



Fall Fertilizer Applications in Corn

// Soil Sampling

Soil sampling should be done about every three years in the spring or after harvest in the fall. However, it can be a challenge to get soil samples in the fall and have the results available in time for a fall fertilizer application. As an alternative, fall fertilizer recommendations can be made from previously collected soil samples if nutrient removal from the recently harvested crop is considered.

// Lime application

Fall is the best time for lime application. Lime neutralizes soil acidity and adds calcium, which is a micronutrient essential for plant growth. A soil pH between 6.0 and 7.0 is the recommended range where plant nutrients are most available. Lime takes time to dissolve in the soil and neutralize acidity, so it should be applied about 3 to 6 months before planting crops. Applying lime in the fall allows time for it to break down before the next growing season. Lime should be applied and incorporated at least a month before adding fertilizers since it can interfere with the availability of fertilizer nutrients, especially phosphorus. Attention should be given to the different sources of liming material. Products vary in their neutralizing efficiency (calcium carbonate equivalent and particle size composition) and can influence optimum lime application rates. Most states test and publish the percentage of lime passing through several different mesh sizes. The smaller the mesh size the faster lime will react.

// Nitrogen (N) application

Applying N in the fall can have the advantages of reduced soil compaction in the spring, spreading out the workload, and economic incentives relative to fertilizer costs. Disadvantages include the potential loss of N between application and crop use and environmental concerns of nitrates leaching into streams, lakes, and groundwater. The optimal application rate of N to minimize input costs and environmental impacts, while maximizing yield potential and standability, can be a difficult value to pinpoint.

Nitrogen sources containing urea and/or nitrates have greater potential to be lost via leaching, volatilization, or runoff. Ammonium-N is relatively stable as it attaches to soil particles while nitrate-N is subject to loss via leaching and denitrification. Due to these concerns, anhydrous ammonia is a good source for fall-applied N. Therefore, anhydrous ammonia applications are recommended for fall treatments because this form of N remains more tightly bound to soil particles.



Figure 1. Anhydrous ammonia should be applied in late fall after soil cools to 50 °F.

Anhydrous ammonia should be applied in late fall (Figure 1) after soil temperatures cool to 50 °F or less and cool weather is expected to continue. Fall applications of N are generally feasible only in areas where low winter soil temperatures limit the nitrification of ammonium. It should not be applied in areas where soils seldom or never freeze or where there is a long period between the time soils reach 50 °F and when they freeze. Nitrifying organisms (which convert ammonium to nitrates) continue to function at temperatures as low as 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 the applied ammonium-N. Use of a nitrification inhibitor can slow the conversion of ammonium to nitrates and improve the effectiveness of fall-applied N. It is best to avoid fall application to sandy soils and poorly drained soils.

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// Phosphorus (P) and potassium (K) application

Fall is typically the best time for making P and K applications because of workload, dry soils, and availability of fertilizers. Fall is also a good time to apply P for environmental reasons since there is generally a lower risk of P runoff with the typical fall weather and soil conditions. P and K fertilizer should not be applied on frozen ground because applications made to fields with any slope can result in significant runoff and fertilizer loss. Soil test recommendations should be followed to maintain P and K above their respective critical levels for the soil to supply adequate quantities of the nutrients to support optimum plant growth. When maintaining P and K levels, replace what is used by the crop each year. A rule of thumb is each bushel of corn harvested removes the equivalent of approximately 0.37 pounds of phosphorus oxide (P_2O_5) and 0.28 pounds of potassium oxide (K_2O). With the wide range of crop yields every year, this is important to consider when determining the amount of maintenance fertilizer to apply. Because much of the P and K are stored in crop residue, silage crops remove more nutrients.

Operating at low soil test levels of these nutrients may reduce yield potential, especially with K. If soil tests show these nutrients to be above the critical levels, applications are not necessary for the next crop. It is common to apply P and K fertilizer once every two years of crop production. In a corn-soybean crop rotation, all of the K can be applied after soybean harvest in the fall ahead of corn. Enough K will be returned to the soil from the corn residue for the soybean crop in the rotation. However, recommended rates of fertilizer should be applied annually to soils that are below critical levels of these nutrients. These annual applications include P and K soil build-up and crop removal needs.

Sources

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(Sources verified 9/14/2019)

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