



Testing moisture probes in Coleambally soils

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in a nutshell

- A web-based service is being designed so Coleambally irrigators will be able to determine where every drop of water goes
- The first stage of the project has been a trial testing soil moisture probes to gather base data
- The ultimate plan is to have the moisture probes sending 'real time' data back to a website, so irrigators can have access to real time data and make immediate decisions about watering
- It is also anticipated the service will be linked to other facilities including area-specific crop ET estimates, crop water use monitoring, spatial ET mapping and a district-wide water balance

Coleambally Irrigation Cooperative Limited anticipates growers in the CIA will eventually be able to access to the 'latest & greatest' information technology to determine where every drop of their irrigation water will be used.

A series of soil moisture probes (SMPs) has been installed on farms in the Coleambally Irrigation Area to determine soil moisture levels in Coleambally soils before, during and after irrigation events. Whilst this is not a new approach to assisting landholders with irrigation scheduling, Coleambally Irrigation Cooperative Limited (CICL) is leading the way in aiming to provide 'real-time' soil moisture data to its shareholders via a web-based platform. This unique Rubicon-developed web-based platform will eventually comprise other interlinked facilities, including area-specific crop ET estimates, crop water use monitoring, spatial ET mapping and a district-wide water balance.

With regard to soil moisture probe deployment, in order to reach this milestone CICL had to walk before it ran. The only sensible way forward was to trial existing SMP technologies whilst the web platform was being developed externally.

The rate of uptake of SMP technology has been very low in the Coleambally area. CICL estimates that less than 1% of irrigators in the Coleambally Irrigation District currently use soil moisture sensors to monitor irrigation applications. One of the barriers to their use in the management of annual crops is that irrigators only get one chance to get it right; miss an irrigation event and the crop could be lost. Thus relying solely on soil moisture sensors has traditionally been considered too great a risk in the view of many CICL irrigators.

For the full benefits of soil moisture sensors to be realised there is a need to be able to deliver water near 'on demand'.

CICL's Total Channel Control (TCC) technologies, employing automated regulators and on-farm FlumeM water supply outlets, are providing CICL's irrigators with this crucial first step. Soil moisture probes are the end link in this overall plan, and their acceptance and adoption is likewise an important step in maximising on-farm water use efficiency and boosting productivity.

SMPs installed

In October 2007, CICL commenced probe installations across the CIA. This program is a key element of the Coleambally Water Smart Australia (CWSA) project which is funded collaboratively by CICL and the Federal Government through the National Water Commission. The criteria for farm selection were simple – landholders that had sufficient irrigation allocation to grow viable summer 2007–08 crops and those who were interested in SMP technology as a potential irrigation scheduling tool.

Griffith-based Cropsol Soil & Irrigation Management supplied and installed five SMPs on five CIA farms. Crops in which the SMPs were installed comprised corn, sorghum and irrigated pasture.

The end of the trial is fast approaching, with crops almost ready for harvesting. A series of grower training modules have been extremely effective in de-mything technical hurdles associated with this style of technology, in addition to giving landholders advanced skills in analysing data and paving the way for neighbours to follow suit. Obviously, yield comparisons may be checked following harvest. CICL will be liaising with landholders throughout this time and is keen to see results. Issues with the inability to access data 'real-time' have significantly and negatively impacted the effectiveness of this particular trial. Decisions on watering regimes could



only be viewed in retrospect which, while certainly part of the learning process, limits the benefits associated with the use of such technology.

First round provides valuable lessons

At the time of writing the first round of this trial is almost complete, with only a few weeks remaining until the associated crops are harvested. The trial has progressed relatively well, with all growers learning much about soil moisture sensor function, data output and data interpretation; and the application and implications of this information for their crop.

The trial over the current summer (2007-08) has shown that soil moisture sensors do offer a significant benefit over the well accepted 'shovel technique'. Take for example the graph (Figure 1) which shows soil moisture reading from a sensor in a corn crop where the irrigator has largely continued to use his accepted method of shovel scheduling. Rainfall events are also evident. The blue zone (upper band) effectively identifies waterlogging, while red (lower band) indicates the refill point and the green zone (middle band) flags the optimal growing condition for the crop. The soil type is a black cracking clay.

