



Australian Government  
Cotton Research and  
Development Corporation



Australian Government  
Department of Agriculture  
and Water Resources



NCEA

National Centre for  
Engineering in Agriculture

## Smarter Irrigation for Profit – Autonomous Furrow Irrigation with small Pipe Through Bank (sPTB)

### What is the research/technology?

NCEA at USQ completed successful remote control furrow irrigation trials with Rubicon FarmConnect systems and structures from 2013 to 2015. A prototype blind head ditch and small Pipe Through Bank (sPTB) layout was tested at "Red Mill", Moree in 2014/15. In September 2015, Waverley Ag at Wee Waa installed on an existing 108 ha field with six irrigation sets of automated sPTB furrow irrigation. The commercially available system installed at Waverley in 18 hectare irrigation sets comprises :

- A Padman Box Culvert (PBC1000) sealed rubber lay-flat gate, at about \$130 per hectare;
- A sPTB every 2<sup>nd</sup> furrow (75mm HDPE PN8), factory cut 4 m long, at about \$140 per hectare;
- A Rubicon FarmConnect BayDrive remote gate controller, at roughly \$180 per hectare;
- Comms tower, and PC & smart-device software across the farm, for about \$20 per hectare;
- Water level sensors in channels & head-ditches to provide alarms, at about \$60 per hectare;
- Head-ditch re-design, lasered sPTB pad construction, and blind head-ditch; roughly \$450/ha.

The current research focus at this site aims to enhance these existing commercially available remote control irrigation systems by using plant, soil, weather, and hydraulic measurements in combination to autonomously control furrow irrigation from the water supply all the way through to the furrows.

Elements of the Autonomous Furrow Irrigation system to be implemented include :

- Automated channel control from storage to each field and irrigation set;
- Integrated field sensors and software models to control irrigations for optimum shut-off time.

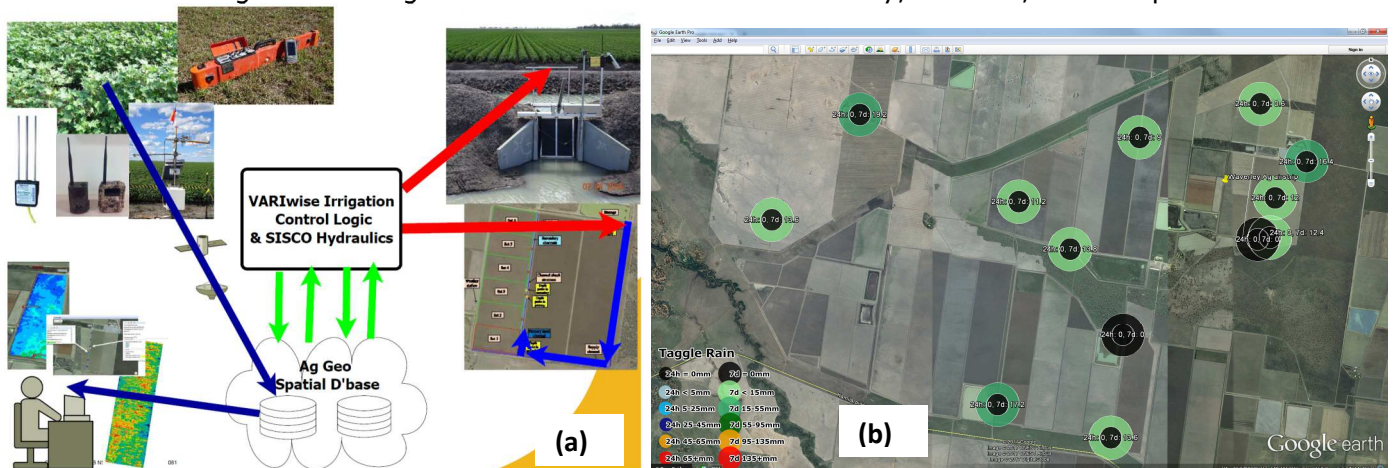
### How will it benefit me?

Automation of furrow irrigation using current commercially available systems allows the grower to:

- Reduce labour requirements in starting siphons and monitoring water levels;
- Remotely control furrow irrigations from an office computer, smartphone or tablet;
- Remotely monitor water levels in channels and ditches and receive alerts based on level.

Future integration of the elements of Smarter Irrigation will enable the autonomous system to:

- Control all water flow from the water storage dam through to the irrigation furrows;
- Adapt irrigation depths to current plant water requirements in real time;
- Ensure irrigation management decisions are made correctly, on-time, and are put into action.



