

Irrigation Management Improvements for San Joaquin Valley Pima Cotton Systems

Project Investigator:

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Executive Summary:

Pima cotton production in the San Joaquin Valley has escalated over the last decade with production peaking at 240,000 acres in recent years. This cotton plant type requires an additional 10 to 20 days to mature when compared to conventionally planted Acala cotton varieties. Recent studies conducted have indicated that Pima cotton can use between 1 to 3 additional inches during the season and often results in an additional irrigation event beyond conventionally grown cotton varieties. Limited information available from deficit irrigation studies suggest Pima varieties may have lower production sensitivity to water deficits and can be deficit irrigated when water supplies are limited with little impact on marketable yield or quality. But very little is known about the best timing and intensity of crop water deficits that maximize yield while improving water use efficiency.

We propose to develop a 2-year project that will address some of the immediate grower informational needs to improve irrigation scheduling methods in Pima cotton. The project is also consistent with statewide water resource management objectives of improving on-farm water use efficiency by reducing agricultural demand for water on Pima acreage.

Our specific objectives are to document, expand our information and compare water use and stress responses of at least two modern, widely-grown Pima cotton varieties with differing growth habits. Establish field studies that quantify yield, growth or quality impacts of different irrigation management strategies that involve timing of irrigation events and specific levels of water stress occurring with deficit irrigation at key stages of

Pima cotton development. Validate current pressure chamber guidelines and improve our understanding of how to monitor moderate water stress levels in cotton. Improve irrigation scheduling methods by reducing the risk of over-applying irrigation water to Pima production fields. Increase the extension outreach component of irrigation scheduling activities that relate to regulated deficit irrigation and how this approach can be used successfully, primarily with Pima cotton, but where appropriate, extend the information to cover Acala cotton.

Studies will be conducted on UCREC land and grower field sites using experimental designs capable of providing statistically robust information on soil, plant and water relations pertinent to the objectives described above. Replicated field plots will be established that allow us to contrast current grower practices with deficit irrigated treatment scenarios that impose stress during separate phenological events. At each study site, comparable stress levels will be established at early flower, peak flower and post-effective flower periods to assess the relative impact of water stress timing on crop performance and water consumption.

Key elements of the crop water balance will be measured and estimated at each site and soil water content monitored throughout the growing season. Water balance measurements will be used to derive irrigation efficiency estimates and relative differences between irrigation treatments. Soil water measurements will be used to define soil moisture depletion volumes and provide relative comparisons of crop water use for each experimental treatment.

Each experimental treatment will be monitored for plant growth and development responses that will help describe crop responses to the individual stress treatments and the low-stress control. Crop water stress levels will be monitored regularly with the pressure chamber and the infra-red gun to assess the duration and intensity of water stress events in each experimental treatment. Individual plot yield and cotton quality measurements will be evaluated at the end of the season to determine water deficit impacts on farm productivity and income.

An important part of our project will be to extend information gained by this and previous studies to the benefits and possibilities of deficit irrigation in cotton. Meetings and field day activities will be used to introduce growers to the concepts of deficit irrigation in cotton and assist them in recognizing opportunities to implement deficit irrigation strategies.