

Irrigation Automation in the Burdekin Sugarcane Industry



Stephen Attard

AgriTech Solutions

Irrigating into the future

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Overview

- Burdekin sugarcane industry
- Automation system used
- Benefits
- Further Developments



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National Environmental Science Programme







Townsville

Burdekin Falls Dam

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image NASA
Image © 2011 DigitalGlobe
© 2011 Cnes/Spot Image

19°58'23.07" S 147°05'27.36" E elev. 86 m

Google

Eye alt. 256.54 km

- ~ 100,000 ha of irrigated land
- Sugarcane dominated
- Harvest 70,000 ha
- 8M tonnes cane
- 1.2M tonnes sugar
- <1,000 ha drip/overhead

- High yielding bores
- Unregulated groundwater extraction
- 8 ML/ha (approx.) surface water entitlement

- 8 ML/ha (approx.) surface water allocation
- Regulated groundwater extraction
- Low yielding bores

Imagery Date: 8/9/2009

15.8 km

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2011 GeoEye
Image © 2011 DigitalGlobe
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19°39'16.26" S 147°15'55.55" E elev. 29m

©2010 Google

Eye alt. 68.58 km



The Burdekin

Jordan Site

Pozzebon Site

Linton Site

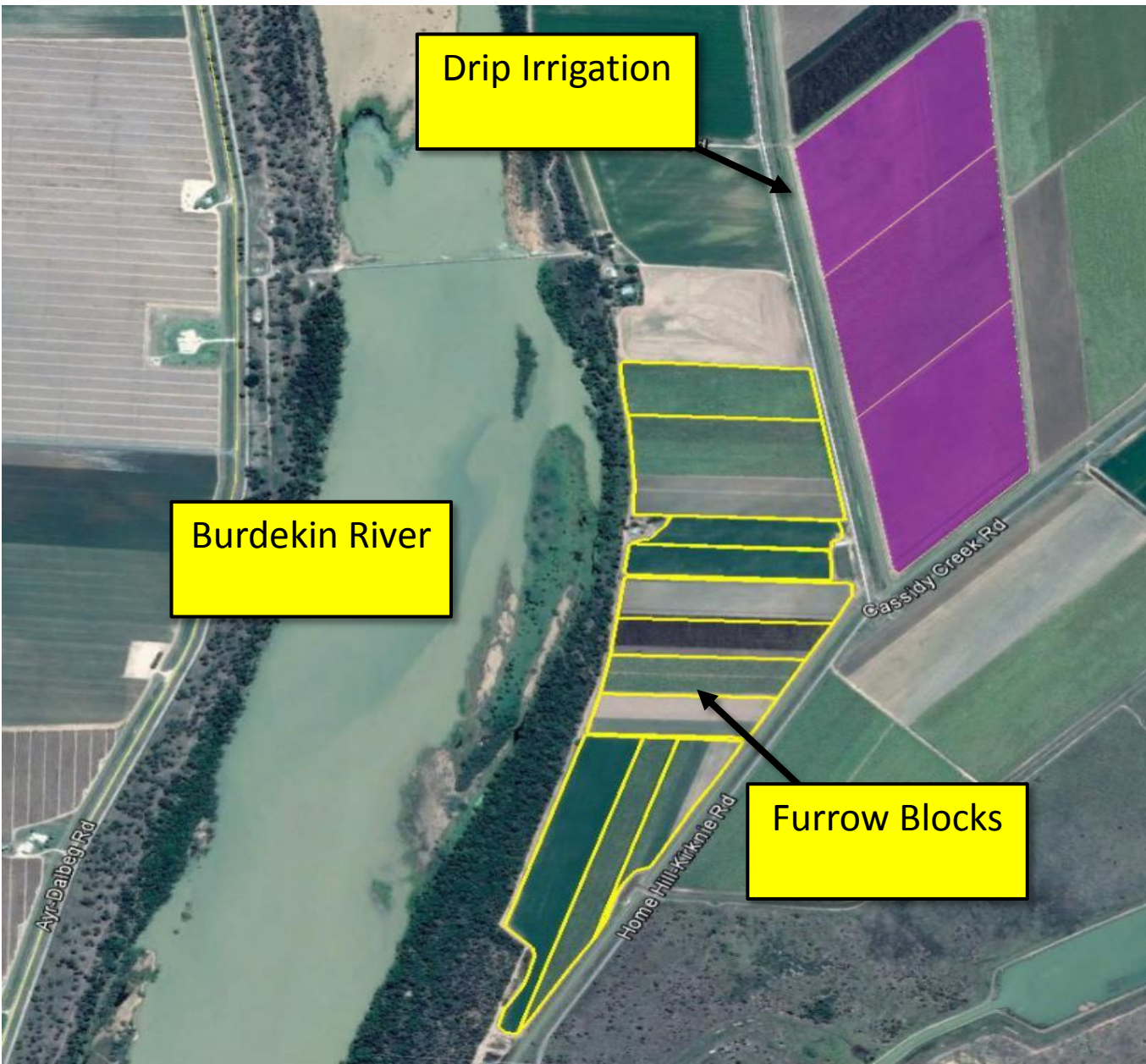


System Components

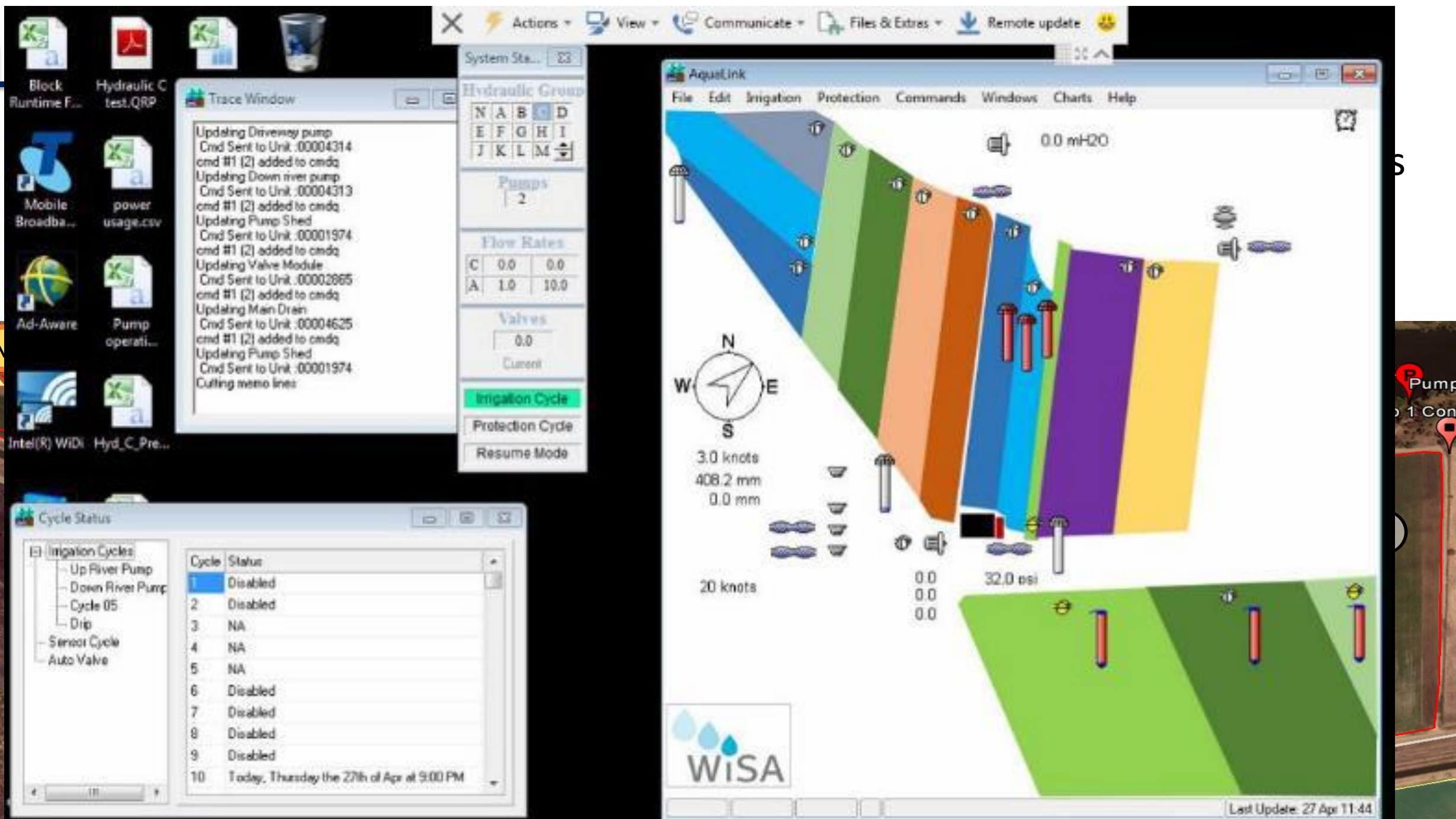
- (WiSA) Radio Base station
 - Connected to PC running control software
- Control system
 - Pump controller
 - Field Control nodes (can connect to two valves)
 - Actuator and valve for each block
- Supply Monitoring
 - Pressure (PST)
 - Flow
- Advance/Drainage Monitoring
 - Water level in drain or
 - advance detection within field
- Other optional sensors (e.g. wind, rain, soil moisture, etc)



