2004 BELTWIDE COTTON CONFERENCES, SAN ANTONIO, TX – JANUARY 5-9

APPLICATION OF COTMAN TO PRODUCTIVITY ZONES WITHIN A CENTER PIVOT IRRIGATION SYSTEM

Robert Flynn
New Mexico State University
Artesia, NM

Abstract

Cotton production on large, center-pivot irrigated fields is often subject to wide variations in soil series which impacts the growth and development of the cotton plant and potential yield. The Cotman® approach to tracking cotton growth and development requires several locations to be sampled which may or may not be suitable for crop consultants. Given the wide variation in soil series and the need to quickly cover large areas this project attempts to quantify the effect of location or "zones" on cotton development as tracked by Cotman for improved characterization of a given cotton field. Cotton development zones were identified on a center-pivot irrigated field in eastern New Mexico based on aerial photos and grid sampling from the 2001 production year. Cotman documented the development of cotton in areas of rocky ground with shallow soils and areas of deeper soils where cotton tended to grow at excessive rates. Production zones were confirmed with lint quality measures. Cotman can be used in performance zones but would be excessively time consuming to try and identify these zones with the software itself. Visual representation of development through aerial photography is a simple enough procedure to identify zones within a given field. These areas could be managed using variable rate applications of growth regulators or fertilizers. The software should help with management of the field as a whole allowing the producer to take these zones into account. Yield maps quantify the acreage that is affected by soil series and can be used to evaluate the economic productivity of the field. Cotman should allow for early detection of potential problems and improve overall profitability.

Introduction

Cotton production on large, center-pivot irrigated fields is often subject to wide variations in soil series which impacts the growth and development of the cotton plant and potential yield. The Cotman® approach to tracking cotton growth and development requires several locations to be sampled which may or may not be suitable for crop consultants. Given the wide variation in soil series and the need to quickly cover large areas this project attempts to quantify the effect of location or "zones" on cotton development as tracked by Cotman for improved characterization of a given cotton field.

Materials and Methods

Data was collected for Cotman software from three zones within one center pivot irrigation system (Figure 1). These zones were determined from yield maps generated in 2001 as well as aerial photographs. Four locations within each zone were used for Cotman data collection. Data included plant height, nodes, squares, flowers and bolls. Weather information was collected outside the field. Cotman® utilized the maximum and minimum temperatures to calculate growing degree days and plant growth stage. Heat units in 2003 were above the 30-year average and are slightly different than those reported from the Seminole weather file in Cotman. The cotton was planted into a standing crop of wheat which was killed with herbicide at the time of planting. This stubble served as a windbreak during stand establishment (Figure 2).

Results

Zone 1 was a very rocky area but had an outstanding stand given the conditions. The soils in this are very shallow with depth to caliche less than 8-inches. Zone 2 plants were noticeably taller than zones one or three for the duration of the year. Soils in this area are 3 to 4-feet deep. Zone 3 was similar to zone 1 with the exception of a deeper soil depth and fewer stones. Plant populations were similar in all zones although zone 2 appeared to have a few thousand less than the other two zones. Height to node ratios were greatest in zone 2. The last half of July had the most square losses from zones 1 and 3. The most square loss seems to have corresponded to a period when temperatures exceeded 100 degrees. Bollman results suggest very little differences among zones for cutout and crop maturity. At harvest, there were several bolls that were slow to open on the very top of the plant due to its height. Quality parameters were also measured by zone. Fiber length was greatest (1.18 inches) from the deepest soil area (zone 2). Micronaire was lowest from zone 3 (3.62) and greatest from zone 1 (4.56).

Conclusions

Cotman can be used in performance zones but would be excessively time consuming to try and identify these zones with the software itself. Integrating data from COTMAN® into a GPS/GIS system may allow for a graphic representation of the field. Visual representation of development through aerial photography is a simple enough procedure to identify zones within a given field. These areas could be managed using variable rate applications of growth regulators, fertilizers, and/or water. Fi-

ber quality parameters of length and micronaire appear to be influenced by soil zones outlined for this field. The software should help with management of the field as a whole allowing the producer to take these zones into account.

Figure 1. Zone locations for 2003 Cotman observations. Top half of pivot is peanuts.

Figure 2. Cotton development on May 30, 337 degree days after emergence.