



Hawkesbury City Council

Composting and  
worm farming  
workshop manual





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# WHAT IS COMPOSTING AND WORM FARMING?

Composting is not a new science, humans have been recycling waste products for thousands of years and nature has been composting since the beginning of time.



Composting is a natural process that involves the decomposition of organic matter. Millions of micro-organisms drive the compost process by breaking organic matter down to its original nutrient form. This valuable nourishment is then returned to the soil to help improve plant growth, water retention and the natural capacity of plants to resist disease.

Worm farming is composting with the extra help of worms. Worms help to aerate the soil and their castings are an excellent fertiliser for the garden.

## IMPORTANT NOTE

It is important to wear gloves when handling compost to reduce the risk of infection. Avoid the disturbance of dry compost materials as this may release irritating spores and fine dust that could cause respiratory problems.

## WHY BOTHER COMPOSTING AND WORM FARMING?

Australia is second only to the United States in the per capita production of waste. Each year every Australian produces around 800kg of solid waste. In New South Wales, an average of 65% of our household rubbish is food scraps, garden waste and other organic matter. In the Hawkesbury, organic materials are the most common item disposed of in residential garbage bins.\*\* The best way to reduce our food and garden waste is to convert it to compost.

Organic material that is deposited in a landfill breaks down in anaerobic (without air) conditions, releasing methane and carbon dioxide. Both of these gases are major contributors to the enhanced greenhouse effect, which many of the world's scientists suggest is changing global weather patterns.

On a more local level, sending organic waste to landfill is simply a waste. Aluminium cans, newspapers and glass bottles are commonly separated for recycling; wherever possible organic waste should also be recycled.

Recycling organic waste using a compost or worm farming system will not only help the environment, the end products will improve the structure of your soil and introduce or replace valuable nutrients vital to healthy plant growth. You will also save money on expensive fertilisers and other products and increase water retention in the soil (therefore reducing your water bill).



\*\* *EnviroCom Australia (2001) Hawkesbury City Kerbside Domestic Waste Audit, October 2001.*

# THE COMPOSTING RECIPE: ADAM

Building a compost heap is relatively simple and can be likened to baking a cake- a good recipe and the right ingredients are essential! There are four important principles to remember for building and maintaining your compost (ADAM). Each of the four principles is important on its own, but when used together they provide an effective recipe for quickly decomposing your garden and kitchen waste.

## THE RECIPE - ADAM

### A - ALIVENESS

Compost is not a pile of dead, rotting rubbish. Compost is a living system in which countless numbers of bacteria, fungi, protozoa and other critters eat their way through your garden waste and turn it into nutrient-rich humus. To encourage "aliveness" in your compost, place the pile directly on the ground and remember to regularly check the air, diversity and the moisture level.

### D - DIVERSITY

Diversity of ingredients is the key to a speedy and efficient decomposition process. Diversity provides the environmental conditions and nutrients for a wide range of organisms that will in turn provide you with balanced and nutrient rich compost.

### A - AERATION

More Air = Less Smell. Air in your compost heap ensures aerobic (air breathing) bacteria will recycle your waste materials. If your compost heap lacks air, anaerobic bacteria will flourish and produce offensive gases. Regular layers of coarse material will keep air flowing through the heap. Turning your heap every 10-14 days and drilling small holes in commercial compost bins can also help aeration.



### M - MOISTURE

All organisms in your pile require moisture. Any dry material should be watered before the next layer is added. A dry compost heap will stop working; one that is too wet will become smelly because air has been forced from the heap. The optimum moisture content is between 50-60% (about as moist as a wrung out sponge). If your compost heap receives full sun, particularly in the afternoon, you will need to regularly check the heap and water when necessary.

## OTHER CONSIDERATIONS

### **T - TIME**

Composting takes time. Don't expect your compost to be ready overnight. If you follow the ADAM principles your final product will generally be ready after 6 - 10 weeks. A hotter compost heap will decompose faster.

