

Soil sense

How to compost on farm

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WHAT IS COMPOSTING?

Composting is the breakdown of any organic material (ingredients) into a crumbly, dark, soil-like product in which none of the original material can be easily identified. Various organic waste materials produced by farming such as husk, effluent, vegetable waste, stubble and so on can be used to produce compost.

The types of composting include:

- **Vermicomposting**—use of composting worms

- **Passive composting**—slow degradation of plant wastes—such as adding mulch to soil
- **Thermophilic** composting—rapid breakdown of organic material where the compost pile gets hot and sterilises seed and pathogens.

This Agnote provides the basic information you need to make thermophilic compost from your farm organic wastes. If you wish to create compost for sale, aim to meet the quality criteria of Australian Standard AS 4454 – 1999 Composts, Mulches and

Keeping the right amount of moisture up to your compost pile is vital.



Soil Conditioners and contact the Environmental Protection Authority for advice on licensing requirements.

BENEFITS OF COMPOST

There are many benefits of using compost. One of the most important benefits is the addition of organic matter. Organic matter provides food for soil life and increases stability of the soil so it becomes more resistant to erosion and compaction and holds more moisture. Compost also:

- adds organic carbon (C)
- protects soil from erosion
- increases soil structural stability
- improves moisture holding capacity
- increases water infiltration and reduces water run-off
- adds nutrients (as slow release)
- encourages a wide range of soil organisms.

WHAT YOU NEED TO MAKE A GOOD COMPOST

The rules of composting are the same whether you are making a small pile for your own garden or a large windrow for commercial production. The key elements needed when making good thermophilic compost are described in the following section.

Aeration

To ensure air can move in the compost heap it is important to turn the pile regularly and include a range of different sized and shaped materials. BUT, remember that large pieces of woody material will take much longer to break down than smaller 'chips'.

DISCLAIMER

The information contained in this publication is based on knowledge and understanding at the time of writing (May 2003). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of New South Wales Department of Agriculture or the user's independent adviser.

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Moisture

Ideally, water content should be 50 to 60% (it feels like a moist sponge but no water comes out when you squeeze it with your fingers). To make sure the pile stays wet enough during the composting process you may need a water supply to keep moisture up to the pile. See also 'Trouble shooting' (page 3).

Organic ingredients

Good compost must have a balance of carbon-rich (woody material) and nitrogen rich (green leafy matter or manure) materials. Select the correct mix to give a carbon: nitrogen (C:N) ratio of about 30:1.

Approximate carbon and nitrogen content of some common farm wastes

Waste material	%N	%C
(High in carbon)		
non-legume hay	1.3	42
macadamia husk	1.3	50
tree prunings	1.0	50
straw	0.7	56
softwood sawdust	0.1	50
hardwood sawdust	0.06	50
newspaper	0.04	25
coffee hulls	1.1	48
(High in nitrogen)		
blood and bone	13	42
vegetable wastes	3	30
broiler litter	2.7	38
grass clippings	3.4	58
cattle (dairy) manure	2.7	48
horse manure	1.6	48

Carbon: Nitrogen Ratio

The C:N ratio can be determined easily when you know the C and N values and weight of the product you are using. To calculate the C:N ratio, divide the total carbon % of your selected materials—or ingredients—by the total nitrogen % of your materials. You can have as many materials as you like.

C:N =

$$\frac{(\text{Weight ingredient1} \times \%C) + (\text{Weight ingredient2} \times \%C)}{(\text{Weight ingredient1} \times \%N) + (\text{Weight ingredient2} \times \%N)}$$

For example, if you are using 4t macadamia husk + 500kg broiler litter + 50kg blood & bone:

$$\text{C:N} = \frac{(4 \times 50) + (0.5 \times 38) + (0.05 \times 42)}{(4 \times 1.3) + (0.5 \times 2.7) + (0.05 \times 13)} = \mathbf{31:1}$$

A suitable area

You will need to dedicate an area for at least 8–12 weeks. The area you identify should be relatively flat and free of stones, tree stumps, drainage lines and weeds (especially bulbous weeds). In addition, you can make a good base for the compost pile using crushed blue metal dust.

