Project Catalyst Final Report

Calibrating GDots to Sugarcane Growth

Grower Information	
Grower Name:	Christian Lago
Entity Name:	RJ Lago Enterprises
Trial Farm No/Name:	BKN-06373A
Mill Area:	Pioneer
Total Farm Area ha:	
No. Years Farming:	
Trial Subdistrict:	Pioneer
Area under Cane ha:	

Background Information

Aim: To calibrate GDots to sugarcane growth to give growers more confidence to use them for irrigations scheduling. To encourage the adoption of GDots as an irrigation scheduling tool.

Background: (Rationale for why this might work)

GDots are a new irrigation management tool to the Burdekin. A GDot is a gypsum block that is buried in the root zone of the crop with a cord that leads to a head unit. The head unit has 7 yellow dots that drop off as the soil dries out. That is, at <10kPa, the GDot has 7 dots. The dots flick to black as the soil dries, so when the soil tension is >100kPa, there are no dots on the GDot.

The GDots do not read soil moisture, they are a measurement of soil tension. This is an indication of how much energy the plant is having to use to extract water from the soil.

Because these tools are new to sugarcane, there has been some confusion about when to irrigate according to the GDots. To calibrate the GDots to sugarcane growth, Farmacist staff use the same method that was developed to calibrate the mini pans to sugarcane. Developed by Evan Shannon and JR Holden, this process involves selecting 25 representative sticks and measuring the daily growth over two irrigations. When the daily growth drops below 50% of the maximum daily growth (i.e. Peak growth was 40mm/day, if growth drops below 20mm/day for 2 days), it is time to irrigate that paddock.

Potential Water Quality Benefit:

Irrigation scheduling tools help growers apply their water when the crop needs it, rather than according to a set schedule. This helps to reduce unnecessary irrigations and improve productivity. Irrigation water is the primary pathway for nutrient and pesticide losses from paddocks, so irrigating according to crop requirement will help growers reduce their losses. Additionally, applying water when the crop will reduce the risk of waterlogging or drying out, improving the crops ability to maintain peak performance.

Expected Outcome of Trial:

By calibrating the GDots to crop growth, growers will have more confidence to use the tool as part of their irrigation management strategies. This in turn will reduce the number of unnecessary irrigations applied reducing the risk of nutrient and pesticide losses.

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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		Install and calibrate the GDot Analyse the data Share with the grower
Stage 2		- Reinstall the GDot for the grower - Work with the grower to maintain it's use on farm -
Stage 3		-
Stage 4		
Stage 5		
Stage 6		

Project Trial site details

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

Block History, Trial Design:

Block History:

Trial Design:
Methodology:

1. **Install GDot in a block of hilled up plant cane. This is done by drilling a 25mm hole into the root zone of the plant, approximately 300mm deep. The gypsum block is pushed down to the bottom of the hole and a mud slurry is used to back fill the hole. The cord that is attached to the gypsum block is run back to the headland (usually top of the block) and attached to the head unit.**
2. **Select 25 representative sticks of sugarcane around where the gypsum block has been installed.**
3. **Measure the height of all of the sticks to the top visible dewlap. This is the base line measurement. The grower can now irrigate.**
4. **After irrigation, measure all of the sticks every day at the same time each day. Ideally, this would be mid-morning. The measurements will be averaged to calculate the average daily growth.**
5. **Continue to measure the sticks until peak growth has occurred, then continue measurements until the average daily growth drops below 50% of peak growth for 2 days.**
6. **Collate the information (average daily growth and GDot readings in kPa) and graph for the grower.**

To make the graphs easier to understand, the dots on the GDots are converted to an average kPa value for that range on the GDot, instead of comparing it to the dots left on the GDot. This displays the data as the lower the number the greater the water content in the soil. The values used are below:

