THE LITTLE
WORM FARM

WORM BIN

Setup & Maintenance

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Introduction

This document aims to provide an easy but safe way (for the worms) to setup and maintain a new worm bin. It is not a comprehensive guide to worm farming, however some links to external resources can be found on the last page.

Setting up the first worm bin has always been a exciting but daunting task for the new worm farmer. "What should I start with?", "Can I use this materials?", "Will my worms like it or will they try to escape?". This guide will try to take you through easy steps of setting up your worm bin and help the worms settling down as fast as possible and showing you how to keep your wiggly friends happy long term.

Feel free to share this document if you think it might help someone. However please do no modify any part of it and be aware that photos are my copyrighted content.

If you have any questions, I'm happy to help wherever possible. Communications channels are available on the following places:

- My website: https://thelittlewormfarm.com/

- My Facebook page: https://facebook.com/TheLittleWormFarmer

- Email: contact@thelittlewormfarm.com

I also have a newsletter where I share some tutorials, content and mini experiments that I either keep exclusive or will public share at a much later date. If you wish to subscribe, please head to: https://thelittlewormfarm.com/newsletter/

Worm packages

Before getting into the technical details on how to setup a bin, I just wanted to quickly go through how worms are usually packaged in. This will influence the way you will get your bin ready for them.

Worms by count or by weight

Traditionally, worms are sold by the weight or individual count. An unnatural high density of worms is being packed up with a relatively small amount of sterile bedding material (shredded cardboard, peat moss), worms need an ecosystem of microorganisms in order to stay healthy. Add to this the stress of travel and environmental change and their chance of survival can be reduced.

The cons of counting or weighing worms is that it's tedious and most of the time the process is actually an estimate. Not a lot of big worm seller will sit down and count 1000 worms for each package. As for weighting, it is more accurate but as worms stress out during transport they also dehydrate and loose weight. Some sellers might also just count or weight the worms once and estimate following packages by volume. A good seller would add extra amount to compensate.

Worm mixes

The term "mixes" here does not refer to a mix of worm species but more to the mix of material and organisms that comes in the package. Worm mixes are a different concept, instead of extracting the worms to weigh or count them, the seller will just scoop out or split a breeding tray or bin and sell the whole mixture of worms, babies, cocoons, castings , bedding material, food particles and most importantly the micro fauna.

This has the advantage of keeping the worms in an environment they are used to and reduce their stress during transport and transfer to their new home. They will, thus, settle and thrive faster.

The cons is you don't know how many worms you have and they might be of various sizes. But this is not really important because the material is so well balanced that the worms, babies and cocoons present in it will thrive and develop very quickly. Red Wigglers cocoons

can contain between 1 and 4 baby worms depending on the specie, the cocoons can survive harsh conditions and offsprings have better adaptability skills than the mature worms. If anything goes wrong with the mature worms, the cocoons will survive and replace the lost population.

Worm mixes can contain one or more types of compost worms. In Australia it is very common to find mixes of different species of worms, they will mostly be Eisenia Fetida (Red Wigglers) and Perionyx Excavatus (Blue Indian worms). Those are two different species that require different environmental conditions. Red Wigglers prefer cooler temperatures while Blue Indian worms prefer hotter temperature so a mix of species will perform better throughout the year in our weather.

If you want to learn more about the worm mixes I'm supplying, have a look at my other free guide "Worm Starter Mix" which can be downloaded here:

https://thelittlewormfarm.com/worm-starter-mix

Starting a new worm farm

In this chapter we will go through the process of choosing a location where to install your worm bin and making a bedding mix prior to adding the worms and the food scraps.

INSTALLATION OF YOUR WORM BIN

If you have bought a commercial worm farm you can follow the instructions on how to assemble it, then ignore all the rest. Do not throw the manual away as we will have a great use for it as we go to the next chapter. You can also skip to "Preparation of the bedding".

If you have built your own worm bin, then take the following steps to make sure it is suitable to host your worms for long term.

