The Agriculture Program
THE TEXAS A&M UNIVERSITY SYSTEM

Improving the Way You Soil Sample

Issue

Soil sampling is generally not practiced often enough by Texas producers, and the usual sampling strategies have not been re-evaluated in many years. Improper soil sampling can result in incorrect fertilizer applications, loss of production and profits, as well as nitrate contamination of groundwater. Animal waste applications to cropland is another important soil nutrient issue. Excessive manuring without proper soil sampling can result in nitrogen and phosphorus imbalances and contamination of surface waters. Nutrient contamination of ground- and surface waters is a pressing environmental concern in Texas and nationwide. Finally, global positioning system (GPS)-referenced variable-rate fertilizer equipment is becoming more available, and economical soil sampling approaches for this technology are needed.

What we have learned

Depth to soil sampling is the first concern. Historically in Texas, soil sampling for nitrate and nitrogen fertilizer recommendations has been done to 6 inches. Our project has shown that this practice can greatly over-estimate fertilizer recommendations by ignoring the often high levels of residual nitrate-nitrogen in clayey subsoils of the 6 to 24 inch layer. By thorough soil sampling of five farmers' fields between 2000 and 2002 in Yoakum, Hockley, Lamb, and Hale counties, we have found that there can be nearly four times the amount of nitrate-nitrogen in the 6 to 24

inch soil layer (average of 70 lb nitrate-nitrogen/ac) as in the 0 to 6 inch top layer (just 18 lb nitrate-nitrogen/ac). Soil sampling to 6 inches is sufficient for phosphorus, potassium, micronutrient, and pH analysis. However, since phosphorus fertilizer is often band-applied, it is important that all positions in the field, i.e. bottom of furrow, side of bed, and top of bed, be sampled and composited.

Where to take soil samples in the field is the second major issue. Grid soil sampling from 0.5 acre to 2.5 acre-grid has been used by researchers and 2.5 acre-grid is used by commercial fertilizer applicators to produce soil test maps. Variable-rate fertilizer application is a service that is now being offered by commercial applicators in the Southern High Plains of Texas. However, grid-soil sampling has received criticism as a practice that a producer could not be able to do profitably. Therefore, there has been interest in "management zone"– based soil sampling. Results from our research show that "directed" soil sampling from management zones based on soil type, landscape position, and/or zones in yield maps can be as effective as grid soil sampling. Specifically, four to six soil samples can be taken from each zone and composited, so that one soil sample from each zone can be sent to a state or private soil testing laboratory for analysis. With this approach, producers can apply different rates of fertilizer to a small number of zones.

Fertilizing by zone is doable, even without variable-rate equipment, if soil tests in certain zones recommend no fertilizer application. For producers with variable-rate fertilizer equipment, less or no fertilizer can be applied to zones testing high in soil nutrients. Similarly, higher fertilizer rates should be applied to zones with low soil test values.

The Benefit

The management zone approach to soil sampling and deep soil sampling are easy to understand and to implement. These improved strategies can result in substantial reductions in farmers' fertilizer application rates and associated costs. Seventy lb nitrate-nitrogen/ac is probably a typical nitrate-nitrogen level in the 6 to 24 inch layer of High Plains soils, nitrogen that can only be realized by soil sampling to 24 inches. This represents a savings of $17/ac that is needlessly applied as fertilizer nitrogen.

Site-specific soil nutrient management approaches are especially beneficial in identifying "hot spots" of nutrients, such as areas where animal wastes have been applied. These approaches will also mitigate excessive nitrate buildup in the subsoils of the High Plains, and minimize leaching to the groundwater. Avoiding excessive phosphorus fertilizer applications by "site-specific" soil sampling and fertilization can help minimize movement of phosphorus in runoff to surface waters. As of the 2002 growing season, we know of at least two prominent area crop/soil consultants who are presently doing deep soil sampling and zone soil sampling in Castro, Hale, and Lamb counties. The Texas Agricultural Experiment Station is promoting these improved soil sampling strategies so that their adoption widens.

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