Linton Site



- Water source:
 - River pumps for furrow
 - channel and recycle pit for drip
- 45 ha of Drip
 - 350 – 450 m long
- 51 ha of Furrow
 - 350 – 750 m long
- Farm is located 40 minutes drive from home



Linton Site

- 11 Irrigation blocks – WHOLE farm is automated
- 6 control nodes & 11 valves
- 3 pumps with flowmeters and PST's
- 3 drain level sensors



Linton Site - Flowmeters

- EM flowmeters installed (replacing Sunwater meters)



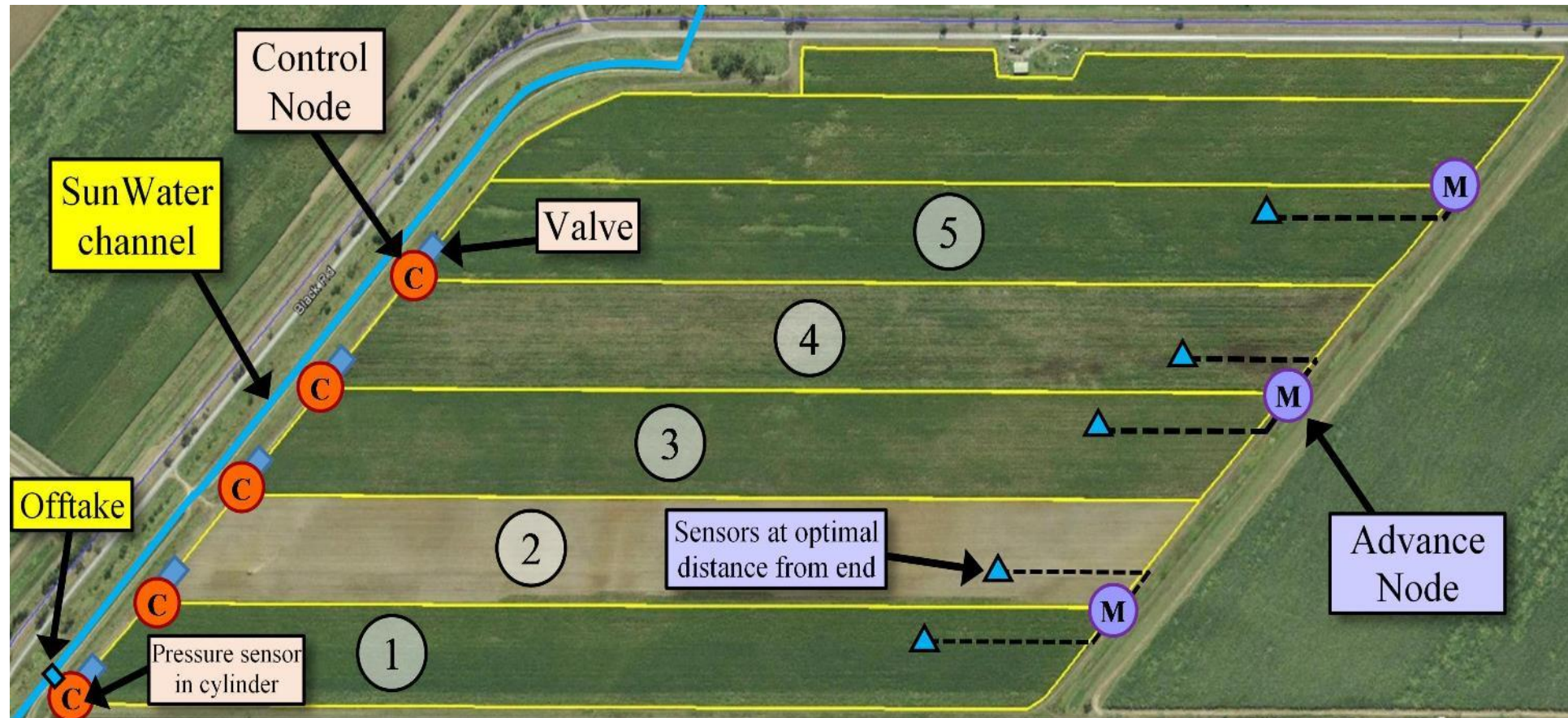
Linton Site – Drain Level Sensors

- Detect small changes in water level in drain
- Farmer will calibrate:
 - First few furrows = small depth
 - Most furrows completed = larger depth
- Can be used to trigger next block to start