### **T - TEMPERATURE**

The micro-organisms in your compost heap produce heat. This heat is held in the heap by the insulating properties of the bin or the compost materials. Remembering ADAM is the simplest way to ensure your heap reaches a suitable temperature. Adding animal manure or blood and bone can assist this process.

# COMPOSTING INGREDIENTS

Nitrogen is a very important element for maintaining healthy compost and is used by essential micro-organisms for growth and reproduction.

A lot of garden waste is dry, brown and woody. These materials are essential for drainage and aeration in the compost heap and tend to be nitrogen 'poor' (low in nitrogen). On the other hand, kitchen scraps and soft, green garden waste tend to be nitrogen 'rich' (high in nitrogen). The trick to successful composting, is to feed your compost a balance of both nitrogen 'rich' and nitrogen 'poor' materials.

## NITROGEN RICH MATERIALS INCLUDE:

- ✓ Grass clippings
- ✓ Fruit and vegetable waste
- ✓ Weeds without seeds
- ✓ Animal manures (chicken manure is best)
- ✓ Coffee grounds and tea leaves/bags
- ✓ Vacuum cleaner contents
- ✓ Human and animal hair
- ✓ Wool
- ✓ Bread



## NITROGEN POOR MATERIALS INCLUDE:

- ✓ Tree prunings, small twigs and sticks
- ✓ Dry grass clippings
- ✓ Straw, hay, cane mulch
- ✓ Leaves and bark
- ✓ Sawdust
- ✓ Egg cartons
- ✓ Torn or shredded newspaper and cardboard
- ✓ Recycled paper

## OTHER USEFUL INGREDIENTS:

- ✓ Wood ash, dolomite or lime (this helps to reduce acidity)
- ✓ Crushed egg shells
- ✓ Seaweed
- ✓ Cut flowers
- ✓ Old potting mix
- ✓ A sprinkling of blood and bone

## DO NOT COMPOST:

- ✗ Meat and fish scraps
- ✗ Dog or cat faeces
- ✗ Dairy Products
- ✗ Chemicals



## SOLVING COMPOSTING PROBLEMS

PROBLEM	CAUSE	SOLUTION
Foul odours	Heap is too wet	<ul style="list-style-type: none"> <li>• Add dry leaves</li> </ul>
	Not enough air	<ul style="list-style-type: none"> <li>• Turn the heap</li> <li>• Add lime</li> </ul>
Slow decay	Not enough nutrients	<ul style="list-style-type: none"> <li>• Add a small amount of nitrogen based material</li> </ul>
	Not enough air	<ul style="list-style-type: none"> <li>• Turn the heap more often</li> </ul>
	Not enough water	<ul style="list-style-type: none"> <li>• Moisten the heap</li> </ul>
Maggots	Meat, seafood, fats or faeces in the heap	<ul style="list-style-type: none"> <li>• Remove the cause</li> <li>• Cover the maggots with lime</li> <li>• Add soil to the top of the heap</li> <li>• Turn the heap the next day</li> </ul>

