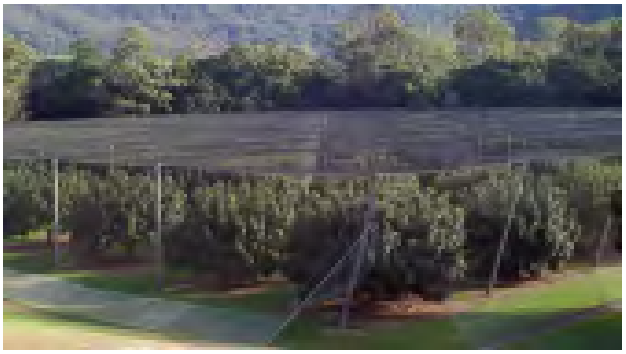
Flying fox control methods research findings



This paper identifies previous research on flying fox damage. It also outlines the actions of the Queensland and New South Wales Flying Fox Consultative Committee.

Queensland Government
Department of Primary Industries and Fisheries

1. Introduction

Flying fox damage to orchards in Australia has been an ongoing and challenging problem for both industry and government for many years. The problem dates back to at least 1929 when Francis Ratcliffe was appointed by the Commonwealth Government to investigate claims that the flying fox was a serious pest of orchards in eastern Australia. The report found that the flying fox at that time was not a serious pest. However, since then many factors have changed and it is now considered that flying foxes can cause significant damage to orchards, particularly under certain conditions. For example, research indicates that flying fox damage is greatest when environmental conditions cause native blossoms not to flower. Crops most affected are low-chill stone fruit, lychee, longan and rambutan, and other crops often damaged include persimmons, bananas, pawpaws and mangoes. Most crops damaged by flying foxes are also susceptible to damage by birds.

Over a number of decades, both Queensland and New South Wales (NSW) have formed flying fox consultative committees to work on identifying potential solutions to the flying fox problem. In addition to these committees, a number of conferences have been held in Queensland and NSW to address the issue (in 1986, 1990, 1994 and 2001). These conferences have provided valuable insights into the different control methods that have been trialled. Table 1 provides an outline of the methods and their success rates.

Table 1 Overview of damage mitigation trialled methods

Technique	Method	Success
Netting – full canopy netting	The net is held permanently by a rigid structure of poles and tensioned cables over the entire orchard.	Success levels are very high. The structure is expensive and prone to damage in regions that experience cyclones, high wind and hail.
Netting – Tunnel Netting	A series of light frames connected by wires are erected at intervals along the row to support the net and hold it away from the tree. The nets are placed over the frame only when fruit has matured.	Fruit touching the net can be damaged by pests on the outside of the net. Nets need to be pegged down to avoid pests getting under the net.
Smell – flying foxes have a highly developed sense of smell.	Carbide	The smell of carbide was successful in deterring flying foxes in 1982 in north Queensland. However, flying foxes will become accustomed to the smell.
Sound	Replaying recorded sounds, such as bangers, clangers, poppers, bombers and sirens	Sound can initially be successful, however long term use is doubtful. Flying foxes become accustomed very quickly to sounds if they are not met with real danger.
Lights	Flashing strobe lights and bright light grids over orchards	Lights can be initially successful, however flying foxes become accustomed to the light and will feed in a fully illuminated orchard. It also has the potential to act as a beacon and guide the flying foxes to the orchard.
Electric wires	Horizontal grid of electrified wires above the trees combined with droppers hanging down the side	Electric wires can be moderately successful, however are now illegal in Queensland (banned in 2001).
Scare guns		Scare guns can be initially successful, however flying foxes will become accustomed if there is no danger.
Bags	Fruit protection bags placed over fruit	Fruit protection bags are an extremely labour intensive and costly mitigation method. Flying foxes can go under the bags.
Chemicals and allied substances	Certain chemicals have been trialled – some make the animals sick or disoriented, others give a bad taste.	Chemicals need to be resprayed after rainfalls, and residues can impact the flavour of the fruit. Methiocarb was used along with others.
Poisons	Various poisons are applied to fruits.	The use of poisons is non-target specific and illegal. It can also bring the fruit industry into disrepute.
Shooting	Shooting of early arriving flying foxes (‘scouts’) prior to entire flock coming to feed.	Crop losses are often still extensive with shooting, especially when there is a scarcity of native food. No longer legal in Queensland.

