

IMPLEMENTATION OF N MANAGEMENT STRATEGIES FOR IRRIGATED COTTON

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Abstract

In irrigated cotton (*Gossypium* spp.) production, water and nitrogen (N) serve as the strongest growth stimulants and are commonly the most limiting factors concerning optimal production and efficiency. If N is to be managed for optimum efficiencies from an agronomic standpoint, as well as within sound environmental management constraints, N fertilizer efficiencies must be optimized. One approach to crop management is to apply each input in specific increments at predetermined or scheduled intervals over the growing season (scheduled approach). This assumes consistency in crop growth patterns and the resultant effects from inputs. Due to the dynamic nature of the cotton plant, shifts in the vegetative/reproductive balance in response to environmental conditions can alter management needs. An alternative approach to N management involves an evaluation of crop condition and the development of treatments accordingly (a crop feedback approach). A series of field experiments have been conducted at three locations in Arizona since 1988 with the objectives of comparing scheduled and feedback management strategies regarding N and to develop management recommendations for optimal N efficiencies (Best Management Practices, BMPs). Results from these experiments have shown that a feedback approach to N management commonly results in a more conservative fertilizer N recommendation and that full yield potentials can consistently be realized with approximately 100 to 180 lbs. N/acre, depending on plant and soil conditions. Recommendations for N fertilization of irrigated cotton have been developed from these studies. These recommendations include: follow a yield goal approach (approx. 60 lbs. N/bale), avoid pre-plant applications, split N applications in-season with approximately 45-70 lbs. N/acre with each application, begin N applications near the occurrence of pinhead squares and complete by peak bloom (600 to 2000 heat units after planting; 86/55 °F thresholds), and follow crop condition (vigor, fruit retention, and N fertility status). To help expedite acceptance and use of these recommendations into conventional cotton production systems, a group of demonstration projects were initiated in 1995 on commercial fields at four locations in Arizona. Treatments consisted of the University of Arizona guidelines (current BMPs) and a range of N fertilization schemes offered by the grower-cooperators in each case for comparison. At each location, entire fields (40 to 150 acres

total) were split into equal areas for treatment comparisons. Treatments in these demonstrations were not replicated, but usually consisted of 20 to 40 acre units (blocks). Crops were managed in each case in an optimal fashion (i.e. water, pest control, etc.). A full battery of plant measurements were collected on 14 day intervals. Feedback treatments were based on fruit retention (FR) and height to node ratio (HNR) estimates, in relation to previously established baselines and thresholds for Arizona cotton. Petiole samples were collected for NO₃-N concentrations in relation to N fertility status of all treatments and N fertilization needs. Rates employed with the feedback treatments ranged from 88 to 194 lbs. N/acre. Rates of comparison ranged from 124 to 283 lbs. N/acre. Yields were determined by harvesting entire treatment areas for each case. Yield results found no distinct differences among the N fertilization regimes. These results reinforce the value associated with pursuing a feedback approach to management in that lower N rates were utilized resulting in optimal lint yield results.