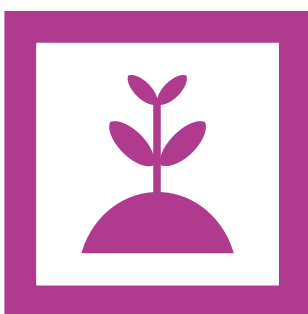


# COMMERCIAL COMPOSTING GUIDE

THIS GUIDE PROVIDES EXISTING AND PROSPECTIVE OPERATORS OF COMPOSTING FACILITIES WITH BACKGROUND INFORMATION TO ESTABLISH A COMMERCIAL COMPOSTING OPERATION AND RESOURCES THAT ARE READILY AVAILABLE AND ACCESSIBLE.



## WHAT IS COMPOSTING?

Composting is the natural, biological decomposition of organic matter by fungi, bacteria, insects, worms and other organisms. Successful composting requires management of the decomposition process so that it is relatively quick, safe and clean. Poorly managed composting may produce offensive odours, encourage pests and vermin, spread plant and animal pathogens, and cause environmental contamination. It may also extend processing times, which will be inefficient in a commercial composting operation and can result in a product of inferior quality.

Organisms that decompose organic matter require the following basic inputs and conditions to maximise their processes and efficiency:

- A suitable 'food' source
- A suitable temperature
- Water
- Oxygen (if decomposing aerobically).



## AEROBIC AND ANAEROBIC COMPOSTING

Biological decomposition of organic matter can take place in either an aerobic (oxygen rich) or anaerobic (oxygen poor) environment. While aerobic decomposition is the most common form of composting in commercial operations, properly managed methods of anaerobic decomposition may be beneficial at sites where pest and vermin are a major issue, or where input materials are unbalanced.

## VERMICULTURE

Vermiculture is the process of composting whereby organic matter is broken down primarily by worm species. As opposed to composting processes that rely on organic matter breakdown by bacterial and fungal organisms, vermiculture benefits from the role the worms play in providing aeration to the compost and the increased speed at which the final product may be generated. Vermiculture operations are usually able to process higher meat product concentrations than other compost operations.

## THE BENEFITS OF COMPOST

### SOIL CONDITIONER AND GREENHOUSE GAS ABATEMENT

Organic matter is not a homogeneous material. Basically, it can be thought of as consisting of two components: a readily broken down fraction; and material that will only degrade over a very long time.

The nutrients embedded in the more readily degraded material are released during composting and become available once again for use by plants and other organisms. The resistant organic material that is left consists of very complex organic molecules, such as humic acid. Accordingly, this resistant material is often termed 'humus'.

Applying compost to the soil therefore not only provides a renewed source of soil nutrients, but the residual organic matter provides resistant soil organic carbon, which is an important sink for greenhouse gases. Furthermore, increased levels of organic carbon improve soil structure, increase its water holding capacity and enhance soil life (by supporting microbial activity, worms, beneficial insects, etc.). It also helps the soil retain nutrients and suppresses some plant pathogens.

Compost is an essential component of many organic farming and permaculture systems. The application of compost to agricultural land not only provides increased soil fertility and water retention but can be an effective means of erosion and weed control.

# GETTING STARTED

## THE RIGHT INGREDIENTS

While the reprocessing of waste organic material into compost is encouraged, it must be done in a manner that does not result in contamination to the compost or the land it is applied to. Compost producers are responsible for ensuring that only material free from contamination is used to produce compost. When sourcing compost for sale or use, ensure it comes from a reputable supplier and does not contain contaminants.

At a very basic level, anything that was once living can be suitable for composting. However, some organic materials (e.g. fish and meat industry products, and organic materials found in hospitality and industrial waste) require special management, or may be considered unsuitable or best avoided in many circumstances.

All organic materials contain both carbon and nitrogen. For optimum biological activity, and thus efficient compost production, there must be a suitable balance of carbon and nitrogen in the material being composted. Generally, a carbon to nitrogen ratio (C:N) at the start of the process of around 25:1 will be satisfactory.

At a somewhat basic level, potential composting materials can be categorised on the basis of colour coded groups— green, brown, yellow and red.

