



Australian Government

**Cotton Research and
Development Corporation**

FINAL REPORT 2016

For Public Release

Part 1 - Summary Details

Please use your TAB key to complete Parts 1 & 2.

CRDC Project Number: CSP1104

Project Title: Applying plant based measurements for irrigation in water limited environments

Project Commencement Date: 01/07/2012 **Project Completion Date:** 30/06/2016

CRDC Research Program: 1 Farmers

Part 4 – Final Report Executive Summary

Provide a one page Summary of your research that is not commercial in confidence, and that can be published on the World Wide Web. Explain the main outcomes of the research and provide contact details for more information. It is important that the Executive Summary highlights concisely the key outputs from the project and, when they are adopted, what this will mean to the cotton industry.

There is significant gap between the average industry yield and the top achievers in irrigated cotton industry of Australia. This gap can be reduced significantly by utilizing the opportunity to improve irrigation efficiency. Improving water use efficiency is also increasingly becoming critical with changing climate and the recent changes in government policy, both resulting in potentially less water available for growing irrigated crops including cotton. Australian cotton growers irrigate their crops by monitoring soil water status and their experience; however, many growers are not experienced.

It has been suggested that irrigation management based on plant's water status might be superior to above mentioned methods as plants respond to both soil and aerial environment. However, easy-to-adopt plant-based irrigation approaches have been difficult to develop with most such methods limited for research purposes only. Canopy temperature which is an indirect measure of crop water status is gaining traction as a practicable method for irrigation scheduling as it can be measured continuously using commercially available infra-red sensors. It has been previously used to schedule irrigation by the BIOTIC (Biologically Identified Optimum Temperature Interactive Console) approach in lateral-overhead and drip systems, with quick irrigation response time (few hours) and capacity for multiple irrigations within a day. Under furrow systems, irrigation intervals are much longer (several days) and is a singular event. This characteristic limits the direct application of the BIOTIC approach to irrigation

scheduling of furrow systems. In this study, we developed an approach for optimizing furrow irrigation scheduling using canopy temperature. A time threshold was developed based on the relationship between plant's water status (leaf water potential) and canopy temperature. This time threshold is defined as the number of hours the cotton canopy temperature can stay above the optimum temperature for physiological functioning of cotton (i.e. 28 °C) without affecting yield. A cotton crop is irrigated when the accumulated stress hours reach the above mentioned time threshold. The feasibility of our approach was tested on cotton in three Australian cotton valleys over two seasons. Yield, yield components, and some fibre quality attributes were similar to those obtained in crops grown under the irrigation practices of high yielding producers using traditional irrigation scheduling approaches. Adoption of our irrigation approach could help boost confidence of irrigators and improve irrigation scheduling of the average cotton grower. Our approach incorporates many of the advantages of applying plant based measure of stress for optimizing irrigation scheduling. This project has truly developed a new and novel tool that will provide the cotton industry an opportunity to be a leader in adopting plant based approaches of irrigation scheduling.