

## Soil sense

# Using compost in macadamia orchards

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### INTRODUCTION

Applying compost as mulch rather than incorporating it into the soil will greatly improve soil health and is an excellent way to obtain the benefits of compost in an orchard situation where incorporation is not possible. Mulch is any material that is placed on the surface of the soil. It is important to note that mulch is not always compost (it can be wood chips or plastic material, for example) but composts make excellent mulch. Application of compost mulches has been shown to:

- increase soil microbial activity
- assist in weed suppression
- suppress disease
- protect against erosion, and
- reduce soil temperature variation, thus reducing soil water loss.



**Compost in a macadamia orchard ready for raking after application by a belt spreader.**

In the long term the application of compost mulch will also:

- improve soil water-holding capacity, and
- increase plant available water.

Compost can improve crop and soil nutrition if made from suitable materials (see Agnote DPI-448 *Soil sense: How to compost on farm*).

### OBTAINING COMPOST

You can either purchase compost from a supplier or make your own (see Agnote DPI-448).

If you buy compost, make sure it is fully composted and pasteurised. To guarantee a high quality product, ensure that the Australian Standard (AS 4454-2003) has been followed in its manufacture. Only through this process will weeds, pathogens, potential disease-carrying organisms, physical contaminants and detrimental chemicals have been excluded.

Good compost will be easily recognisable and has the following distinct characteristics:

- smell – a pleasant earthy smell, with no bad (sour or rotten) smells
- feel – moist and earthy, not wet and sloppy or dry and powdery.
- appearance – dark soil-like particles, in which original organic materials are not distinguishable.

When purchasing commercial compost you may have the pH and the carbon to nitrogen (C:N) ratio checked in a laboratory to ensure they meet the Australian standard. The C:N ratio will indicate the maturity of compost. Compost with C:N ratio around 15:1 indicates a



**A twin disk spreader is effective for gaining an even coverage to a depth of 30 mm.**

mature compost. A higher C:N ratio shows that the material has only been partially composted and is high in carbon. Compost that is too rich in carbon will temporarily 'tie up' nitrogen from the soil. A low C:N ratio also indicates partially composted material, with possible detrimental effects on plants.

### **Compost particle size**

Using compost that is fine (below 15 mm) in a spreader will ensure even coverage. In macadamia orchards, fine compost is required to enable harvesting of nuts off the ground. In situations where harvesting does not take place off the ground (e.g. avocado orchards), larger fractions (>20 mm) that break down less rapidly may provide a more stable surface and protection from erosion while increasing the length of time for which the compost provides soil health benefits.

### **Compost moisture content**

It is best to spread the compost with a moisture content between 50% and 60% (it will feel like a moist sponge but no water comes out when you squeeze it in your hand). If the compost is too dry it may start to repel water and will not form a good orchard floor surface. If it is too wet and sloppy it will be difficult to spread and runs the risk of becoming anaerobic – this is a problem because the organic acids produced can be quite damaging to soil and plant health. For the same reason, do not apply any compost that has a foul smell.

## **HOW TO APPLY COMPOST**

Tractor-drawn machinery is usually required to spread compost. If you are applying compost to a small area you may choose to simply rake it out by hand. A major obstacle to applying compost mechanically is bridging, which stops the compost flowing. This is overcome by using a spreader with a continuous or cleated belt to provide the compost to one of the delivery systems described below.

For small farms, a **manure dropper** of about 1 cubic metre capacity can be used. This is attached to the three-point linkage of a small tractor. The bin doubles as a scoop for filling and manure or compost or other materials can then be dropped or banded where required, making this an effective one-person operation.

To cover larger areas implements such as **spreaders** are needed. For an orchard, a spreader between 3 and 4 cubic metres is best. For an efficient operation a separate loader such as a front end loader is desirable. You may decide to use a contractor if you do not have a spreader.

### **Disk or twin disk spreader**

This will throw compost out behind the hopper and is effective at getting an even coverage to a depth of 30 mm. Compost is either thrown out to one side by a single disk or spread both sides using a twin disk. However there is little control over where the compost ends



**A belt spreader has the advantage of directing the compost towards where it is needed, although further spreading (below, right) may be required.**

up so you cannot limit the compost to a particular area such as the drip line.

