## Fall and Spring Fertilizer Options for Corn

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**CORN PRODUCERS** can often make more profit by minimizing tillage. However, in many situations no-till reduces corn yield. When corn follows wheat, or grows on fine-textured or poorly-drained soils, cool temperatures limit seedling growth. Fall zone tillage is one way to overcome some of the problems with no-till. It also opens up new fertilizer placement options.

The concept of tilling narrow strips in the fall is attractive because:

- It requires only one-third to one-half the time and fuel of a fall moldboard plowspring secondary tillage system.
- It provides a zone of bare soil that warms more quickly in the spring.
- It retains residue cover on the untilled land, protecting against erosion and maintaining infiltration.

Equipment is available that uses air delivery to combine fall application of granular fertilizer with fall zone tillage. This could be an economical way to supply some of the crop's nutrient requirements, particularly for nutrients like phosphorus (P) and potassium (K), that are not easily lost from the soil. Getting some of the nutrient application job done in the fall helps streamline spring field operations, resulting in better chances of timely planting.

*Fall zone tillage equipment should ridge the soil to create an optimum seedling environment for the following spring.*

The performance of fall zone tillage has improved slightly in more recent years as we have learned to build the appropriate size of ridge on the tilled zone and take advantage of the opportunity to plant earlier than in no-till. If planting into the soft zone in the spring creates a depression, it can delay emergence, especially if water accumulates. Newer equipment is designed to ridge at the same time, and some growers have found it useful to pack the tilled zone as well.

One drawback of zone tillage is that it disturbs the network of mycorrhizal fungi that can help the corn seedling take up nutrients. Pure no-till may take better advantage of these biological partners of the corn plant, but the drawbacks of colder soils and later planting may outweigh the benefits.

Ontario research conducted from 1996 through 2002 indicates that fall zone tillage produces yields about the same as no tillage but less than full tillage with a fall moldboard plow (**Table 1**). Yields with fall zone tillage averaged about 4% lower than those with full tillage. These data were obtained from sites where corn followed wheat, one of the most difficult crops to follow in a no-till situation.

**Table 1. Corn yield in four tillage systems, averaged across 17 site-years from 1996 to 2002.**

| Tillage | Corn yield, bu/A |
|---|---|
| No-till | 144 |
| Fall zone-till | 145 |
| Fall and spring zone-till | 144 |
| Moldboard plow | 151 |

In these same trials, corn responded to P and K fertilizers applied in either fall or spring (see **Tables 2 and 3**). However, the responses did not interact

with each other—the response to spring application occurred whether fall fertilizer had been applied or not. Also, responses to fertilizer were similar for each tillage system. The soil test levels at these sites ranged from medium to high for both P and K.

**Table 2. Corn yield in response to fall applied fertilizer, averaged over four tillage methods, two spring fertilizer levels, and 10 site-years, 2000 to 2002.**

| Fall fertilizer, lb/A $N\text{-}P_2O_5\text{-}K_2O$ | Yield, bu/A |
|---|---|
| 0-50-100 | 140 |
| 0-0-0 | 137 |

**Table 3. Corn yield in response to spring-applied fertilizer, averaged over four tillage methods, two fall fertilizer levels, and 11 site-years, 2000 to 2002.**

| Spring fertilizer, lb/A $N\text{-}P_2O_5\text{-}K_2O$ | Yield, bu/A |
|---|---|
| 30-25-30 | 140 |
| 30-0-0 | 133 |

The research confirms that fall-applied P and K fertilizer boosts crop growth independent of spring-applied fertilizer, but not enough to provide an economic response in one year. The benefit from fall application derives from building up soil fertility. The response to spring-applied P and K starter is more direct and provides an economic return in the year of application.

Extensive research in Iowa indicated that no-till corn gained more yield when K was banded 6 to 8 in. deep (either in fall or spring) than when it was planter-banded 2 in. below the seed in the spring. For P, there was no yield advantage to deep banding in the fall.

**We need to learn more about optimum placement and timing for each nutrient in modified tillage systems. So far we can conclude that P and K produce larger yield responses applied in the spring than in the fall, but also that there appears to be an independent yield boost from fall-applied fertilizer. Experiments on placement in high-yield systems are continuing.** ■

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