



19th

**Precision
Agriculture
Symposium**

**Monday 12th - Tuesday 13th
September 2016
City Golf Club,
Toowoomba QLD**

This event was made possible by the following partners



**INCREASING THE ADOPTION OF
PRECISION AGRICULTURE IN AUSTRALIA**

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SPAA also thanks the Condamine Alliance for supporting a number of farmers to attend this years' event and the University of Southern Queensland NCEA for welcoming the group to their research facilities.

Welcome!

The 19th Symposium on Precision Agriculture in Australasia sees the PA community focusing on Queensland. Developments in Queensland have been spectacular within a number of industries for many years and the time is right to expand the reach across multiple industries in the state.

Work across Australasia has also continued to embed the use of PA technologies and techniques within agricultural systems and to push towards more data-driven decisions across operations. And while a number of agricultural industries are beginning to consider the value in coupling information and decisions across the production/supply/consumption sectors to optimise the entire system, the necessary monitoring, integrated feedback and intelligent response to achieve the goal remains poorly developed in nearly all agricultural industries.

This is in major part due to a gap in research and development aimed at combining a technical understanding of the production side of agricultural food and fibre systems with the identification of data requirements at important stages within each sector of the system, the ability to devise technical solutions to data gathering, and the analytical and practical skills to use the data to optimize whole system operations.

This holistic systems view requires the convergence of agricultural science, engineering and agribusiness expertise to gather and effectively utilise digital data. Creating such digital agri-food and fibre systems will drive agriculture towards sustainable production, delivery and consumption. In such systems, data-driven decisions will be whole-system considerate, optimised using intelligently gathered information, and capable of adapting to alterations in operational parameters as well as feedback signals from all sectors.

Developing agriculture through data-driven decisions in this way will also provide new and stimulating pathways to attract a greater number of young, enthusiastic people to engage in the agriculture community. However, to match the practical developments within industry we need to provide new education programs at the secondary and tertiary level that will excite students and deliver skills for this data-driven agriculture. This is now a challenge to all of us, not just current the education community! Resources/support needs to be sector-wide because the benefits will be.

These agricultural systems built on the greater use of data-driven decisions will see us identifying, gathering and using relevant digital data in a more diagnostic way to optimise management and outcomes across all aspects of the breeding and selection (crops and animals), production, processing, distribution, retail and consumption sectors.

As predicted back in 1997 when this Symposium series began, PA will have succeeded when the term PA becomes redundant, the philosophy and attendant technologies and techniques embedded in agriculture. As we move towards data-driven agriculture systems, we can say we are nearly there.

Brett Whelan

for

The PA Lab and SPAA teams



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Presentation program

MONDAY 12th SEPTEMBER 2016

12.00pm Arrival, Registration & Lunch

12.55pm Welcome

1.00pm Does optimum surface landforming offer Precision Agriculture's highest ROI?
Graeme Cox (DAVCO Optisurface)

1.20pm UAV mapping of rhizoctonia root rot for targeted treatment
Andrea Hills (DAFWA)

1.40pm Remote sensing options for predicting rice biomass and nitrogen uptake
Brian Dunn (NSW DPI)

2.00pm PA on-farm in the SA Mallee
Wade Nickolls (Pinnaroo SA)

2.20pm Industry news – Case IH

2.30pm Afternoon Tea

3.10pm Industry news – Graingrowers

3.20pm SwarmFarm
William McCarthy (SwarmFarm)

3.40pm PPMS: Cattle and pasture production data without the sweat!
Sally Leigo (NT DPI&F)

4.00pm Multi-temporal remote sensing for yield prediction in sugar crops
Moshiur Rahman (UNE PARG)

4.20pm Camera-based plant sensing and irrigation control for broadacre cropping
Alison McCarthy (NCEA)

4.40pm Big data applications for informed decisions.
Lisa Prassack (Prassack Advisors)

5.20pm Close

5.30pm *PA Connections @ City Golf Club*

7.00pm *Symposium Dinner @ City Golf Club*

TUESDAY 13th SEPTEMBER 2015

8.25am Welcome

8.30am Industry news – John Deere

8.40am Automated analysis of UAV imagery for crop scouting
Cheryl McCarthy (NCEA)

9.00am Understanding yield variation in tree crops through satellite remote sensing
Andrew Robson (UNE PARG)

9.20am 101 ways to make PA work in Queensland vegetables
Sarah Limpus (QLD DAF)

