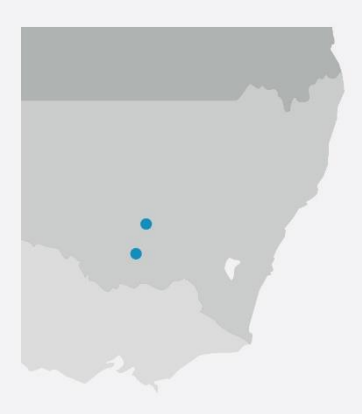
Automated irrigation systems: Smart Irrigation control for water and labour savings in rice growing systems.

1. What is the project about?



This project is developing a linked sensing, forecast and automation control system for rice (Smart Irrigation). Previous research has found Smart Irrigation control systems can significantly improve the water productivity of a partly ponded or strategic ponded 'Dry Rice' system. Dry Rice systems aim to minimise water application and use.

Soil moisture monitoring, water control, crop stress monitoring together with automated Internet of Things (IoT) irrigation control structures and weather forecasts are important components Smart Irrigation control systems.

This project is pulling these components together to develop and commercialise cost effective and reliable Smart Irrigation control systems for rice production. Systems that can also be integrated into the Sunrice GIS system.

Research and development activities are being conducted on two sites. One at Widgelli in the Murrumbidgee Irrigation area and the second at the Rice Research Australia (RRAPL) farm near Jeriliderie in southern NSW.

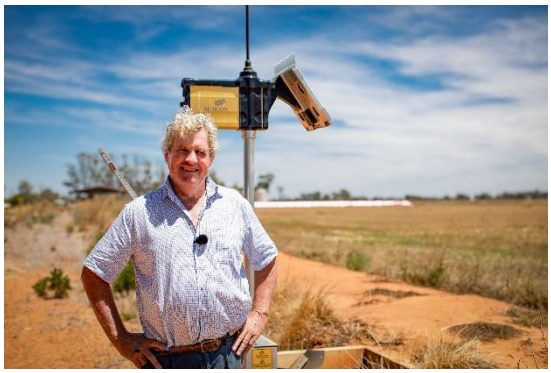
2. Why automate irrigation systems?

Water price and labour costs are fundamental drivers of irrigation decisions and business success.

Optimal sensing and forecasting systems linked to automated irrigation systems can maximise water productivity and reduce labour costs.

'Dry Rice' systems aim to minimise water application and their use will be critical in ensuring the industries future.

3. How will the research benefit irrigators?



Ecomonic benefits of rice automation have been analysed using a baseline economic approach focused on the farm level. This analysis and results have recently been publised in Farmers Newsletter No. 204 Spring Edition. https://irec.org.au/wp-content/uploads/IREC-FN204-fin.pdf.

The results of the analysis show a potential range of economic benfits under three scenarios ranging from $666/ha to $2827/ha over a 10 year period. Current sensing and automation systems developed in the project are well below $666/ha (varies due to bay size etc) so the economics for irrigation automation in rice are favourable, especially with high water prices.

A number of rice farmers are now investing in automation technology specifically to grow rice. An early outcome from this project.

Australian Government
Department of Agriculture, Water and the Environment

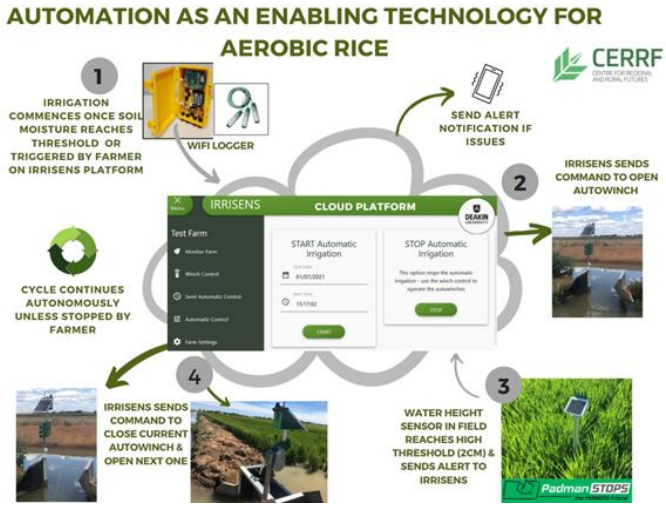
This project is supported by funding from the Australian Government Department of Agriculture, Water and the Environment as part of its Rural R&D for Profit program.

4. Key results to date

During the 2020/2021 irrigation season, three trial sites were established with smart sensing and automation equipment. Two sites were in the Murrumbidgee Irrigation Area at Wigelli and Bilbul and a third site at the Rice Research Australia (RRAPL) farm in Jerilderie, NSW. These sites were used for performance testing of the smart sensing and automation equipment and refinement of field based sensors and control algorithms for irrigation control. Full cloud based integration of sensing and automation control structures has been achieved. Sensing and control algorithms were refined for rice to reduce system costs and increase performance/reliability of automation and these are being incorporated into products by commercial partner Padman Automation.

The 35-ha site at Bilbul was used to grow a commerical scale aerobic rice crop using smart sensing and automation to control irrigation (Figure 1). Aerobic rice systems present a major challenge for farmers in that a high frequency of irrigation is needed and therefore they have a very high labour demand. The smart sensing and automation system was able to successfully control 264 automated irrigation events for the season and significantly reduced labour costs. Water productivity in these aerobic trials was as high as 1.0 T/ML.

Figure 1: Diagram showing components of smart sensing and automation in aerobic rice



A drill sown strategy was followed in the other two trial sites. The smart sensing and automation system was successfully used to automatically control irrigation events during the non-ponded period of the crop by using water height thresholds (mesured with pressure transducer water height sensors) and to automatically maintain desired levels of water in bays during the ponding stage of the crop by means of water height thresholds (high and low) and pairing bay inlets and outlets.

Integration of smart sensing and automation into the Sunrice GIS has commenced and will be on-going. Data generated from the smart sensing elements of the project has the ability to be linked to the Sunrice GIS system to assess management outcomes. Refinement of the economic benefits has been undertaken and based on initial analysis, the developed smart sensing and automation systems from the project are economically viable for irrigators across a range of bay scales.

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

- *Economic case study: Smart irrigation control in rice growing systems*. Available at: https://smarterirrigation.com.au/smart-irrigation-control-in-rice-growing-systems-economic-case-study/
- *Case study: Growing rice with less water and labour*. Available at: https://smarterirrigation.com.au/growing-rice-with-less-water-and-labour/
- *New technologies for irrigation*. Available at: https://smarterirrigation.com.au/dr-john-hornbuckle-associate-professor-from-deakin-university-talks-about-new-technologies-for-automation/

For further information or project progress updates, contact: John Hornbuckle, Project Leader; T: 0429 862 920
E: j.hornbuckle@deakin.edu.au

Australian Government
Department of Agriculture, Water and the Environment
This project is supported by funding from the Australian Government Department of Agriculture, Water and the Environment as part of its Rural R&D for Profit program.
CRDC