Probing the benefits of soil moisture monitoring

As communications technology improves and becomes more affordable, CANEGROWERS is helping members put it to work on cane farms.

On the Atherton Tableland, CANEGROWERS members are using Bluetooth data-loggers to record and access irrigation information, saving growers time and boosting productivity through precision irrigation management.

BY JOHN FLYNN

In the distance, the giant Mount Emerald wind farm turbines were spinning at a rapid pace as CANEGROWERS Tableland Senior Extension Agronomist **Drewe Burgess** supervised the harvest of a Sugar Research Australia field trial on the **Salvetti** family's farm at Arriga.

In the foreground, a centre pivot irrigator continued its gradual crawl across the cane fields, delivering water to the crop on a day of gusty breezes and beaming sunshine.

"It's just a simple matter of pulling up in your vehicle. You can just hold the phone out the window."

In a region where weather tends to be dished out in lavish helpings, the combination of long hours of daylight, strong wind and intense heat in the warmer months means high rates of evapotranspiration are a constant companion for cane growers.

Add to that soils that are often free draining and a consistent dry season stretching from the end of winter, through Spring and into the early Summer during the key growth phase for

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the sugarcane crop, and precise irrigation management becomes essential to maintaining productivity.

As experience has shown, not only on the Atherton Tableland but also in the Burdekin, if you choose the right varieties and get water to the crop when needed, sugarcane grown under controlled irrigation will consistently outperform dryland farming techniques.

"This variety, KQ228, seems to thrive on soils such as we've got here, which is a basalt-derived soil that has high water holding capacity but very good internal drainage as well," Drewe explained as the *Australian Canegrower* was taken on a farm tour to inspect the latest irrigation monitoring technology.

"From the end of August through to Christmas, that's the critical period for irrigation and that's the period when crop evapotranspiration rates peak.

"Normally they start to peak in early November, particularly with the early established crops starting to reach full canopy and you're starting to get into that part of the year where you've got the longest days and plenty of sunshine and heat.

"All the crop really needs is water to make it grow."

Fortunately, the latest irrigation monitoring tool being used by Tableland cane growers is not only helping take the guesswork out of timing irrigation events but is doing so in a way that is both cost-effective and easily accessible.

Utilising funding provided by the Queensland Government's Rural Water Use Efficiency Scheme (a predecessor to the current Farm Water Futures scheme), CANEGROWERS Tableland worked with technology provider Taindata to establish a network of soil capacitance probes paired with Bluetooth-enabled data-loggers that are giving farmers access to irrigation data with the ease-of-use of a smartphone.

Rolled out with participating growers at ten farms across the region, the system relies on an Enviropro sealed-unit soil capacitance probe, hardwired to a Bluetooth-enabled Tierra data-logger which communicates directly with an Android phone or iPhone.

Irrigation data can be quickly downloaded to an app on the smartphone, then uploaded to a website once the smartphone is within range of an internet connection.

"It's just a simple matter of pulling up in your vehicle, you don't even have to get out," Drewe explained during an on-site demonstration of the technology.

"You can just hold the phone out the window, point it at the logger and as long as you're within fifteen to twenty metres, the phone will connect wirelessly to the logger.

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Pictured: Enviropro sealed-unit soil capacitance probes are hardwired to a Bluetooth-enabled Tierra data-logger which communicates directly with a smartphone. (N.B. The Tierra data-logger pictured is a discontinued model. A new model is available for purchase)

"We've got about ten growers involved in this project. But eventually we'll make the data available to all growers."

"Once it's found and identified the logger, the data will get automatically downloaded to your phone. Once it's on your phone, if you've got adequate internet connectivity, it will automatically upload your data to the internet where you can access the website."

The technology represents a step forward, according to Drewe, on the previous generation of soil probes which relied on a more expensive telemetry system to communicate data, utilised PC-based as opposed to cloud-based software, and required soil probes be removed prior to harvesting.

The Enviropro capacitance probes are buried underground and connected underground to the data logger which sits at the edge of the block.

"We've standardised on an 80cm probe which has eight sensors along the full length of the probe and I install them underground so that the shallowest sensor's at 30 centimetres and the deepest sensor is 100 centimetres," Drewe said.

"Because we can bury them underground, we can also bury the cable out from the edge of the paddock to the logger which means once it's all buried, there's no further need to service that system."

Back at the CANEGROWERS Tableland office in Mareeba, Drewe can view irrigation data from each of the ten farms connected to the system and provide members with reliable advice on crop hydration.

The data sets available to growers include sum graphs that show what water the crop has been using over set periods, along with stack graphs that break down the drawdown of water at each sensor level between 30cm and one metre.

"This is an interesting bit of data because this period through here the grower thought he was putting on adequate amounts of water," Drewe noted while examining charts from one of the local growers.

"But once you see what happens in the wet season and you see how much higher the moisture level is when the profile is full of moisture, you then realise that, no, really he wasn't actually putting on enough water and this period here the crop was using more than he was putting it on.

"It was somewhere during this time that I rang him up and said, 'look, I think you're not putting enough water on, you need to increase it' and he started to put more on through this period."

Stack graphs provide a particularly useful data set for farmers and agronomists to help determine if a crop is sufficiently hydrated, or under stress.

"The greatest benefit the stack graph gives you is it shows you where the water is penetrating into the profile.

"Here, there's a rainfall event and here you can see an increase down at the bottom sensor," Drewe said.

"It tells you where the moisture has penetrated into the profile, which is useful if you're irrigating on a free draining site, you can keep track of where the water is passing beyond that deeper sensor.

"It also indicates when the crop's using water, you can see how deeply the crop is extracting water out of the profile."

All growers connected to the system have web-based access to data from other participating farmers. It is a useful tool, especially in situations where farms may have similar soil types or rainfall patterns during wetter periods.

"We've got about ten growers involved in this project who put their hands up to purchase the probes and the data loggers, but eventually we'll make the data available to all growers in the district," Drewe said.

"Even those who don't have moisture probes can at least look at the data coming from these ten growers, there might be one or more of those sites on a similar part of the district, so those other growers can take advantage of data from that farm." ■

Pictured: (above) Stack graphs help farmers and agronomists determine if a crop is sufficiently hydrated, or under stress; (right) soil moisture monitoring is not the only trial work being undertaken on the Tablelands. SRA is also conducting harvesting efficiency trials in the district.


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