Jordan Site

- 82 ha, 1300m furrows
- 5 Irrigation blocks
- 5 control nodes (*1 per valve*)
- 1 Pressure transducer + Doppler flowmeter inside supply
- Advance sensors (*100–200m from end with nodes outside field*)
- Farmer wants to minimise Tail-water



Jordan Site



END OF ROW 5_6

END OF ROW 3_4

END OF ROW 1_2

4.3km

Pump Control

3.5km

Cao

Jordan Site – Advance Sensors

- Not Possible with a fixed time schedule:

- Sample of Completion times:

	Block 1	Block 2	Block 3	Block 4
Max time	1595	1559	1338	1153
Min Time	568	1273	840	885
Average (minutes)	869	1442	1006	999

- Water needs to be stopped several hours before reaching the drain
- A “Trigger Distance” determined for each block through SISCO modelling.
- Soil moisture sensors were buried at those locations (*100 – 200m from end*) and connected to radio node outside field.
- System is now set to switch to next irrigation set at the time at which water is detected

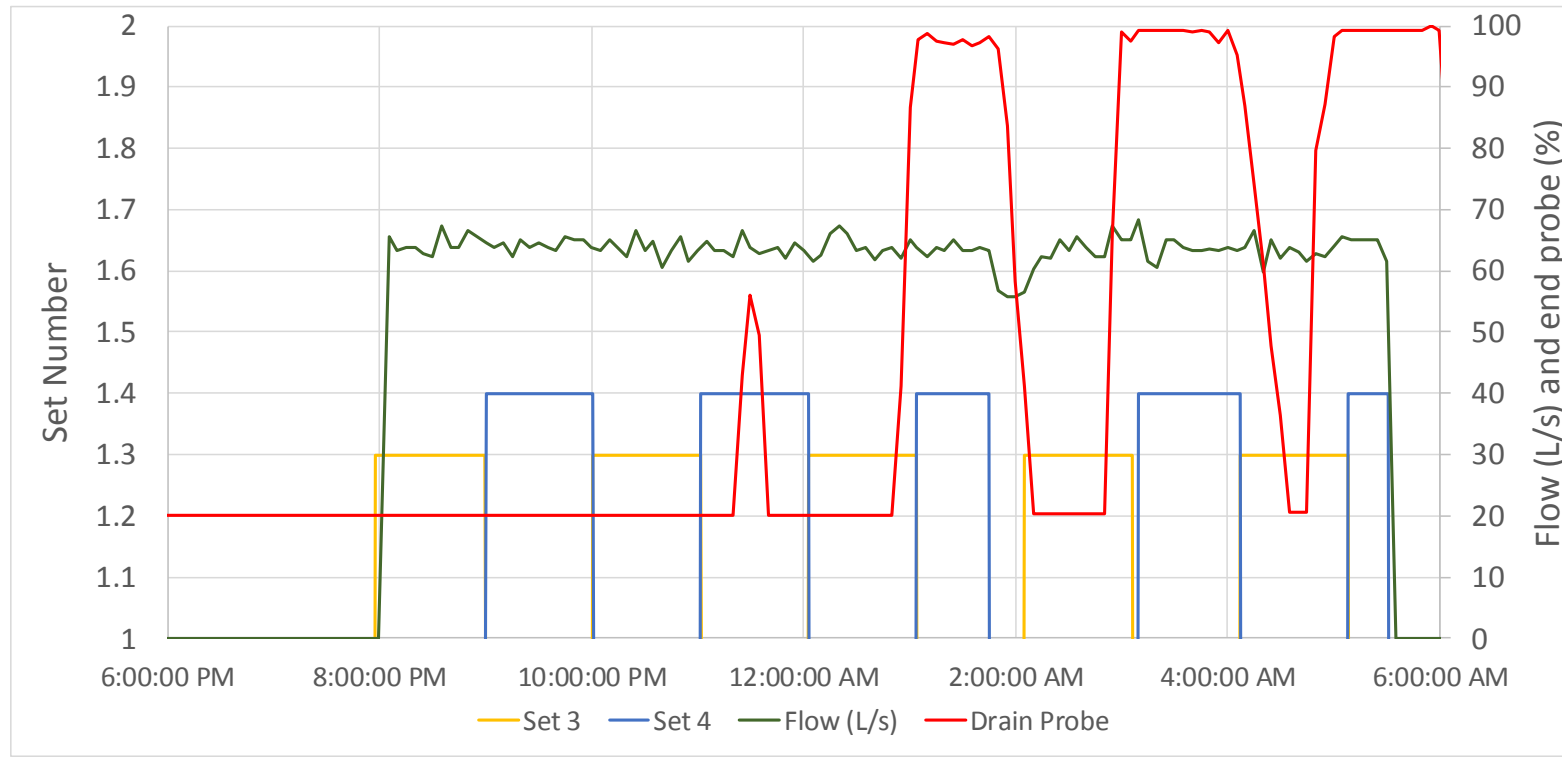


Jordan Site – Advance Sensors



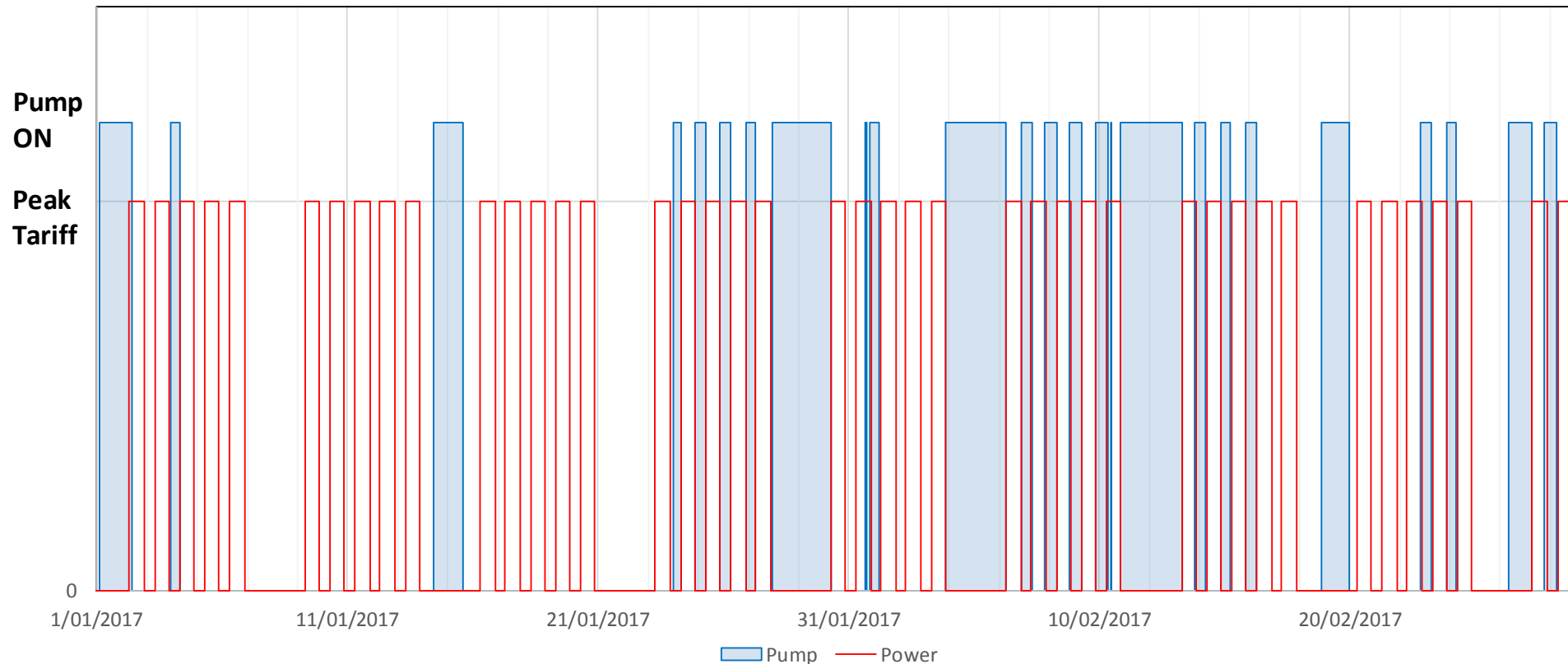
Linton Site – Surging

- Records from the system indicated Aaron was under-irrigating some fields
 - Confirmed with IrrigWeb analysis
- Aaron tested surging on problem fields
 - Reduced run times & Increased depth infiltrated



Linton Site – Off Peak Power

- Aaron can now schedule all irrigations to occur in off peak power periods
 - Savings of around \$122.40 per hectare
 - Measured data approx. 2% usage in peak 98% in off peak

