



# Gardennote

## Worm farms

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Tiger worms (*Eisenia fetida*) feeding on potato mash

Many shires are providing worm farm kits at a subsidised rate to ratepayers, to encourage recycling and reduce waste management cost and landfill. Worm colonies convert organic waste material to liquid and solid fertilisers. They require very little attention and are generally not affected by pests or diseases.

This Gardennote describes the setting up and management of worm farms and points out some frequently experienced problems.

### Basics

Worms can be kept in any container, as long as it is well drained, aerated and covered.

Commercially available 'Worm factories' consist of 2 trays with perforated bases, which fit onto a collector tray with legs. The top tray holds the worms and bedding, the second tray holds the previous cycle's worm-casts and the bottom

collector tray collects the leachate. Worm-casts are the by-products of the worms' activities. They are nutrient rich piles of excrement and are excellent when mixed with poorer soils, potting mixes and compost. Good round, crumbly castings may take several months to produce, but because of their unique biological and organic composition they stand alone as a magnificent soil conditioner. Leachate is a liquid produced by the worms and the natural decomposition of food scraps and other organic materials. It too is nutrient rich, full of microbes and beneficial bacteria and can be used as a powerful fertiliser. Earthworms most suitable for garden rearing are introduced species such as the common tiger worm, *Eisenia fetida*, or the red worm, *Lumbricus rubellus*. These worms are more gregarious than native worms, tolerate disturbances better, and generally breed to higher populations. They will typically live for between 2 to 4 years, although

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*Worm farm with leachate catcher (bucket)*

under optimal conditions, they have been known to live for over 15 years.

Worms are hermaphrodites—they possess both male and female reproductive organs, but they will use a partner to breed. Eggs are laid within capsules in the soil and will hatch in about three weeks. These worms mature 60 to 90 days later and may then lay an egg capsule about once a week for several years.

### Getting started

Set your worm farm up shaded from the summer sun. Controlling the temperature to around 24°C will improve the overall performance of your system. In hot weather the worm farm may need to be regularly moistened. In frost affected areas, choose a frost-free location.

If you are using a commercial worm farm kit, it will hopefully come with enough bedding material to fill the middle tray. Fill the middle tray with the worm and bedding mix supplied with the worm farm. Place the middle tray onto the collector tray and then add the top tray, which should be filled with new bedding. New bedding can be made up from materials such as cow manure, a little soil, vegetable and food scraps, tea bags, coffee grounds, cardboard and paper strips, weeds and lawn cuttings. Don't overdo it with lawn cuttings though, they can 'sour' the mix. Composting worms will eat almost anything that was once

alive, and prefer a variety just like we do. Keep the system covered with the lid or something like carpet underfelt or hessian cloth. The worms will gradually move from the middle tray to the top (feeding) tray in the search for food. Make sure that the top tray sits firmly on the surface of the bedding in the middle tray so the worms can move freely through the perforations into the new feeding tray above.

Commence feeding worms in a new system slowly for about a week, this gives the worms time to adapt to their new environment. Other foods worms like are crushed egg shells, avocado skin, poultry pellets and even dog manure, but make sure the dog has not been recently wormed. Avoid adding meat products, citrus and onion scraps as these may produce offensive smells, attract pests and are not favoured by the worms anyway.

**Note:** It is important manure is not added from an animal that has been drenched for parasitic worms in the last two weeks. Also, because of its high ammonia content when fresh, poultry manure should be well-aged before incorporation.

### Maintenance

As a rough guide, 1 kg of worms (3000 to 5000 individuals) need 3 to 4 kg of food per week. Do not over-feed the worms. You will know when you are if the food is constantly uneaten and the mix 'sours' or seems too soggy, it may also start to smell rancid. A good bed should be damp, not wet, and should smell nice and earthy. A freshly fed bed has a lumpy irregular surface. When the lumps disappear and the surface becomes smooth, this confirms the worms are eating the food and are ready for more. As the worm population grows they will start eating more food and here's a tip—worms don't have teeth so they will eat a lot easier if the scraps are finely chopped. Digging their food under slightly with a small garden fork makes it more accessible to them also, because worms detest the light.

Keep the pH of the bedding about neutral (pH 7). If it is too acid (pH 5 or less), light sprinklings of



*Addition of straw improves aeration and drainage*



*Home made worm farm*

lime or dolomite will help to neutralise it. Worms are often pale-coloured in acid beds. Unsuitable alkalinity (pH 9 or more) may be corrected by adding peat moss and shredded newspaper. pH testing kits are readily available and worth the investment because apart from testing your worm farm bedding, they are useful for a variety of other garden or water testing duties. Many gardeners underestimate the importance of correct soil pH, and how an inappropriate pH can cause a variety of garden ailments.

Check the texture of the contents in the top tray (bedding) from time to time.

The ideal bedding should be:

- able to retain moisture
- well drained
- of neutral pH (6 – 8)
- fairly light and crumbly.

Food scraps will generally keep the system moistened, but you need to check for dryness at least once a week, especially in warmer months. If the bedding seems too dry, you will need to water it. A handful of bedding, squeezed with a strong hand, should produce a drop or two of moisture. Don't over water the system because excess water will displace the oxygen in the bed and worms need plenty of oxygen. If the worm farm bedding does become sludgy, mix in some handfuls of straw or strips of newspaper. It is also a good idea to aerate and turn the bedding carefully, about every two weeks with a light fork. Contrary to folklore, worms do not survive a shovel wound well—if they are cut in half they will probably perish, not become two.

