

March 2020 Investment Insight

Deep banding combined with strip-till improve P and K use efficiency

In conservation tillage systems, proper fertilizer phosphorus (P) and potassium (K) management is critical to optimize yield and minimize negative environmental impacts. Five researchers – partially funded by NREC – worked together to assess the responses of crop yield, nutrient use efficiencies, root growth, and soil test P and K levels to tillage, fertilizer placement, and fertilizer rates in a corn–soybean rotation.

Experiments were conducted over an eight-year period in central Illinois with tillage/fertilizer placement as the main plot (no-till/broadcast, strip-till/broadcast, and strip-till/deep band) and PK fertilizer rates as the subplot.

Here is what they have learned:

The no-till/broadcast treatment consistently reduced yields in corn by 6.2 and 4.5% and in soybean by 3.1 and 6.1% relative to strip-till/broadcast and strip-till/deep band, respectively. Also, no-till/broadcast treatment had greater root length density at in-row and between-row positions relative to strip-till/broadcast and strip-till/deep band.

Nutrient use efficiency indices (partial nutrient balance, agronomic efficiency, and partial factor productivity) declined with increasing P and K rates, but were not affected by tillage/fertilizer placement treatments. Deep banding significantly reduced soil



P and K concentrations in surface layers while increasing them at the depth of application.

These results underscore the reported potential for deep banding combined with strip-till to improve conditions for nutrient uptake while reducing the risk for nutrient losses to the environment. Critical soil test P and K levels (21 mg P kg⁻¹ and 217 mg K kg⁻¹) were similar for P and greater for K than the current university recommendations, which highlight the need for continuous refinement of soil fertility recommendations to keep

pace with changes in production technologies and yield levels.

The results of this research were published in the *Agronomy Journal*. NREC-funded researchers include Fabián Fernández from the University of Minnesota, Cameron Pittelkow, Kristin Greer and Mingwei Yuan of the University of Illinois, and Dan Schaefer with the Illinois Council on Best Management Practices and. Additional support for this research was provided by GROWMARK and the Champaign County (Illinois) Soil and Water Conservation District.

Core Ideas

- No-till reduced yield relative to strip-till.
- Deep banding P and K with strip-till resulted in no yield advantage over broadcast applications.
- Environmental advantages outweighed the agronomic advantages as deep banding effectively reduced soil P and K levels in soil surface layer.
- Critical soil test K levels were greater than current recommendations.



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