



## HINKLER AGTECH INITIATIVE

# Honeybee Pollination Mapping Technology

### INTRODUCTION

*This trial was undertaken as part of CQUniversity's Hinkler AgTech Initiative. The Initiative aimed to increase the productivity and profitability of the Bundaberg region's agricultural sector through greater availability and utilisation of agricultural technology (AgTech). An extensive consultative process undertaken with agribusinesses identified on-farm needs that may be addressed using AgTech. Trials of selected AgTech products and services were then undertaken in partnership with agribusinesses and technology providers to determine the technologies' efficacy in on-farm conditions. This summary provides an overview of findings from one of the technology trials, including grower feedback and considerations for other growers when deciding whether to utilise the technology in their own enterprise.*

## Background

Almost 70% of Australian horticultural and agricultural crops rely on honeybees for pollination. Growers usually engage commercial beekeepers to provide pollination services and, in most instances, beekeepers place their hives together in locations that are easy to access and cause the least disturbance to farming operations. There is rarely any scientific rigor applied to the number and placement of hives, other than the experience of the beekeeper.

Despite the many benefits that commercial beekeeping provides to agriculture, the industry is facing serious challenges. Honeybee populations in Australia are rapidly declining due to a range of factors including the use of pesticides, habitat loss, disease and climate variability. This decline has the potential to have a significant impact on food production and growers are turning to innovative technologies to better understand the behaviour of honeybees and ensure the most effective and efficient pollination of their crops.

## The Technology

Bee Innovative's 'BeeDar' technology is a radar-based system that monitors individual bee movement and pollination activity in near real-time. The system consists of a state-of-the-art radar sensor which is mounted to an aerial drone. As the drone passes over a crop, the sensor

detects the presence of individual bees and analyses their pollination activity.

Pollination activity is measured by the number of bees active in each square metre of crop. Three flights are undertaken each day for a period of three days, to account for variables such as weather that can impact pollination. Data from all flights is then combined into heat maps that indicate the average pollination activity throughout the crop.

## The Trial

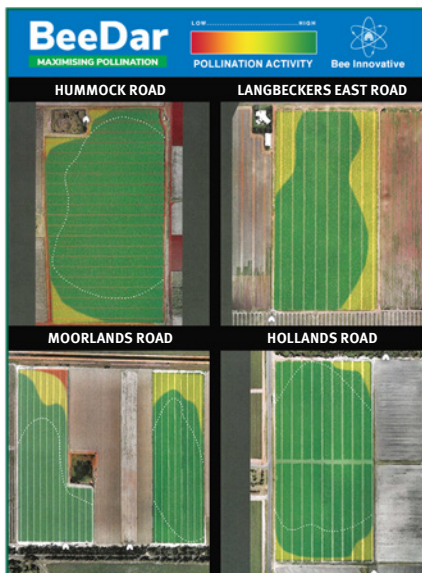
For this trial, Bee Innovative was engaged to deploy a BeeDar-equipped drone over four watermelon crops grown on separate farms in the Bundaberg region. The drone was flown over each crop three times (morning, midday and afternoon) over three separate days, for a total of nine flights per crop.

All flights were completed at flowering when pollination was critical for fruit development. Prior to harvest, test samples of 50 melons were weighed and measured from three 10m x 10m areas in two of the crops. The aim of this sampling was to determine any correlation between pollination activity and crop production.

## RESULTS

Resulting pollination maps for the four trial farms are shown on next page. (Note the white icons representing beehive location on farms)





For this trial, the pollination levels were represented as:

- Red- 0-20 bees/m<sup>2</sup>/hr
- Yellow- 21-50 bees/m<sup>2</sup>/hr
- Green-- 51-99 bees/m<sup>2</sup>/hr
- Dashed Green- > 100 bees/m<sup>2</sup>/hr

As indicated in the heat maps, pollination activity varied between and within the trial crops. Some pollination variation is a function of where the beehives are located relative to the crop with lower pollination rates being recorded further from the hive. Other variations are caused by structures, tree lines or prevailing winds.

The ground truthing data demonstrated a good correlation between pollination activity and crop yield. An average fruit sampled from green zones were 30% heavier than fruit sampled from red zones.

## Further Information



For further information on this trial and results, email CQUniversity's agricultural research team: [agriculture@cqu.edu.au](mailto:agriculture@cqu.edu.au)

For further details on BeeDar technology, including case studies and grower testimonials, contact Bee Innovative: [beeinnovative.com.au](http://beeinnovative.com.au)

Summaries of other technology trials undertaken through the Hinkler AgTech Initiative are available at: [bundabergagtechhub.com.au](http://bundabergagtechhub.com.au)

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## Value to Business

The value of the BeeDar technology demonstrated through this trial is the potential increase in crop production resulting from optimal pollination rates being achieved across a crop. The results from this trial cannot be directly translated to every situation due to a vast range of agronomic and geographic variables, but it is clear from this trial and other applications of the technology throughout Australia that variation in pollination activity in any given crop greatly affects crop productivity.

Bee Innovative is the sole provider of this technology and its cost structure varies according to the area being mapped, and ranges from \$40/ha\* for areas greater than 400ha to \$150/ha\* for small areas, e.g., 10ha. These costs do not include travel and accommodation for the drone pilot, who is based in the Hunter Valley. The service provided by Bee Innovative includes a specialist drone operator, provision of density mapping, data interpretation and recommendations for improved pollination.

## Grower Feedback

Trial Summary Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I see value in this technology		✓			
I found the technology easy to use				✓	
The technology was easy to integrate within my business				✓	
I was satisfied with the service provided by the AgTech company				✓	
I intend using this technology in my business		✓			
I recommend this technology to other growers				✓	

## Other Considerations

When deciding whether to use this technology, growers should consider:

- At the time of publication, Bee Innovative was exploring other options for provision of the BeeDar service, including leasing of the technology through approved, local drone operators.
- Another option for individual, smaller growers to reduce the cost of this technology is to collaborate with other growers to form a single integrated mapping zone. This option also has the benefit of assessing pollination activity on a larger scale than individual farms and potentially providing a more efficient and effective solution to optimal siting of hives.