

A Guide to Composting with Worms

Common Worm Species

Eisenia fetida: Pronounced “iSEEnee a FETid a”, is one of the worms that can process a large amount of organic material in their natural environment. They tolerate large temperature, moisture and pH ranges and can also tolerate being handled.

Eisenia andrei is closely related to the *Eisenia fetida* and is known as the “red tiger”. This worm performs as well as the *E.fetida*, and it does not hurt to have a combination of both worms in your bin.

Lumbricus rubellus is another worm that can be used for composting. Some consider *L.rubellus* to be the true red worm. It is also called the dung worm, or red marsh worm. This worm loves manure and compost piles but has also been found working the earth which makes it doubly effective as the two other composting worm varieties, stay mostly at the surface of the soil under the mulch.

These 3 species are part of the 20 earth worm families on planet earth which includes over 6000 species. Global research continues into these amazing creatures, which means species and families will continue to evolve.

Bedding Materials

Worms, like you and me, need both protein and carbohydrates to get a balanced diet. Carbohydrates for worms come from carbon-based bedding materials. To reduce the environmental footprint, try to choose a local material that is a waste product instead of buying something from far away. These can include:

The smaller the pieces the better!

- non-coloured, non-glossy newsprint
- coconut fibre for those living close to the tropics
- shredded office paper
- colourless, gloss-less cardboard
- unbleached paper towel that has been used to wipe counters without chemicals
- toilet paper rolls
- Animal manure (free of antibiotics and worming agents)
- moist straw
- brown leaves
- brown grass clippings

Environmental Conditions

Composting worms originate from warmer parts of the globe, typically in wet regions. They have evolved to stay above the soil where it is moist, but not too wet. Most of these worms are litter eaters, not soil workers, so it is important to provide them with a moist bed of litter and food. It is actually the microbes on the organic matter that these worms want! When choosing your worm farm, it must be impossible to drown the worms, so the design must allow for worms to breathe and drain liquid freely.

The worms respire through their skin which is most effective when their skin is moist. The worm's body is comprised of about 75% water, and therefore if you keep their bedding at the same moisture level, they won't have to work as hard to breathe, eat, or process their food. 75% moisture feels like water running out between your fingers when you squeeze a handful of bedding.

These are the conditions that compost worms thrive in.

- Temperature: 15 – 25 C
- Moisture: 75%
- pH: 6.5 to 7.0 • An aerobic environment, i.e., lots of oxygen.

How Much do They Eat?

This depends on climatic conditions, summer to winter and humidity is important. These worms will eat about **30 per cent of their bodyweight a day** during the warmer months. As your worm population increases, the amount of food you feed them will increase as well! Put into perspective, 1000 worms weigh approximately 250 grams.

What not to feed Worms!

Processed foods, dairy products, cheese, bread, pasta, meat, avocado, chilli, citrus, pineapple, rice, pawpaw, vinegars, any type of oils, left over cooking grease, tomatoes, salt, onions or garlic. All of this can be composted or fed to Black Solider Fly Larvae (BSF) [Contact Us](#) to discuss how to attract BSF!

What do they produce?

Worms produce the most amazing soil amendment for the garden and grass pastures or lawns!

Worm castings is one of the most valuable products that you can introduce into your soil! It is like probiotic yogurt for your plants! Castings are loaded with beneficial microorganisms (see below) which build fertility in the soil continuously. They are very high in organic matter (also known as OM and soil carbon) and humates which are both extremely important to plant and soil health.

A recent research project showed worm castings improved tomato yield by 74% while increasing vitamin C content by 47% and soluble sugar by 71%. Now that is a healthy pest and disease resistant plant!

Worm castings are an amazing resource that are loaded with billions of beneficial organisms and elements to create healthy soil and plants! Worm farms also produce worm juice or Leachate which is the run off from your worm farm. **This liquid has no Micro-organisms to keep your plants healthy!** While it has some minerals, this is not enough to maintain healthy living soil. Reuse this liquid back over the blanket covering the bedding to maintain optimum moisture for your worms and microbes. Making a “Worm Extract Liquid” is by far the best method of using worm castings, follow the link below to learn how to make your own WEL! (worm extract liquid)

Download our; [How to Use worm castings](#)

WARNING!!!