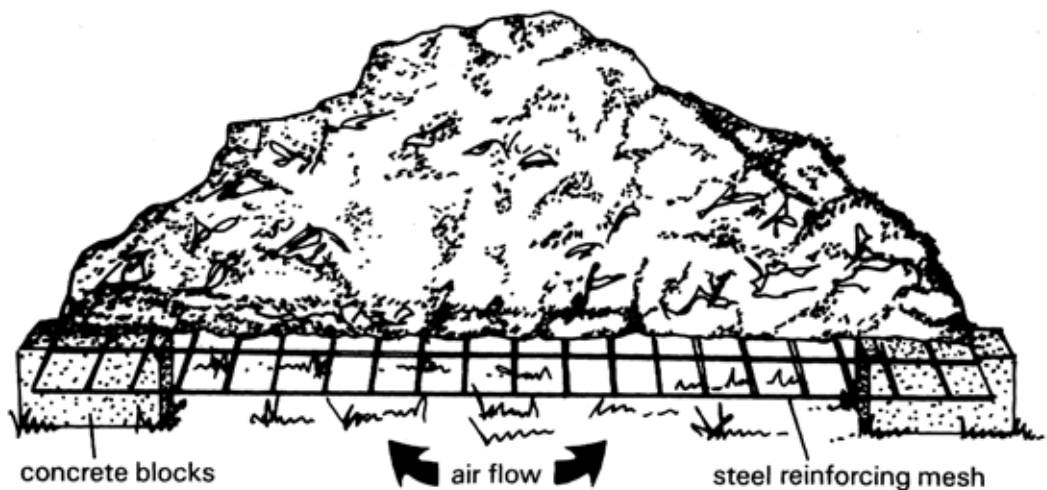
# COMPOSTING SYSTEMS

There are many methods to produce compost and a range of compost systems that can be bought or built to produce compost.

## COMPOST PILE

Choose a site and add compost materials. Maximum size should be around 1.5 x 1.5m. Heap should be turned every 10 -14 days.

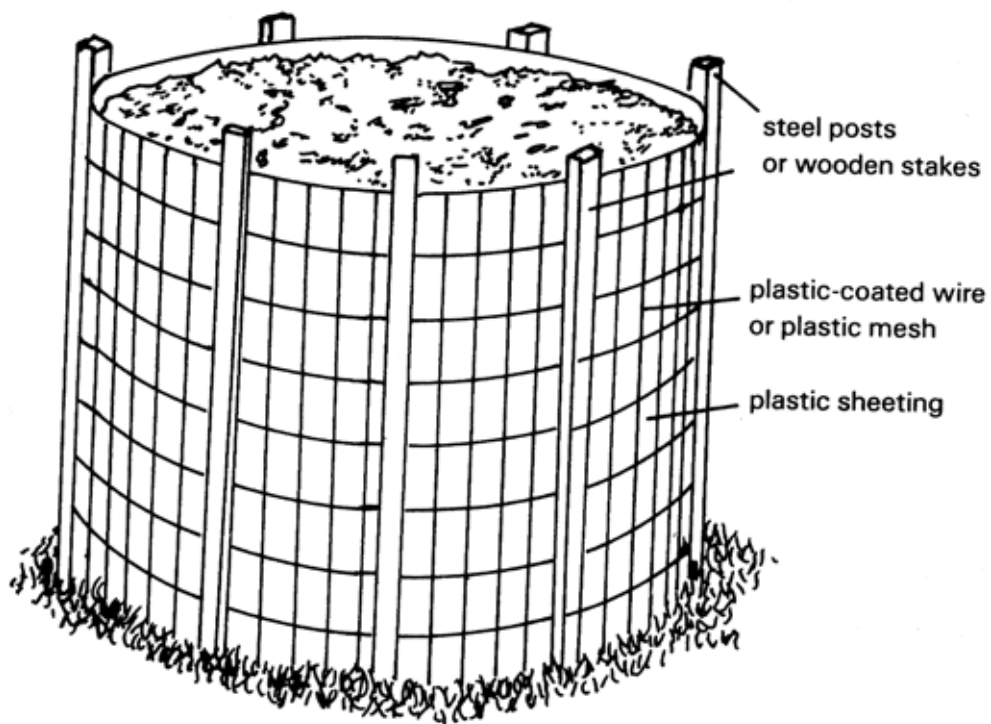
Materials:	No materials necessary, suitable space is needed.
Cost:	Cheap, minimal cost.
Advantages:	Cheap to build.
Disadvantages:	Requires regular turning, is open to scavengers and can seem untidy.



NOTE: Placing the heap on wire mesh or inserting PVC pipes with holes, can increase airflow.

