemental sulfur fertilizers must be converted to sulfate by biological processes. Biological oxidation of elemental sulfur is affected by soil moisture and temperature and by particle size. While it may be less expensive, elemental sources may not become available to the crop in the year of application and yields may be reduced *(Table 1 and Fig. 2)*. **Ammonium sulfate provides immediately available sulfate and is the material of choice for meeting crop sulfur needs.**

Fig 1. Sulfur increases corn starter performance in Kansas.



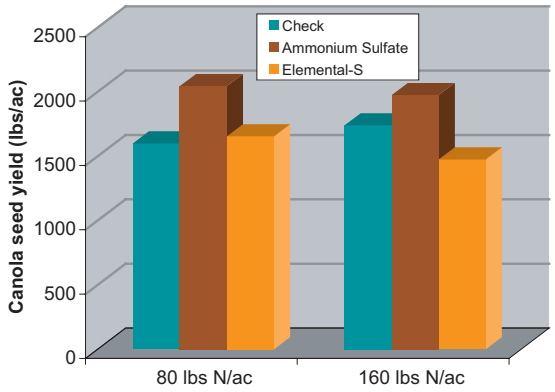
Source: Kansas State University

Table 1. Sulfate-S outperforms elemental S in Wisconsin alfalfa trials.

	1997	1998	1999	2000	Total
Check	0.74	4.08	4.33	3.3	12.45
Sulfate	0.97	4.27	5.09	3.74	14.07
Elemental S	0.66	4.4	4.96	3.43	13.45

Source: University of Wisconsin

Fig. 2. Ammonium sulfate outperforms elemental sulfur in North Dakota canola.



Source: North Dakota State University, 2000.

The Ammonium Sulfate Advantage

Ammonium nitrogen is a stable, but plant-available, N source. There are three main mechanisms by which N can be lost from the soil - volatilization, denitrification, and leaching. Ammonium sulfate is less susceptible to ammonia volatilization losses than urea or UAN nitrogen sources. It can be applied on the surface of acid soils without the risk of ammonia volatilization. Ammonium sulfate can retard denitrification and leaching losses because it is converted to nitrate more slowly than some other N fertilizers. It remains longer in the ammonium form, which is held on the soil particles and not leached.

Additionally, researchers have recently found that crops yield significantly more when the majority of the N is supplied in the ammonium form. Plants take up both ammonium and nitrate, but must convert nitrate to ammonium after uptake. Supplying more N in the ammonium form reduces the energy cost to the plant so more energy goes into grain production. ■

Ammonium sulfate can increase crop yields and quality. Let the winning ammonium sulfate combination enhance the efficiency of your fertilizer programs. Call your Agrium representative to discuss your ammonium sulfate needs.