The Sex Life of Worms



Figure 17. Worms are hermaphroditic.

Illustration 1: from Worms Eat My Garbage by Mary Appelhof

These little composters are Hermaphrodites (produces both male and female gametes) and are quite promiscuous. According to Mary Appelhof, author of *Worms Eat My Garbage*, 8 of these worms can reproduce into 680 grams in as little as 6 months. If you extrapolate that, 1000 worms can reproduce into about 80kg of worms in as little as 6 months if you have enough space and the right conditions.

Worms reproduce by rubbing up against each other, exchanging sperm which allows them to produce cocoons. These cocoons can contain as many as 3-4 eggs each and can hatch anywhere from 3 weeks to 6 months depending on conditions.

Since worms reproduce based on the presence of the right conditions, if there is no new food or bedding, the population is too high, or the whole bin is full of only their castings, they won't reproduce. You must keep them moist!

Because the amount of breeding these worms do is based on the proximity of other worms (the closer they are, the more bumping into each other they do), a smaller bin will encourage more breeding. If your goal is breeding, you could run a small bin to encourage the worms to reproduce, harvest the cocoons and transplant them into new bedding material.

Sizing Your Worm Bed & Buying the Right Amount of Worms

To size your worm bin, you need to know how much food in the right ratios you are going to produce per day. Knowing their eating capacity from the above equation.

You don't want to start with a farm full of worms! You want them to breed up to fill the farm! 500 worms are enough for small farms like "worm café" and other suburban home systems.

1000 worms (250 grams) for any containers approximately 200 litres. Biolytic type septic systems can be refreshed with as little as 1000 to 2000 worms.

If the bedding is too deep, the bottom can turn anaerobic (low oxygen) which is not where beneficial microbes or worms want to be. This is why the 3-tray system is recognised as the most efficient worm farm system.

Amendments:

Availability of minerals in the soil is determined by the life in the soil. It is the soil life that facilitates trading of minerals with exudates (plant-produced sugars) from plants. If the specific microorganism that makes a specific mineral is not available, it has the same effect as not having the mineral available in the soil at all. As the worm system is a "probiotic" system, we can mineralize the castings by adding supplements to the system. The only option is to add natural supplements that have multiple benefits. Because worms have gizzards, instead of teeth, they need to have some grit to help them break down their food, much the same as chooks. We add

[Soil and Worm Farm Booster](#) once a month. The equivalent total of 50 grams to every square metre of bedding surface will provide the grit for their digestive system and minerals to boost the castings efficacy, this also helps balance the pH. This

approach provides a healthy balance of minerals for all organisms to consume, which will make your castings the perfect food for your soil.

How to Add Food:

When you start your worm system, it is good to start slow. It is easy to overload the system if you are not used to it. Also, worms are only one of the many creatures that make the process work, and it takes time for these other creatures to start working as well. If you have 250 grams of worms, add a handful of food every few days for a few weeks. Monitor the food on a regular basis to see how quickly it is being decomposed and being consumed. If it is building up and starting to smell, stop adding food until it is gone, or take some out to avoid bad smells, mould and fly problems!

When adding kitchen scraps as they have been sliced, pull some of the bedding aside and bury the food underneath. If you have no castings, make sure you can cover the food with damp bedding material. Another technique is to mix the food scraps with damp bedding and wrap it in newspaper. Place this food gift into the compost bin and cover with more bedding. If you don't cover your food with castings and bedding, you can end up with problems as described above. Best method is to keep a cover blanket moist which flies or rats cannot get under!

Harvesting Castings:

From the day you start a 3-tray system, it will take up to 6 months before the first tray is ready to harvest. After that, approximately every 2 months the bottom tray will be ready to harvest. The smaller the worm farm, the sooner the bottom tray will be ready. Once the top tray is full of bedding that looks almost like pure castings to the ledge where the next tray sits, it is time to stop feeding. Wait 2 to 4 weeks then take a scraping off the top of the bedding in the top tray. Save this in a bucket to add to the new top tray. Remove the middle tray and harvest castings from the bottom tray. Clean this tray before replacing back on top as the top tray. add a small amount of food, wet that in and cover with a wet porous cover blanket. Enticing the worms up into the new tray can be achieved by adding some mill-run mix, bran or wheat germ with their normal food to the new tray before wetting in.