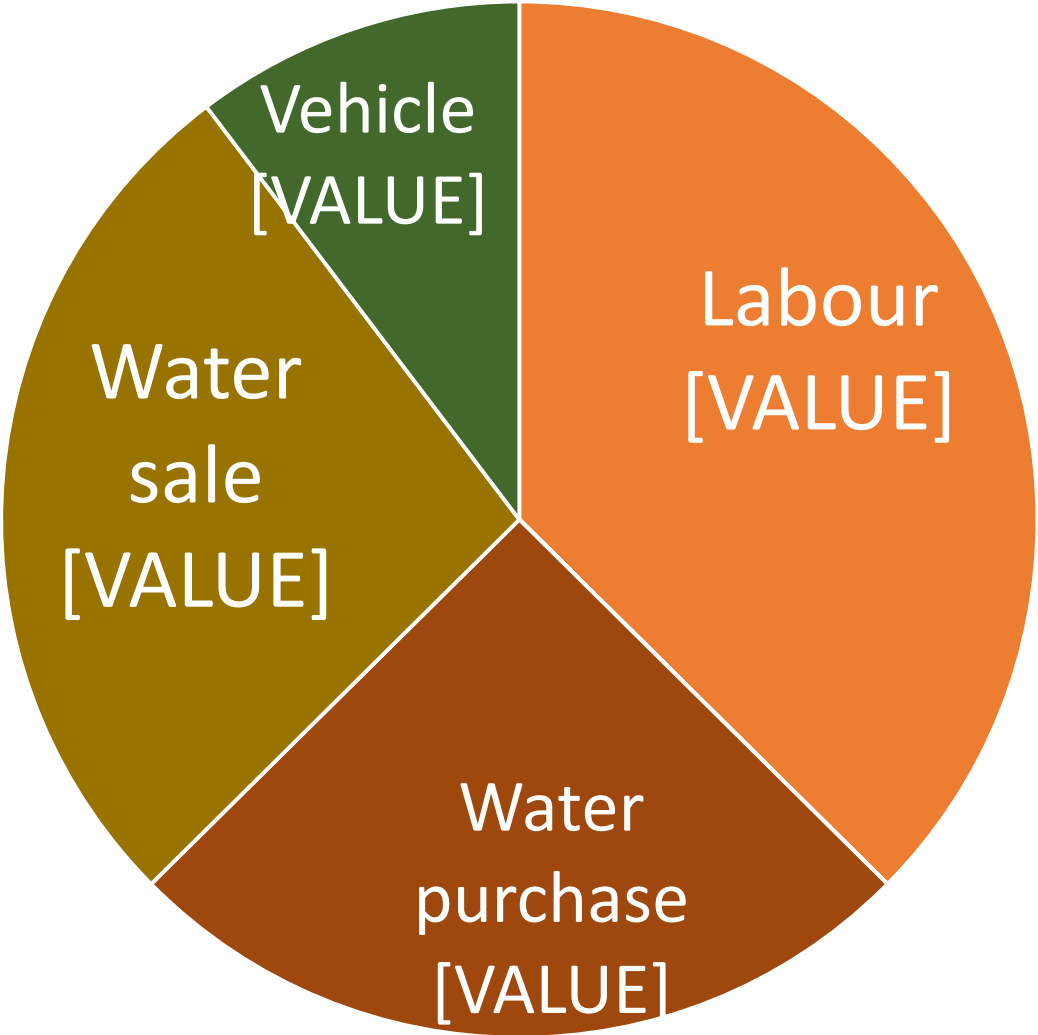


Farmer	Russell Jordan	Aaron Linton	Denis Pozzebon
Area automated during project (ha)	82	53	27

Summary of Benefits			
Water saving	✓✓ Approx. 10-15%	Blocks were being underwatered	✓✓ Approx 20%
Energy use saving—reduced pumping time	Gravity system, no pumping	Not applicable	✓✓✓
Saving from changing electricity tariff	No pumping	✓✓✓✓ >40% reduction	Potential saving but not investigated during project
Labour saving—time spent changing/checking irrigation and travelling to the farm	✓✓✓✓	✓✓✓✓	✓✓✓✓
Vehicle cost saving	✓✓	✓✓✓✓✓ > 10,000 km/yr	✓
Improved record keeping—irrigation is automatically captured	✓✓	✓✓	✓✓
Social or family benefits	✓✓✓✓	✓✓✓✓	✓✓✓✓
Water quality improvement	✓✓	✓✓	✓✓
Reduced deep drainage losses (water table impacts)	✓✓✓	✓	✓✓

