

## IMPORTANCE OF STARTERS IN REDUCED TILLAGE SYSTEMS

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### Summary

Use of starter fertilizer is a well-established and often profitable practice in corn production. Trends toward higher soil fertility levels and more extensive use of no-till or reduced tillage have caused growers to question whether use of starters is becoming more or less important. Corn response to fertilizer placement depends on the existing soil fertility (soil test) status (Randall and Hoeft, 1988), and response to starter can also be influenced by other factors including, soil compaction, date of planting, and tillage system. Where soil test levels are in the responsive range, starter fertilizers usually increase yields because plants respond to the nutrients in the starter. This response is likely regardless of other management practices such as tillage system or date of planting. At high soil fertility levels, the response to starter, when it occurs, is probably due to a placement effect that enhances early season plant growth or helps overcome limitations to nutrient uptake imposed by the management system.

More frequent corn yield responses to starter fertilizers are observed in no-till or reduced tillage systems. Potential reasons for these observations may include lower soil temperatures and early season plant growth rates, increased stratification of soil nutrients, increased soil compaction, and higher soil moisture content in systems with little or no tillage as compared with conventional tillage. Several reports of response to starter fertilizer or potassium additions using various placement methods indicates that some reduced tillage systems may have higher than anticipated needs for potassium. For example, Rehm reported potassium deficiencies in ridge-till corn at high soil test levels in Minnesota, and showed that this deficiency could be minimized with banded potassium additions. In Iowa, Bardoli and Mallarino (1998) found no-till corn responses to deep-banded potassium at some sites with high soil K levels. In Wisconsin, on-farm work that included a range of tillage systems, found that corn response to starter fertilizers on high testing soils was more likely at soil test K levels below 140 ppm (Bundy and Andraski, 1999). In conventional tillage, Wolkowski, et al. (1987) showed that corn yield reductions due to imposed soil compaction could be partially offset by banded potassium additions even at relatively high soil K levels.

In northern climates, responses to starter fertilizers are often anticipated due to cold soils and slow plant growth rates early in the growing season. While starter fertilizers accelerate early plant growth under these conditions, yield increases do not always occur. Bullock et al. (1993) reported that starter fertilizers on high testing soils increased plant growth and development rates, but that this increase in early growth often did not result in a yield increase. In Wisconsin, a comparison of starter fertilizer response in no-till and moldboard plow tillage showed that planting date had a major influence on corn response to starter in no-till with the largest yield response to starter occurring at the later planting dates (Bundy and Widen 1992). In moldboard plow tillage, responses to starter were observed at all planting dates. In view of the findings of Bullock et al., it appears that use

of starter fertilizer at the later no-till planting dates stimulated early season plant growth and development compared to where no starter was used. This accelerated early season growth allowed attainment of more of the crop yield potential before the end of the growing season. This concept was confirmed in on-farm studies where response to starter on at high soil test levels was more likely at later planting dates or with longer season (relative maturity) hybrids.

In general, use of starter fertilizers for corn may be more important in no-till or reduced tillage systems than in conventional tillage. Responses to added nutrients and to placement have been found in previous work. Potassium in starter appears to be particularly important in reduced tillage, since responses to applied potassium can occur even at high soil test levels. Use of starter fertilizers in reduced tillage may help overcome the effects of slow early growth and soil compaction. On high testing soils, response to starter fertilizer is most likely with late planting dates and with long season relative maturity hybrids.

### References

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