- Green materials are rich in nitrogen and have a low carbon-to-nitrogen ratio. (However, not all organic materials that are rich in nitrogen are green.) Common examples of nitrogen-rich materials include grass clippings and general kitchen scraps.
- Brown materials are rich in carbon and have a high carbon-to-nitrogen ratio. (Similarly, not all organic materials that are rich in carbon are brown.) Common examples of carbon-rich materials include straw, sawdust and cardboard.
- Where green materials are seen as the essential nitrogen components of compost, brown materials may be viewed as a bulk loading mechanism, making the parameters of the process easier to manage.
- Yellow materials are generally able to be composted quite well, but typically require a greater attention to detail than green or brown materials. An example of this is human waste, which can be effectively composted but requires stringent controls and management to eliminate the risk of the spread of pathogens and diseases, as well as nitrogen overloading.

- Red materials exhibit characteristics that mean they should either not be used at all, or will require very highly specialised treatment and management (e.g. petroleum products, fats and oils).

The optimum blend of appropriate materials will accelerate the composting process.

While perhaps overly simplistic for a large commercial composting operation, such a classification system can provide a useful approach when initially sourcing materials and may be used by smaller operators without the capacity for accurate analytical testing.

Apart from the C:N ratios, other factors need to be considered when deciding what materials to source for a composting operation. Products that might chemically contaminate the compost (e.g. sump oil, pesticides or chemically treated timber) should not be added. Inclusion of materials that might contain plant or animal pathogens needs careful consideration and management if they are to be rendered harmless. The addition of plant species considered weeds also needs careful attention. Some organic materials can even contain or produce substances that are toxic to some composting organisms.





## THE RIGHT CONDITIONS AND PROCESSES

Humans have improved upon the natural composting process very little and, as such, decomposing organic matter will usually need little human interference to perform at its optimal capacity if provided with the right ingredients and conditions.

As such, if the right ingredients are used in the correct ratio, then conditions producing optimum compost rates will usually create themselves.

The composting process will be efficient and effective, with minimal generation of offensive odours and/or environmental problems if the following conditions are maintained:

- Keep moisture between 35 and 60%. The compost should have the feel of a squeezed out sponge. Moisture levels can be estimated by attempting to make a ball with a handful of composting material. Generally, a weak ball may be formed that will break apart when bounced in the hand. If the material is unable to hold any shape at all, the compost is likely to be too dry. If water is able to be squeezed from the ball, the material is likely to be too moist.
- Keep the acidity of the material at a pH less than 7.5. This is best controlled by maintaining a balanced input of materials (e.g. the addition of too much lime will increase the alkalinity of the compost).
- Temperatures within the compost need to be around 55°C. Digging into the heap should give off heat that warms the hand without discomfort. This rule, however, differs for vermiculture systems, where the ideal temperature for optimal worm activity is around 20°C. Too high a temperature may result in worm migration out of the active feedstock layer and lead to a breakdown of the system.

Optimum temperatures, moisture levels, aeration and mixtures of materials will generally provide good incidental control of flies and other insect pests. Rodents, birds and feral animals may be harder to control. However, good site hygiene and management will lessen the need for specific control measures.

Pre-processing (to physically break larger-sized material into smaller, more readily degraded fragments) can often improve the efficiency of the process by reducing the time taken to produce a suitable product. An example of this is through the preferential addition of sawdust as opposed to woodchips.



## THE RIGHT SITE AND SYSTEM

The space needed for a composting operation depends upon the intended scale and the specific system design to be used. Processing and storage of compost may entail the presence of large amounts of material onsite for several months.

Large commercial composting operations commonly use a 'windrow' system where compost heaps are often hundreds of metres long and are aerated using heavy machinery. Smaller operations may use any number of methods, potentially utilising boxes, barrels or containers to house their processing compost.

Potential offsite impacts (namely visual, odour, dust, noise and runoff) are critical considerations. The most effective ways of dealing with offsite impacts are to select a site separated from neighbours and sensitive land uses by appropriate distances and physical boundaries, combined with good process management.

When selecting a site for a composting operation, consider:

- the estimated processing and storage times with regard to the amount of material being composted, the desired end product, the system in place and the associated space requirements
- separation distances and physical barriers to sensitive environments and neighbours. Residences, hospitals, schools, other businesses and public areas (e.g. parks, churches, halls, sporting grounds, etc) will require special consideration
- local climatic conditions, particularly rainfall, temperature, and wind speed/direction
- distances to surface and groundwater resources, as well as the likelihood of flooding
- availability of water
- a suitable slope for drainage (too flat a slope may cause ponding, odour and other problems, while too steep a slope can result in scouring and erosion of material from compost piles)
- access to sufficient supplies of the appropriate materials, as well as a market for the final product
- ACT and interstate regulations that may impose restrictions on the transport and treatment of certain wastes.

## TARGETING A MARKET

Consider the target market for the product. This could be local residential and/or nursery markets, large agricultural and forestry markets, or even both. The target market may influence the ingredients that are sourced.