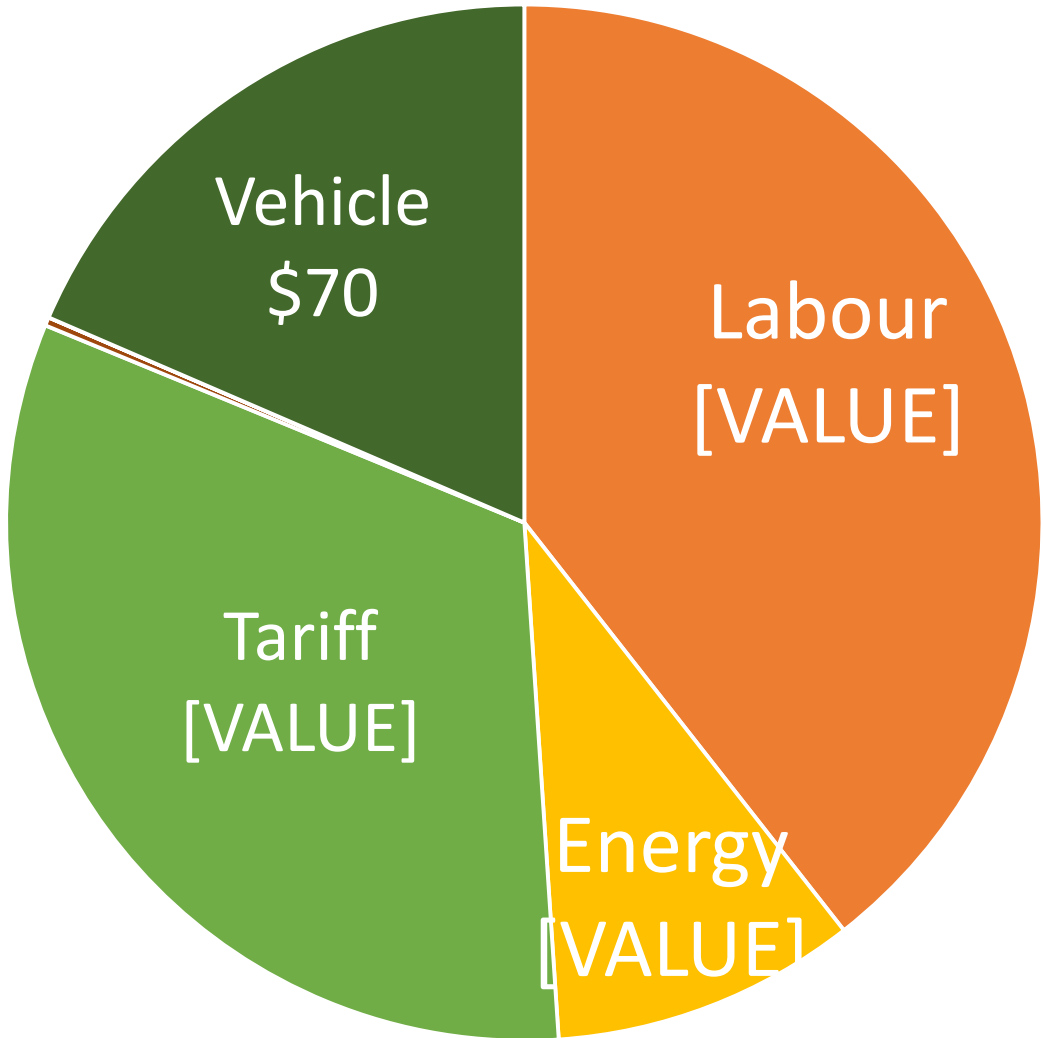
Jordan – annual costs & savings (\$/ha)

	\$/ha/year
Labour	\$58
Electricity (energy)	\$0
Electricity tariff	\$0
Water purchases	\$39
Water sales	\$42
Vehicle R, M & F	\$16
Total annual benefit	\$155
Annual cost*	\$87
Benefit - Cost	\$68
* Borrowing costs not included	



