Excerpt from Illinois Agronomy Handbook, Chapter 9

http://extension.cropsciences.illinois.edu/handbook/

Time of Nitrogen Application Fall Applications

Because of concerns over environmental degradation and reductions in economic return on N brought on by higher fertilizer prices, fall applications should be done only in soils and regions with low N-loss potential. Fall N applications should not be done in soils that are sandy, organic, or very poorly drained or that have excessive drainage, or where soils rarely freeze or temperatures decline very slowly from 50 °F to freezing.

Nitrogen, other than that included incidentally with the phosphorus application, should not be fall-applied for corn on any soil south of a line that approximates Illinois Route 16, or the terminal moraine of the last glacier. Soil maps may be used to determine where within this boundary area fall N can be safely applied. Most of the incidental N in phosphorus fertilizers should not be expected to be available the next spring. However, the amount of N in a typical P application is small, and so its loss would rarely translate into a significant yield loss.

When applied properly, fall N on wheat is acceptable (see the discussion on page 129 on wheat, oats, and barley). Fall N applications are often preferred because they are more economical to farmers and the fertilizer industry. Fall applications often lower the cost of fertilization by reducing transportation and storage expenses and by requiring less storage and application equipment. They also provide logistical advantages, such as saving time in the spring to allow for early planting, better distribution of labor and equipment, and generally better soil conditions in the fall to protect soils from compaction during fertilizer application.

In places where fall application is environmentally acceptable, farmers should apply N in forms that do not contain nitrate. The preferred source for fall application is anhydrous ammonia, because it nitrifies more slowly than other forms. Manure and poultry litter can also be applied in the fall as long as they are incorporated in the soil and the guidelines are followed on soil temperature and soil conditions as described for fall application of inorganic N fertilizers. Urea-containing fertilizers, even when incorporated, are not as effective as fall-applied anhydrous ammonia or spring-applied urea.

Fall N applications should be done when daily maximum bare soil temperature at 4 inches is below 50 °F. On average, this temperature is reached after the first day of November in northern and central Illinois. However, this average date is not a satisfactory guide because of the great variability present from year to year.

Current soil temperatures for different regions of Illinois are available at www.ifca.com or at www. isws.illinois.edu/warm/soiltemp.asp. While these temperatures may be useful in most cases, soil temperature can vary due to many factors, including soil color, drainage, and amount of crop residue on the surface. For this reason the best method to determine soil temperature is direct measurement in the field to be fertilized. It is important to note that while the rate of nitrification is significantly reduced below the recommended 50 °F soil temperature, microbial activity continues until temperatures are below 32 °F. The 50 °F temperature for fall application is a realistic guideline for farmers.

Applying N earlier risks too much loss (Figure 9.9). Waiting until later risks wet or frozen fields, which would prevent application and fall tillage. In Illinois, most of the N applied in late fall or very early spring is converted to NO_3^- by corn-planting time because of nitrification during the long periods when soil temperatures are between freezing and the mid-40s. In consideration of the date at which NO_3^- is formed and the conditions that prevail thereafter, the difference in susceptibility to denitrification and leaching loss between late fall and early spring applications of NH_4^+ sources is probably small. Both are, however, more susceptible to loss than is N applied at planting time or as a sidedress application.

Large amounts of residue generated from corn or other crops can create challenges for planting and field operations in the spring. There is also concern that the high ratio of carbon to nitrogen in the residue means a high potential for tying up N and making it unavailable for the following crop when it needs it. A common question has been whether application of N, such as UAN, on the residue would help with the breakdown of corn stalks. Research has shown no benefit in fall application of N to increase microbial decomposition of corn residue or to improve N availability for the next crop. Typically, low temperature or dry residue, and not N availability, is the main limiting factor for microbial decomposition of residue in the fall.