Australian Government
Cotton Research and Development Corporation

NCEA

Real-time, web-enabled adaptive control and monitoring of surface and overhead irrigation systems

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USQ UNIVERSITY OF SOUTHERN QUEENSLAND

fulfilling lives

Irrigation control system

Surface irrigation system

Overhead irrigation system

1. Sensors

2. Control strategy

3. Real-time irrigation adjustment

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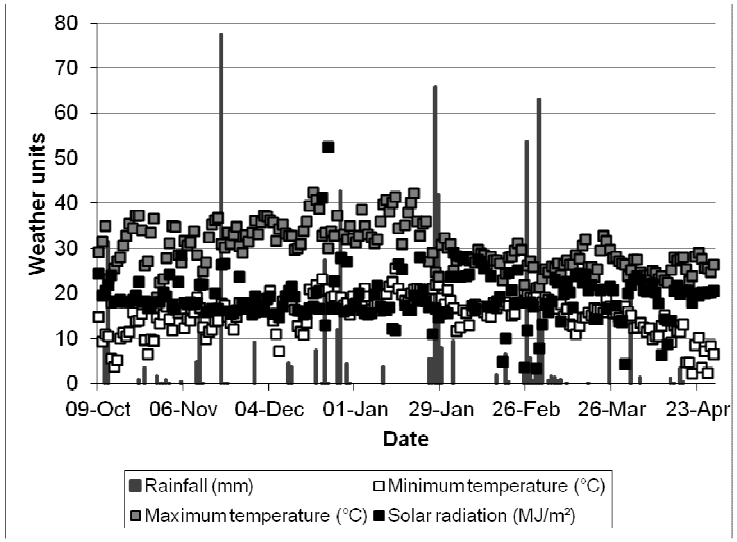
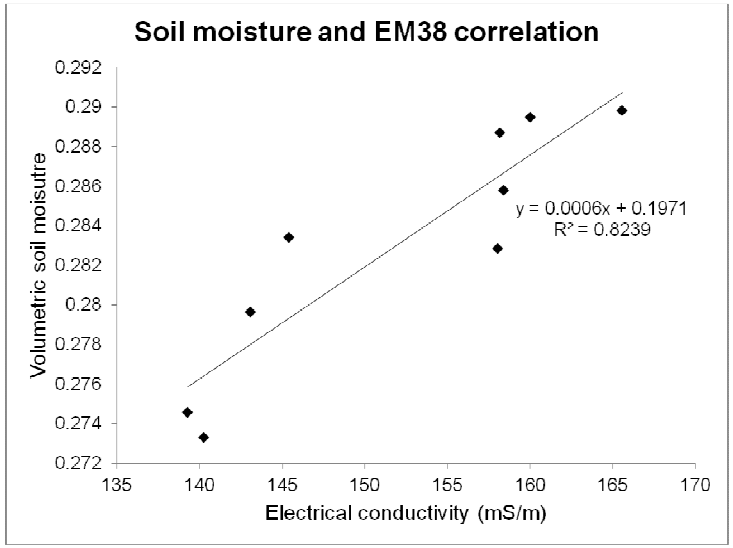
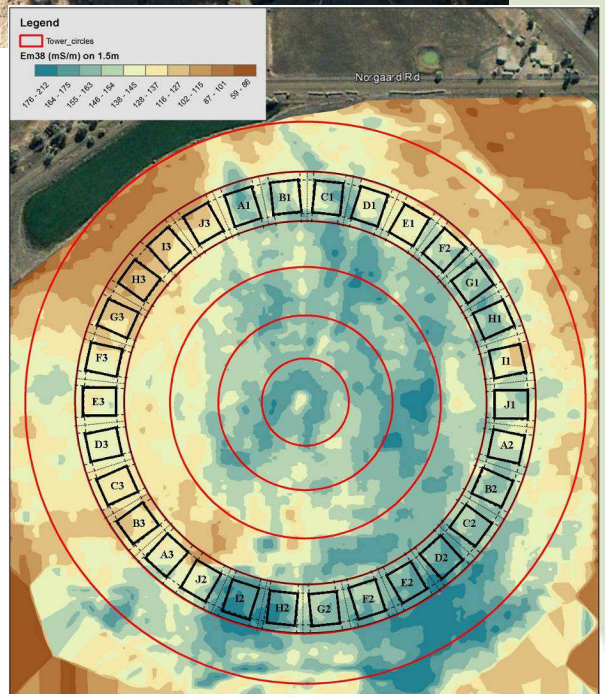
Internet-enabled infield sensors

- Data uploaded to server from:
  - Weather station
  - Soil moisture sensors
- Variability estimated from EM surveys







