

CASE STUDY: MACADAMIA NUTS, COFFEE PLANTATION AND STRAWBERRIES

David Forrest, *OrganicForrest*, at Federal near Lismore in northern NSW has 1600 organic macadamia nut trees that are up to 20 years old, 300 bunya nut trees, strawberries and coffee trees. The bunyas, for bush food, are long term, taking 12 to 18 years to mature and were thoughtfully planted in a line so that people would not find themselves in the midst of falling nuts. Although the bunyas are still in the juvenile stage they are now bearing nuts.

Figure 29: A view of the plantation showing windbreak in the background, juvenile bunya trees, bungalow palms and strawberries in rows in the foreground.



The plantation also has 1000 Davidson plum, 100 Jaboticaba (a tropical fruit) and lemon myrtle. The trees are planted according to land capability.

The well established windbreak with 14 varieties of eucalypt and callistemon, lemon myrtle and leptospermum provide habitat and food source for beneficial insects, including the *Trichogramma* wasp (see below). The protection from prevailing wind increases the productivity of the plantation and some timber is harvested for firewood for the house and occasionally for poles. Leaves from the lemon myrtle tree make a tea that you can drink. The oil from the tree has anti-bacterial and anti-fungal properties and is used as a fungicide in food products including sorbet, sauces, biscuits and spreads.

In addition to the commercial crops and the windbreak the plantation also has stands of banana, paw-paw, nasturtium, bangalow palm, pumpkin and chilli and a vegetable garden.

The property was a dairy until the 1960s and then ran beef cattle; today it is a fertile plantation with many plant species. There are now 20,000 more trees than there were 25 years ago.

David teaches units of sustainable agriculture at Wollongbar College of TAFE and he is president of Tweed-Richmond Organic Producers (TROPO) and a vendor at the Rainbow Region Organic Market, the first certified *organic only* farmers' market in Australia. The market has been going for more than seven years.

Macadamia nut plantation

Figure 30: A view of the macadamia plantation, notice the windbreak in the background.

Ground cover for the plantations. It has always been important to establish and maintain ground cover to prevent erosion of the red soil on the steep slopes in this area of high annual rainfall.

In the early stages of the macadamia plantation, David planted about 4km of raspberries, rows of vines up and down the hilly terrain and under the young trees. The berries were used to shade the soil, conserve soil moisture and to compete successfully with weeds. The berries also promoted earthworms which provided worm casts for the soil organic matter. The berries were used as a short-term crop to make use of the land around the young macadamias. As the macadamia trees matured, David removed the berry vines and replaced them with a ground cover and a compost program.

Figure 31: Sweet smother grass grows in the shade of the plantation trees

Figure 32: Peanut grass, a legume that provides ground cover in the plantation

David prunes the trees to prevent a canopy forming because that would result in too much shade. The pruned trees let in sunlight and so maintain good ground cover. Plants selected for the ground cover are species that tolerate shade under the trees. The most successful ground cover has been sweet smother grass *Dactyloctenium australe*, because it is shade tolerant and grows well to provide the ground cover under the trees. Another useful plant is peanut grass or Amarillo peanut (*Arachis pintoii* cv. *Amarillo*) a legume that provides perennial ground cover and nitrogen for subtropical orchards.

This active management of the plants improves productivity and helps control the spread of disease in the trees (see next page).

Figure 33: Macadamia kernels provide mulch for the vegetable garden



Figure 34: Coffee kernels find a use in the vegetable garden

Strawberries

The strawberries are planted into a straw bale with compost on top of it. The straw forms mulch within 12 months and the strawberry runners take off. The strawberries are managed as a perennial crop, unlike the annual crops of more conventional systems. Every few years David replants to improve plant density for management.



Coffee plantation

Compost is the basis of good nutrition for the productive coffee bush. David makes some of the compost he uses and also purchases a certified product. He spreads it at the rate of three cubic metres per hectare and supplements it regularly with a nutrient such as dynamic lifter. The plants are healthy and not affected by any pests or disease.

In a subtropical region at low altitude, such as Federal, coffee has a long slow growth season; this contrasts with tropical regions where higher altitude is required for slower growth.

The beans from each bush are harvested at least twice per year. Harvesting the beans and roasting them for market are highly mechanised processes. The harvest can be two hectares per day but the beans must be at the correct stage of ripeness and not harvested too early; however they can hold on the bush once they have matured.

Plant nutrition

All additives are slow release and one part of the plantation is treated each year. Here are examples

- rock phosphate
- basalt dust (contains calcium and trace elements)
- rock potassium or potassium sulfate for fruit crops
- lime.

Pests and disease

Strawberries. Birds could be a problem with the ripe strawberries but the currawongs in the windbreak trees chase the other birds away (currawongs don't eat strawberries).

Figure 35: David Forrest carefully harvests organic strawberries

Fungus in strawberries is to be avoided because one affected fruit can destroy the punnet and harvesting is a specialised procedure because the fungus can be difficult to detect and fruit must be free from any trace of it to ensure a continual high standard of ripe, fresh fruit of high quality. Although utmost care when harvesting is essential, the fungus problem is low because watering is minimised and drip irrigation, rather than an overhead system is used.



Macadamia. The ground cover prevents dust and fungal spores from being carried up into the plants and keeps soil conditions healthy. Disease is managed by developing healthy plants and creating biodiversity. The healthy plants are better able to stand attack and fight off disease and the biodiversity provides habitat for a range of beneficial organisms. This pro-active management is more successful than trying to kill off each new problem as it appears.

Trichoderma fungus actively controls *botrytis*. The *Trichoderma* is mixed with a liquid tea made from compost and other plant and animal sources. The mixture is sprayed onto the plants. The tea is a source of nutrition for the *Trichoderma* and helps it reproduce and survive. A spectrum of microbes is used to compete with husk spot on the macadamia.

David uses a biological control release program. The organisms are supplied by Bugs for Bugs, in central Queensland. Here are some examples of the organisms he uses:

- Lacewing, a general predator, lays eggs in newly hatched larvae of pest insects
- *Trichogramma*, a wasp parasite, lays its eggs inside the egg of pest caterpillars

Figure 36: *Trichogramma* eggs on the medium from the supplier. These eggs soon mature into the adult wasp that protects the macadamia tree from nutborer insects.



The wasp versus the nutborer pest. *Trichogramma cryptoflavia* is a beneficial native wasp that lays eggs inside the eggs of the pest nutborer insect. The wasp larvae feed on the egg of the nutborer, pupate, become adult wasps and fly off to search and destroy new nutborer eggs.

The nutborer population is monitored by using a pheromone of the male nutborer as a lure to catch the pests. When nutborer numbers indicate a problem, David places his order for the *trichogramma* eggs. Of course, the wasp eggs come at a cost but it is comparable with spraying insecticide (could be less cost than sprays) and in addition to being an organic solution it has the added advantage of not destroying any beneficial insects.

The *trichogramma* wasp and all other adult beneficial bugs need nectar to stay in the area, so it is important to have flowers all the year in the area around the crops. These flowers are provided by the native species of plants used in the windbreaks and shelterbelts and also by ground cover.

Market

Figure 37: Some products from the plantation

Macadamia. In addition to the market for the nuts there is a good organic market for packaged bulk kernel and for processed products such as nut butter and nut cream.

Strawberries. The berries are sold at local farmers' markets and on the conventional market to restaurants and chain stores and some are sold in jams. They are selectively harvested throughout the fruiting season;

Coffee. The beans are sold through markets and also through a local coffee house that specialises in roasting and marketing organic coffee beans.



The farm is certified by Australian Certified Organic (ACO previously BFA).