Project Catalyst Final Report

Using End of Row Sensors to Manage Tailwater

Grower Information	
Grower Name:	Bryan Langdon
Entity Name:	Langfarm Pty Ltd
Trial Farm No/Name:	BKN-09449A
Mill Area:	Kalamia
Total Farm Area ha:	
No. Years Farming:	
Trial Subdistrict:	Airville
Area under Cane ha:	

Trial Status
• Completed

Background Information

Aim: To utilise radio base stations and radio, wireless technology **to alert grower to finished sets, reducing run off and water wastage.**

Background: (Rationale for why this might work)
Approximately 95% of sugarcane grown in the Burdekin is furrow irrigated. Irrigation run off is a function of furrow irrigation. At the moment, growers can't be sure when their sets have finished, therefore, significant water losses may occur. There is no alert system currently available to growers that will alert them to when water has reached the bottom of the paddock.

- **If we assume that 20% of applied irrigation water is lost to run off:**
- **The grower applied 0.6ML/ha during an irrigation**
- **If 20% is lost, that is 0.12ML/ha OR 120 000L/ha of run off per irrigation**
- **If we assume this is over a 12 hour set, what happens if we shorten the irrigation to 10 hours? How can we achieve this?**

- **If our previous 12hr irrigation was applying 0.6ML/ha, this equates to approximately 50 000L/ha per hour**
- **If the sensor alerted the grower at 10 hours instead of 12, he/she could shorten the irrigation by 2 hours. This would save 100 000L/ha from being applied.**
- **This would also save around 20 000L/ha from leaving the paddock as runoff (assuming 20% loss).**

Potential Water Quality Benefit:
Irrigation run off is the primary pathway for nutrient, pesticide and sediment losses from the paddock. By reducing the volume of water leaving the paddock, it is hoped that the level of nutrient, pesticide and sediment that leaves the paddock is also reduced.

Expected Outcome of Trial:
By supplying the grower with a wireless end of row sensor, it is hoped that being alerted to when their sets have finished will lead to sets being changed or pumps being turned off in a more timely manner.

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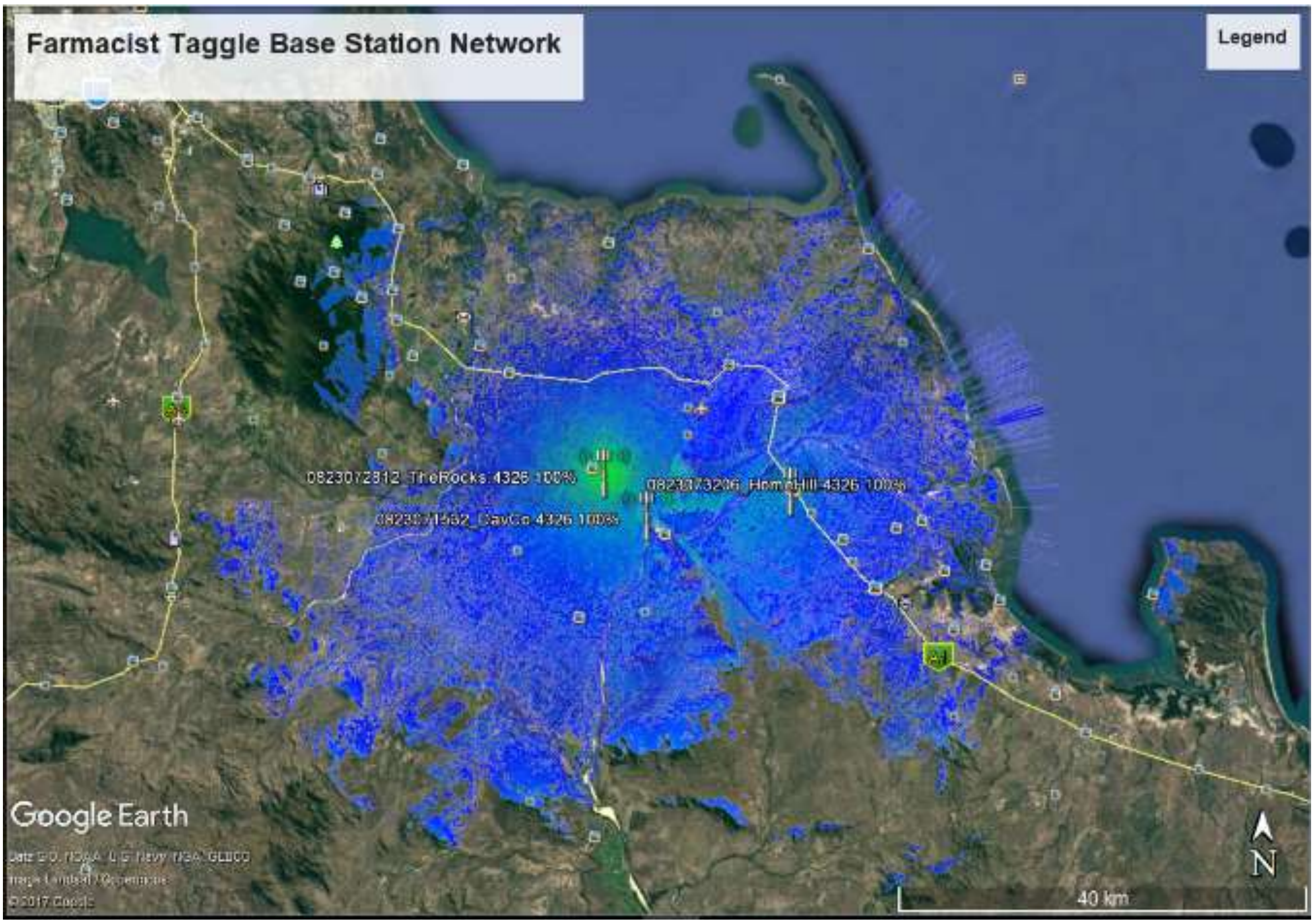
Where did this idea come from:

Plan - Project Activities	Date : (mth/year to be undertaken)	Activities :(breakdown of each activity for each stage)
Stage 1	**Jan-July 2017**	Design an end of row sensor that will communicate with a low power radio base station network
Stage 2	**July – Dec 2017**	Implement the base station network
Stage 3	**Jan -Dec 2018**	Test the sensor for reliability and robustness.
Stage 4		
Stage 5		
Stage 6		

Project Trial site details	
Trial Crop:	Sugarcane
Variety: **Rat/Plt:**	Various
Trial Block No/Name:	Various
Trial Block Size Ha:	Various
Trial Block Position (GPS):	Various
Soil Type:	Various

Block History, Trial Design:

Once the base station network was set up, the coverage is expected to be similar to the image below:



The sensor being used is pictured below:

It is a simple open/close circuit – a complete circuit (in water) reads as “wet” and an incomplete circuit reads as “dry.” The notificatiosn are sent to the Farmacist smart phone app (available for iPhone and Andriod):

Treatments:

Original Design: Prong system – the water reaches the prongs and forms a connection between the two. This creates a bridge between the two, completing the connection. The sensor then sends a notification that states that the sensor is “wet.” When the water drops and there is no longer a bridge, the sensor reads as “dry.”

Second Design: Float switch system – when the water causes the float to rise, it completes the connection and activates the sensor to read as wet. When there is no water and the float drops, the connection is broken and the sensor reads as dry.

Results:

The intital design of the sensors (prong system) was working well; however, due to the way the circuit was designed and the quality of the prong sensors, there was an issue with corrosion. When the sensors were in contact with water, the circuit was running electricity through the prongs, causing electrolysis. This was corroding the plates on the prongs, causing the sensor to send notifications at the wronf time, or not send them at all.

To combat this, the prong sensor was replaced with a float switch. Because the float switch is plastic, the electrolysis issue that was occurring was no longer an issue. It was on this farm that the float switch design was tested for effectiveness, and it was found to be a far more reliable design. There are still some issues – by moving from the electrical option to mechanical, there is a risk that mud or debris will jam or block the float, preventing it from moving up and down and creating/disconnecting the circuit. This has been somewhat mitigated through enclosing the sensor in a section of PVC. This allows water to reach the sensor but prevents large pieces of debris from coming in contact.

The major issue in this case was the lack of reliable radio signal over this farm. Though the sensor is working, the radio signal issues have prevented the sensors from being used to their full potential.

Conclusions and comments

If the sensors can be developed to be more robust and reliable, and the base station network can be improved to deliver more consistent signal to greater areas of the Burdekin, this technology could be very useful to Burdekin growers. However, with the current technology and radio signal, the sensors are not reliable enough for growers to trust them to send accurate notifications. Until then, they are unlikely to gain traction as a irrigation management tool.

Advantages of this Practice Change:

These sensors could help growers by alterting them to when their sets have finished so they can change the set or turn them off. This helps them to save water and power and reduces the risk of inputs (fertiliser and pesticides) leaving the paddock. The sensor is also a low cost option, which would help with uptake.

Disadvantages of this Practice Change:

At the moment, the technology and radio signal is not robust or reliable enough for growers to trust the sensors to alert them to when their sets are finished. If growers rely on the sensors at the moment, and the sensor does not send them a notification when the water has reached the end, this could result in excessive water being applied – a waste of water, power, inputs and risks flooding paddocks and/or neighbours.

Will you be using this practice in the future:

If the technology becomes more accurate, this would be a useful tool to growers in managing their irrigations. Until then, probably not.

% of farm you would be confident to use this practice :

With the technology in it's current state, the grower is not confident in this practice.