

Latest digital technology for automated irrigation on display

■ By Lou Gall – Project Officer, Gwydir Valley Irrigators Association

THE 2021 Gwydir Valley Irrigators Association (GVIA) Smarter Irrigation for Profit field day held at Keytah near Moree brought together irrigators from Victoria, southern, central and northern NSW, and from St George to Ayr in Qld. This was an opportunity for farmers to share each other's experiences with different irrigation setups and to learn what is happening in the irrigation efficiency research space.

There were presentations from a number of the Smarter Irrigation for Profit phase 2 research team including John Hornbuckle from Deakin University, Malcolm Gillies and Joseph Foley from University of Southern Qld, Hizbullah Jamali and Chris Nunn from CSIRO and the GVIA. The primary focus of discussions was grower-led research, looking into how irrigators can use new and innovative technology to improve their irrigation efficiency. The grower panel and presentations were a real highlight of the day.

System comparison trials continue with a drive for automation

The Keytah system comparison trial has been running since 2009. The initial driver was to compare the performance of four commonly used irrigation systems:

- Siphon;
- Bankless channel;
- Lateral move; and,
- Subsurface drip.

Throughout the years the trial has confirmed that there is more variation between seasons than there is between systems.

This is not surprising given the variable nature of the Australian climate. With the talk of a more variable climate into the future, irrigators must strive to optimise irrigation events regardless of the system in use.

The 2020–21 season has seen the continued investigation of automation of irrigation systems as part of the trial. Automation using sensors and remote control of water management has the potential to improve irrigation efficiency by optimising each and every irrigation during the season. There are also the additional benefits of more efficient use of labour and significant energy saving. The pressurised systems of drip and lateral move have had automation assisting with managing irrigation events since the trial began. In recent years, the focus at Keytah has been on automating surface irrigation.

This season the drip system has been updated by Netafim and Sundown Pastoral Company to a non-permanent drip line, which is utilising the existing pumping and filtering arrangement. The drip tape has a thinner wall than the original permanent sub-surface tape and is fitted to a surface submain. Irrigations have been scheduled remotely with consultation between Netafim and the Keytah agronomic team.

The manual siphons in the trial were replaced with small pipe-through bank, fitted with smart siphons in 2017–18, and the original bankless system was fitted with automated gates.

The 2020–21 season has seen the remote control of the



EnviroNode IoT control for Smart Siphons. (PHOTO: Lou Gall)



The drip system was updated this season. (PHOTO: Lou Gall)



The new bankless design at Keytah can be fully automated.
 (PHOTO: Sascha Estens, Rabbit Hop Films)

siphon field upgraded using the EnviroNode IoT. This provides an opportunity to control the head ditch weir, and the various siphon sets remotely. The hub is also fitted with several channel level sensors so the irrigation manager can monitor and maintain a uniform head height to improve the application uniformity and distribution of each irrigation and each siphon set during irrigations. There has also been investment in water advance sensors, which provide the irrigation manager with real time information on how each irrigation is progressing down the field. This will enable irrigations to be managed more efficiency.

In recent years, the Sundown Pastoral Company team at Keytah has been transitioning towards automated bankless channel irrigation. The bankless channel field that was initially in the trial is still in production and fitted with water level sensors that allow automatic transition between bays.

This bankless design is now being complemented by a much larger, 500 hectare field which can be fully automated. The field day started at this new development. Nathaniel Phillis, the irrigation manager at Keytah, is able to remotely monitor and



An EnviroNode siphon controller. (PHOTO: Lou Gall)

control gates and water movement via an iPad. The Padman webapp portal and mobile app are also able to send critical alerts to the operator. Those present were able to hear from Nathaniel about the design and his experiences of irrigating the field this season.

The bankless channel field has been setup with the Goanna Ag GoField technology which includes soil moisture, local weather observations and the new canopy temperature sensor technology from CSIRO. A better understanding of how your crop is performing can further enhance irrigation management.

At the end of the season, data on yield and water use efficiency as measured using the gross production water use index will be collated. This water use efficiency measure considers yield, rainfall, used soil moisture and irrigation water applied to give a realistic indication of how each of the systems has performed. Data from this season will complement that collected since 2009.

