Fall or Spring Anhydrous Ammonia Application

- A fall application can reduce soil compaction and spread out the workload, but there can be a greater risk of nitrogen loss.
- A spring application can reduce the risk of nitrogen loss, but could delay planting and increase the potential for crop damage.
- Splitting nitrogen applications in the fall and spring can help to minimize potential risks associated with applying the total amount at any one time.

Anhydrous Ammonia

Anhydrous ammonia can be a good and economical source of nitrogen (N) fertilizer for corn. It is a gas that quickly reacts with soil water to form ammonium-N, which binds to clay and organic matter in the soil. Nitrification is a temperature-dependent process in the soil that converts ammonium-N to nitrate-N. Nitrate is the form of N that is available for plant uptake, but it is also a form susceptible to N loss by leaching and/or denitrification. Under anaerobic (lack of oxygen) soil conditions, the denitrifcation process occurs where nitrate is converted to N gases, which can be lost through volatilization. Warm soil temperatures favor nitrification, and warm temperatures along with wet soils favor denitrification. When compared to other N fertilizers, the rate of conversion to nitrate in the soil is slower with anhydrous ammonia, helping to minimize the potential for N loss.

Fall Application

Anhydrous ammonia is the preferred N fertilizer for a fall application because of its slower conversion to nitrate. Advantages of fall-applied N can be reduced soil compaction and spreading out the workload. Disadvantages can be the loss of N between application and crop use, and environmental concerns with nitrate runoff and leaching. Fall anhydrous ammonia applications are common in areas that have favorable soil and weather conditions. Fall applications should not be made in areas where soils seldom or never freeze, or where there is a long period between the time when soils reach 50° F and when they freeze. Nitrifying organisms continue to function down to 32° F, but at a slower rate. Long periods of time at low soil temperatures above 32° F can still result in nitrification of a large percentage of fall-applied N. Therefore, fall applications should be made when the soil temperature is below 50° F and continued cool weather is in the forecast. Including a nitrification inhibitor in a fall N management system can potentially help slow the conversion of ammonium to nitrate.

Loss of N from anhydrous ammonia application can be higher under extended warm periods in the fall, and under prolonged wet conditions in spring before planting. If the following spring is dry, there may be little risk of N loss from a fall application. A wet spring will increase the risk of N loss.

Spring Application

Applying anhydrous ammonia in the spring has the advantage of limiting the time between N application and crop use when N loss can occur. Leaching and surface runoff potential of N can also be less of a concern. Disadvantages would include workload issues that could delay timely early plantings. A wet spring can delay applications and cause problems with soil compaction. Early N uptake by the crop may be limited with a delayed application and without good dispersal of N in the soil. Another risk of applying anhydrous ammonia in the spring is the potential for damage to the crop when it is applied too close to planting.

Splitting Fall and Spring N Applications

A way to minimize the risks is to apply some N in the fall and the rest in spring. The N applied in the fall can provide what the crop needs to get started in the spring. The remainder applied in the spring, closer to when the plant needs the N, helps to increase use efficiency and reduces the chance of loss by leaching and denitrification. Applying lower rates of anhydrous ammonia in the fall can help to increase the efficiency of a nitrification inhibitor. Lower rates applied in the spring also helps to minimize any risk of crop injury. Nitrogen levels should be monitored in the spring to determine additional needs for maximum yield potential.

Sources: Nafziger, E. 2013. Is fall nitrogen application a good choice? Corn and Soybean Digest. http://cornandsoybeandigest.com.; Strengths and weaknesses of fall-applied anhydrous ammonia. On-Farm Network Advance. October 11, 2012. www.isafarmnet.com.; Mullen, R. and Florence D. 2010. Fall application of anhydrous ammonia - A good idea? C.O.R.N. Newsletter 2010-34. The Ohio State University Extension. http://corn.osu.edu.; Fall nitrogen application: What, when, where, and how. http://www.ifca.com. Web sites verified 9/21/15.

For additional agronomic information, please contact your local seed representative. Developed in partnership with Technology, Development, & Agronomy by Monsanto.