Determining total fertility in strip-tilled fields

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Band fertilizer placement may cause non-uniform distribution in the soil. Why does this matter?

Because when fertilizer is unevenly distributed, it may not be possible to use traditional sampling strategies to measure whole-field fertility, said assistant professor of crop sciences Fabián Fernández. No recent published studies have looked at this problem.

Fernández has conducted research to determine potassium and phosphorous distribution in no-till and strip-till soils and to develop improved sampling procedures for measuring field fertility.

The problem, according to Fernández, is that fertility decreases between the rows but increases in the rows where the fertilizers are being banded. This would not be a problem if the location of the fertilizer band changed from year to year.

"Since the introduction of real-time kinematic (RTK) satellite navigation and the use of strip-till, farmers are always planting, and applying their band fertilizer, on exactly the same location," he explained. "What happens is that all the fertilizer that was applied uniformly on the surface is now concentrated in a small fraction of the soil." Because plant roots extend farther into the soil than just the small area where fertilizers are applied, fertility levels must be determined for the field as a whole to ensure that fertilizer applications are optimized to maximize crop yield and profitability.

Environmental issues are also involved. "If we are unable to determine the fertility of our field accurately because of the sampling method we are using, we may be applying more fertilizer than we need," said Fernández. "A lot of the environmental issues have to do with phosphorus moving out of the fields as runoff from the soil surface."

The study, conducted in Pesotum, Ill., involved applying different rates of phosphorous/potassium blends in fall 2007 and 2009 before corn planting. Applications were broadcast-applied in no-till and strip-till and deep-banded at six inches below the surface in the crop row in strip-till. Fertilizer levels were measured every year at four-inch increments from the surface to a 12-inch depth, with samples collected at the row and at a distance of 7.5, 15, and 22.5 inches away from the row.

Results indicated that there was no need to adjust fertilizer rate based on tillage or fertilizer placement. Fernández explained that the plants send roots all over the soil profile, mostly in the surface layer, regardless of the fertilizer band. Thus, it does not really matter if fertility levels vary across the rows as long as the fertility level is sufficient for the crop.

What is important, however, is finding a way to estimate total field fertility when these differences occur. "The main message," said Fernández, "is that for every time you take a sample where the fertilizer band is located, you need to take two or three samples outside of that band to make a composite sample to send off for analysis."

More information: This research, "Assessment of Soil Phosphorus and Potassium Following RTK-Guided Broadcast and Deep-Band Placement in Strip-Till and No-Till," by Fabián Fernández and Daniel Schaefer, will be published in the May-June 2012 *Soil Science Society of America Journal.*

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