Smart sensing and automation in cotton

This year the new bankless channel field at Keytah is being used not only in the GVIA comparison trial but also by the Deakin University team in their Smarter Irrigation for Profit 2 project: *Integrated smart sensing and automation for cotton*. The Deakin university team is led by John Hornbuckle with support from Rodrigo Filev Maia and Carlos Ballester Lurbe.

This project is developing and trialling low cost, integrated sensing and automation platforms that remove the requirement for manual irrigation checking and control. The irrigation platforms are being developed in partnership with growers such as Keytah, and agriculture technology providers to make sure they are practical, reliable, and effective. Padman Stops and Goanna Ag are partnering with Deakin university in this research.

Currently most irrigators manually check the status of crops and manually control irrigations. The process of checking status and controlling irrigation can be time consuming and potentially inaccurate. Sensors in the field provide more information about soil moisture infiltration and water movement.

The field at Keytah has been fitted with supply gates, drive over head ditch, stops fitted with auto-winchers and a number of soil moisture monitoring units – including capacitance probes and watermark sensors. There is also a weather station on site which is collecting rainfall information, and a radio gateway that enables communication between devices and apps.

Soil moisture tension has been identified by the Deakin team as a key measurement which can be used for autonomous irrigation due to its 'absolute' measurement nature which allows it to be used across multiple soil types without site specific calibration issues. This is a particularly important consideration when using such data for autonomous irrigation as 'calibration' and 'drift' in sensor data across an irrigation season are major issues when using soil moisture data for autonomous irrigation hardware control. The smart sensing project is developing a range of algorithms using machine learning which can be applied within irrigation seasons and across seasons to future predict soil moisture tension for triggering irrigation events. These are being tested at Keytah this 2020–21 irrigation season.

The Deakin team is looking at controlling actual irrigation events as opposed to scheduling timing of irrigation events. To do this they are utilising water level data collected from pressure transducer and ultrasonic water height sensors for triggering gate drops between irrigation bays.

The Irrisens automation can be used to control irrigation events to reach a water depth within a bay and 'hold' that water at that level to promote infiltration without overtopping the



The GVIA field day gave irrigators a wonderful insight into the latest irrigation technology. (PHOTO: Melanie Jensen)

hill or bed, allowing difficult soil types to be more effectively irrigated. The cloud based Irrisens platform can now be run in a supervised or unsupervised fashion allowing full automation from the channel delivery outlet.

The GVIA field day provided an opportunity for John Hornbuckle to explain how the project was going at Keytah this season and gave more irrigators an opportunity to talk with John, Rodrigo and Carlos from Deakin and Keytah staff to understand how they are managing their irrigations and how they may use the integrated, smart sensing irrigation technologies and automation platforms into the future. Being able to see technology like this being applied on a commercial scale enables irrigators to make their own assessments of what will suit their specific locations.

No two irrigation farms will be the same. Each grower will assess their specific water position, soil, plant, and weather information with farm management objectives when they make irrigation scheduling decisions. The use of smart sensing and automation will provide them additional scope to adjust their irrigation events to match irrigations more optimally to soil, plant, and weather parameters.

This project and many other SIP2 projects are building the capacity of research and commercial partners to offer 'fit for purpose' automated irrigation technologies and platforms. The smart sensing work that has taken place in southern NSW in previous seasons is now being tested real time in the north of the state. The commercial industry partners involved in the project, Padman Stops and Goanna Ag, are now offering systems developed in the project across all Australian cotton growing areas and have established networks to provide service support. Both partners gave presentations at the field day.

For more information visit the Smarter Irrigation for Profit website and watch the webinar and video:

Smarter Irrigation for Profit » Gwydir Valley demonstration of the application of the latest digital technologies for precise automated irrigation

<https://smarterirrigation.com.au/dr-john-hornbuckle-associate-professor-from-deakin-university-talks-about-new-technologies-for-automation/>

<https://smarterirrigation.com.au/southern-nsw-cotton-research-update/>

<https://smarterirrigation.com.au/rodrigo-filev-talks-about-integrated-smart-sensing-and-automation/>

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