DIY worm farm checklist

First, congratulations on successfully building your worm farm! Just to make sure it is all good and reduce chances of having issues in the future here is a list of points to be checked:

Aeration

Even though worms don't have nose they do breathe through their skin and need oxygen to live, additionally vermicomposting is an aerobic process (that requires oxygen) and does involve microorganisms that also breathe oxygen. Thus, having a properly ventilated bin is critical for bringing in that precious gas and evacuate the nasty ones that are generated during the composting process. Drilling small holes on the lid and the side of your bin, most of the time, won't be sufficient. For best performance, you'd better cut out a large section from the lid and/or the sides and cover it with a fly screen. This will allow a much better airflow while still preventing access to most critters.

The lack of aeration is one of the three most common mistake done by a new worm farmer.

Drainage

With time, the food scraps you will be adding to the worm bin will break down and release a lot of moisture that will gradually leach down the bottom of your bin. Too much water sitting for a long time will prevent oxygen from reaching inside the wet block, this anaerobic block will start developing bad bacteria and will be smelling foul and you really don't want this to happen.

So unless you are are good at moisture control, it is highly recommended to have a liquid collection tray underneath your active tray (where your worms live and where you feed them). That collection tray would have a drainage whole and if your bin is indoor you could install a spigot to allow regular emptying of the collection tray. The liquid from the collection tray is called leachate (commonly and wrongly called worm tea or worm wee), we will go into details later on. Later on, as you will improve your kills, the tap can be left open to provide extra air input.

Stability

It would be frustrating if after several months of successful operation to one day find your bin on its side and all the content on the ground. Make sure the construction is sturdy and if the bin have legs then make sure they are strong enough because a worm bin full of moist finished vermicompost can weigh a lot. Also, is the material you chose is suitable for long term contact with a moist environment?

Contact

If you have constructed a multiple stacking tray system then make sure the trays are not just sitting on top of one another. It is important that each tray can partially slide inside the tray below it, this is because you want the bedding in one full tray to be in constant contact with the base of the tray above. The reason being worms, even though they can, don't like climbing walls and ceilings and a gap would prevent them from migrating upwards towards the new empty tray above.

Lid

A lid is useful to create obscurity for the worms as they don't like light. It is also none way of preventing the worms from escaping the bin. They can also help invasion by other critters such as flies.

However it is actually not required.

The worms usually try to escape a worm bin if they are stress (after shipping from their original farm for example) or if something went wrong in their bedding (too much food that

creates heat, acidity etc...) or if they lack of oxygen. So a better way to make sure the worms are happy is to provide them with enough air and make sure you don't overfeed and adopt best practices (not watering, adding a lot of bedding material at each feeding etc...).

If the bin needs protection from external critters, it can also be replaced by a sheet of fly screen or geofabric held in place with bungee cords. Those materials are breathable so will provide better aeration than a solid lid.

Choosing where to install the worm bin

Your worm bin can be installed indoor, the worms will actually appreciate the stable ambiant temperature of our homes. However make sure the place needs to be well ventilated (so under a kitchen sink is not ideal) and away from any unexpected heat wave (such as on a balcony or behind a window that might receive a lot of sun). A laundry room or garage (if it does not get too hot during the summer) can do. Some people have installed their worm farm in their bathroom or in a corner of their living room. If you have the chance to have a basement, then this could also be a great location for a worm farm. Well maintained, a worm farm should not smell bad but rather have a nice earthly smell just like when you walk into the wood.

A worm farm will do perfectly well outdoors (most of mine are outdoor) as long as you can find a place that is constantly in the shade or only receive a very short time under the early morning or late afternoon sun: under a pergola, a tree, a coop house etc...

Extremely high and low temperatures can kill the worms. Even couple of hours in direct mid-day sunlight during winter might still be fatal.

Stacking tray vs single compartment bins

With single compartment bins such as a simple Rubbermaid style container, it is easy as you just use that directly. However with stacking bins you usually have the base that is on legs, it is called the collection tray. Its purpose is to collect the leachate, which is the excess moisture that comes from the feeding (top) tray and leaches all the way down to the bottom. Depending on the model you have bought, there could be two or more extra trays with holes in the bottom, those are your active trays, one of them will be the feeding tray sitting at the top of the stack and the others will contain the vermicompost/castings that will sit for maturation. Start by adding one active tray on top of the collection tray and prepare a bedding for it.

Preparation of the bedding

Now that you have chosen a location and installed your worm farm, the next step is to prepare a bedding for your wiggly friends.

