APPLICATION OF GPS AND NEAR-SURFACE GEOPHYSICAL METHODS TO EVALUATE DIFFERENCES BETWEEN AGRICULTURAL TEST PLOTS

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A field research facility with two pairs of replicated agricultural test plots (four total) was established at a location in northwest Ohio during 2005 for the purpose of studying water table management strategies. Initial efforts at this field research facility were devoted to evaluating differences between replicated test plots in regard to topography, subsurface drainage system characteristics, and soil properties. Real-time kinematic (RTK) global positioning system (GPS) receivers along with ground penetrating radar and resistivity geophysical methods were employed to accomplish this task. Real-time kinematic GPS was used to map topography, while also determining coordinates for soil sampling locations and some geophysics measurement locations. Ground penetrating radar geophysical methods were employed to assess differences in subsurface drainage system characteristics. Spatial variations in soil properties were gauged by mapping apparent soil electrical conductivity with resistivity methods. The RTK-GPS topographic survey found an elevation difference of 1 m to exist across the four test plots. The ground penetrating radar survey found a 0.25 m dissimilarity in drainage pipe placement depth between two of the replicated test plots. Resistivity methods clearly showed differences between replicated test plots with respect to average apparent soil electrical conductivity values and the spatial patterns of apparent soil electrical conductivity. However, soil sample physical/chemical property data indicate that the apparent soil electrical conductivity response is itself governed by complex interactions of several soil properties. Overall, the GPS and near-surface geophysical information obtained at this site provided valuable insight on test plot dissimilarities that may affect differences in the hydrologic response between replicated test plots.