Utilization of COTMAN to Enhance Profitability of Cotton in Arkansas

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COTMAN OVERVIEW

COTMAN is a crop-management system based on in-season plant monitoring (Danforth and O’Leary, 1998). The COTMAN computer software makes it easy to enter data and generate the reports used to make management decisions. The program is divided into two parts, SQUAREMAN and BOLLMAN. SQUAREMAN is used to monitor crop development up to the time of first flower. At first square, plant stand counts and average first-fruiting node numbers are recorded. During squaring, ten plants at each of four sites per field are monitored weekly for presence of first-position squares. Reports provide feedback on square retention and plant stress based on nodal development. Square-shed information alerts growers to pest problems and augments insect scouting reports. A quick comparison to the target development curve tells if crop pace is too slow, too fast, or just right for an early crop and high yields. BOLLMAN is used when the crop is flowering to monitor boll-loading stress and to assist with end-of-season crop termination decisions. Beginning at first flower, nodes above white flower (NAWF) counts are recorded weekly from ten plants at each of four sites per field. Establishing the last effective boll population or the last group of bolls that will contribute significantly to yield and profit is essential for making end-of-season decisions. Cutout is reached when NAWF counts become less than five or when the probability of accumulating sufficient heat units (850 DD60s) to mature a flower falls below a user-defined threshold of 85% or 50%. From cutout until defoliation, daily high and low temperatures are recorded from a local weather source. Crop termination guidelines are based on heat unit accumulation beyond cutout.

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PLANT GROWTH OVERVIEW

The perennial nature of cotton often forces managers to manipulate growth and development to optimize seed and lint production. Maintaining the proper balance between vegetative and reproductive growth is essential for high yields. During squaring it is important to maintain good square retention and to develop the plant structure necessary to achieve yield goals. A realistic goal at first flower is to achieve a range of square retention from 80 to 85% and nodes above first-position white flower of nine to ten. Square retention values prior to first flower are most impacted by insect pressures. Plant structure prior to flowering is negatively impacted by stress. Fertility and moisture are the dominant factors impacting plant structure prior to flowering. Square retention values less than 80% will often result in delayed maturity and excessive vegetative growth due to the lack of adequate fruiting forms during boll development. Boll weevil eradication efforts and Bollgard technologies have helped to reduce the occurrences of low retention rates through squaring as well as into flowering. Retention rates of 90% or greater can present logistical challenges to managers because margins of error for input timings are small. Delays in timing can result in excessive square shed. High retention values coupled with poor plant structure can result in premature cutout, significantly impacting yields. Shed as a result of environmental stresses is often greater in situations where retention rates are very high. Managing inputs to achieve nine to ten NAWF at first flower will result in the plant having the necessary “horsepower” to avoid premature cutout in most instances. Fields in which NAWF values are in a range of six to seven will require immediate action to alleviate stress to avoid premature cutout. High retention values will magnify the urgency to relieve the stress in this situation. As a rule, early or more determinate varieties are more sensitive to having adequate “horsepower” at first flower to achieve desired yield potential than later or less determinate varieties. Being on track at first flower or taking corrective actions to get back in line shortly thereafter is necessary to achieve high yield goals.

COTMAN FROM FRUITING TO CUTOUT

The BOLLMAN component of COTMAN is much less labor intensive than the SQUAREMAN component. This component of COTMAN offers the manager great insight on the crop with little additional time requirements. Essentially all consultants record NAWF data. Tracking NAWF from first flower to cutout and evaluating the slope can help managers identify fields that can be “pushed” to help preserve existing yield potential. The target for comparison during flowering is a value of 9.25 NAWF at first flower or 60 days after planting and NAWF of 5 at 80 days after planting. The actual line from the field does not necessarily have to match this line exactly but should run parallel to it. The rate at which this line falls is a measure of stress. There are two types of stress. A boll load stresses the plant and is thought of as a good stress. Lack of moisture and fertility stresses the plant and is thought of as a bad stress. Excessive stress will generally produce a line that falls much faster than the target slope. Lack of stress, good or bad, will result in a line that runs flatter than the target. Fields experiencing slopes of NAWF values that are parallel to the target and possessing high
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Retention values are most often the fields that will respond favorably to additional inputs to “push” the crop.

**CROP TERMINATION**

Once the last effective boll population or cutout is established, heat units (HU), or DD60s, are accumulated to aid in termination decisions. Crop termination guidelines published in the 2006 Arkansas Cotton Newsletters were as follows:

- Insecticide termination for lepidopterous and lygus species: NAWF=5 + 350 HU
- Irrigation termination for North Arkansas: NAWF=5 + 350-400 HU
- Irrigation termination for Central Arkansas: NAWF=5 + 400-450 HU
- Insecticide termination for stink bug: NAWF=5 + 450 HU
- Irrigation termination for South Arkansas: NAWF=5 + 450-500 HU
- Insecticide termination for fall armyworm: NAWF=5 + 650-700 HU
- Insecticide termination for defoliating insects: NAWF=5 + 650 HU
- Defoliation initiation: NAWF=5 + 850 HU

**PRACTICAL APPLICATION**

COTMAN is an effective management tool. Better information means better decision making. Each field has its own report. COTMAN provides users timely information on square retention, plant, and fruit numbers per acre. The graph of crop development pace reveals much about the “horsepower” of the crop. Flowering dates of the last effective boll population (cutout) provide the benchmark for all end-of-season decisions. COTMAN eliminates end-of-season guesswork. It helps users determine when bolls are safe from insect pests and when to defoliate for optimal yield and quality. The cost of full-season crop monitoring is more than offset by savings on late-season insecticide. Timely feedback on crop development pace and stress gives growers potential to take prompt corrective actions. This program is easily integrated into management systems and helps tie everything together to enhance overall profitability.

**LITERATURE CITED**