



focus on **irrigation** research

Irrigation scheduling using canopy temperature: Let the plants do the talking!

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What is the research/technology?

Cotton production in Australia is limited by lack of water availability in most years. Growers take many factors into account when making important irrigation decisions to maintain yield and quality.

Irrigation timing is one such critical decision growers have to make as both water stress and over watering result in yield penalties, making it important to match irrigations with crop water demand. Successful managers do this well, but often need to rely on experience rather than definitive data to make decisions. Furthermore, a plant's ability to access soil water is influenced by many soil and other environmental factors.

We are investigating the use of plant sensing technologies for optimising irrigation scheduling in cotton systems in Australia. We monitor the canopy temperature to understand a crop's demand for irrigation directly from the plant, as it integrates the effects of the soil and aerial environment.

How will this project benefit me?

This research offers growers the opportunity to use an irrigation scheduling tool that is based on real-time monitoring of a crop's need for water using canopy temperature sensors. The canopy temperature infrared sensors are affordable, easy to use and maintain, and can be a significant addition to the suite of tools available to growers for making important irrigation decisions.

Why is it important?

Cotton plants function best within a narrow range of canopy temperatures known as the thermal

optimum or thermal kinetic window. Plants regulate canopy temperature by opening and closing of leaf stomata, and release their heat load through transpiration.

However, as access to water is reduced, plants close their stomata, resulting in elevated canopy temperatures. Closure of stomata also results in reduced photosynthesis, thereby reducing biomass accumulation rate and fruit retention.

Thus, through being strongly related to soil water availability, canopy temperature measurements enable continuous monitoring of a crop's requirement for irrigation using a plant-based method that is practical to use on commercial farms.



What are the key findings/results to date?

CRDC funded research at CSIRO Myall Vale over the last decade shows that canopy temperature is strongly related to cotton yield and fibre quality. These relationships coupled with our understanding of a crop's canopy temperature response to its environment, have resulted in developing a method to trigger irrigation decisions. Scheduling irrigations using this method have resulted in yields that matched those of experienced irrigators in different cotton growing valleys in New South Wales and Queensland.

What are the next steps?

Managing irrigation in partially irrigated systems remains a significant challenge in the cotton industry. Cotton growers use different strategies such as planting in different row configurations to improve water use efficiency in limited water situations. As canopy temperature is affected by a plant's access to (or lack of) soil water, regardless of location of water within soil profile, this method may help improve irrigation scheduling in partially irrigated systems where different row configurations are used.

Building on our knowledge of using canopy temperature in fully irrigated systems, we are also investigating using canopy temperature to trigger irrigations in limited water situations.

Where do I go for more information?

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