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PRE-PLANT SOIL NITRATE – MEANINGFUL OR MALARKEY?

The idea of using soil nitrate as a potentially meaningful crop nitrogen (N) management tool dates back to the early 1900s. A lot of work has been done in the last 25 to 30 years to correlate soil nitrate levels with crop N uptake, and to calibrate rates of N addition to satisfy crop nutritional requirements. Many state private and public laboratories—especially in colder and less humid regions (i.e., west of the Mississippi River)—provide soil sampling guidance, accurate nitrate analyses, and timely delivery of results. Skilled crop advisers in those respective regions often assist farmers in interpreting those test results and making adjustments to N applications that help satisfy season-long crop needs.

Most crop advisers know that the closer to planting time when the soil samples are taken, the more reliable the measured nitrate values may be for making potential adjustments in crop N rates. Many things can happen to residual nitrate that is measured in the soil profile near harvest time, and planting of the next crop. It is well-recognized that soil nitrate changes with soil wetting and drying. Soil microbes can use (immobilize) and render nitrate temporarily unavailable for root uptake, and nitrate can be converted and lost to the atmosphere as a gas under persistent warm and waterlogged conditions. Nitrate leaching beyond the crop root depth and groundwater contamination risks will rise when moisture levels exceed soil evaporation and crop transpiration. That helps explain why proper soil sampling depth (usually the root zone) is critical to correct soil nitrate interpretations.

Dips in crop prices, and uncertainties in the supply and price of N sources, are driving farmers and their advisers to use sharper pencils in their 4R N management decision-making. Scientists in Missouri, for example, have noted that pre-plant soil nitrate is most meaningful on 1) fields that have a prior-year manure application history, 2) following a drought year on fields with a high carry-over potential, and 3) following fall and early spring fertilizer N applications where excessive rainfall may have caused nitrate losses.

Nitrate drainage and runoff losses from fields to tributaries emptying into the Mississippi River have been a concern for decades, and now many states have developed challenging nutrient loss reduction strategies; to address associated algae blooms in local lakes, streams, and rivers and also the downstream low-oxygen (hypoxia) conditions in the Gulf of Mexico. Local hotspots of groundwater nitrate contamination are also a pressing concern in many states.

To know if there is unused nitrate in the root zone of crops planted this spring, would pre-plant soil nitrate testing be a wise choice? Soil testing labs, university research/extension specialists, and experienced crop advisers should be consulted to determine if pre-plant soil nitrate tests are meaningful for local crops and local conditions. Growers are reminded that regionally-proven, correlated, calibrated, and independently field-verified soil nitrate tests should not be cast aside in the face of the current excitement surrounding newer soil N tests. Coordinated evaluations of newer tests and tools,.... in varying geographies,..... with repeated and multiple N rates on the same areas (plots) over several years,..... will reveal the value of newer tests and tools, and their dependability.

While it is true that a point-in-time pre-plant soil nitrate test may be a relatively poor indicator of the season-long supply of available soil N, what would a test result showing 20 to 40 lb/A of soil nitrate-N this spring mean to your initial crop N fertilization rate and timing decisions? Is pre-plant soil nitrate testing right for you and your crops this year?

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