Under ideal conditions, the numbers of some worm species can reach 5000 individuals in only the space of a large bucket, and they may double their collective weight each month if given enough elbow room.

When the worms reach large numbers or the tray is full with worm-casts, stop adding food. After two weeks of non-feeding, swap the trays so the feeding tray with the worms is now the middle tray. Collect the previous middle trays' contents



*Ferment fly*



*Reticulated slugs at right*

for use in the garden. Refill this tray with new bedding (to attract the worms) and place on top. Again, make sure the top tray sits firmly on the surface of the bedding in the middle tray so the worms can migrate upwards freely.

If using a non-stacking or a homemade tub-styled worm farm you can dry the bedding off by not watering, forcing the worms down to the moister mix below. The castings on top can then be skimmed off for use in the garden. New bedding should then be added and carefully turned through with a fork.

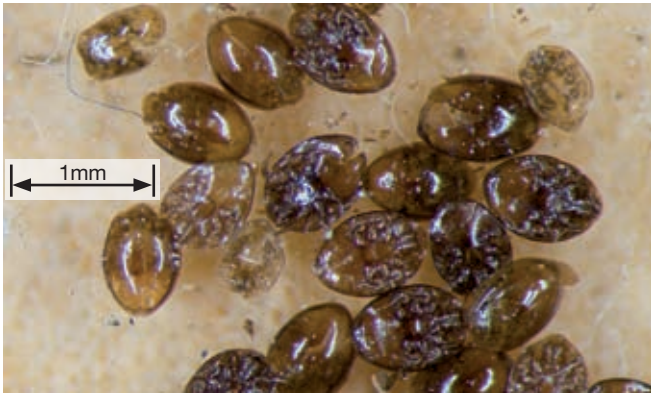
When using the worm-casts in your garden, you usually find that some worms have remained in the mix. These can be incorporated into the garden beds and will help improve soil structure.

### Use of worm-casts and leachate

The worm-casts (also called vermicasts) are very rich in organic nutrients including nitrogen, minerals and soil beneficial microbes and enzymes. The term vermicompost is used for vermicasts that also contain some uneaten worm food (scraps), and is also more likely to contain egg capsules and immature worms. Incorporating a handful of worm-casts or vermicompost into the soil at the base of a plant will provide the plant a nutrient rich mix with superior water holding capabilities, especially if it contains some little worms! Worm-casts can also be used to enrich potting mixes or poorer soils. Mixing about 25%



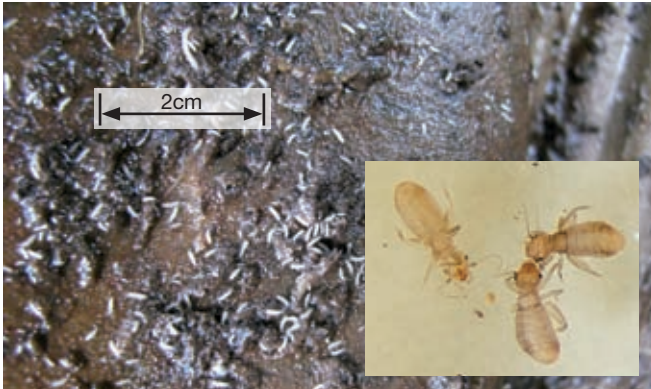
*Wet worm farm with small white worms present*



*Oribatid mites*



*Soldier fly larvae*



*Psocids (inset: magnified)*



*Small white worms*

of quality worm-casts to the soil will improve the nutrient and water holding capacity of the soil and provide sufficient nutrition for about 6 months of healthy plant growth.

Leachate is the liquid that has passed through the worm farm system and been collected at the bottom. This can be applied as a powerful fertiliser to plants using a watering can. Dilute this 1 part leachate to 9 parts water or thereabouts. As well as leachate, a powerful liquid fertiliser can be created by mixing worm-casts with water at a rate of about 20%, shaking vigorously and leaving to soak. This mixture should be shaken again after a day and allowed to settle before the liquid is drained off and used in the garden.

### Other organisms in the worm farm

Snails, slugs, ants, cockroaches and slaters may be present in your worm farm. They generally don't interfere with the worms, but you should bury the food scraps to discourage them.

Ferment flies (small flying insects), oribatid mites and psocids (book lice) can occur when the bedding is overfed, too damp or acidic. Reduce feeding, water less or apply sprinklings of dolomite or lime to reduce the acidity.

If you see little worms in your worm farm, they could either be young composting worms, nematodes or entrachyadids.

Young composting worms are translucent white at birth and look like threads of cotton just a few millimetres long. Within a few days, however, they begin changing into their characteristic red-brown colour and are entirely self sufficient from birth. Entrachyadids and nematodes are little white non-segmented worms and are harmless, but they may indicate acidic conditions.

If large maggots are seen in your worm farm, these may be soldier fly larvae. Don't be alarmed if they appear as they too are beneficial to waste breakdown, but can be controlled by reducing the acidity.

### Specimen identification requirements

When sending or delivering samples, the following information is required:

- Collector's name, location (where the specimen was found), full address, telephone number and e-mail address, description of the damage and date collected.

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