What is a bedding?

The bedding is where your worm will be living when they are not eating the food scraps. It is a safe place for them to retreat to, away from the layer of food that can heat up and become acidic. Even if you made a big mistake, on occasion, the presence of a good layer of bedding will save your worms from certain death. This is one of the most important part of your worm bin and also one of the three most common beginners issue.

Why do you need to add bedding materials?

Most people think they only need to add the worms and then throw food scraps in the bin and it's job done. A worm bin is not a garbage bin! While this may work for some, it is also a great way to kill all your worms at once, especially in a small enclosed system such as a domestic worm bin. If you've ever run a regular compost or have piled up grass clippings you would know how hot the compost or grass pile can get. Throwing heaps of scraps in the bin will heat up, release too much moisture, ferment, become acidic, release gas and smell and sooner or later kill the worms or repel them.

Food scraps are, in composting terms, called "green" materials. They are rich in nitrogen (N) and feed the bacteria. The bedding is made of "brown" materials rich in carbon (C). Just like with traditional composting, a good C:N ration is critical to a good performance. Bulky and moisture retaining material are preferred such as cardboard, egg boxes or newspaper. The bulkiness will increase airflow and a good moisture level is important.

A good layer of bedding is important, so if you've accidentally added too much food scraps, the worms have somewhere safe to retreat to. In the summer time the worms will also dive down into the cooler bedding to avoid the heat on the surface that has been made worse by the presence of fresh food waste. With time, the bedding material will break down and become worm food, this is especially useful if you need to go on holiday for an extended period of time.

So you should start with 6 to 30 cm of bedding material depending on the depth of your bin and remember that this material will start breaking down and drop in volume in couple of weeks. I usually go for half the effective depth of a tray full of initial bedding.

What material can be used as bedding?

To make your bedding you can use one or more types of bedding material, they need to be carbon rich materials ("browns" such as dry leaves, paper etc..).

I highly recommend using cardboard, egg boxes and newspaper because they can be easily obtained and you are recycling more materials. If you have a paper shredder that can handle cardboard (10 sheets of paper) then you can use it but hand tearing them into palm-sized pieces is all you really need.

Some people also use aged grass clippings, horse manure, coco coir, peat moss etc... but there can be risks associated to grass clippings and horse manure; coco coir and peat moss can be expensive and the production of peat moss is not sustainable. Corrugated cardboard, newspaper and egg boxes can be obtained for free and are excellent materials.

How to use the bedding material?

For creating your initial layer of bedding, first wet down or soak the material for a moment and then squeeze all the water out of it so it is just moist with couple of drops coming out. Then add the bedding material directly to the tray, you can first add a layer of newspaper sheets if the bedding material is so fine it could go through the holes of the tray. Fill the tray up to half way or at most 30 cm thickness. When setting up with a worm mix, you can reduce the amount of bedding material because the mix already contains the bedding from the original bin.

When feeding the worms, use the same quantity of dry bedding material under the food scraps, this bedding material will absorb excess moisture leaching from the decomposing scraps. Cover the fresh scraps with more bedding materials to restrict access from the flies to the scraps.

Adding the worms

Once the bedding material has been added to the worm farm you can now safely add the worms and a bit of food scraps. If you have access to some finished compost or vermicompost, aged grass clippings or partially composted fall leaves, you can add a handful to inoculate with beneficial bacterias.

A worm mix is coming with a lot of existing bedding material which reduce stress on the worms when being added to a new worm farm. It also comes with a healthy population of micro-organisms so you don't need to add anything else to inoculate your new bin. If you

have bought a worm mix then just empty the package on top of the bedding you have prepared and you are ready to go.

Start with a handful of food scraps deposited in a corner of the bin and wait until the following week before adding more if it has all gone. From there on follow the feeding method as described in the next chapter.

Feeding the worms

What to feed the worms?

Your compost worms will love common kitchen scraps: fruits and veggies. You can feed them virtually anything that is a fruit or veggie but you should avoid these:

- rice, pasta, bread, oat, wheat, chicken feed are to be avoided or only in very small amount to avoid heat and other issues
- meat/dairy products: causes many issues onion, tomato, citrus: contains elements worms won't appreciate
- pineapple, papaya/pawpaw: is said contains meat tenderising enzymes that can harm the worms but I personally haven't had any issues with them when added with other food scraps
- pet manure: special treatment needs to be done first for health issues
- other animal manure: can be used but only if you know what you are doing

How often, how much and where to feed the worms?