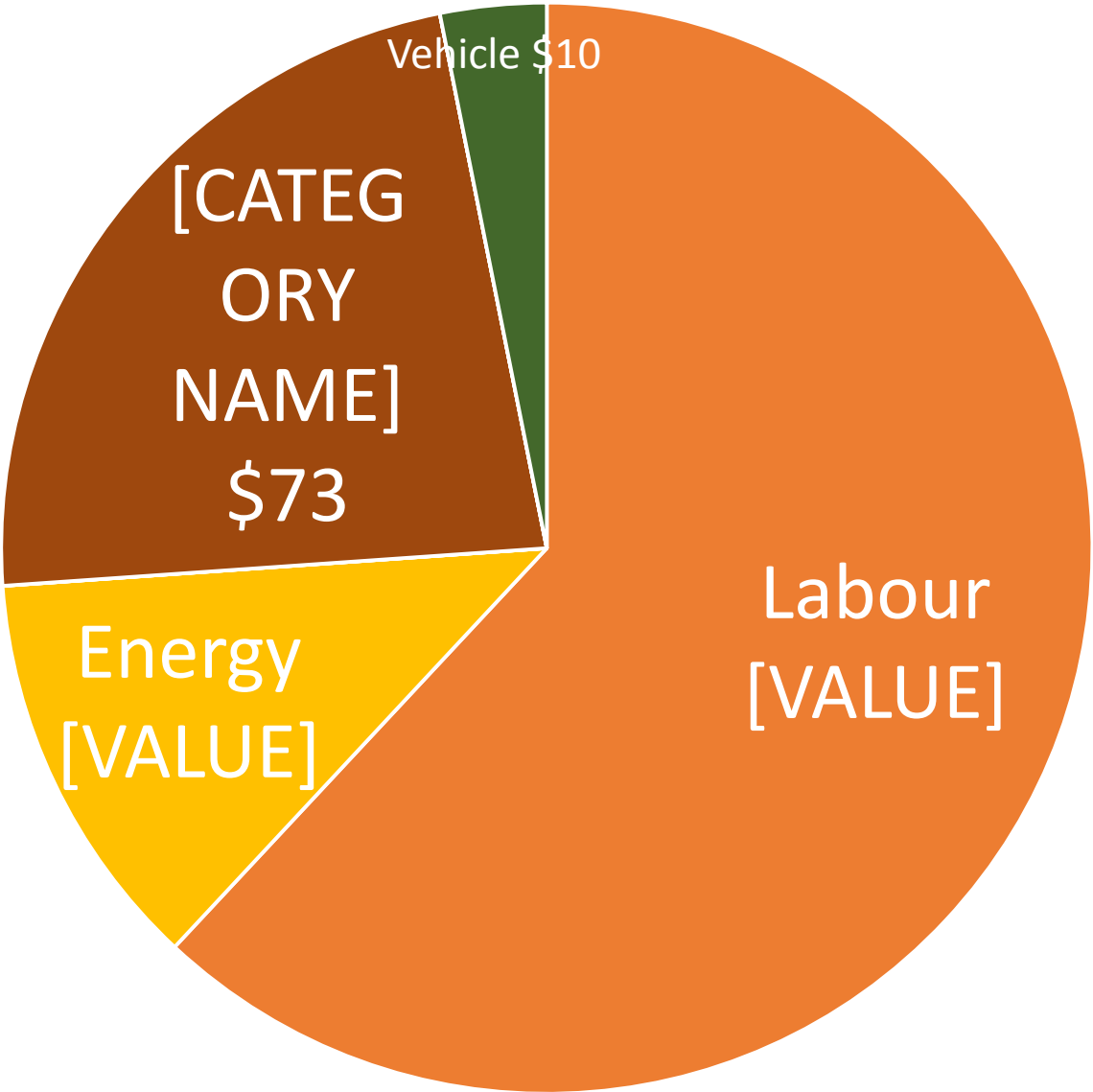
Linton – annual costs & savings (\$/ha)

	\$/ha/year
Labour	\$149
Electricity (energy)	\$36
Electricity tariff	\$122
Water purchases	\$1
Water sales	\$0
Vehicle R, M & F	\$70
Total annual benefit	\$378
Annual cost*	\$184
Benefit - Cost	\$194
* Borrowing costs not included	



Pozzebon – annual costs & savings (\$/ha)

	\$/ha/year
Labour	\$197
Electricity (energy)	\$38
Electricity tariff	\$0
Water purchases	\$73
Water sales	\$0
Vehicle R, M & F	\$10
Total annual benefit	\$318
Annual cost*	\$316
Benefit - Cost	\$2
* Borrowing costs not included	



Developments

SRA funded project + farmer co-investment

- 3 farms
- 164 Ha

2018 installation

- 3 original farmers
- 3 new farmers
- 550+ ha automated



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NESP project 3.1.2

- Automate the irrigation and rainfall data from automation software (WiSA) to irrigation scheduling tool (IrrigWeb)
- Reduce farmer time - Aaron Linton 2016/17 irrigation season
 - 1001 irrigation events
 - 118 rainfall events
 - Between 50 - 100 hours of manual data entry saved



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Stephen Attard

AgriTech Solutions

0418 155 844

steve@agritechsolutions.com.au