

Using drone technology to release beneficials in cotton

USING beneficials to manage pest populations has long been part of growing cotton in Australia. Some growers and consultants have been introducing laboratory bred beneficials, purchasing 'bugs' through the mail and walking through the crop depositing them on leaves by hand, so as to increase natural populations. Drone Agriculture has been working with these growers for the past three seasons, using a patented heavy-load drone to quickly and efficiently release beneficials through crops, allowing greater coverage at the right time with a fast delivery system.

Nathan Roy, co-owner and chief pilot of Drone Agriculture has been involved in agriculture his entire life. "We have always used predators to manage our pest populations with the view of ensuring our produce is as healthy as possible by minimising chemical applications. The fact that replacing a chemical application with a predator release makes for a healthier workplace for my team and home environment for my family is also a key priority."

Releasing insect predators by hand is an extremely labour intensive job, requiring passage throughout the crop and physically transferring each bug to a favourable location on the plant, depending on what the crop is, what pest has become the problem and the appropriate predator and their biology. It also produced haphazard results, with beneficial populations sometimes not building up sufficient numbers to take a hold. "We had to find a suitable delivery system for the predators," said Nathan. "Persisting with hand applications was unsustainable from a cost perspective but also from a predator survival perspective."

Drones have been used for decades in military operations, but miniaturisation technologies in the 1980s and 1990s saw a new generation of drones being developed. These drones were smaller, stronger and with significantly greater computing capacity to be able to perform intricate manoeuvres. Applications for such devices spread beyond the military into scientific research, rescue operations, surveillance and, eventually, agriculture.

"I have always been fascinated by innovations and new developments, particularly in aviation. The potential for drones really pricked my interest" advised Nathan. So, like any innovative Aussie farmer with a need, Nathan found a solution.



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The drone releases beneficials with an even distribution across the paddock.

Utilising the expertise of an aviation technician and a fellow pilot, the team trialled many designs of drones and payloads until they developed one that met their needs. “The drone had to carry enough predators to cover a reasonable area and be sufficient to build up numbers quickly within the crop. The machine had to be strong enough to manage reasonable winds and any inversions that may happen within a crop, have a good range and accurate speed to achieve good efficiencies whilst maximising predator survival on release,” said Nathan. “It may sound simple enough, but a lot of research and development has gone into this design, which we were then able to patent.

“We started trials on our family citrus and strawberry farms, which resulted in further modifications of numerous prototypes. The strawberry industry quickly embraced this approach to pest management, with exceptional results. By 2014 business expanded to pumpkins, melons, tomatoes, chillis and then into pears and almond orchards in Queensland, NSW and South Australia.”

It has been an exciting journey for Nathan as he has expanded his drone applications to new industries; learning the various pest and beneficial populations associated with each crop, and then working alongside specialist agronomists and consultants to understand appropriate pest thresholds prior to beneficial releases and the ideal conditions for those releases in each circumstance.

“Each industry has IPM guidelines and most regions have area wide management plans, which are tremendously helpful. At the same time, every single application is different. Besides the crop, pest and beneficial variances, each crop is influenced by its growth stage which dictates where the drone needs to fly. The surrounding topography will impact wind speeds and directions. Temperature has a huge influence on how the drone flies as well as beneficial survival post-release. Then there are client variances – some clients want to get predators out early to stay on top of

any insect pests; others want to wait until pest populations are growing.” Nathan explained.

In 2016 Nathan started working with a couple of cotton consultants who were looking for a solution to controlling silverleaf whitefly (SLWF, *Bemisia tabaci* biotype B), which had shown early resistance to Admiral Insecticide, a core insecticide for those looking to be ‘IPM-friendly’ in cotton.

“I work alongside ‘Bugs for Bugs’” explained Nathan. “They breed the beneficials and take orders from growers, agronomists and consultants, and where and when appropriate, they recommend Drone Agriculture as the delivery system. Besides being significantly faster than hand applications (tremendously saving labour costs), the drone releases beneficials with an even distribution across the paddock, which is just not possible by hand. We are able to target hotspots if required, but most releases are blanket applications.”

Lucas Findlay, owner of Findlay Farms at Narrabri is familiar with both techniques of application as he used to release beneficials by hand under his grandfather’s supervision in the 90s. “When Drone Agriculture came along we were already familiar with the idea of putting predators into the crops. We tried it three years ago for the first time, in a really bad season for whitefly when people sprayed three times and it was a really big year for pests in general.

“Wherever we spread the bugs, we didn’t spray for whitefly. I don’t know if it works but I cannot say it didn’t work, which is why we did it again last season. The same thing occurred last year – wherever we spread the bugs we didn’t spray for whitefly. We did two releases last season. We still sprayed for whitefly last year across a lot of the farm, but not where we released the bugs. I have no idea if it was the bugs, but I’m confident enough to keep trying it.”

Nathan Hamblin came to the same conclusion: “I can say that it worked because we didn’t have to do a whitefly spray. We would have had to spray for whitefly at some time during the season last year and we didn’t do one spray for it. Numbers did get up there mid-way through the season, but we just let the bugs do their job. We didn’t have to spray and we didn’t see too much honeydew.”

Matthew Wannan agreed: “It obviously worked because we took samples for analysis and in excess of 65 per cent of the whitefly had died due to paralysis. So if you’re on threshold and you can kill 65 per cent of those insects with a release of beneficials then that takes you way below threshold.”

For many growers though, taking a ‘green’ approach is also important. “When we release beneficials, we’re not killing all the other beneficials,” said Matthew Wannan. “Even softer chemistry will have collateral damage on your beneficials, and you’re better off if you can hold onto them. They’re controlling other things like mites, mirids and all those other pests that we don’t want to get into the crop either. Once you start going with chemistry, sometimes you’re killing the beneficials that’re helping you.”

Nathan Hamblin agreed: “I really like the program. We have to get greener so we have a better social licence in the future. If that means more beneficials and less sprays then that’s the way we have to go and that’s the way I want to go.”

“We are a small operation and we’re still in the process of finding our feet in the cotton industry” says Nathan Kay. “There are some glitches in the system we need to address, but we released over a million bugs in the Wee Waa region last week and we’ll repeat that volume this week, with another million in the Griffith and Swan Hill regions after that.”