Fruit load estimation sensor

Overhead-mounted platform for centre pivots/lateral moves

Ground-based platform for surface irrigation

Irrigation application

- Advance meters
- Flow meters on surface and overhead systems

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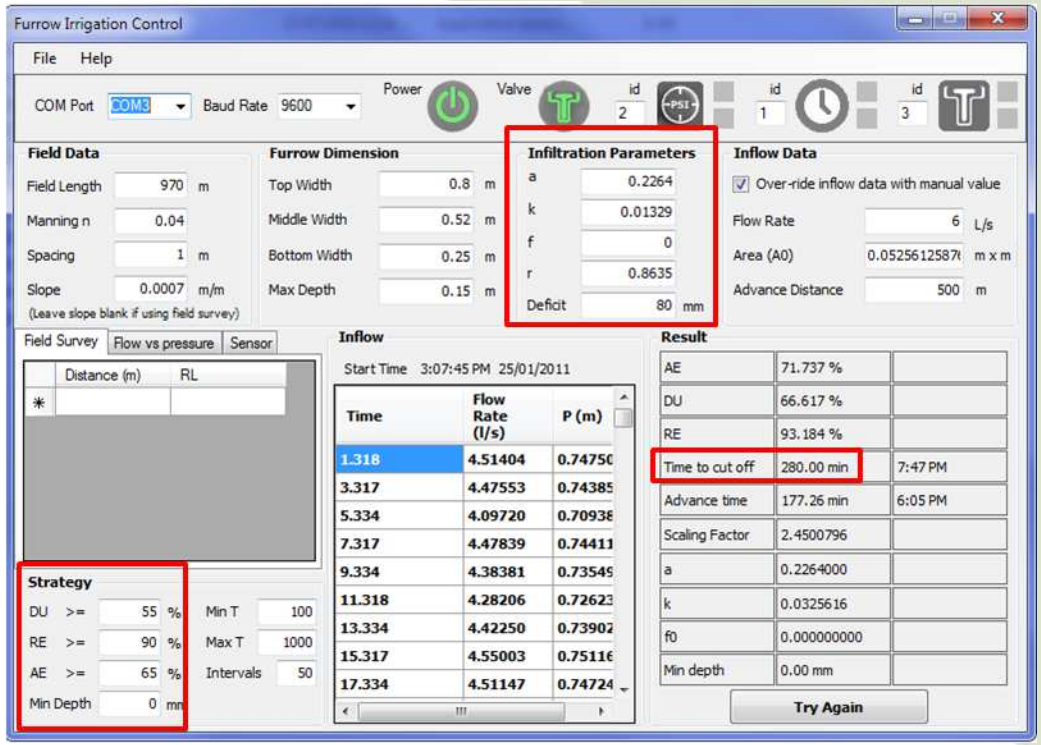
Irrigation control strategies

- Use sensed data to determine irrigation application/timing
- Developed adaptive control frameworks:
  - AutoFurrow – real-time surface irrigation event optimisation
  - VARIwise – site-specific surface/overhead irrigation control

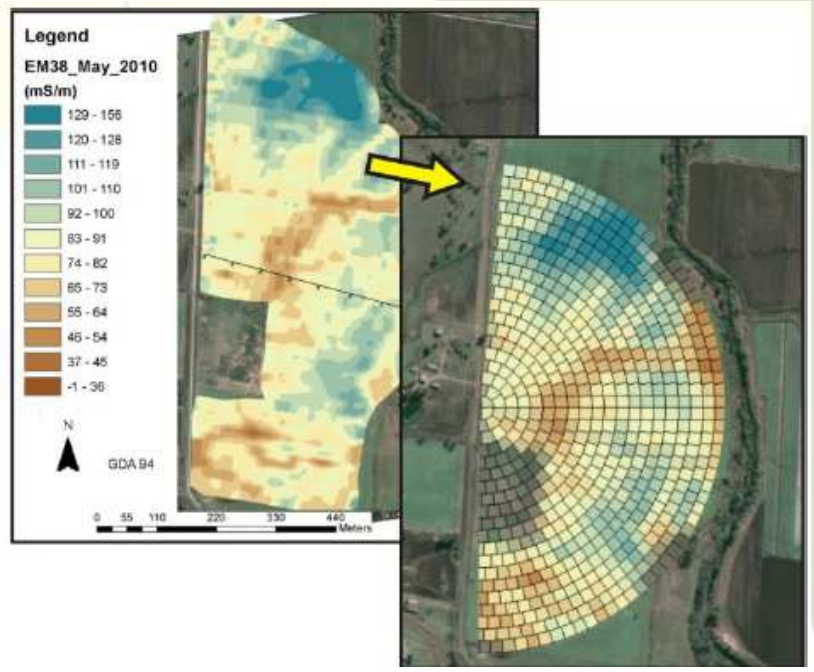
AutoFurrow

- Real-time optimisation of irrigation along surface irrigated fields
  - Requires advance and flow measurements
  - Simulates hydraulics
  - Determines flow rate and cut-off time to optimise application efficiency or distribution uniformity



VARIwise

- Simulates and develops irrigation control strategies at spatial resolution to 1m^2 and any temporal resolution
- Control strategies based on difference between measured and desired performance
- Analyses irrigation hydraulics and updates irrigation control signals



