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CHANGING TILLAGE, CHANGING NUTRIENT MANAGEMENT

Crop producers have increasingly shifted to conservation tillage systems over the past few decades, but several issues are emerging that may modify the trend. There are important implications for nutrient management. A change in tillage is an opportunity to change application methods to improve nutrient use efficiency.

Last year the area planted to corn in North America increased by more than 15 million acres. This year (2008) again it is likely that more corn will follow corn, a situation in which it is more difficult to plant without tillage. Some soils that have been in no-till long-term may be tilled for the first time in many years.

Continuous no-till has numerous benefits. It often improves soil aggregate stability and increases water infiltration. However, it can also lead to accumulation of P at the soil surface causing higher P concentrations in runoff. This is suspected to be happening in some of the watersheds draining into Lake Erie, where the declining trend in particulate P is possibly starting to be overshadowed by a more recent trend of increasing dissolved P.

Recent research in Nebraska found that a one-time moldboard plowing reduced dissolved P loss from soils that had been managed as no-till for many years. The plowing increased total P loss at one site, but decreased it substantially at another. It had no effect on soybean and sorghum yields, but increased yields of corn planted a year later.

Similar research in Indiana found that rotational tillage reduced runoff volumes and concentrations of dissolved N and P, compared to a no-till field. For soils that have accumulated extremely high levels of available nutrients at the surface, plowing once in 10 years may benefit both yield and water quality.

Research on K needs in Ontario soils managed no-till for many years also found that a one-time fall moldboard plowing boosted corn yields. Corn responded more strongly to K, however, in soils that remained no-till.

Starter fertilizers have long been recognized as important for no-till corn. However, many studies also find similar responses to starter fertilizers—and similar total N requirements—for tilled and no-till corn. One recent study in central Illinois did find a difference, where no-till increased both yields and N requirements of corn.

Maintaining soil aggregate stability…and maintaining or increasing soil organic matter… remain important goals in tillage management. The results above encourage on-farm experimentation with different approaches to rotational tillage, testing opportunities to improve nutrient use efficiencies at the same time.

Considerable research points to practices that provide more efficient use of N by corn than surface-applying urea or urea-ammonium-nitrate around planting time. These practices include soil-incorporation, applying sidedress in late spring, or using controlled-release forms or inhibitors. There's no "one-size-fits-all" solution for either tillage or nutrient management. Consult your crop adviser, look for local research results, and test to find which efficiency-enhancing practice suits best.

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Abbreviations in this article: P = phosphorus; N = nitrogen; K = potassium.