



# Does Maintaining Soil Test Phosphorus Require Application Based on Crop Removal?

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*Early-season phosphorus deficiency on corn at the V3 growth stage in southwestern Minnesota. Photo by University of Minnesota Extension Nutrient Management.*

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Phosphorus fertilizer recommendations generally follow one of two approaches. In the “build and maintain” approach, farmers measure soil test phosphorous (STP), build P levels to a specific target, and then maintain it by applying P to compensate for what crops take up. Farmers taking the “sufficiency” approach, in contrast, test the soil to determine how much P the crop needs to maximize yield but don’t worry about maintaining specific soil test values.

Researchers examined the fate of applied P and changes in STP values over time for the two approaches. They established various STP levels, monitored annually STP and the amount of P removed in harvested grain, and assessed changes in various P fractions in the soil. At four of six sites, initial STP was maintained with a negative net P (less P was applied than was removed in grain). At those sites, applying removal-based P rates increased STP over time. There was also a significant correlation between changes in net P and inorganic P fractions. Most change occurred in more plant-available P fractions, accounting for 66 to 100% of the change in net P. There was little, if any, effect of surplus application of P on the organic P fractions or on less-available inorganic P fractions.

**Adapted from** Sims, A. L., Fabrizzi, K. P., Kaiser, D. E., Rosen, C. J., Vetsch, J. A., Strock, J. S., Lamb, J. A., & Farmaha, B. S. (2023). Soil phosphorus balance in Minnesota soils and its effects on soil test phosphorus and soil phosphorus fractions. *Soil Science Society of America Journal*, 87, 918–931.

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