

Abstract

TITLE: Demonstration of real-time irrigation decision-making and control for site-specific irrigation of cotton using a centre pivot, 2012/13

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Automated, site-specific irrigation control systems provide opportunities to deliver irrigation requirements when and where they are needed in spatially variable fields. Site-specific irrigation hardware developed for centre pivots and lateral moves currently involves loading the site-specific irrigation volumes before the irrigation event. However, the required irrigation application often changes during the irrigation event depending on the time taken for the machine to pass over the field. The irrigation volume may be further refined and updated in real-time during the irrigation event using infield measurements (e.g. weather, soil-water) or measurements of the crop from sensors mounted on the irrigation machine (e.g. cameras).

The real-time irrigation control framework 'VARIwise' automatically determines site-specific irrigation requirements using weather, soil-water and plant growth measurements. These use control strategies and crop production models to predict irrigation application that achieve the desired performance objective (e.g. maximise crop yield, water productivity).

An adaptive control strategy trial was conducted on a span of a centre pivot on a cotton crop at Jondaryan, QLD in 2012/13 to demonstrate the integration of infield sensors with a real-time irrigation control system. This utilised real-time, Internet-enabled irrigation control hardware, weather data, soil-water sensors, irrigation machine mounted plant sensing systems and a processor running VARIwise. The plant sensing systems estimated plant density, flower count and boll count from images, and plant height from a distance sensor. The adaptive control trials produced an average yield improvement of 7%, and water use reductions of 4% compared with industry-standard irrigation treatment using FAO-56.