9.40am PA in Vegetable cropping - our journey so far
Ed Windley/Ben Moore (Kalbar Growers Group)

10.00am SPAA Project updates

10.10am WEEDit
Steve Norton (Croplands)

10.20am Morning tea

10.50am AgDNA (*Paul Turner*)

11.00am Recent developments in sugar cane yield monitoring. *Troy Jensen (NCEA)*

11.20am Changing with time. *Denis Pozzebon (Farmer)*

11.50pm New technologies for airborne pest & disease surveillance
Rohan Kimber (SARDI)

12.10pm Targeting nitrogen to productivity zones: combining geophysics, yield data and moisture probes to reduce risk and improve profitability
Frank D'Emden (Precision Agronomics)

12.30pm PA on Coondarra *St John Kent ('Coondarra')*

12.50pm Progress on 'Biomass Business- pasture biomass measurement tools
Karl Andersson (UNE PARG)

1.10 pm Close and Lunch

2.00pm NCEA tour



Knowledge management, sensing and control tools for irrigated broadacre cropping

Alison McCarthy, Michael Scobie, Malcolm Gillies, Lidya Agustina and Joseph Foley

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Summary

The NCEA has developed grower tools for irrigation management to improve productivity and water use efficiency. This presentation will provide an overview of the NCEA's suite of tools as follows:

Knowledge Management System for Irrigation (KMSI, kmsi.usq.edu.au) for irrigation and energy efficiency assessment, recording and scheduling

KMSI includes a suite of online irrigation, nutrient and energy calculators and database tools suitable for use by both growers and consultants. The two groups of tools are calculators which provide simple input/output interfaces, and databases which are password protect stores of information that can be used for benchmarking. These tools are targeted to growers (which require low detail) and extension/consultant tools (that requiring higher level of skill and some training). Examples include the Irrigation Performance Audit and Reporting Tool (IPART) and the Nutrient Balance and Reporting Tool.

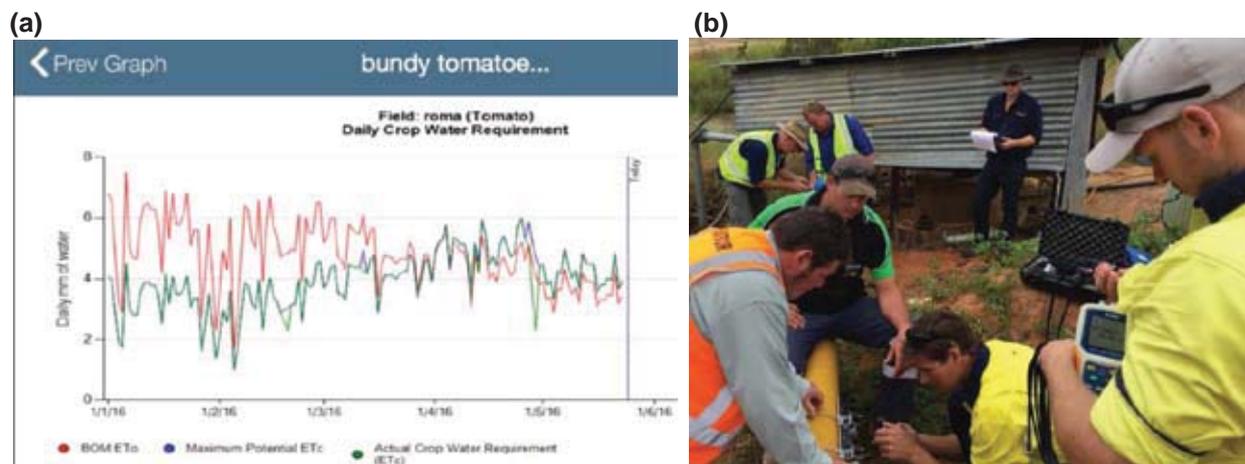


Figure 1. (a) Screen capture of KMSI Scheduling Irrigation Diary (SID) App; and (b) energy assessment being conducted for use in KMSI Irrigation Pump Evaluation and Reporting Tool (IPERT) web tool.

Surface Irrigation Simulation, Calibration and Optimisation (SISCO) for optimisation of surface irrigation flow rate and timing

SISCO simulates, calibrates and optimises surface irrigation events. SISCO can simulate temporal variations in inflow rates and spatial variations in soil infiltration, roughness and furrow geometry. Measurements of inflow and advance rate can be entered into the software to estimate characterise soil infiltration parameters and



Figure 2. Automation of furrows in cotton with small pipe through bank.

