PROJECT CATALYST

Case Study

Monitoring In-Field Soil Moisture of Varying Growth Zones to Accurately Schedule Irrigation Events

LANDHOLDER	Greg Macelroy
LOCATION	Burdekin
CATCHMENT	Lower Burdekin
RAINFALL	1181 mm (2021) Ayr DPI
PROPERTY SIZE	165 ha
ON-GROUND PROVIDER	Farmacist-Burdekin

Project Catalyst is a grower led, sugar cane innovation and adoption project that explores, develops and validates farm management practice change to improve the enduring water quality of the Great Barrier Reef.

BROADER ADOPTION VALIDATION & GROWER SUPPORT

Founded in 2009, the project operates in the Mackay Whitsunday, Burdekin and Wet Tropic regions to deliver valued practice change outcomes and develop methods for industry adoption. Under the Broader Adoption and Grower Support program, professional on-ground service providers assist selected growers to adopt and validate appropriate change practices. Service providers continue to monitor implementation bene its and derived environmental performance improvements. Through targeted extension activities, the program seeks to accelerate the uptake and broader adoption of improved farming practices at local, regional and industry levels.

Image 1. Irrigation scheduling tool (G-dot)

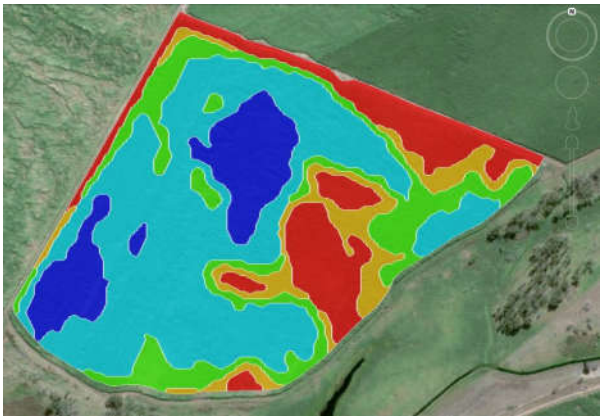

Figure 1. NDVI Satellite imagery (red to blue; low to high potential yield)

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Goal

To compare crop water use between high and low yielding areas in order to implement a schedule that is tailored to the paddock.

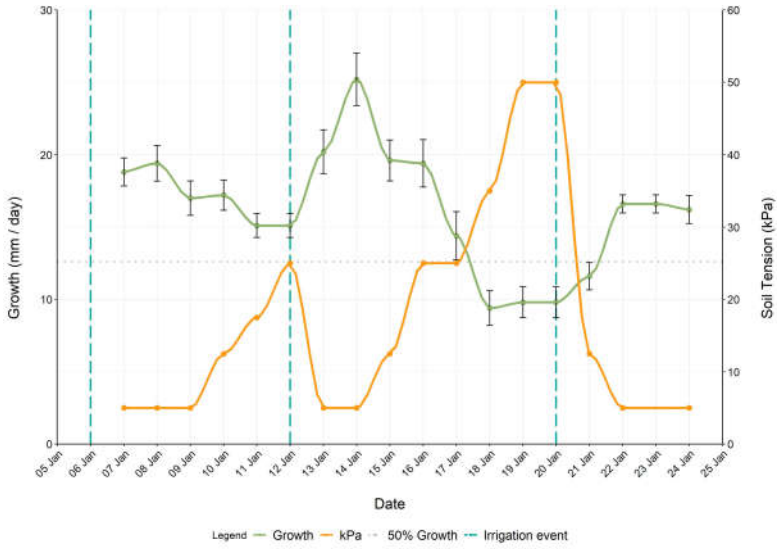

Figure 2. Cane crop growth (mm/day) and soil tension (kPa) measurements of the levelled area

Overview

Water is a key driver of yield within fully irrigated systems of the Burdekin. Over application incurs higher costs and increased probability of nutrient loss, whilst under application can lead to crop stress and reduced yield. In-field soil moisture monitoring equipment, i.e., G-Dots (Image 1), can measure soil tension (kPa) and assist growers in aligning irrigation events with crop requirements. These tools must be calibrated to increase data confidence, which is achieved by measuring crop growth and soil tension over two irrigation events. The trigger point at which irrigation is required to maintain yield occurs when daily growth rate drops below 50% of maximum growth for two consecutive days.

Figure 3. Satellite imagery including G-dot locations (G).

Action

Paddock 5-1 was partially levelled 10-years ago (2012). The soil is classified as a friable loam (CUma2) and deep cores to 800 mm identified sand at 400-500 mm and 300-400 mm in levelled and non-levelled areas, respectively. It is likely that depth to sand is a key driver of yield, limiting soil water holding capacity and reducing the "bucket" of water the crop draws from. Good and poor yielding zones, reflective of levelled and non-levelled areas, were identified by satellite yield imagery (Figure 2) and ground truthed. Two G-Dots were installed to compare soil moisture tension and current irrigation scheduling of the two irrigation sets, which currently run every 7 days (Figure 3). Over two weeks (05/01/22 - 24/01/22), daily crop growth measurements including 25 representative cane stalks were taken and averaged in both zones. Soil tension readings (kPa) were also collected and compared to the daily growth rates.

Outcome

As expected, average crop growth rate was greater for cane planted in the levelled area (16.2 mm/day) compared to non-levelled (11.7 mm/day), with maximum growth peaking at 25.2 mm/day and 18.6 mm/day, respectively.

A 7-day schedule was proven timely for the levelled area of the paddock, with crop growth rates only subceeding 50% maximum growth for more than two consecutive days, when days between two irrigation events increased to 8. In contrast, it took 5 days for average daily crop growth to reach or subceed 50% max growth in the non-levelled area.

Data collected from the higher yielding levelled zone represents the majority of the paddock area (Figure 1), and so it remains more pragmatic for the grower to continue irrigating on a 7 day scheduling regime.

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