Feed once a week an amount of food equal to the weight of worms you have. At each feeding, feed one half of the surface area at max, then the following week feed the other half and come back.

When you come back to a previously fed area, verify that the previous food has almost gone before feeding again:

- if there is still a lot left, wait until it is almost gone and feed again in smaller quantity
- if there is none left, feed again an increase the amount by a little bit.

As time goes, your worms will breed and their population will increase, the feeding method described above will allow you to dynamically adjust your feeding to your worm population. By feeding half of the surface area of the time, there is always a safe area for the worms to retreat to if there is something wrong with the fresh food scraps. At one point you will see

your food scraps from a previous feeding has totally disappear, add more food next time. This amount will increase until the max population for your bin has been reached.

How to add the food scraps?

Dig a little whole in the current bedding and put the material aside. Put some dry bedding material in the hole, apply a little bit of the worm farm conditioner, add the food scraps on top of the bedding material, cover the food with the material you put aside earlier, cover with more bedding material.

This will help controlling odour and keep most of other critters at bay.

Other feeding methods

There are other feeding methods and some people don't even add bedding material at all in order to maximise the amount of food waste they can compost a one time. However, I find this method, which is also called pocket feeding, much safer.

Maintenance of a worm bin

Environment Control

The worm farm is a living environment that hosts a plethora of composting micro-organisms (worms, bacteria and various beneficial little insects). It is important to keep this environment in good shape to keep those micro-organisms happy.

Air/Oxygen

Vermicomposting is an aerobic process, it requires oxygen to work properly. All beneficial organisms in a worm farm live on oxygen and require a balanced moisture and temperature level.

You need to ensure your worm farm is installed in a well ventilated area and that the bin allows a good air flow.

Moisture

Worms don't have a nose, they breathe through their skin and require it to be kept moist in order to allow oxygen absorption. This is why we need to keep our worm bin moist. However, excess of moisture can be bad as water will prevent oxygen from circulating freely in the bedding and will create anaerobic pockets which might generate a lot of issues later on.

Your bedding/vermicompost should be moist but not wet. If you squeeze a handful of bedding, there should only be one or two drops of water coming out of it. It should feel like a moist sponge. Another test of the vermicompost is to take a handful and squeeze it, if it stays in a block and is easily broken down by a gentle pressure from the thumb then the moisture is ideal. If it does not stay, it's too wet. If it does not break down easily or is muddy then it's too wet.

The tap on the collection tray is not there to create juice. It is there to fix moisture imbalance in the worm farm. I advise to leave the tap open all the time to let the water evacuate, it will also let air come in from the bottom. Just place a bucket or other container to collect that leachate and dump it. The best would be adding enough dry bedding material so that no leachate is generated.

DO NOT water down your worm farm! This is bad practice made popular on the Internet. Even some manufacturer recommend doing it on a weekly basis to generate some worm juice/worm tea/worm wee. This is NOT good. Not only it takes away the good stuffs from your vermicompost but it can also create anaerobic pockets as described earlier, later on when you try to harvest the vermicompost, it will be muddy and will become rock hard when dried on top of your garden soil. Even in summer, don't water in an attempt to cool the worms down, water is better heat conductor than the bedding or vermicompost and you might end up with the opposite effect.

Instead of watering, use a sprayer to moisten the surface if it is too dry you want to cool it down a bit. If it is too wet, then add more dry food scraps or add more dry bedding material.

Temperature

In our Australian climates, compost worms should do fine even in winter because it does not freeze. However in summer it can get very hot, so keeping the worm farm in a shaded area is very important.

