



INSECT MANAGEMENT

case study

Growing cotton without insecticide: using IPM to control pests

Boggabri cotton grower, Andrew Watson, has shown that with optimal growth rates, a healthy population of beneficial predators and a plant monitoring approach, it is possible to grow a Bollgard II crop without (or with significantly reduced reliance on) insecticides.

The Watson family's Kilmarnock Farming Pty Ltd enterprise is an irrigated and raingrown cotton and grain farming system combined with a well integrated pasture based grazing system adjacent to the Namoi River.

Andrew's focus is on profitable farming in conjunction with responsible environmental management.

After many years working towards improving natural habitat on farm, by 2015 Andrew (pictured) had documented a significant change in pest pressure in his cropping system.

"As the tree belts and shrub vegetation grows and thickens throughout the farm, we have found we are no longer reaching insect pest thresholds that would in the past have indicated a need to spray.

"This is different to seven or eight years ago when we tolerated over threshold populations, to avoid destroying beneficial insects, giving the beneficials extra time to control the pests.

"It's very important to highlight that while insect pest numbers have been reduced in our fields, most nearby cotton farms are still reaching threshold populations requiring chemical sprays," noted Andrew.



"Birds and bats can disturb moth feeding & mating and can consume up to 50 per cent of the pests in a crop."
- Andrew Watson.

Integrated Pest Management (IPM) and habitats

Andrew believes establishing populations of beneficial insects that will be active early in the crop is a valuable practise in efforts to reduce pesticide use.

“The impact of surrounding vegetation as a source of these beneficial insects is not fully understood, but trees, shrubs and pastures are likely breeding grounds,” explained Andrew.

He says creating a cotton crop conducive to ladybeetle, damsel bug and lynx spider populations is central to the management of heliothis and mirids throughout the season.

“The use of soft chemistry that does not disrupt beneficial insects or flare pest species is important.

“Bollgard II has definitely contributed to improvements in IPM, and there is no doubt that it has reduced the reliance on conventional chemistry.

“In addition to beneficial insects, birds and bats can disturb moth feeding and mating activities and consume up to 50 per cent of the pests in a crop.”

Research suggests the biggest driver of beneficial bat and bird populations is the close proximity of appropriate habitat and ‘safety zones’.

“Having a diverse habitat is useful as some bird species prefer smaller shrub type vegetation, while other species prefer large trees,” said Andrew.

“Bats require day time shelter, with different species needing different homes. Some need small holes and cracks in tree bark, while other bats will need larger forms of shelter.

“Safety zones are areas where birds feel safe from predators. Some birds prefer to retreat to nearby timber, while some are happy to take refuge in reasonably fully grown cotton.

“The distance birds and bats are prepared to fly from habitat or safety zones is also dictated by size. Smaller microbats about the size of your thumb will only venture short distances, while larger microbats, about the size of your palm, will travel further,” said Andrew.

Pest control by birds and microbats

Insectivorous birds and microbats are voracious predators and provide a valuable ecosystem service by eating agricultural pests. In order to provide this free pest control service these animals require suitable nesting/roosting habitat in proximity to the crop.

Proximity of roosting habitat, flying techniques, manoeuvrability and foraging strategies (such as gleaning insects off surfaces or on the wing attacks) determine which species are able to sustain long flights and forage in open areas such as over crops.

Preliminary results of research conducted on Andrew Watson’s farm by UNE PhD student Heidi Kolkert (pictured), has found that several species of insectivorous birds and microbats forage for insects inside cotton crops.

Data collected during the 2014-2015 cotton season shows that microbats are flying over the centre of cotton paddocks distant from remnant vegetation, most likely predating on a range of crop insects. Threatened species including the Yellow-bellied Sheathtail Bat, Little Pied Bat and Large-eared Pied Bat have been recorded on the property.

As the cotton matures, smaller bird species (particularly wrens and the golden-headed cisticola) also seek refuge in the cotton crop.





Plant mapping to control secondary pests

Andrew made his first forays into growing cotton without insecticide sprays in the 2007 and 2008 seasons, and continues to work towards reduced pesticide use in his cropping system.

With Bollgard II technology keeping helicoverpa at bay, Andrew focuses on the control of secondary pests in the crop through non-chemical means, including a comprehensive plant mapping system:

- Decisions to spray secondary pests are not based solely on pest numbers, but also consider crop growth, beneficial species and seasonal factors.
- On a weekly basis, Andrew measures plant heights, internodes and fruit numbers. This information is plotted so the management team can assess how the crop is progressing.
- Using plant map information, Andrew has been able to avoid mirid sprays, even when numbers are above threshold, without having a significant impact on yield.
- In situations where mirids are at or above industry thresholds, the decision to spray is based on the state of the crop.
- If fruit numbers are high, Andrew says it may be possible to leave the mirids.
- Decisions about 'how many fruit is enough' will vary between varieties and with the season.
- Avoiding plant stress – Andrew likes to see the crop growing at an optimum rate by optimising management factors including irrigation timings, furrow depth and nutrition.

"If we can achieve this then I am more comfortable with the impact of some fruit loss. If the crop is not growing well or fruit numbers are not robust, secondary pest control decisions become more critical."

Andrew says his cropping experiences have raised questions about traditional pest control, particularly with regard to the need to count helicoverpa eggs as part of Bollgard II management.

Andrew asks whether it might be more constructive to instead count beneficial insect numbers, and focus on plant changes.

Andrew Watson is a Nuffield Scholar, a former NSW Farmers' Young Farmer of the Year, the 2008 Australian Cotton Grower of the Year, and the 2014 Brownhill Cup winner.

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