

# Improving water quality for the Great Barrier Reef and wetlands by better managing irrigation in the sugarcane farming system

## Summary

In line with the Reef 2050 Water Quality Improvement Plan (WQIP; State of Queensland, 2018), the revised Burdekin WQIP has aspirations to achieve a 60% reduction in dissolved inorganic nitrogen (DIN) by 2025. Because of the strong linkage between irrigation management and DIN losses, managing DIN must involve improved irrigation management and scheduling. The challenge is how to do this in a way that remains both practical and profitable for farmers and, accrues environmental benefit.

Increasingly, farmers world-wide are turning to automated irrigation systems to save them a significant amount of time by remotely turning on and off pumps and valves. Unfortunately, automated irrigation systems on their own do not provide insight on “when to irrigate and how much water to apply?”. To unravel these complex interactions, an irrigation decision support tool is needed. However, due to the high frequency of irrigations across dozens of paddocks, and the need to water almost all year-round, irrigation decision support tools can be very tedious and time-consuming for farmers to use daily. For these reasons, many farmers will not adopt these tools, and in doing so, fail to optimise irrigation use efficiency due to the multi-factorial nature of the farming system.

The NESP TWQ Hub Project 3.1.2 team, in close partnership with its industry stakeholders, and its industry partners, investigated if the Internet of Things (IoT) could make the two technologies of WiSA and IrrigWeb share data and work together seamlessly as ‘one’ SMARTER technology.



## Key Results

### Successful adoption of Uplink

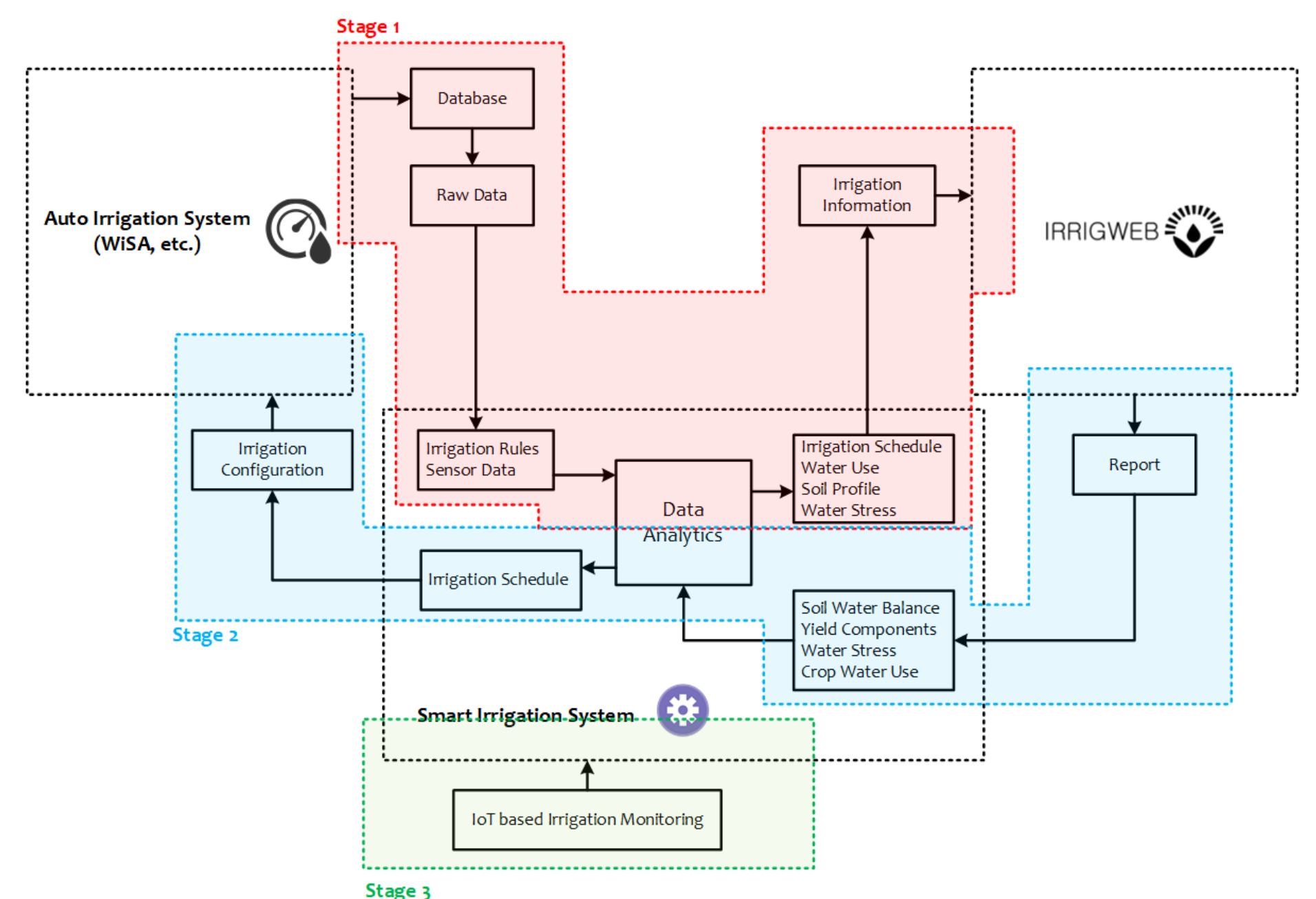
The Uplink program was successfully deployed on a Burdekin farm, and has been automatically uploading irrigation and rainfall records to the farmer’s IrrigWeb since August 2017. The results showed that a significant amount of time (more than 200 hours) had been saved via this process.