2. Queensland Flying Fox Consultative Committee

The Queensland Flying Fox Consultative committee (QFFCC) was formed in December 1998 following approaches by Queensland Fruit and Vegetable Growers (QFVG) (now Growcom) to the Department of Primary Industries and Fisheries, Queensland (DPI&F) and the Environmental Protection Agency (EPA). DPI&F chaired the committee and provided secretariat support. The committee held its final meeting in 2003.

Membership included:

- EPA and Queensland Parks and Wildlife Service (QPWS)
- QFVG (provided grower representatives from fruit growing regions in north, central and south Queensland and an environment policy specialist)
- Queensland Conservation Council/Queensland Wildlife Preservation Society
- NSW Farmers
- NSW Agriculture.

The QFFCC conducted an audit on known flying fox management action on crops, and identified seven areas that relate to management of the problem. These areas are:

- deterrents
- conservation status
- destruction
- protection systems
- economic support
- forecasting
- communication.

These areas provided a focus to the activities of the QFFCC.

The key outcomes resulting from the QFFCC were:

A netting project to prepare a model for assessing the economics of netting, different netting systems and possible effects of netting on crops was developed and funded by DPI& F.
A number of trials were undertaken to identify potential smell and taste deterrents with the results discussed in section four.

Options for economic assistance for netting were investigated by the QFFCC.
The newsletter (BatChat) was used to alert growers to potential seasons when flying fox activity is likely to be high.

BatChat was distributed to keep key stakeholders up to date with the outcomes of the committee.

A list was developed of flying fox, preferred tree species to help those who wished to avoid the use of these species, or encourage use of these species.
A poster was developed that identified the species of flying fox found in Queensland.

At the conclusion of the QFFCC, there was no one ‘size fits all’ method developed to control flying foxes in orchards. It was found that full canopy netting provided the best protection from damage.

DPI&F created the publication *To Net or Not to Net* as a result of the QFFCC. The third edition has recently been updated and is available on the DPI&F website (www.dpi.qld.gov.au). It covers all control management options for flying foxes with a specific focus on netting, as well as cost examples for several different types of orchard netting. Contact details are also provided for businesses involved in manufacturing, supplying and installing orchard netting.

3. NSW Flying Fox Consultative Committee

The NSW Flying Fox Consultative Committee (FFCC) held its first meeting on 24 August 2001. The committee is still active, and its aim is to provide an open forum for key stakeholders to discuss and develop strategies for the conservation and management of flying foxes in NSW.

Membership includes:

- NSW Department of Environment and Climate Change
- NSW Department of Primary Industries
- Nature Conservation Council of NSW
- NSW Farmers Association
- Local government and shire associations
- NSW Agriculture
- NSW Banana Industry Committee
- NSW Royal Society for the Prevention of Cruelty to Animals (RSPCA)
- Scientific community.

The FFCC identified a list of priority research projects. The projects included research into interactions between humans and flying foxes and the roost preference of the grey headed flying fox. Projects directly applicable to flying fox damage in orchards are discussed in more detail in the next section.

4. Overview of recent Australian research projects into flying fox damage mitigation

QFFCC projects

Smell deterrents

Trials were undertaken into smell deterrents. The results indicated that the smell deterrents were not an effective method of crop protection. However, it was indicated that oxalic acid may be worthy of further investigation. This was due to the possibility that oxalic acid may cause a powerful, conditioned food aversion similar to what occurs in plants to discourage premature consumption of young ‘green fruit, and discourages browsing of foliage. This would require the development of a non-phytotoxic oxalic acid compound.

Bat Guard trial

This trial tested the effectiveness of an ultra sonic sound deterrent system (Bat Guard) in fruit orchards. The trial also incorporated strobe lights. The outcomes of the trial suggested that flying foxes can tolerate ultra sonic sound.