Producing a marketable compost of high quality requires due care during processing. Certain markets may demand a consistent product, with special requirements for pH and nutrient content. Some may even require an auditable quality control system be implemented. Additionally, targeting certain packaged compost or potting mix markets may require a sterilisation process be used to meet quality standards.

The Australian Standard AS4454-2003 prescribes measures to be referred to when creating a compost product that is safe for commercial use. The measures aim to give assurance that a product is of a consistent quality, is uncontaminated by heavy metal concentrations, and is free from plant and animal pathogens and plant propagules. Tests, with varying degrees of complexity, are included in the Appendices of the Standard to provide a means of determining the quality of the product.

## GAINING THE RIGHT APPROVALS

Commercial composting is a prescribed activity under Division 8.1 of the Environment Protection Act 1997 and therefore requires an 'environmental authorisation' (EA) if a facility composts, or is intending to compost, more than 200 tonnes of animal waste or 5000 tonnes of plant waste per annum. Furthermore, the Environment Protection Authority (EPA) may request individual composting operations to gain an EA or enter into an 'environmental protection agreement' below these thresholds.

All composting operations are encouraged to develop and implement an 'environmental management plan' (EMP).

Development of an EMP promotes effective business management through the planning and documentation of intentions and outcomes, and aims to provide the EPA and site operators with a useful tool for the protection of the environment.

Additional approvals may be required, and obligations may arise, under other legislation, such as the Waste Management and Resource Recovery Act 2016 and the Public Health Act 1997.

# SPECIAL CONSIDERATIONS

Although the concepts inherent to basic composting are relatively simple, a commercial operator must take into account important considerations:

- Seek specialist advice before incorporating significant quantities of meat and fish products into a composting operation.
- Take care when sourcing ingredients that may have been affected by certain physical, chemical and biological contaminants.
- Under certain conditions, compost has the potential to spontaneously combust. To minimise the risk of fires, monitor temperatures and pay attention to moisture levels and the aeration of the compost pile. A fire management plan may need to be developed and incorporated into the site's EMP.
- Composting green waste has the potential to unintentionally introduce weed species into the finished product. Limit the survival of weed species' seed banks by maintaining ideal composting conditions where heaps are kept moist, stable temperature is maintained and adequate aeration provided.
- Pasteurisation of product created in vermiculture systems may be necessary to eliminate the risk of animal pathogens, plant pathogens and plant propagules surviving the process. Do this by composting the material at temperatures exceeding 55°C either before or after its breakdown in the vermiculture system.

# WEBSITES TO GET YOU STARTED

- The [Recycled Organics Unit \(ROU\)](#) based at the University of NSW has a large number of useful resources and publications.
- The [Waste Management Association of Australia \(WMAA\)](#) provides quality background information to get started.
- The [Bokashi](#) method of anaerobic composting allows wastes, including meat and fish products, to be fermented quickly, without producing offensive odours. Bokashi Composting Australia is a privately owned company but their website provides useful information on the method.
- The [Australian Worm Growers Association Vermiculture Inc](#) is a network of worm farmers that promotes the farming of worms for the recycling of organic waste.

# RELEVANT LEGISLATION AND USEFUL GUIDELINES

- *AS4454 Composts, soil conditioners and mulches* (Australian Standard 2003—currently under review)
- *Best Practice Guideline to Composting* (WMAA 2004)
- *Composting and Related Facilities EIS Guideline* (NSW Department of Urban Affairs and Planning 1996)
- *Composting and Related Organics Processing Facilities* (NSW Department of Environment and Conservation 2004)
- *Environmental Assessment Guides for Planners: Composting* (SA Environment Protection Authority 2007)
- *Environmental Standards: Assessment and Classification of Liquid and Non-liquid Wastes* (ACT EPA 2000)
- *Environment Protection Act 1997*(ACT)
- *Environmental Guidelines for the Preparation of an Environment Management Plan* (ACT EPA 2009)
- *Guidelines for Using Compost in Land Rehabilitation and Catchment Management* (NSW Department of Primary Industries and Department of Environment and Climate Change 2007)
- *National Environment Protection (Movement of Controlled Waste Between States and Territories) Measure* (National Environment Protection Council—as varied November 2010)

**For further information** visit [www.act.gov.au/accesscbr](http://www.act.gov.au/accesscbr) or contact the Environment Protection Authority on 13 22 81, or by email at [environment.protection@act.gov.au](mailto:environment.protection@act.gov.au).

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