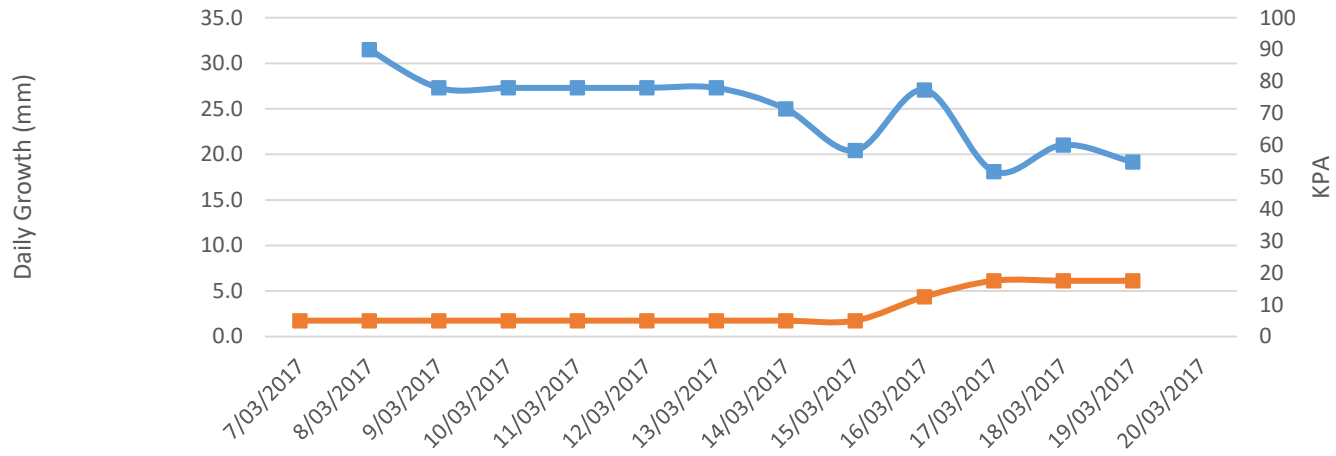
Dots on GDot	kPa Range	kPa Value
7	>10	5
6	10-15	12.5
5	15-20	17.5
4	20-30	25
3	30-40	23
2	40-60	50
1	60-80	80
0	> 100	105

Treatments:

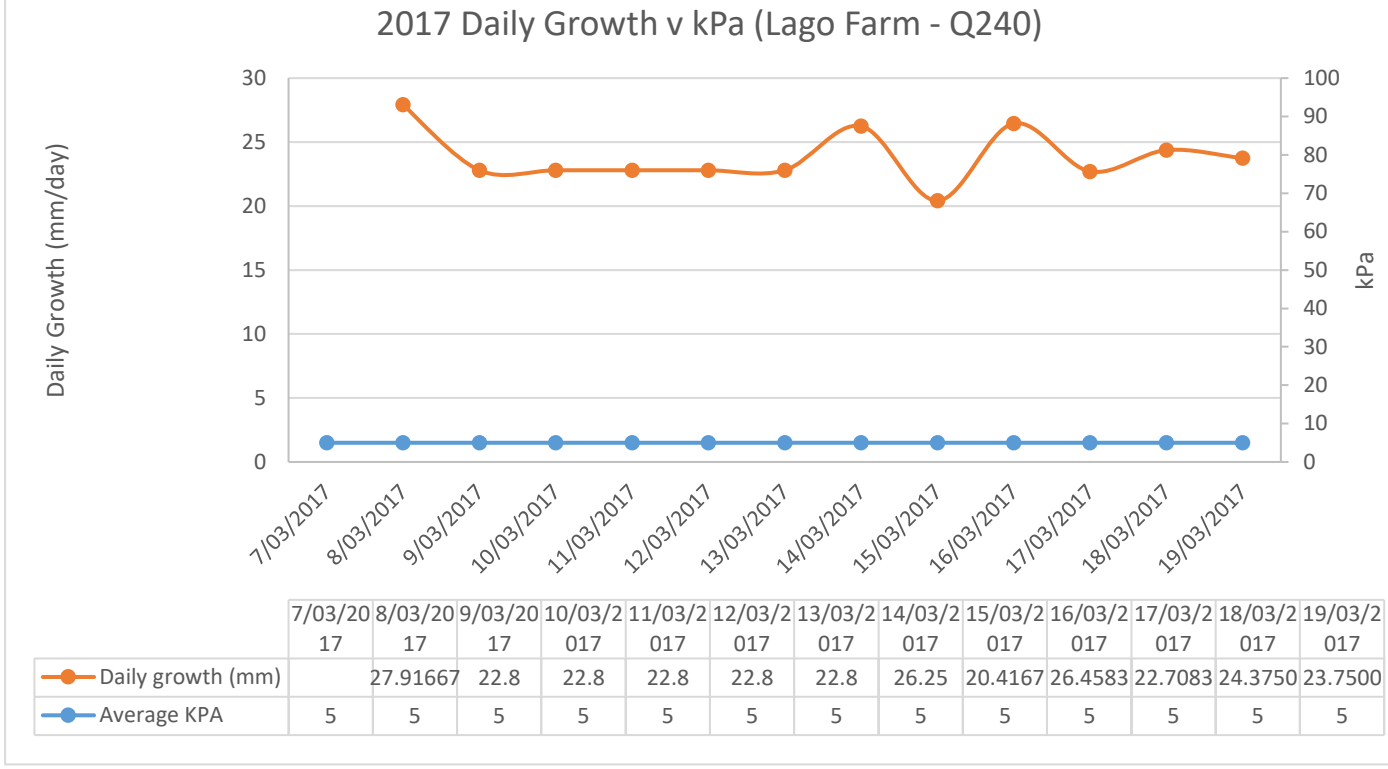
Install and GDot and calibrate it to crop growth.

