

# QLD Veg Automation News

January 2017

Over the last six months, we completed process flow analysis and prototype testing work with grower co-operators as part of the initial DAF Veg automation project (VG13113). This project is now completed and the final report is available through Hort Innovation or from the project team.

The first series of trials for early problem detection and rapid yield assessments for the new project VG15024 are in place. Results to date are summarised on Page 2.

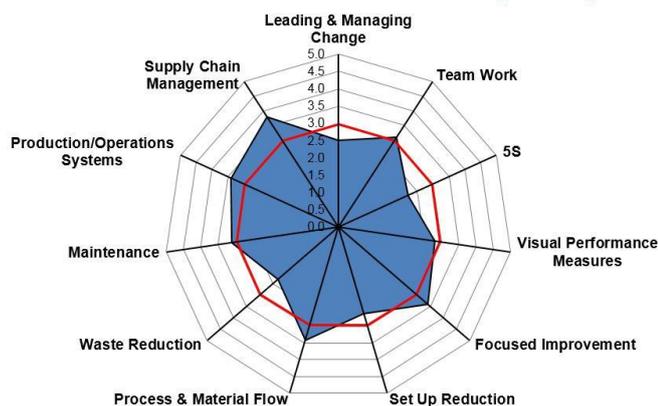
## Process flow analysis - Lean case studies

In July and August 2016, three enterprises tested Lean concepts and tools to see if they were of value to the vegetable industry. QMI Solutions delivered the workshops.

Lean is a continuous improvement approach to business used in the manufacturing and mining industries to reduce waste, address constraints and create 'pull through' of product in response to customer demand.

### Operational Excellence Best Practice Maturity

Overall Average Maturity = 3.0



### QMI Lean audit assessment – example results

We found that Lean has some things to offer the vegetable industry however the process needs to be much better targeted. At a busy time of the year, growers found the workshops slow going. Our case study enterprises had already carved out most obvious waste from their operations. Their existing

systems and processes also need to be much better integrated into the workshops. That said, for horticulture Lean offers:

- A systematic method for analysing the business and identifying potential ways of increasing productivity
- A different perspective from QA and HACCP which are risk focused – Lean focuses on identifying constraints and waste

Lean did help growers identify areas where existing processes could be improved and highlighted priority areas that needed attention (perhaps already on the jobs to do list). These improvements have been implemented.

An information leaflet summarising Lean concepts and tools plus case study results is available from the project team. For detailed information on Lean go to <http://www.lean.org/whatslean/>

## Outsmarting the crows: Designing an autonomous system to manage pest birds

From July 2016, CSIRO and DAF completed three wireless sensor network deployments on a Gatton farm to evaluate a prototype system for managing and deterring pest birds in crops.

This prototype test network was constructed using commercially available technology – sensors to detect movement which, when triggered, activate sound or light. A camera to record activity was integrated into this network and includes a sophisticated 'sentinel' system that can potentially record and classify pest incursions and their reaction to various deterrents.

**The idea is to minimise human input so that you can sleep soundly at night in the knowledge that your mobile phone will sound the alarm if the system can no longer cope**

The in-crop field deployments allowed CSIRO to quickly evaluate technologies and gain a first-hand

appreciation of the scale of the problem. There are a number of engineering challenges to solve to make the network system weatherproof, large scale, secure and low power so that it can be deployed over the longer term.

The aim is to develop an intelligent autonomous system that can not only detect vertebrate pests but can stay one step ahead of the pest bird or animal as it 'learns' to adapt to the different deterrents that the system has at its disposal.

It is early days however results are promising with further deployments planned in 2017 as part of a small DAF funded innovation project. To develop the system to its full potential will require significant up-scaling of staff and funding.

### **Early problem detection with hyperspectral imaging**

This risky and highly experimental research has caused the DAF/CSIRO team some headaches. Some aspects of the work are proving very tricky but we are making good progress.

**Can hyperspectral imaging and wireless sensor networks detect crop problems early perhaps even before the human eye can?**

The scenario of choice for the first set of pot trials is Tomato Spotted Wilt Virus (TSWV) in capsicum as that crop/disease combination minimizes risks of trial failure while fine-tuning protocols for imaging and data collection to ground truth.

Hundreds of leaves need to be imaged to build a library of the 'spectral signature' of TSWV which will stand up to the more variable and less controlled light conditions in the field.

Two controlled lighting imaging trials were completed in the glasshouse complex at EcoSciences Precinct (ESP) in Brisbane late last year with a second series of pot trials planned for the first half of this year.

Once the trial system is worked out, the early detection process can then be adapted for other crop x problem situations. The front runners for these are powdery mildew in cucurbits and bacterial leaf disease in capsicum.



***Capsicum pot trials – leaves ready for sampling***

Depending on results, we may then progress to capsicum field trials at DAF Gatton Research Facility and cucurbit pot trials at ESP later this year.

### **Rapid yield assessment with vision systems**

QUT completed two trials in a capsicum crop at a protected cropping site at Giru in North Queensland during July and August 2016 with a further three trials planned for this winter.

Two cameras captured 3D data of red capsicum fruits to 'train' and evaluate vision-based algorithms. Each fruit is then assessed manually for size, colour, weight and marketability – first or second grade according to defects – to ground truth the machine generated data.



***Assessing fruit to ground truth machine data***

The first trial of field grown capsicum work was planted at Gatton Research Facility in September 2016 with data collection starting in mid-December. The next update will report on results from this trial.

**For more information on any of these topics please contact the project team:**

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