If you get more than two days over 38C:

- Leave the lid open during the day and cover back at night if you want. Slow down on the feeding or stop it all together, fresh food scraps will heat up and add to the current ambient heat.
- DO NOT pour water, as water is heat conductive, spray lightly if needed.
- Remove the blanket.
- You can freeze a bottle of water and put the bottle in the top tray. DO NOT add ice cubes as they will melt and over-wet the bin.
- You can also add extra trays filled with moist bedding material below the feeding tray, the worms will be able to go down to find a bit of coolness as long as there is contact between the base of the tray and the bedding of the tray below.

pH / Acidity

If you have followed the feeding method and are adding enough bedding material, then you should not need to worry much about pH. However it is a good safety practice to add some pH buffer in order to automatically fix any acidity issues related to overfeeding. A pH buffer is a material that remains neutral in a pH neutral environment, but as soon as the pH decreases (acidity increases) the buffer material will react with the acidic material to neutralise it.

The pH buffer used in worm farming is Calcium, more accurately Calcium Carbonate ($CaCO_3$), it is available in several forms: egg shells, oyster shells, garden lime, dolomitic lime etc... Egg shells can be finely ground to create a powder. Oyster shells can be found as oyster shell flour. The garden lime and dolomitic lime can be bought cheap in hardware stores or garden centres. In Australia you can find 10 kg bags of garden lime for just $12 and the bag will probably last you forever or at least several years.

When setting up a new bin, add two handfuls to the initial bedding, later on add few pinches or use a shaker bottle and shake over the bedding before adding the food scraps. It is like adding salt and pepper to a dish.

Light

They don't have eyes but worms are sensitive to light, they sense light via photosensitive cells on their skin. They generally void light and a long exposure to direct sunlight will be fatal. You will notice that every time you remove the lid, they will start moving and bury themselves inside the bedding.

For happy worms, provide them obscurity by installing your bin in a shaded area. If you have chosen to not use a lid for better aeration, then use a worm blanket or a sheet of newspaper or cardboard to cover the surface.

At night if you want to spy on the worms, you could use a red light to shine on them as they cannot sense that colour. That is how I caught them on film here:

https://youtu.be/21Rm0diIJVo

Privacy

Worms are not pets, even if we would like to, most of the time they actually don't even need you, you could be gone for two months without feeding them and they would still be fine when you return.

Worms don't like light and vibrations, so opening the lid and fluffing around (digging into the content to expose the worms) is a disturbance to them. You will notice that every time you open the lid, the worms will stop feeding and start burying themselves down, you have just slowed down thee composting process. Frequent disturbance can also affect the population growth rate. So it is best to limit any disturbance to the once a week feeding time, that that opportunity to check if the moisture is correct both at the surface and a bit deeper.

The less you disturb them, the more time they spend doing what they do best: composting your food scraps.

Adding a new tray

This task obviously only applies to worm bin that are made of stacking trays. Once your first tray is full with the last feeding, wait for a bit more than a week and observe its level. If the level drops down lower than the contact marker then continue feeding until the level seems to stabilise slightly above that marker. The contact marker is usually a line or a protruding bit, it indicates where the base of another tray would stop if you stack it on your current tray. The importance is to maintain a constant contact between the base of the top tray and the content of the bottom tray. This is because worms need that contact to travel between trays.

After adding the new tray, add some more bedding material over the whole surface area and continue feeding as usual.

Harvesting

When the last tray available is full, the level is stable and you cannot feed anymore, it's time to harvest the bottom active tray. This usually takes few months depending on the size of your trays. You will need to unstack all the top trays first.

You will most likely see some worms still wandering in that bottom tray along with baby worms and even cocoons. That's normal and you don't have to remove them from the vermicompost. They will do just fine in your plant pots or in your garden provided the surface is covered with some mulch to keep it moist and protected from direct sunlight.

However if you really want to separate worms and cocoons, the most simple way is the light method. Make one or several pile of vermicompost and shine a light on them from above. Worms hating light will migrate down, you will then brush the castings from the top out and continue until you only have a ball of worms left on the table. For separating the cocoons you will need a hand sifter with a mesh of 1/8 inches (3 - 4mm) or pick out them by hand.

Troubleshooting

There are times where we will encounter issues what ever we do, which is normal. A worm farm is an eco-system, it contains living beings and caring for any living beings is not always an easy task. Here are few things you can do in case of issues.

Bad odour

A well maintained bin should not smell bad, it should have an earthy smell. If your bin smell foul, this is certainly due to a high level of moisture that has created a anaerobic environment and the most common reason for this would be overfeeding. Too much food waste has been added to the bin, the worms have not consumed it fast enough, the food waste has started breaking down, releasing a lot of water, the fermentation process kicked off etc... and bad smell followed.