Results:

There were 4 attempts to calibrate GDots for this grower. The grower wanted to calibrate two different varieties of cane to see if there was a difference between their water requirements. The varieties chosen were Q183 and Q240. The first two calibration attempts were in March 2017. Both sites were going well; however, wind gusts from Cyclone Debbie (20th of March) caused the cane at both sites to lodge. This prevented any new measurements from being taken, so the new sites couldn't be started until the new year. The graphs can be viewed below. The graph for the Q183 site was nearly at the irrigation trigger point when Cyclone Debbie occurred, which was disappointing. The Q240 site still had some time to go before it was going to reach the trigger point.



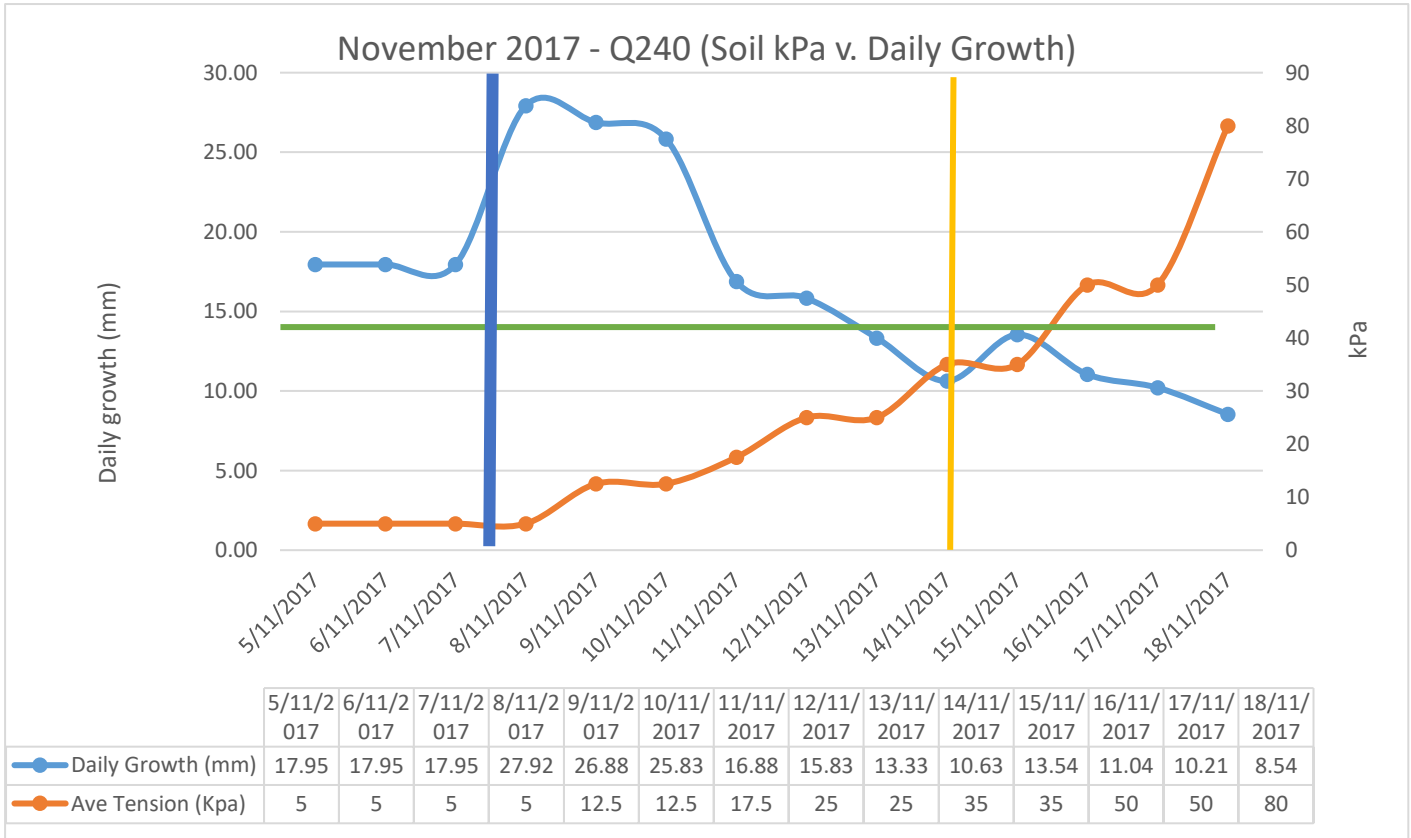
	7/03/2017	8/03/2017	9/03/2017	10/03/2017	11/03/2017	12/03/2017	13/03/2017	14/03/2017	15/03/2017	16/03/2017	17/03/2017	18/03/2017	19/03/2017
Daily Average (mm)		31.5	27.3	27.3	27.3	27.3	27.3	25.0	20.4	27.1	18.1	21.0	19.2
Average KPA	5	5	5	5	5	5	5	5	5	12.5	17.5	17.5	17.5