From this trend it is apparent that this irrigator is watering too soon with the shovel technique, which is not providing an adequate indication of what was happening at depth within the root zone of the crop. This crop will continue to

be monitored for the entire crop cycle to allow comparison between scheduling techniques; but it would be fair to say that even up to early January the crop could have used one less irrigation event if optimally scheduled. Crop yield across a number of maize crops will also be key data for comparison.

Two grower training sessions were conducted. The second, in mid January, focussed on a trip to three of the trial sites to ground truth probe data and interpretation. Earlier issues with on-screen data presentation were soon evident. The inability, functionality-wise, of the software to allow the setting of lower (onset of water stress condition) and upper (onset of water-logging/saturation) agronomic lines, made accurate assessment of soil conditions difficult. Timescales were also not adjustable, making longer-term assessment of overall soil moisture levels difficult. Though not a complete solution in any sense, these issues have been worked around by manually downloading data directly from the site, and then post-processing and interpreting the data back in the office, by Cropsol's agronomist. Results and feedback were then relayed to growers within 24 hours. Although this allowed the scrutiny of past data, it did not allow watering regime decisions to be made 'real-time' in the paddock. This aspect of the process is currently being resolved through continued software/interface development, agronomist and grower feedback on what is desired, and improved radio communications to the central data hub.