There should be enough room for machinery use to turn the compost. The pile should be located so it will not contaminate adjacent land or waterways via wind drift and water runoff.

Machinery

If making a large amount of compost, you will need machinery to turn the pile. A front-end loader or excavator is ideal. Alternatively, you may consider using a contractor.

Cover

You may need to cover your pile if there is excessive rainfall.

HOW DO YOU CREATE GOOD COMPOST?

Constructing a pile

Mix all materials and construct a pile that is between 1.5 and 2 metres high and 2 to 3 metres wide. It can be as long as you need. Every 1 metre in length will make about 3 cubic metres (m³) of compost at these dimensions.

Add water so that the pile is wet through but not soaked. Check a sample of material from the pile—if it glistens with water but doesn't drip excess water then it is wet enough.

Turning the compost pile

After about one week, check the temperature in the pile. It should be between 50 and 65°C (this is now considered a thermophilic compost). Use a shovel to dig a hole in the middle of the pile. You will probably notice steam rising and the compost should feel uncomfortably hot. You can check the temperature accurately with a thermometer or a data logger, which transfers temperature information to your computer.

If the temperature is right, turn your pile about seven days after measurement, or when the temperature starts to decline. If the temperature is above 70°C turn the pile immediately and reduce pile height to a maximum of 1.5m.

When turning the pile, ensure the materials from the outside of the pile are placed on the inside. This can be achieved by rolling the pile over using a front-end loader or lifting the pile and dropping in its original place using an excavator.

Monitor the temperature

Keep monitoring the temperature on a weekly basis and turn the pile after the correct temperature has been reached each time.

The pile will probably need to be turned at least three times before the compost is ready for use but may need up to six turns, depending on the materials used. Once the pile has stopped producing heat let it 'cure' for at least two weeks before use. See 'Trouble shooting', below, for any problems.

NOTE: It is important for the compost pile to reach about 60°C to kill any unwanted pathogens and weed seeds and

TROUBLE SHOOTING

Problem	Cause	Remedy
Excess water running off	Too wet	Add dry materials or let pile dry out a little.
Bad smell	Anaerobic conditions	Add larger materials and turn more often.
Ammonia smell	C:N ratio too low	Add extra high-C materials.
Clumping	Compost is too wet	Add dry materials and turn.
Pile won't get hot after set-up; the compost process does not appear complete.	C:N ratio too high	Add high nitrogen materials, but avoid fertilisers such as urea.
	Moisture is incorrect	Adjust accordingly.
	Too little oxygen	Turn pile.

break down all the material properly. It must not get hotter than 70°C as this will reduce the nutrient and carbon value of your compost and kill beneficial decomposer organisms.

WHEN IS IT READY?

Good quality compost should take about 8 weeks; macadamia husk can take up to 12 weeks. It is very important not to use compost before it is ready as beneficial organisms will not have established, and nitrogen will have been temporarily taken by the decay organisms and be unavailable to plants.

When the compost is ready it has the following distinct characteristics.

- **Smell**—nice earthy smell, with no bad (sour or rotten) smells
- **Feel**—moist and earthy, not wet and sloppy or dry and powdery
- **Appearance**—original organic materials are not distinguishable. Pile contains dark soil sized particles.
- **Temperature**—pile stops getting hot.
- **C:N ratio**—between 15:1 and 20:1 (a laboratory test for this costs about \$25).

The composting process takes longer if there is:

- insufficient water, or
- too much carbon rich material.

FURTHER INFORMATION:

DPI-347 *Organic materials in horticulture—their safe use*
Australian standard AS4454-1999 *Composts, Soil Conditioners and Mulches Standards Australia 2nd Ed* (1999)

See also the following web sites:

www.recycledorganics.com

www.epa.nsw.gov.au

www.ea.gov.au

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