**Figure 1: (a) Autonomous system architecture showing sensor data feed to system, Irrigation Control Logic, oversight by grower, and remote control of gates for head-ditch and channels; (b) NCEA Taggle RainGauge Google Earth app using \$300 gauge plus transmitter, working over distances of 12 km.**

## Why is it important?

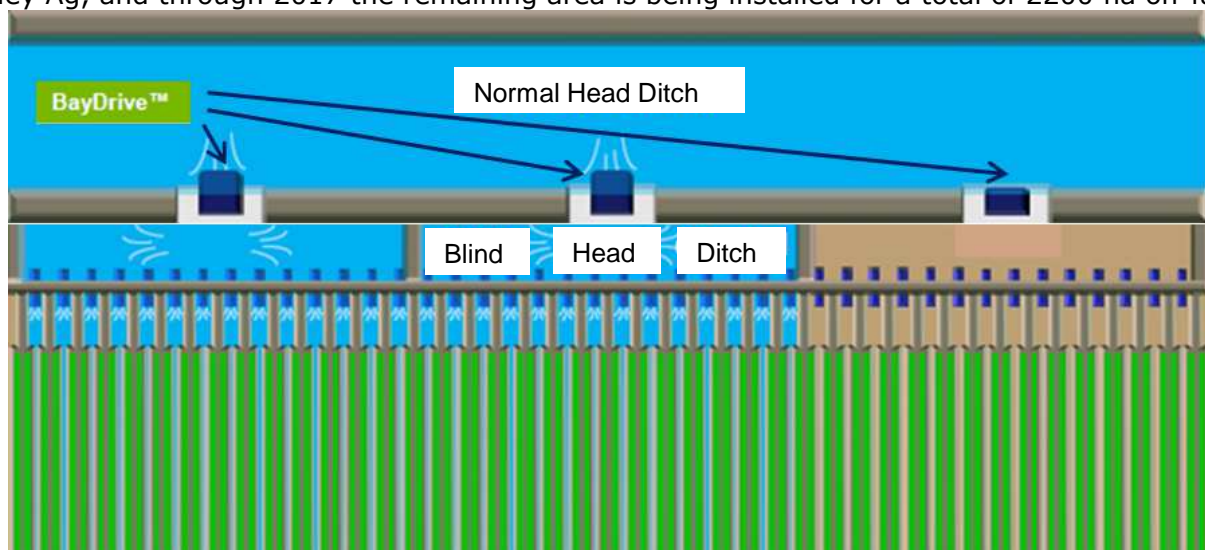
Rising labour costs, and a real difficulty in sourcing irrigation labour means that it is increasingly difficult for growers to make the right irrigation decisions, and to be able to put them into action on-time. This two staged approach of :

1. installing automation to reduce labour, and
2. implementation of smarter irrigation using novel sensing and modelling technologies will ensure that furrow irrigated cotton remains profitable and sustainable into the future.

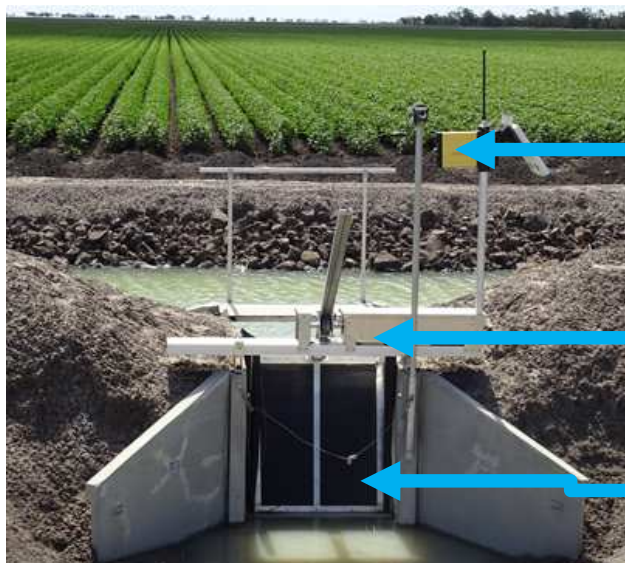
The automated sPTBs have functioned well through the 2015/16 and 16/17 cotton crops delivering uniform flowrates across each 310m wide irrigation set. Blind head ditch levels have been controlled to provide individual furrow flowrates from 3 to 4.5 L/s, as required. The one metre wide lay-flat gates have easily supplied the desired high flowrates of 60 ML/d per set, so that two are run together.

The channel level sensors have proven to be of great benefit to the farm manager, saving many countless trips to storages, head-ditches & supply channels, to check and adjust water levels. These have given them confidence to know that the gates are opening and closing as required, and irrigations have been completed remotely at the farm house. At this site it is estimated that the cost of implementing the automated furrow irrigation layout will be recovered in three to four seasons.

In 2016 another 400 hectares of sPTB furrow irrigation with remote control capability was installed at Waverley Ag, and through 2017 the remaining area is being installed for a total of 2200 ha on-farm.



**Figure 2 : Existing head ditch with Rubicon BayDrive gates, secondary blind head ditch, small PTBs, rotabucks, and low wide beds with irrigated furrows every two metres.**



Telemetry node

Rubicon BayDrive remote control gate opener

PadmanStops 1m box culvert  
PBC1000 w/ rubber sealed gate

The research is being completed as part of the Smarter Irrigation for Profit project, supported by funding from the Federal Government's Department of Agriculture and Water Resources as part of its Rural Research and Development for Profit program, Cotton Research and Development Corporation, & Uni of Southern Queensland.

### Smarter Irrigation for Profit Project

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