Influence of Within-Field Soil pH Variability on Peanut Growth and Yield: A Case Study to Demonstrate the Benefits of Variable-Rate Lime Applications

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Proper fertilization in peanut requires adequate lime application to maintain a soil pH between 6.0 and 6.5 as nutrients such as P and K are more readily available in this range, and to ensures high peanut yield and quality. In most agricultural fields in the southeastern US, soil pH can vary within the fields. Thus, precision soil sampling strategies for site-specific management of soil pH are recommended but still not widely utilized by the growers. This case study was conducted to show the effects of uniform lime application in a field with soil pH variability with a goal of demonstrating the need and benefits associated with variable-rate lime applications in peanut production. A 37.5-ac field in Tifton, GA was soil sampled on 2.5-ac grids to map soil pH variability within the field. Three different soil pH zones (zone 1: 5.5 – 6.0, zone 2: 5.0 – 5.5, and zone 3: 4.5-5.0 soil pH) and the corresponding lime application rates (0.5, 1.0 and 1.5 ton/ac for zone 1, 2, and 3 respectively) were determined for the field. However, based on the traditional single composite soil sampling approach utilized by the grower, a single rate of 0.5 ton/ac of lime was applied uniformly across the whole field. Plant tissue samples, crop growth assessments in the season and yield at harvest were recorded in all three zones. All data were statistically analyzed using an alpha value of 0.10. Results showed that plant nutrient levels and crop growth in the season was considerably lower in soil pH zones 2 and 3 representing low soil pH areas in the field. When compared to zone 1, peanut yield was reduced by 1,262 and 4,577 lbs/ac in zone 2 and 3, respectively. An economic analysis to compare uniform and variable-rate lime application was performed which indicated that implementing grid sampling and variable-rate lime application could increase the gross revenue by $37/ac in this field. The potential increase in revenue would also cover the additional cost of grid-sampling ($6.5/ac) and the additional lime ($4/ac) needed in the low soil pH areas. This case study demonstrates how variable-rate lime application can help in addressing soil pH variability in the fields while paying for the precision soil sampling approach and the cost of variable-rate technology.