Precision Soil Sampling Methods for Site-Specific Nutrient Management in Peanuts

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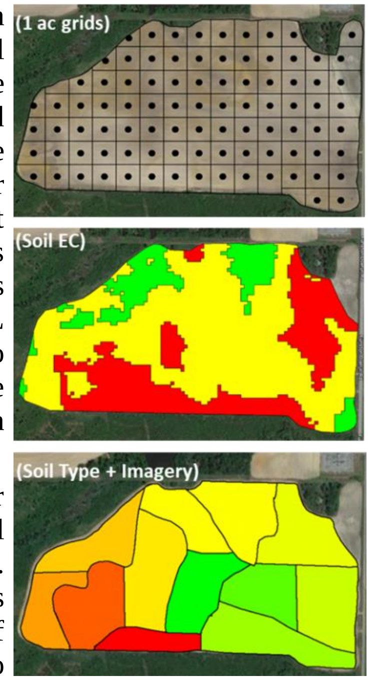
Objective: To evaluate and compare the effectiveness of different zone-based soil sampling methods for depicting spatial soil pH variability and variable-rate lime applications in peanut fields

Methods & Data Collection: Multiple grower fields (to be planted in peanuts in 2023) ranging in size from 40 to 92 ac were selected and soil sampling was conductesd using three different zone-based approaches: the first one consisted of utilizing single spatial layers (soil EC, soil type and in-season aerial imagery) to delineate management zones whereas the second method involved combination of two or more spatial layers together (soil type and imagery, soil color and elevation, etc.) to create management zones. The third method consisted of using one of the commercial providers (SoilOptix) that offers a zone-based soil sampling services to growers across the southeastern states. All soil samples were analyzed by the UGA AESL Lab and soil test results from each zone sampling stragetgy was used to create spatial soil pH maps. The corresponding variable-rate lime application maps for each field were created to determine the application accuracy as well as to perform economic analysis using lime at $50/ton.



Results: The application accuracy (%) and application cost ($/ac) for variable-rate application of lime associated with different zone-based soil sampling methods are presented in graphs below for two different fields. When assessing effectiveness of zone sampling using single spatial layers (Field 1; left graph), soil type by itself exhibited an application accuracy of >70% for VR lime while also being cost-effective as compared to application costs for 1.0 and 2.5 ac grids. Both soil color and EC only showed moderate application accuracy (~66%). For zone sampling based on combination of two spatial layers (Field 2; right graph), soil type and imagery had application accuracy >75% for VR lime, which was better than accuracy for 2.5-ac (71%) grid sampling and were also cost-effectve than 1-ac grid sampling. Zones based on soil color and elevation also were also moderately accurate (68%). Field 2 also had more variability than field 1. For soil sampling zones based on commercial service provider (software), they showed an application accuracy of >73% for lime in Field 1 but only ~60% in Field 2. The exact costs, especially per acre charges and re-occurring fees, associated with most commercial software's are also not known which makes it difficult to determine total application costs as it can vary largely based on the software type and the features provided by commercial soil sampling companies. Overall, these results suggest that zone-based soil sampling has a potential to inform precision lime applications in peanut fields but the choice of spatial layer(s) would depend largely on main drivers of spatial variability (such as soil type, texture or elevation) in that field. In some highly variable fields, grid soil sampling may still be the most accurate and cost-effective approach.