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Fine-Tuning Nitrogen Application Rates and the Utility of Starter Fertilizers
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Nitrogen application rates have, historically, been dictated by the crop yield goal. Therefore, many producers seek to determine their nitrogen application rate based off of their anticipated yield goal and many apply a similar nitrogen rate to all of their corn production fields. However, many University researchers are seeking to redo and refine the nitrogen rate recommendation process. Using the yield goal to anticipate the required nitrogen rate has shown to be a poor predictor; with the actual required nitrogen rate being both under- and over-estimated in many cases. **Researchers have therefore concluded that there is a poor relationship between yield and the best nitrogen rate.**

Greater specificity is needed, on a field-by-field basis, when managing and applying nitrogen. Contributions from the soil's residual nitrogen component and organic matter content are often underestimated by producers. Obtaining an accurate soil analysis, with the current organic matter content, is important when determining the nitrogen application rate. For example, for a silt loam soil with a cation exchange capacity of 10-18 and less than 2.0% organic matter, the soil N credit would be 40 lbs. With a soil organic matter content of 3.0%, 60 lbs of nitrogen would be credited.

Normally, spring sampling of crop production fields have shown an average residual nitrogen rate of approximately 25 lbs nitrogen per top ft, with a total of 50 lbs N per top 2-3 ft of the soil profile. However, on-farm research conducted throughout Ray and Lafayette counties in 2006 suggested higher residual N rates in many fields. For example, the residual nitrogen rate in the top foot of soil in one Ray County field was 76 lbs per acre – 3 times the assumed residual nitrogen rate. Residual nitrogen was also found to vary significantly from field to field. Producers interested in fine-tuning nitrogen rates are encouraged to sample for residual nitrogen in each production field, to a soil depth of 12-36 inches. The University of Missouri Extension Soils Testing Laboratory will analyze the soil sample for both the ammonium and nitrate forms of nitrogen.

Lastly, questions have arisen regarding the utility of starter fertilizers. The majority of research studies have shown a yield increase with starter fertilizer when the soil test phosphorus levels are low to moderate. For example, fields with phosphorus soil test levels below 25-30 lbs/acre are the best candidates for a yield increase from a starter fertilizer application. A yield increase with starter fertilizer has not normally been demonstrated when soil test phosphorus levels have been maintained at medium to high levels. Interestingly, the University of Missouri conducted research, investigating the length of time in which the phosphorus remains concentrated in the band area. Five months after application, the residual starter bands were relatively small and highly concentrated with phosphorus. Phosphorus concentrations, five months after the starter application, ranged from 1.7 to 7 times the concentration as in surrounding soil.