NSW FFCC projects

Grey headed flying fox management – fruit yield loss and financial analysis of netting

The final report of this project is due in March 2009. The study began in October 2006 and investigates the production losses attributed to grey headed flying fox management (GHFF) in the orchards of the Sydney basin. It also examines the effectiveness and economics of non-lethal, control techniques including netting and environmental variables within and around orchards that affect damage caused by GHFF.

In the last two years, the project has established that there are significant losses of fruit production caused by GHFFs in the Sydney basin. Financial analysis modelling projected that positive benefit from netting of orchards occurred within 18.5 years in the worst case scenario for small orchards, and after 4.5 years for the best case scenario in large orchards.

Mitigation of Damage by GHFF using decoy feeding (Kevin MacFarlane, 2004)

A study was conducted in the summer of 2003/04 to test the possibility of decoy as a crop protection method for flying fox attacks on commercial orchards. The previous study – food preference of the GHFF - found that banana and native blossoms were preferred. Chopped bananas were placed in bags (onion bags) and hung in windbreak trees. Bag visitation rates were high, however the technique and scale of the damage measurement was insufficient to establish whether there was a significant reduction in damage.

Food Preference of the grey headed flying fox (Praveen Gopalan, 2004)

This project undertook a series of captive trials to determine the food preference of the GHFF. The study found flying foxes preferred blossom (their main source of native food), banana, red papaya and the Kensington Pride mango.

Royal Botanic Gardens, Melbourne

In 2001, a series of research projects was undertaken in the Royal Botanic Gardens in Melbourne by the Australian Research Centre for Urban Ecology. In the early to mid 1980s, GHFF established a permanent year round roost within the Fern Gully of the Royal Botanic Gardens. The Botanic Gardens provided an opportunity to test various methods of flying fox deterrents in a controlled setting. Projects included:

- effectiveness of the phoenix wailer (an auditory deterrent) at deterring GHFF from roosting in the fern gully
- effectiveness of ultrasound at deterring GHFF from roosting in the fern gully
- effectiveness of envirospray ultrawax flying fox repellent (the active ingredient is a food grade capsicum extract - Capsaicin) as a deterrent against GHFF in the Royal Botanic Gardens.

Each project was found to have no effectiveness in deterring GHFF from roosting. In the majority of cases, the flying foxes did not appear to be disturbed or distressed by any of the deterrents. In the case of the phoenix wailer, the GHFF used the cable from which the speakers were suspended as an artificial roost to investigate the speakers at close range while they were playing.

5. International observations and research relating to fruit bat damage

Anecdotal evidence suggests that many of the methods applied in other countries are not applicable to Australian conditions. There has been research undertaken in India in an attempt to develop non-lethal methods of fruit bat control.

Israel

Three main methods are currently used to protect Israel's commercial orchards from fruit bats. Each method has strengths and weaknesses, and long-term studies are needed to find the most efficient strategy.

Crops are covered with nets to keep bats and birds away from the fruit. Since 1990-91, fruit bats have been caught in mist nets set around loquat and lychee plantations during periods of high feeding activity; netted fruit bats are culled. Fruit growers in northern Israel are working with sonic animal scares to control fruit bats. Although inexpensive, the long-term effectiveness is not yet clear.

The article 'Conservationists Make Steady Progress' can be viewed at www.batcon.org

India

Non destructive control of the bat, Cynopterus sphinx Vahl (greater short nosed fruit bat) in grapes in India (Abraham Verghese, 1998, International Journal of Pest Management)

This study advocated erecting netting to control bat damage.

Muntingia calabura – an attractive food plant of cynopterus sphinx – deserves planting to lessen orchard damage (Jamaican Cherry) (Natarajan Singravelan and Ganapathy Marimuthu, 2006, Acta Chiropterologica)

This project suggests that if Jamaican Cherry were to be grown in and around orchards, damages caused by fruit bats to commercial fruit crops may be decreased and therefore would serve as a non-destructive method for managing removal of commercial fruits by bats.

6. Conclusion

The challenge to address flying fox damage in orchards is an ongoing one. A significant amount of research both in Australia and overseas at this stage has failed to identify a deterrent method that has achieved the success rate of full canopy netting.