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COTMAN AS A SITE-SPECIFIC MANAGEMENT TOOL

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Abstract

COTMAN™ was developed to assist in management decision for average field conditions. In this study, COTMAN data collected from individual sampling locations within a field were compared to average field conditions in two distinct Texas growing regions. Both imagery and spatially dense maps of plant height were used to characterize the variability present in the field. It was found that different management recommendations could result within a particular field when regions of significant variability are considered separately. The results of this study suggest that COTMAN could be a useful tool in making site-specific management decisions, and that spatial data could in turn improve selection of COTMAN sample sites.

Extended Summary

The COTMAN management software package has proven to be a valuable tool for cotton producers, but its adoption has been limited by the requirement for extensive crop monitoring. Since COTMAN was developed for whole field management, sampling strategies are necessary to accurately determine the average field conditions. Management zones which reflect actual field conditions and desired management scheme must be selected in order to ensure meaningful output from the software. Precision agriculture technologies can aid in assessing field conditions and in determining management zones. Test locations were selected from two distinct Texas cotton growing (Brazos River valley near College Station and coastal plain near Wharton). Both irrigated and dry-land sites were included. Four sampling locations were chosen at each site by an experienced COTMAN scout. Two additional sampling locations were selected from the aerial imagery of each field in Digital Orthophoto Quarter Quad (DOQQ) format. Each field was monitored per COTMAN recommendations throughout the growing season. The monitoring sites were located by scouts for sampling via handheld differentially corrected GPS receivers. GPS was utilized to ensure that exactly the same locations were monitored each time data was collected. Plant height was spatially recorded at each test field on an approximately bi-weekly basis throughout the growing season using the HMAP system. Regions within each field consistently representative of the average plant height were identified.

The test sites near Wharton had little variability, with the standard deviation of plant height ranging from 3.1 inches for the irrigated field early in the season to 4.6 inches for the dry-land field late in the season. Brazos Valley site had significant variability, with the standard deviation of 8.6 to 12.1 inches. The NAFS/NAWF curves for all fields show little difference between using 2 sites in consistently average regions versus using all sampling locations. There was somewhat less difference between the two curves in the Wharton County sites (<2 days difference in cutout) where little variability is present across the field compared to the Burleson County site (~5 days difference in cutout) with significant variability. The management recommendations from both SQUAREMAN and BOLLMAN are identical for all fields for both inputs. Conversely, curves generated from a single site with greatest variation from the average were significantly different from the other two at all sites. The difference is greatest for the Burleson County site due to the high degree of variability present at the site. COTMAN generated different management recommendations for the Burleson County site when using a single site that had the greatest difference from field average conditions.

COTMAN generates uniquely different management recommendations within a particular field when regions of significant variability are considered separately. Regions with different crop development and regions that are consistently representative of the field average can be identified by plant height sensing. Once identified, management zones can be fully characterized for COTMAN with two intelligent sampling locations. Precision agriculture provides a means to select intelligent COTMAN sampling locations within management zones. Intelligent sampling locations selected with the aid of detailed spatial data such as the consistent average height regions identified in this study contain plants representative of the field average. Two sampling locations selected from consistently average height regions within a field were able to generate equivalent COTMAN outputs to those generated with three times as many sampling locations from the same field for all sites considered in this study irrespective of field size.