If you do not have a worm tower, here are some options. Remove the castings onto a plastic sheet and make fist sized piles. Make sure that the room where you harvest the castings is well lit. Worms hate light, so they will go to the centre of the pile to avoid it. Leave the piles out for 30 minutes to an hour and then start peeling the piles back until you reach the worms. Put the worms back into your worm farm.

Feed some mill-run mix or bran in one corner of the area. Wait a couple of days until you see a mass of worms in that space. Then harvest castings from the opposite end of the farm. You will never get castings out without some worms in it!

Worm farm predators: Keep an eye out for hollow trails through the bedding, this is a sign you have **CRICKETS** in your worm farm, and they eat worms so find them and feed them to your chickens or Kookaburra's! another predator is **RATS**. Make sure they cannot get into the worm farm. Strap a lid on firmly! A night time predator of earthworms is the Australian **BANDICOOTS** are omnivores, they can't climb, so watch out for them in your garden! Python snakes will keep rodents to a minimum, so it's good to have them around. **ANTS** will nest in the bedding and destroy your worm population and feed. Avoid this silent hidden invertebrate by placing legs of the worm farm in water containers.

Worm farm Beneficials:

Springtails are a sign of a healthy ecosystem which your worm farm will become in time. They come in a variety of sizes and colours.

Using the iNaturalistAU website is much easier and more detailed than the smart phone App. Simply type in at the search box what you are looking for.

Huntsman Spiders will keep the cockroaches and other predatory insects under control. **Pythons** will do the same with any worm eating rodents.

Adding compost worms to your garden:

If you must, remembering they live just under the mulch and only a few centimetres into the soil. They will go in and out of a standing PVC pipe (90 to 150mm diameter) on its end. Drill a series of 5mm holes all around the top section. Bury at least $\frac{3}{4}$ of the pipe, then start adding kitchen scraps in the pipe with some compost worms, place a cap on top. You can continue to feed the worms as described earlier, simply add the feed from the top of the pipe and replace the cap each time. If you blitz kitchen scraps in a coffee grinder after adding a little water, the worms will find it much easier to consume the food. This method will allow the worms to go out into your garden soil, leave their castings for the plants to enjoy and you don't harvest anything except nutritious food or look at beautiful full flowers. If a bandicoot finds your worm towers, you may have to fence it out!

Troubleshooting:

Fly problem

If you end up with a ton of fruit flies emerging from your system there are a few things you can do to remedy the situation.

1. Bury your kitchen scraps under bedding and castings. The deeper you bury them, the less likely the flies are to lay eggs.
2. try adding animal manure on top of the kitchen scraps and cover with a moist porous mat. We use upholstery felting, and can cut a cover mat to size for you.
3. "Gift" wrap your food scraps in newspaper for your worms after soaking in water for a while.
4. Add lots of moist bedding on top of your worms
5. Get a small dish and add apple cider vinegar with a drop of dish soap. Place this near the compost bin to trap the flies. Or ask us how to make a fly trap.

Odour Problem

An odour problem is your worm's way of saying, "There's too much green food". Stop feeding your worms green material (nitrogen) and add some brown (carbon). It should smell like rain forest earth. Keep moist and wait for the food to be consumed before feeding again. Keeping the brown and green materials at a ratio of about 3:1 will help avoid these problems.

Worm Resources

This information came from a number of resources over many years of research, a big thankyou to the unknown names who contributed.

Books:

- Worms Eat My Garbage, Mary Appelhof
- The Worm Book: The Complete Guide to Gardening and Composting with Worms, Nancarrow, Loren

Websites:

Please!!!! Just follow this guide, then if you have issues we can actually help.

Beneficial Insects:

<http://www.natural-insect-control.com/index.php>

For more information or answers to your questions, contact:

Phone: 0418 750 070 – Scott Robinson

email: scott@polyculture.com.au

The Soil School details:

Social Media (educational content)



Downloads: <https://polyculture.com.au/soil-services/>

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