	7/03/2017	8/03/2017	9/03/2017	10/03/2017	11/03/2017	12/03/2017	13/03/2017	14/03/2017	15/03/2017	16/03/2017	17/03/2017	18/03/2017	19/03/2017
Daily growth (mm)		27.91667	22.8	22.8	22.8	22.8	22.8	26.25	20.4167	26.4583	22.7083	24.3750	23.7500
Average KPA	5	5	5	5	5	5	5	5	5	5	5	5	5

Two sites were set up for calibration in late 2017. In this case, the two varieties being compared were Q240 and Q253.

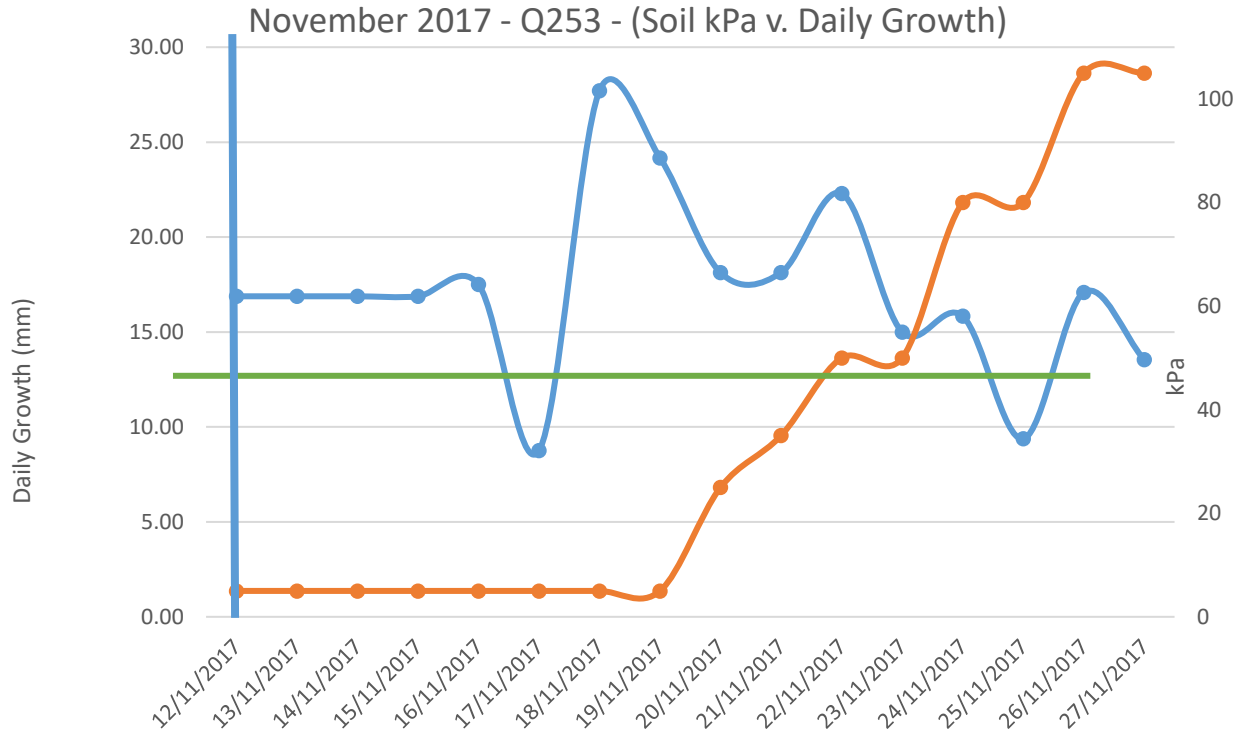
The Q240 site produced a clear calibration graph, as can be viewed below:



	5/11/2017	6/11/2017	7/11/2017	8/11/2017	9/11/2017	10/11/2017	11/11/2017	12/11/2017	13/11/2017	14/11/2017	15/11/2017	16/11/2017	17/11/2017	18/11/2017
Daily Growth (mm)	17.95	17.95	17.95	27.92	26.88	25.83	16.88	15.83	13.33	10.63	13.54	11.04	10.21	8.54
Ave Tension (Kpa)	5	5	5	5	12.5	12.5	17.5	25	25	35	35	50	50	80

This site was calibrated between the 5th and the 18th of November. Peak growth occurred on the 8th of November (28mm/day) and it dropped below 14mm/day for two days on the 13th and 14th of November. The kPa at this stage was 30-40kPa, which equates to 3 dots left on the GDot.

The Q253 site had some growth fluctuations during the calibration process that made calibrating the GDot very difficult. A trigger point could not be determined from the calibration site (see below), so a trigger point based off soil type was recommended to the grower (determined from multiple calibration sites on the same soil type).
As can be seen in the graph below, though the soil tension increased periodically, the daily growth did not drop as expected, and fluctuated. By the time the growth appeared to be dropping, the GDot had been on zero dots for a number of days, which is far below the normal recommended trigger point.



	12/11/2017	13/11/2017	14/11/2017	15/11/2017	16/11/2017	17/11/2017	18/11/2017	19/11/2017	20/11/2017	21/11/2017	22/11/2017	23/11/2017	24/11/2017	25/11/2017	26/11/2017	27/11/2017
Daily Growth (mm)	16.88	16.88	16.88	16.88	17.50	8.75	27.71	24.17	18.13	18.13	22.29	15.00	15.83	9.38	17.08	13.54
Ave Tension (Kpa)	5	5	5	5	5	5	5	5	25	35	50	50	80	80	105	105

Overall, the grower really appreciated the calibration sites and has taken to the GDots very well. He has installed them each year since 2017, a clear indication of adoption.

Conclusions and comments

Calibrating the GDots to crop requirement was a useful exercise to help develop the grower's confidence in the tool. **Getting the grower involved in the process helped him understand the relationship between water use and crop growth, and the readings on the GDot.**

The grower has adopted the GDots, and regularly uses them as part of his irrigation management.

Advantages of this Practice Change:

- **GDots are simple and easy to use and install**
- **Calibrating the GDot helped built confidence**
- **GDots require little maintenance, so growers are more likely to use them**
- **Irrigating according to crop requirement will help reduce unnecessary irrigations being applied, leading to less risk of nutrient and pesticides leaving the paddock.**

Disadvantages of this Practice Change:

- **The gypsum blocks need to be replaced every 4-5 years**
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Will you be using this practice in the future:
Yes.

% of farm you would be confident to use this practice :
The grower has a GDot on 4 blocks on his farming area.