ARGOS

AGRICULTURE RESEARCH GROUP ON SUSTAINABILITY

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Biodiversity on Kiwifruit Orchards: the Importance of shelterbelts

Why study shelterbelts & biodiversity on kiwifruit orchards?

Shelter is necessary for establishing and then maintaining high levels of fruit production and quality in kiwifruit (*Actinidia spp*) orchards. Most research on shelter has investigated how best to protect and grow shelterbelts so as to capture their direct benefits and to minimise unwanted impacts on kiwifruit production. ARGOS research aims to assist both economic and environmental sustainability by discovering underlying causes for constraints or trends in orchard performance. Therefore we set out to discover whether variation in shelter could drive observed differences in ecological processes in different parts of an orchard, between orchards and between different orchard management systems. ARGOS's environmental team is particularly interested in determining how shelter plantings affect biodiversity, partly because New Zealand society is looking increasingly to farmers of all kinds to conserve biodiversity on private property, and partly because demonstrated biodiversity care can add 'intangible' market value to unique NZ-grown kiwifruit production systems. ARGOS is comparing biodiversity in three different types of NZ kiwifruit orchards - KiwiGreen Hayward ('Green'), KiwiGreen Hort16A ('Gold') and Organic Hayward ('Green Organic').

Shelterbelts are potentially very important ecologically because they create variation in micro-climate in different parts of the orchard (frost prevalence, warmth during daylight, rainfall, light levels, wind etc.). This variation in turn may favour a greater variety of species within horticultural 'ecological landscapes'. Shelterbelts are also potential 'ecological refuges', because they are less disturbed by mowing and spraying. We therefore set out in 2004 to make baseline measures of the variety and type of plants in orchard shelterbelts. We will resurvey these sites periodically to see whether biodiversity

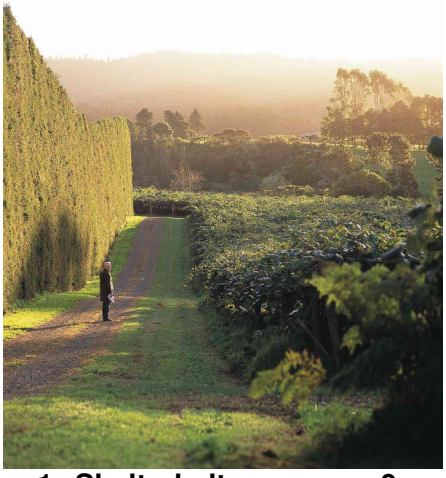

Figure 1. Shelterbelts average 9 m high and caste long shadows over vines in some seasons and parts of the day. They create ecological variation and therefore ecological opportunity for different plants and animals in orchard systems.

is being maintained or enhanced in kiwifruit orchards over the coming decades. See ARGOS Research Note 24 for details on how we surveyed the shelterbelts.

Results and conclusions

Most shelterbelts from KiwiGreen orchards had no woody plants growing underneath them, but around 10% had 4 or more species present (Figure 2). Shelterbelts in Organic orchards had over twice as many shelterbelts with 4 or more woody species growing underneath.

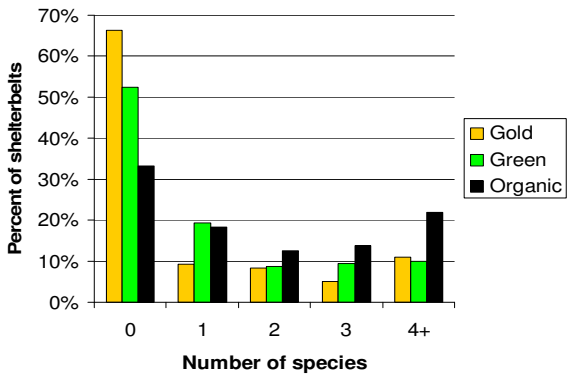

Figure 2. Percent of 424 live shelterbelts surveyed in autumn 2004 that had increasing numbers of woody plant species growing underneath.

There was also evidence of less accumulation of dense litter beds under organic shelterbelts – these mats smother the ground and prevent regeneration of other species. Also there were more rank grass patches at the base of the shelterbelts from organic orchards than KiwiGreen ones. This parallels other observations of a greater variety of plants and more rank grass on organic orchard floors under the vines themselves (see ARGOS Research Note 26). These small micro-sites may be important sites for animals of all sorts, especially invertebrates that can exploit small habitat patches. Similarly, there was slightly greater variety of species making up the main part of the shelterbelts themselves on organic orchards.

Only about 6% of the species occurrences of trees making up the shelterbelt hedge were of native species. These were mainly mahoe, totara, mapou, lemonwood and kohuhu, all native species known to be able to withstand heavy browsing, and therefore hedge trimming. The actual proportion of shelter trees that are native is much lower than 6% because an occurrence of just one native tree on that shelterbelt counts as one occurrence, just as the scores of introduced species (usually Japanese cedar, she-oak, willow and poplar) only count as one occurrence each. Although many introduced species shelter and feed native species, in general ecologists expect that increased presence of native trees will promote the variety and abundance of native birds and invertebrates in the orchard.

Ecologists have shown over and over in nature that plant biodiversity is a key driver of animal biodiversity, so the increased diversity of woody plants and micro-habitats observed in this study leads us to expect increased animal diversity on organic orchards. ARGOS research has already demonstrated increased variety and/or abundance of birds, spiders, earthworms and nematodes on organic orchards compared to KiwiGreen orchards so we believe that a sensible broad pattern is now emerging from our first comparisons. Work is now swinging round to understanding why these differences occur and to measure long-term trends on focal species to assess environmental sustainability. ARGOS will also explore practical ways of enriching shelterbelt vegetation and other orchard habitats e.g. by introduction of a greater variety of predominantly native plants. Our goal is to simultaneously provide economic, social and environmental gains for KiwiGreen and Organic producers alike.

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