Identifying And Correcting The Causes Of Yield Variability In Cotton And Corn Fields

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Cotton and corn yield vary substantially within fields depending on variation in soil types, topography, and inherent soil characteristics. With the increasing cost of inputs, farmers need information about managing variable fields, including information about field yield limitations. This better enables the use of appropriate strategies for inputs levels justified by the field potential. The concept of precision farming is one way producers account for field variability to increase productivity. Use of site-specific inputs, however, assumes the causes of yield variability are correctly identified. In a Cotton Inc. sponsored study, intensive sampling and characterization of field variability identified factors potentially affecting yield in three fields (one in the lower Red River Valley, one on the Macon Ridge and one in the Mississippi River Delta) to evaluate approaches that might reduce effects of field variability. The soil types ranged from Norwood/Moreland silty clays in the Red River Valley; Calloway/Gigger silt loams on the Macon Ridge and Bruin very fine sandy loam/Sharkey clay in the Mississippi River Delta. Electrical conductivity was determined for each of the three fields with GPS-equipped Veris instrumentation. Using EC soil maps, field topography and NRCS soil type maps, 20 to 22 small areas with different soil traits were identified within each field and sited by GPS. These areas were thoroughly soil sampled to 0- to 6- and 6- to 12-inch depths for analysis of nutrient status. The fields were uniformly planted with cotton in 2009 and data collected weekly in each plot in the three fields for agronomic growth traits. Leaf samples were collected at early flowering and mid-boll fill from each plot for plant tissue analyses. At harvest, cotton lint yields were highly variable within fields ranging from 333 to 1153 lb/ac on the Calloway/Gigger field, 929 to 1397 lb/ac on the Norwood/Moreland field, and 540 to 1296 lb/ac on the Bruin/Sharkey field. Correlations analyses were done relating yield variability to specific field traits of soil texture, pH, organic matter, and soil and plant content for N, P, K, Ca, Mg, S, Mn, Zn, B, Cu, Fe, Mo, Na, Ni, Si, Co and Pb. Soil analyses were also done for nematodes. There were relationships between several of the plant nutrients and yield for each of the fields and also potential deficiencies (and toxicity) of several nutrients, which were affected by field and by location within fields. Reniform nematode infestations were high in two of the fields and a probable cause of some of the yield limitations and variability. Plant leaf analysis did relate to the apparent soil nutrient deficiencies but some of the low soil nutrient values did not result in verifiable plant deficiencies. However, P, S, and Zn were deficient, and Mn levels were excessively high, in plants at the Red River and Macon Ridge field locations. The experiments were repeated on the same fields in 2010 but planted with corn rather than cotton. The 2010 corn results will also be discussed. Δ

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