## STEEL WIRE ENCLOSURE

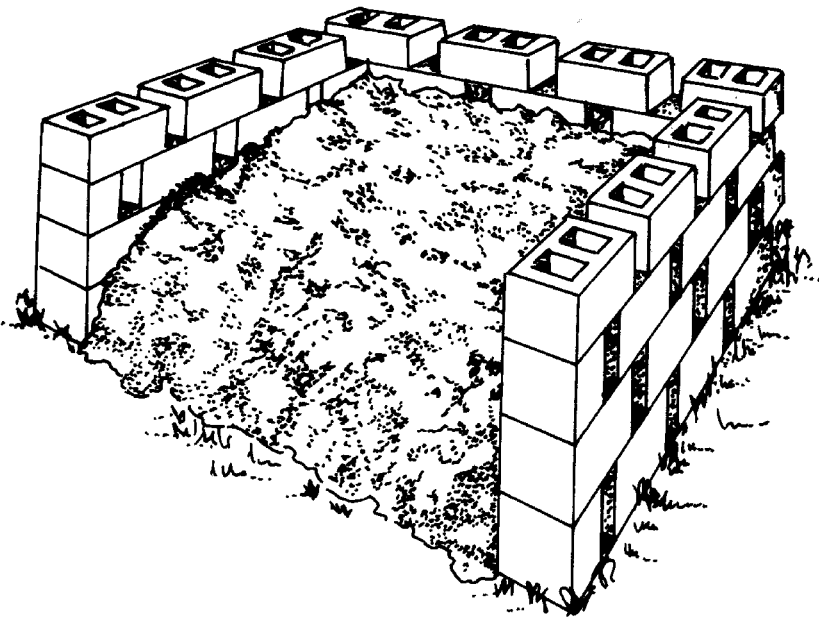
<b>Materials:</b>	Star droppers/wooden stakes, wire or plastic mesh.
<b>Cost:</b>	Varies depending on materials used. Maximum cost is approximately \$60.
<b>Advantages:</b>	Relatively cheap, easy to erect and move.
<b>Disadvantages:</b>	Difficult to access for turning and adding large volumes of compost materials.



**NOTE:** Open composting systems may dry out easily, keep moist.

# BESSER BLOCKS/RAILWAY SLEEPERS

<b>Materials:</b>	Sleepers or besser blocks as required. Old pallets also make excellent sides.
<b>Cost:</b>	Varies depending on materials used. Maximum cost is approximately \$200.
<b>Advantages:</b>	Allows good airflow, easy access when adding materials, long lasting.
<b>Disadvantages:</b>	Can be costly, significant space is required.

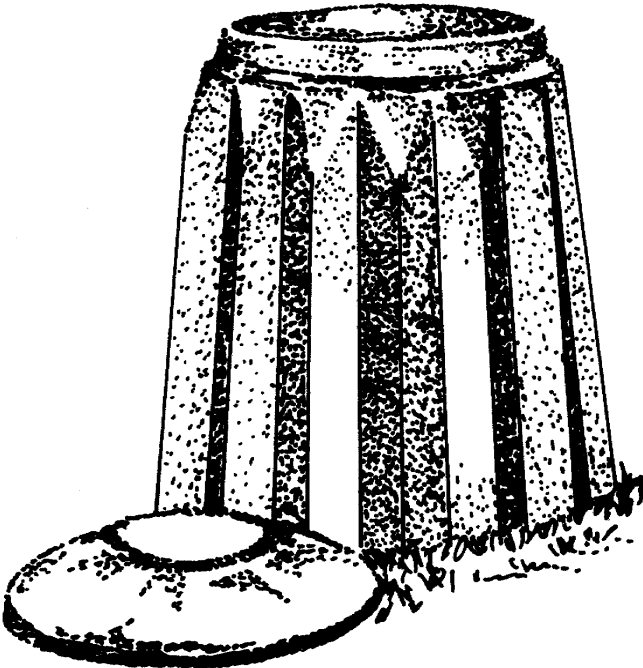


NOTE: Can be made using old or recycled materials.

# COMMERCIAL BINS

A huge range of plastic compost bins is available from hardware suppliers.