### Implementation of Downlink

A one-month trial was conducted in a commercial farm environment for the Downlink program. The Downlink program calculated and applied irrigation schedules automatically using IrrigWeb, but also incorporated practical constraints, such as energy, pumping capability, irrigation priorities and farmer irrigation preference. The trial result demonstrated the Downlink program could effectively manage irrigation scheduling by incorporating irrigation decision support tools with practical limitations.

### Estimating Water Quality Benefits

As an additional achievement to the project, the P2R Projector was used to estimate the improved WQ benefit associated with smarter irrigation practices identified in this project. Using a range of scenarios, the Projector estimated a range of DIN improvements from 4.8 kg N/ha/year up to 28 kg N/ha/year. With approximately 80,000 ha under sugarcane production, the Projector indicates annual potential benefits of between 384 to 2,240 tonnes of N. This would indicate that smarter irrigation practices will make significant inroads to meeting the Burdekin sugarcane region’s DIN reduction target of 720 t/year.



Smarter irrigation system using IoT:

- (i) Stage 1 – auto-irrigation management: an Uplink program (WiSA to IrrigWeb) automatically extracts, calculates and uploads the irrigation and rainfall data from WiSA to IrrigWeb;
- (ii) Stage 2 – smarter irrigation scheduling: a Downlink program (IrrigWeb to WiSA) automatically exports, converts and applies the optimised irrigation schedule from IrrigWeb to WiSA; and
- (iii) Stage 3 – IoT based irrigation monitoring: an IoT based irrigation system monitors the irrigation events happening on the farm, and utilises the data from flow meters, valves and pumps to ensure the operation of the Uplink and Downlink programs.

## Conclusion

The smarter irrigation system represents a solution to saving energy and improving water quality by transferring more farmers to high efficiency irrigation practices. The success and benefits of the Uplink program have captured the attention of many farmers in the Burdekin. There is a growing demand from industry to implement the Uplink program on more farms. Increasing the number of farmers who meet, or exceed, industry best practice irrigation management, will make significant contributions toward meeting the Reef 2050 WQIP targets. To this end, a ‘train-the-trainer’ model in the installation and testing of the Uplink program in the Burdekin presents a plausible pathway to wider adoption and builds regional capacity to ensure the project outputs are easily accessed after the project finish date.

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