Remove any excess food scraps, add more dry bedding materials, sprinkle some pH buffer (see previous chapter), mix that into the top couple of inches, stop feeding for a week or two then at next feeding, reduce the amount of food waste and increase the amount of dry bedding material under the food scraps.

Too wet or too dry

A worm bedding/vermicompost should be just moist enough that f you squeeze a handful you can only get couple of drops of water dripping out. Another test is to squeeze a handful, if it stays when you release the pressure but can then be broken down by a little push from the thumb then it's good, If it does not stay in a block this means it is too dry. If it does not break down when you press with the thumb or if it is already a block when you picked it up then it is too wet.

How to fix a wet bedding: mix in more dry bedding material and fluff it gently then at next feeding time, add more dry bedding material under the food scraps.

How to fix a dry bedding: DO NOT WATER the bin. First verify if it is only the surface that is dry or also the bottom. If only the surface is dry then you can simply spray it down. If the bottom is also dry (which is unlikely if you have a plastic stacking system) then at next feeding use moist/wet bedding material under the food scraps.

Worms are climbing walls, under the lid, in the collection tray or escaping

It can happen that worms are wandering around in the bin, they can go all the way up to the lid or all the way down to the collection tray. If there is only a few of them then there is nothing to worry about. However if you see a bunch of them then something is wrong with the bedding and in most case again the cause would be overfeeding which would have lead to one or many of the following cases: high increase in temperature, high amount in moisture and decrease of oxygen, high increase in acidity (decrease in pH), high amount of toxic gases. Fix this with the solution for bad odours above.

Other reasons for a mass exodus can be drastic change in weather conditions or presence of something that generate a lot of vibration (worm farm installed in the laundry and the washing machine goes in fast spinning mode). Move the worm bin into a calmer room.

Some types of worms are also more susceptible to make an exodus for no apparent reason and adding new worms to a new system also have this effect as the worms are stressed from the transport and change in their environment. Remove the lid and shine a light on the bin at night for the first three to four nights, worms don't like the light and wills stay put.

A lot of white bugs have appeared in the bin

A worm bin is a whole eco-system, the worms are not the only actors in the food composting process. First on the scene are non visible (to bare eyes) organisms: the bacteria, they are the one breaking down the food and making it soft enough for the worms. It is only when the food is soft enough that the worms start consuming it.

But bacterias are not the only agent in food decomposition, other critters such as the tiny white, grey or orange springtails are also part of the team. Actually there are more of those beneficial organisms: potworms, rolly pollies, mites etc... They all have a role bin a worm bin, rare are organisms that will harm the worms. Feel free to contact me if you find some suspicious critters and need confirmation.

Conclusion

I hope this little document was helpful to you. It should help you started on the right foot. There are more to know about worm farming but this should be minimum information you need to know. As usual, I'm always happy to answer any questions you have on worm farming so please do not hesitate to contact me, you have my contact details on the introduction page.

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You will find on the next page three totally free other worm farming related guides that will give you additional tips and tricks.

Other Resources

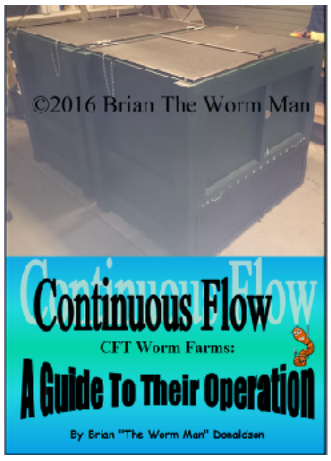
Whether you are a beginner or an experimented worm farmer, the resources listed here can help you get the most of your worm farming systems.

The Free Worm Farming Guide

Free guide by Pauly Piccirillo. For more in-depth info, checkout the Worm Farming Revolution book linked inside. Get it now...

10 Biggest mistakes new worm farmers make

Learn from other's mistakes. Larry J. Shier has compiled a list of very common mistakes and their solutions. Get it now...



Continuous Flow Guide

Brian Donaldson introduces us to the use of Continuous Flow Through (CFT) worm bins. Get it now...