# The role of landscape in area wide management of silverleaf whitefly

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When individual farmers try to control mobile insect pests on their own farms without reference to other crops and vegetation in the surrounding landscape, it can be a frustrating experience. Like the proverbial cat, the pests sometimes come back. Unfortunately, mobile pests don't recognise farm boundaries.

A research team at CSIRO Entomology has been investigating the behaviour and management of insects at the landscape level. The example they used was silverleaf whitefly (SLW), *Bemisia tabaci* Biotype B, in a tropical horticultural production area near Bundaberg in Queensland.

While, the research trials were conducted predominantly in horticultural crops, the findings are also relevant to broadacre grain production.

SLW is only about one mm long but it is a major global pest of grain, vegetables, cotton and ornamentals. Now found across Europe, Asia, Africa, the Americas and several Pacific countries, it attacks more than 600 plant species. First detected in Australia in 1994, it causes problems in horticultural, cotton and grain crops in Queensland, northern New South Wales and parts of Western Australia. The pest status of SLW is compounded by the fact that it is pesticide-resistant.

Mobile pests such as SLW are most troublesome when they arrive as crops are emerging and are vulnerable to attack. In this situation their numbers can build rapidly, particularly if there are no natural enemies around to keep the numbers down.

Early colonisation of crops by pests (and their natural enemies) depends on pest populations in the surrounding region. This includes the number and size of the populations and the distance of these pest populations from the newly planted crop.

## Area wide management

In order to understand when area-wide management (AWM), as opposed to on-farm control of a pest is needed, it is necessary to have information on these populations and to know how mobile the pest is.

The research investigated how fast SLW find a new crop, what proportion of the crop they colonise and how heavy the infestation is. The team also wanted to know what role the surrounding landscape played in new infestations and what the implications of their findings would be for managing this destructive pest

Investigations were conducted in two different landscapes that were four km in diameter and 20 km apart. Although the same crops were grown in each landscape, they were in different proportions and one was being farmed much more intensively (45 crops host to SLW totalling 1.7 km$^2$) than the other (16 crops host to SLW totalling 0.6 km$^2$). This affected the numbers of SLW present in the respective landscapes and their distribution across these landscapes.

Within each landscape there were two treatments – adjacent to a host crop with SLW and far from a host crop with SLW, that is more than 250 metres away. The team put out sentinel plants to mimic real fields (around 6500 in total), either adjacent to a host crop with SLW or greater than 250 metres from a host crop. They repeated this three times over a 14 day period. This allowed them to see how fast and how often colonisation happens.

These trials found that SLW colonised the sentinel melon seedlings within three days (sentinels were replaced every three days so colonisation could have, in fact, occurred within the first or second day), and that there were repeated incursions.

This is a reasonable effort for such tiny insects and demonstrates their mobility. But the proportion of crop colonised and the heaviness of the infestation depended upon the populations of SLW in the surrounding landscape.

In intensely cropped landscapes (for example, those that have large populations of SLW), the proportion of the new crop infested is determined by the number of

An adult silverleaf whitefly.


Sentinel plants on the back of a truck ready to be transported to the experimental field.

SLW host crops in the landscape within a three km radius around the newly infested crop. But the severity of the SLW infestation is determined by sources within 100 metres.

In contrast, in landscapes with limited crop production and few SLW, the density of SLW within 0.5 km explains the proportion of a crop that is infested. The severity is again determined by sources within 100 metres.

Regardless of where the sentinel plants were, higher infestations of SLW occurred when wind speeds were low, such as less than around 14 km per hour. In windy weather they stayed put.

### So when is AWM necessary?

When dealing with a highly dispersive insect such as SLW, area wide management is essential in intensive production areas as this particular pest will travel often and over relatively long distances to infest a new crop. On-farm control of SLW populations will reduce the heaviness of infestation to newly planted crops, but it will not stop a crop from being infested.

In these times of growing costs for controlling pests and the need for greater on-farm efficiencies, these results could provide an opportunity for grower communities to work together to develop cost-effective integrated pest management strategies for their area.

Left to right: Andy Hulthen, Lynita Howie and Anna Marcora preparing sticky traps for the field.

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Sentinel plants at one of 20 points in the experimental fields.