<b>Cost:</b>	Varies depending on design. Cost ranges from approximately \$50-\$100.
<b>Advantages:</b>	Fully enclosed, neat and easy to move.
<b>Disadvantages:</b>	Some bins can become anaerobic (no oxygen) which can produce smells; bin capacity may be too small for keen composters.

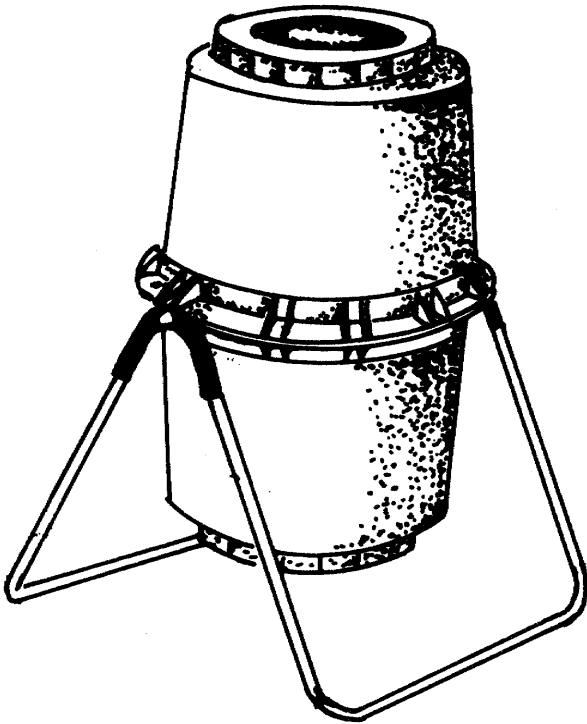


**NOTE:** Perfect for the average householder.

# BARRELS AND TUMBLERS

A range of commercial barrels and tumblers are available. Barrels and tumblers use a tumbling action to aerate the compost- just like a clothes drier! Tumblers can also be made using steel drums and other suitable materials.

<b>Cost:</b>	Ranges in price from approximately \$120-\$500.
<b>Advantages:</b>	Can produce compost very quickly.
<b>Disadvantages:</b>	Can be costly and can require more attention to produce results than other methods.



NOTE: Turn regularly to speed up the composting process.

## USING COMPOST

There are many ways to use the end product of your composting efforts. Here are some useful ideas:

- When planting out seedlings, add some compost to provide a growing boost. Compost can be used as a starting mix for vegetable and flower seeds. Mix one-third sand with two-thirds compost to create a fine textured soil. Use a sieve to separate the larger particles- these can be returned to your compost heap to decompose further.
- Top-dress the lawn with fine compost- sprinkle a thin layer of compost on your lawn once or twice a year to encourage healthy growth.
- Use your finished compost as a mulch to fertilise plants and garden beds. To mulch with compost, add a depth of 5-7cm of compost to the soils around the drip line of plants. Don't place compost mulch directly up against the trunk of trees or main stem of plants.
- Finished compost can be used as bedding material for your worm farm.



# MAKING A WORM FARM

Worm farming is an excellent way to compost and the by-products of a worm farm are an excellent fertiliser for your garden. Worms mix and aerate soil and produce nutrient rich castings that help to keep our soils healthy. Worm farms are also useful for people who live in flats or units who may not have the space to set up a compost heap.



Worm farms are simple structures that you can either make yourself or buy from hardware stores, nurseries and large department stores. Check in the Yellow Pages under 'Worm Farms' for a list of local suppliers.

A commercial worm farm is a neat and attractive way to recycle food waste and comes complete with instructions and all the materials necessary for setting it up.