Manning roughness of individual furrows. Surface irrigation cut-off time can then be optimised in the software for individual furrows to optimise uniformity and/or application uniformity. SISCO has been evaluated for cotton, sugarcane and dairy surface irrigation event control and hydraulic optimisation using Rubicon automation irrigation hardware (Figure 2).

VARIwise for optimisation of site-specific irrigation application for surface and overhead irrigation

VARIwise steps toward autonomous irrigation and nutrient prescription and application by linking infield sensing, closed-loop control strategies and control actuation. 'VARIwise' is a software framework that implements and simulates site-specific control strategies on fields with sub-field-scale variations in all input parameters including nutrients (Figure 3). This enables:

- o data input at any spatial resolution;
- o incorporation of crop model output for simulated response/prediction of crop response;
- o incorporation of hydraulic equations to determine irrigation and fertiliser variability according to sprinkler or surface application hydraulics;
- o implementation of image analysis algorithms to extract plant growth and fruiting from cameras on infield vehicles capturing top view images of the crop (irrigation machines and a moped);
- o implementation of simple kriging and co-kriging algorithms for assigning measurements to each zone in the field; and
- o implementation of control strategies that use a calibrated crop model and/or the soil/crop response to predict the application that will produce a desired agronomic response for all sub-field management zones.

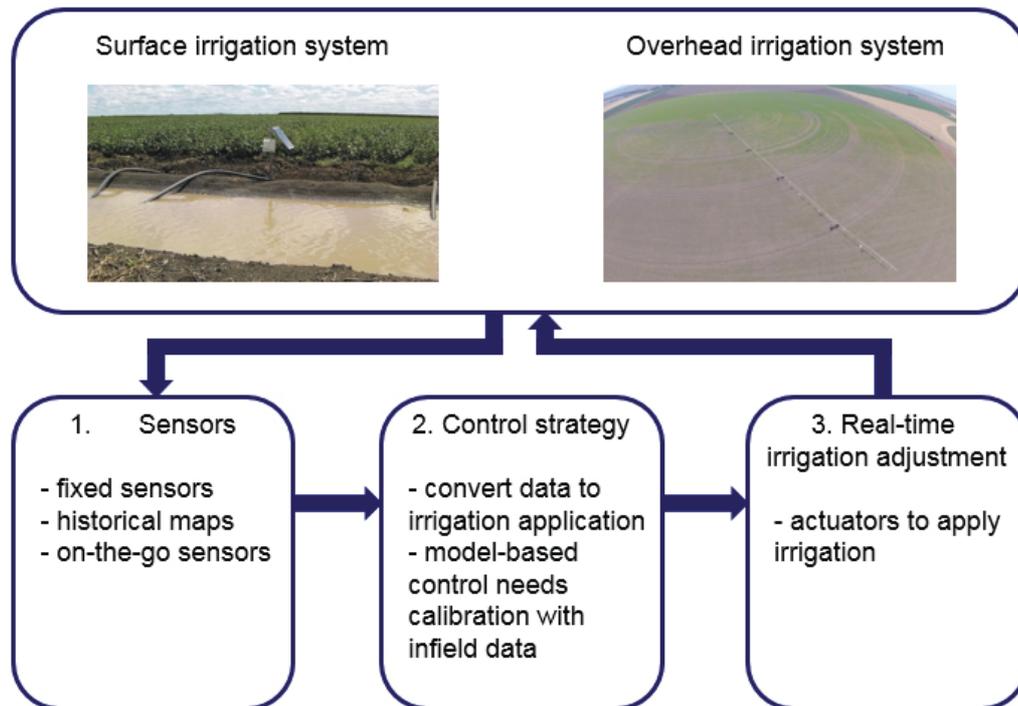


Figure 3. Generic irrigation control system for surface and overhead irrigation

VARlwise is being trialled on cotton crops in Jondaryan and Wee Waa, dairy in Tasmania pastures and sugarcane in Ayr. These are being trialled on surface and overhead pressurised irrigation systems with commercial irrigation automation hardware: Rubicon for surface irrigation and Valley or Lindsay Zimmatic variable-rate nozzles for irrigation machines. Low-cost cameras and infield soil moisture sensors collect plant and soil information for the control algorithm.

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