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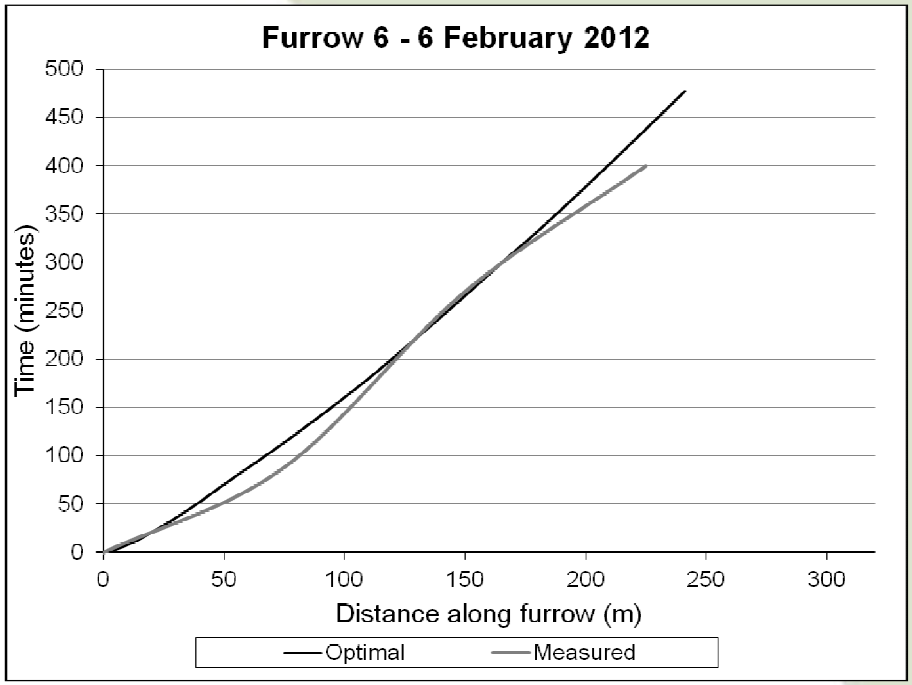
Real-time surface irrigation adjustment



Real-time overhead irrigation adjustment

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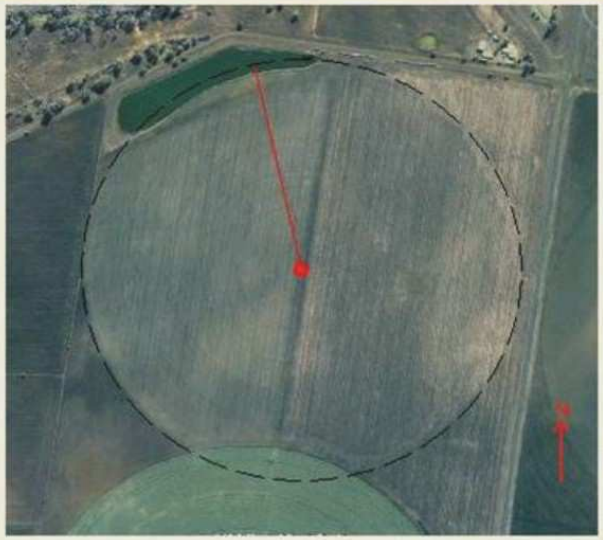
Irrigation valve control — LogMeIn - Remote Session



Servo	Open	Closed	Flow rate
1	120	150	0.373
2	107	148	0.403
3	100	148	0.376
4	95	152	0.363
5	105	160	0.37
6	114	145	0.345
7	126	156	0.393
8	105	150	0.375
9	105	160	0.435
10	105	151	0.463
11	105	146	0.412
12	95	144	0.431
13	106	153	0.426
14	120	151	0.4
15	119	153	0.47

Update servos

All valve details

Add | Edit | Copy | Delete | Current location: -27.392621458°S, 151.60634491°E, at bearing 347.2° | Backup

Bearing	Latitude	Longitude	Direction	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
228	-27.5560	151.91716	CW	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
240	-27.5560	151.91716	CW	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
252	-27.5560	151.91716	CW	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
264	-27.5560	151.91716	CW	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
276	-27.5560	151.91716	CW	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
288	-27.5560	151.91716	CW	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
300	-27.5560	151.91716	CW	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
312	-27.5560	151.91716	CW	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
324	-27.5560	151.91716	CW	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
336	-27.5560	151.91716	CW	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
348	-27.5560	151.91716	CW	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75

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Irrigation control system implementation

- Bay irrigated dairy fields in Victoria
- Siphon surface irrigated cotton farms
- Centre pivot irrigated cotton
- Setting up for gated pipe implementation

Conclusion

- Created frameworks that enables spatial/point-based databases
- Developed Internet-enabled sensors for input to control strategies
- Forms basis for automated irrigation decision-making

Acknowledgements

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