## HOME-MADE WORM FARMS

1. Find two stackable containers of equal size for your worm farm - old wooden drawers, plastic crates or polystyrene fruit boxes make good farms.
2. Punch or drill some holes in the bottom of your upper container to allow worm juice to drain to the lower container. In the lower container, make a tap so that you are able to drain and collect the worm juice.
3. Place an up-turned empty ice-cream box in the bottom of your lower container. This will assist any worms that fall through to the lower container to climb back up to the top. It will also form an island for your worms and prevent them from drowning in the worm juice.
4. Make a 10-15cm layer of bedding for your worms in the bottom of your upper container. A mixture of aged compost, coconut fibre and shredded newspaper makes excellent bedding. Soak the bedding in water before it is added to the container.
5. Add your worms- you will need at least 1,000 worms to start your worm farm. Worms from your garden are not suitable; you will need to buy suitable worms (such as Red worms or Tiger worms) from a worm breeder.
6. Allow the worms to settle into their new home for approximately a week before feeding them for the first time. Feed your worms to one side of the upper container to allow a food free area for worms to roam.
7. Cover the upper container of your worm farm with a few sheets of newspaper or a piece of hessian. This will help to keep the worm farm dark and moist.

# HINTS FOR HAPPY WORMS

## FOOD

Worms like to eat most fruit and vegetable scraps but since worms don't have teeth, it is helpful to cut scraps into small pieces. Worms also like to eat:

- ✓ Paper
- ✓ Soil
- ✓ Leaves
- ✓ Hair
- ✓ Crushed egg shells
- ✓ Shredded and soaked cardboard

There are a number of foods that worms would prefer not to eat. Avoid feeding your worms meat as it can lead to odours and may encourage maggots. Other foods you should avoid feeding your worms include:

- ✗ Citrus fruits
- ✗ Onion, including garlic and shallots
- ✗ Dairy products

Add a sprinkle of wood ash, dolomite or lime every few weeks to help prevent the worm farm from becoming too acidic.

## LIGHT AND MOISTURE

Worms usually live underground where it is cool, dark and moist. Make sure your worm farm is not in direct sunlight and ensure that the cover on your worm farm is kept moist.



# USING WORM CASTINGS AND WORM JUICE

Worm farms produce two types of garden product- worm castings (or worm poo) and worm juice (or liquid fertiliser).

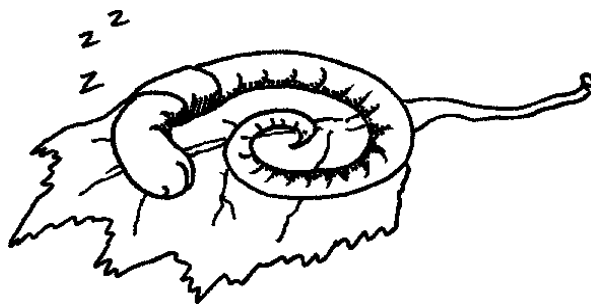
## WORM CASTINGS

Worm castings can be collected from your worm farm by light separation. Open the lid of your worm farm and wait for the worms to burrow down. Simply remove the top layer of worm castings and replace with a new layer of soil.

Worm castings can be used as an excellent fertiliser by applying it straight on the garden or onto your pot plants. Worm castings can be mixed with potting soil or sand to make a potting mix suitable for many types of seedlings.

## WORM JUICE

Drain the worm juice from the lower layer of your worm farm into a suitable container. Dilute the worm juice 1:10 with water using 1 part juice and 10 parts water. Worm juice can be used as a fertiliser for all plants. Vegetables particularly love it but it is also good for feeding indoor plants and garden flowers. Worm juice can also be used as an organic spray to strengthen the immune system of your plants. Worm juice can be stored almost indefinitely in a cool, shaded site.



# NOTES

Composting workshops are provided free to residents of Hawkesbury City as part of Council's Waste Education Program.



The Waste Education Program is sponsored by the waste collection and processing contracts.

**J.J. Richards**  
& Sons Pty Ltd



### **Acknowledgements:**

- Contents:** Peter Rutherford and Mary Lou Lamonda,  
The Australian Compost and Worm Book, Apollo Books, 1996.
- Environment Protection Authority NSW, Don't Rubbish Green Waste,  
1997.
- Illustrations:** Frank Haddon, A Practical Guide to Composting, Simon & Schuster,  
1993.