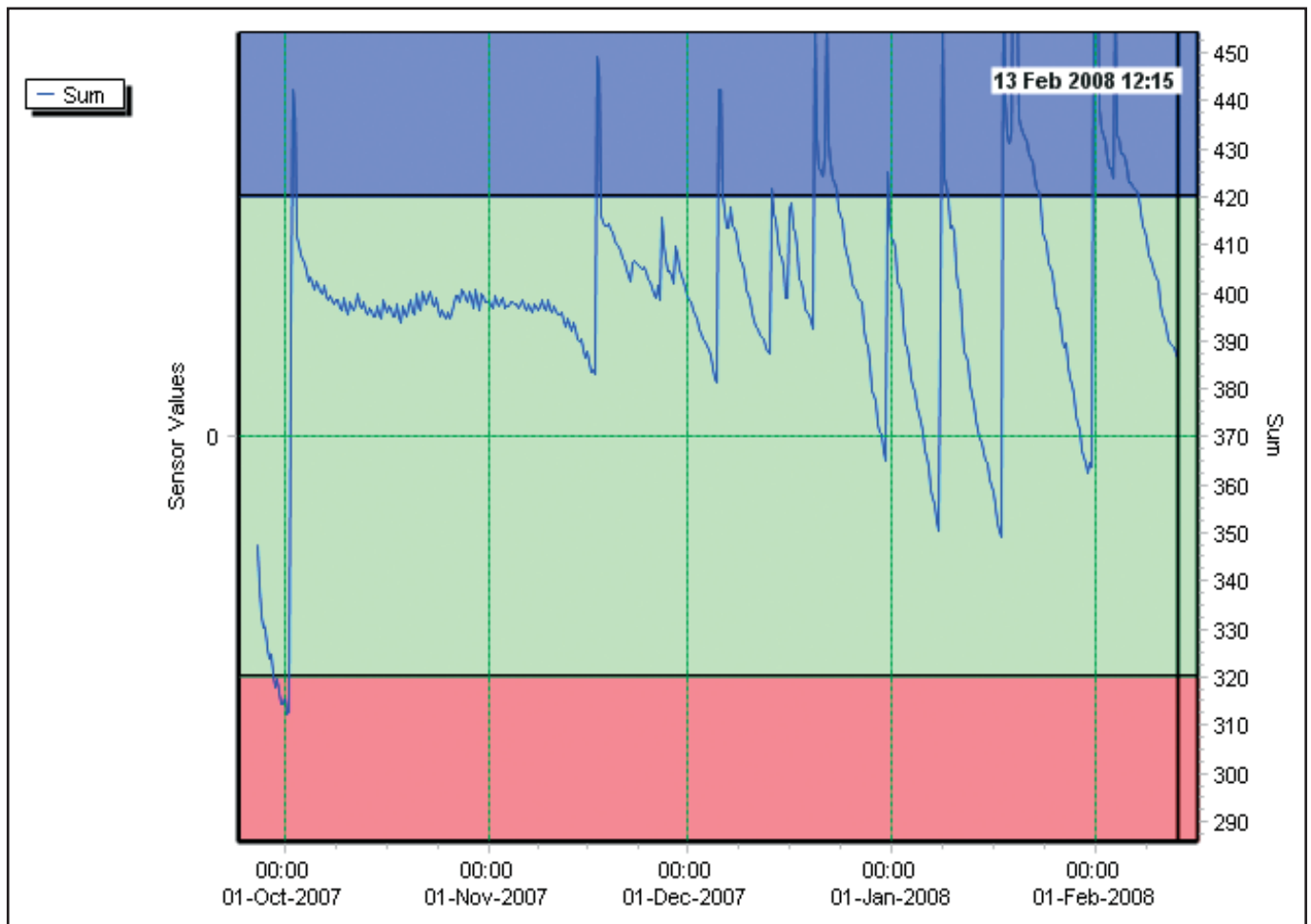


Figure 1. Soil moisture trends over a number of irrigation events.



Overall, trial participants agree that access to current data is vital and on this proviso, soil moisture probes can be a very effective tool to assist in the precise scheduling of watering events and to prevent under/over watering. One of the key lessons learnt to date is the critical importance of ongoing agronomic support to the successful application of soil moisture sensors. The data produced by the soil moisture sensors requires careful analysis to determine the refill point as the crop develops. It is evident that even with some initial training irrigators were not confident in interpreting the soil moisture trends for their crops without the assistance of the irrigation agronomist. More exact watering events can result in significant water and labour savings, in addition to demonstrating Coleambally's continued commitment to enhancing on-farm water use efficiency and improved productivity.

100s of SMPS for next round

More probes will be installed in autumn/winter 2008 crops. CICL is currently registering growers interested in participating in the next phase of the program. The entire process is currently being reviewed and streamlined, having incorporated lessons and running improvements from the last round. Interested growers are required to have a FlumeGate M water supply point currently installed and operational on the potential SMP-recipient farm, enough water with which to irrigate the crop for its effective lifespan over the season, and a healthy and cooperative attitude towards learning more about the place of SMPs in the local scene.

The SMPs installed in 2007 were the first of 300 earmarked for the CIA under this element of the project. CICL is interested in trialling different types of SMPs offered by various manufacturers. Already trialled are capacitance units offered by Aquaspy (sealed) and Sentek (unsealed). Other unsealed units of varying lengths and sensor depths, are likely to be tested in-field.

Future SMPs may be supplied and installed by various contractors, who will have the opportunity to demonstrate

the effectiveness of their products, training and support. The contract for the supply and installation of the remaining SMPs, plus the delivery of the all-important grower training modules, is likely to be tendered out in the coming months.

CICL project complements DPI project

The SMP project conducted by CICL follows on from a NSW DPI awareness project that started in 2006. The DPI project aimed to increase the use of soil moisture monitoring equipment in irrigation decision making and lead to better water use efficiency. In this project, soil moisture assessment equipment was installed and utilised at a number of winter National Variety Trial sites around the Riverina. Training for irrigators was also conducted by DPI. Farmers found that the monitoring equipment was user and time friendly, as various depth readings could be obtained quickly and easily in the paddock.

The DPI project was expanded in 2007 and 2008 to cover all southern irrigation districts. For more information on this DPI project, please contact Coleambally District Agronomist Kieran O'Keeffe on 02 6960 1319 or Irrigation Officer Robert Hoogers on 02 6951 2628. ☀

Further information

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Figure 2. A soil moisture probe installed in a corn crop.



Figure 3. The componentry associated with a SMP.