QLD Veg Automation News

September 2016

These updates now report back on two Queensland projects:

VG13113 Evaluation of automation and robotics innovations: developing next generation vegetable production systems.

This project scopes developments in automation, robotics and sensing. It also provides opportunities for growers and industry to discuss and consider which of these technologies might be of value to their business in the future.

An outcome from the project is a list of industry priorities for R&D reported on in the last QLD Veg Automation News.

VG15024 Vision systems, sensing and sensor networks to manage risks and increase productivity in vegetable production systems.

This collaboration between the Department of Agriculture and Fisheries (DAF), Queensland University of Technology (QUT) and CSIRO addresses three (of five) priorities identified with growers and industry last year:

- Automated crop management, specifically automated crop health monitoring and plug and play interchangeable modules
- Sensing and sensor networks to improve field productivity
- Robotic harvesting, specifically yield and maturity assessment using vision systems

The new project will align with *VG15003 Using autonomous systems to guide vegetable decision making on-farm* led by the Australian Centre for Field Robotics (ACFR) at the University of Sydney.

The new project: Vision systems, sensing and sensor networks for veggies

The project will investigate and develop novel sensor technologies and algorithms for rapid yield assessment and early problem detection in selected vegetable crops. The aim is to develop technologies that are modular so that they can be used on the most appropriate platform for the task required.

1 **Development of pest, disease, disorder and stress management tools** based on hyperspectral imaging technology and crop micro-climate monitoring using wireless sensor networks (WSN) combined with observation and diagnostics to ground truth. This will involve extensive laboratory and research station trial work to determine the crop x problem scenarios most likely to achieve a successful outcome during on farm testing. The research will determine if the technology can assist with very early problem detection so alerting growers to potential issues perhaps before they can be seen with the human eye.

2 **Development of vision systems for rapid assessment of fruit quantity and quality** (e.g. size and colour) of capsicum crops grown under protected cropping and field grown systems. Advanced machine based knowledge of likely product quantity and quality will be useful for improved workforce allocation, pack out estimates, managing markets proactively and enhanced quality management down the value chain. It is an essential first step towards crop forecasting and selective robotic harvesting of vegetables.

3 **Grower and industry engagement and communication** early in the R&D process to ensure that future technologies are fit-for-purpose, therefore more readily commercialised and incorporated into field and packing shed operations. The aim is to strengthen and expand feedback loops between researchers, machine system developers and end users (growers, regional consultants, agronomists and engineering firms) through a series of forums, workshops, field days, demonstrations and targeted project updates.

Regional review meetings

Three regional review meetings were held in autumn 2016 - Bowen 10 March; Bundaberg 22 March and Gatton 7 April. The purpose was to:

- review and confirm industry priorities with growers and their service providers
- update regional industry on progress in automation, sensing and robotics R&D
- continue to build feedback loops between growers, industry and R&D providers.

Researchers from QUT and CSIRO in Brisbane and ACFR in Sydney attended the meetings via webinar. This 'virtual participation' worked very well with an excellent response from growers and industry. To overcome regional bandwidth problems, we down loaded voice over video presentations earlier.

QUT's Harvey in action in a greenhouse at Giru

Topics covered included QUT's Agbot 2 and their work with the robotic capsicum harvester Harvey; ACFR's Ladybird and RIPPA the weed zipper; and from CSIRO, hyperspectral imaging 101 and wireless sensor networks. More information is available through these links:

RIPPA™ Endurance Trial, Cowra - Agriculture | ACFR - ACFR Confluence

AgBot II: A New Generation Tool for Robotic Site-Specific Crop and Weed Management - YouTube

Harvey the Robotic Capsicum (Red Pepper) Harvester - YouTube

Our thanks to Chris McCool and Tristan Perez (QUT); Phil Valencia and Peyman Moghadam (CSIRO) and Salah Sukharieh (ACFR) for their time and willingness to try out the webinar format.

Prototype autonomous system to detect and manage birds

CSIRO deployed a wireless sensor network on a farm in Gatton earlier this year to develop innovative methods for managing and deterring pest birds on farm.

It is early days however results are promising with further deployments planned over the next six months.

CSIRO system to detect moving objects in a Gatton lettuce crop – time lapse shows a person moving through the crop with cars in the background (red dots)

Process flow analysis - Lean

Queensland Manufacturing Institute (QMI) and the project team are trialling Lean, a continuous improvement methodology, with three vegetable enterprises in Queensland.

Lean is used in the manufacturing and mining industries to increase productivity by:

- systematically reducing waste: any activity that absorbs resources without adding value
- addressing constraints and bottlenecks in the system – from field to despatch.

The aim of these case studies is to determine if Lean concepts and tools are of value to the vegetable industry.

Work is currently underway with results expected to be available by the end of September.

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

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