25 Spatial Corn Yield During Drought in the SE Coastal Plain

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Throughout the southeastern USA coastal plain, Carolina Bays are low, depressional areas that often have different soils and a wide variation in crop yield. Corn (Zea mays) appears to be the most susceptible to soil variation, especially during periods of drought. During 1993, a severe drought yr in this region, corn yields were measured at 209 sites within an 8-ha field where yield variation among soils had been evaluated for 12 crops. Site-specific effects of soil variation on crop phenology, biomass, and yield components were measured at 11 sites. Time-domain reflectometry (TDR) soil moisture probes were installed at eight of those sites, two within each of four map units. These were monitored from 40 days after planting until after maturity. Drought stress during vegetative growth caused severe leaf rolling in several areas, while other areas suffered no visually-apparent stress. This observation was supported by infrared thermometer measurements of canopy temperature (TC), which ranged from ambient air temperature (TA) to about 10°C higher. Rain following the period of drought reduced TC-TA to near zero for all soils, indicating that the stress was relieved. Plant height five days before the rain ranged from 0.48 to 1.34 m. Mid-silk leaf area index ranged from 1.15 to 2.56. Time of tasselling and black layer formation ranged over three weeks. Grain yield ranged from 104 to 318 g m⁻² dry weight at the 11 primary sites and from 18.5 to 419.8 g m⁻² in the entire field. Mean yield over 209 18-m² plots was 214.8 ± 79.3 g m⁻² on a dry weight basis (2481 ± 916 kg ha⁻¹ at 15.5% moisture). This high variation in crop yield presumably resulted in large differences in residual N since fertilizer applications were uniform across the entire field. We suggest that additional analysis and stochastic simulation are needed to estimate risk from such an occurrence and to develop environmentally safe N management practices for subsequent crops.