



HINKLER AGTECH INITIATIVE

Swarm Drone 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

Chemical pesticides and herbicides are used extensively in Australian horticulture to protect crops from pests and diseases that can cause significant damage and reduce crop yields. Traditional methods of applying chemicals range from manual spraying using handheld or backpack sprayers to ground-based tractors fitted with spray booms. All these methods have potential limitations including lack of precision, inefficiency, potential for spray drift and inaccessibility during wet periods. Given these limitations, growers are seeking alternative application technologies that are safe, cost-effective and reliable.

The Technology

Drone technology refers to the use of unmanned aerial vehicles (UAVs) for various applications. When 2 or more drones are flown in unison, they are referred to as swarm drones. Swarm drones are flown in coordinated groups

by one or more operators to perform tasks more quickly and efficiently.

Swarms of XAG P30 spraying drones were used for this trial. The XAGP30 is an aerial spraying system, fitted with a fully automated flight control system with GPS capacity. This system navigates the drone at centimetre-level accuracy, enabling the user to spray precisely and only where needed. Each drone holds 16L of liquid spray and the size and flow rate of the droplets can be easily adjusted to match the spray medium and required coverage rate.

The Trial

For this trial, professional drone pilots were engaged to undertake two flights. Both flights were undertaken during wet conditions and the grower was unable to deploy his tractor-based spraying units due to saturated soil conditions.

Spraying was undertaken during early morning to avoid wind drift and achieve higher application efficiencies.

RESULTS *The results of both trial flights are presented in the table below:*

Crop Type	Area (ha)	No. of Pilots	No. of Drones	Spray Application Rate (l/ha)	Time Taken (hrs)
Sweet Potato	40	2	4	60	4
Lucerne	30	2	30	30	3

Value to Business

The greatest value of drone technology demonstrated through this trial was the productivity gained by avoiding significant pest infestations, due to prevailing weather conditions. For this trial, both spraying operations were required immediately to be most effective. A single drone would need to be deployed over several mornings, running the risk of continued inclement weather and greater pest infestation. For this trial, the grower estimated that the ability to deploy swarm drone technology immediately in a single application averted a crop loss of approximately 30%.

Another benefit of swarm drone technology demonstrated in this trial is the savings in costs compared to single drones performing the same work. The charge out rate for a single drone / single operator deployment is usually based on a 'per hour' basis. The charge out rate for swarm drone deployment is derived on a per hectare basis to allow for the cost of multiple drones and operators. Cost comparisons between swarm and single drone deployment for this trial are detailed in table below:

Crop Type	Drone Configuration	Area (ha)	Time Taken (hrs)	Charge Out Rate*	Total Cost (\$*)
Sweet Potato	Single	40	16	\$250/hr	4000
	Swarm	40	4	\$65/hr	2600
Lucerne	Single	30	12	\$250/hr	3000
	Swarm	30	3	\$50/hr	1500

Based on these costs, the grower saved \$1400 and \$1500 respectively for the sweetpotato and lucerne flights by deploying swarm drone technology vs single drone technology.

An additional value of drone technology is the savings in spray medium because of their ability to spray the required amount of spray only where needed and reduce spray drift. For this trial, it was estimated that the amount of spray medium used was 20% less than traditional tractor-based methods.

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 swarm drone technology, growers should consider:

- The qualifications and experience of drone pilots. Rates charged by commercial drone pilots vary greatly but it is more cost-effective and safer to engage a pilot who is adept and experienced at flying in an agricultural setting.
- It is not possible, due to regulatory or safety provisions, to deploy swarm drones in all settings. A qualified, licensed drone pilot will be able to advise whether swarm drones are permissible in a particular setting.
- If considering buying a drone outright for personal use, the XAG P30 spraying drone used in this trial costs \$39,000* and requires specialised training and licensing requirements to fly with a full payload.

Further Information



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

The Civil Aviation Safety Authority (CASA) regulates the use of drones in Australia, including pilot licensing and accreditation: casa.gov.au

For further details on agricultural applications of drones, including the XAG P30 spraying system, contact OzTech Drones, Bundaberg: oztechdrones.com

Summaries of other technology trials undertaken through the Hinkler AgTech Initiative are available at: bundabergagtechhub.com.au

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