### **Belt spreader**

A belt spreader is a large bin with a moving belt for the floor. At the end of the bin there is an opening to which the material being spread is moved. The quantity of material delivered depends on the speed of the belt and the size of the opening at the end of the bin.

A belt spreader will place the compost out in the tree row in a pile 30 mm or thicker. You may then have to spread the compost further using a rake or other machinery. The advantage of using a belt spreader is that you can direct compost placement more accurately, but further spreading may be required.

The pattern of distribution of material depends on the ground speed of the tractor and the speed of the disks or side-delivery belt. Most spreaders use rear-mounted, variable-speed rotating disks to spread materials behind the implement, but some may also provide for side-delivery and 'banding' of material, which is useful in situations such as vineyards or orchards. By adjusting the operation of the various components of the machine, compost or other materials can be spread fairly accurately.



### **HOW MUCH TO APPLY**

Compost application rates are often described in different ways (volume, weight or depth of application), which can be confusing. An approximate guide is that 1 litre per cubic metre (1 L/m<sup>3</sup>) equals 0.02 m<sup>3</sup> per tree or a 1 mm thickness cover over the ground.

The amount of compost you need to apply will depend on what you are using it for. Soil remediation requires greater quantities (from 0.5 m<sup>3</sup> to 2 m<sup>3</sup> per tree)

and targeted application in particular areas of concern. However, using it as part of a crop/soil nutrition program requires smaller quantities (0.02 m<sup>3</sup> to 0.6 m<sup>3</sup>) that will not provide the benefits of erosion and weed control.

The time between compost applications varies depending on the thickness at which it is applied and the coarseness of the compost. The thicker the initial application the greater the length of time before the next application is needed, leading to a saving in application costs. If 100 mm is used, it is likely that further application may not be required for 10 years.

Often the production benefit of applying compost in tree crops is not seen immediately but in one macadamia orchard following a 100-mm application, there were a large number of feeder roots mining the compost within 12 months.

### **Remediation**

To benefit soil health, applying a layer between 0.5 and 1 m<sup>3</sup> per tree is sufficient. If remediation of an eroded site is your goal you may need up to 2 m<sup>3</sup> per tree, as this will improve soil health plus protect the underlying ground surface from further erosion during heavy rainfalls.

Trial applications of compost on working macadamia farms have indicated that management practices including harvesting will not be altered by any of these application rates.

### **Soil/crop nutrition**

If compost is to be used as part of a crop/soil nutrition program then the nutrient content of material should be taken into account and amended with fertilisers if necessary to lift the quantity and availability of nutrients. Remember that the nutrients in compost are present in forms that are released slowly over time and not all at once after initial application. The rate of compost application ranges from 0.02 to 0.06 m<sup>3</sup> per tree in one or two applications during the growing season.

### **WHEN TO APPLY**

Compost should only be applied when fully composted (see Agnote DPI-448) and when it fits in best with other farm operations.

Partially composted material has the potential to harm plants because:

- Pathogens and weed seeds might not be destroyed.
- The decomposition process will continue after the material is spread on the orchard floor and any valuable nitrogen will be taken up by the decomposing organisms and not be available to plants, which may lead to a temporary nitrogen deficiency.

In macadamia orchards compost can be applied before the start of the harvesting season. Application in January allows the compost to settle and form a firm orchard floor so that sweeping and other operations can be carried out in preparation for harvest. If compost is not applied well before harvest begins, it is best to defer to the spring after harvest is complete.

Other tree crops will benefit from applications of compost. For more information on this contact your local adviser about timing of applications.

### **FURTHER INFORMATION**

Agnote DPI-448 *Soil sense: How to compost on farm.*

Agnote DPI-347 *Organic materials in horticulture – their safe use.*

Australian Standard AS 4454-2003 *Composts, soil conditioners and mulches*, 3rd edn, Standards Australia 2003.

The following websites:

[www.recycledorganics.com](http://www.recycledorganics.com)

[www.epa.nsw.gov.au](http://www.epa.nsw.gov.au)

[www.deh.gov.au](http://www.deh.gov.au)

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