

Worm Composting Basics

University of New Hampshire Cooperative Extension

Worm composting (or vermicomposting) is a natural and efficient way to recycle your organic kitchen scraps. And it sure beats plowing through knee-high snowdrifts to the compost pile in the middle of winter! Worm bins really require very little in the way of maintenance and care. You can keep them anywhere the temperature will not go down to freezing such as a basement, insulated garage or under the kitchen sink. The best temperature range is 55-77 Fahrenheit.

This is a great project to do with kids; it's easy to make compost using worms as long as you have the right container, bedding material and the right worms. And the finished product, consisting mostly of worm castings, can be used with perlite to make a houseplant potting mix, added to planting holes when transplanting seedlings, or simply incorporated into flower or vegetable beds.

You can either make your worm bin yourself or order it from a number of different sources. Common materials for a do-it-yourself project are opaque plastic storage boxes and wooden boxes built from exterior-grade plywood. A basic design would be 1 foot high, 2 feet deep and 3 feet wide with aeration holes in the bottom. Depending on the size of your container, you'll need to drill 8 to 12 holes (1/4-1/2 inch in size) in the bottom. A simple cover can be made from a sheet of black plastic. A cover will help conserve moisture and provide darkness for the worms. A box this size will accommodate about 6 pounds of kitchen scraps a week (the average amount from a family of 4-6). You will need to keep the bin elevated at least an inch off the ground for air circulation. Place a tray underneath to capture excess liquid which can be used as liquid plant fertilizer.

The bottom of your bin will need to be lined with a 2 to 3 inch layer of bedding material. Cellulose-based materials like shredded newspaper, corrugated cardboard or coarse sawdust are best. Tear newspaper or corrugated cardboard into 1 to 2 inch-wide strips. Before putting bedding material into the bin, dampen it with lukewarm water until it has the same moisture content as a wrung-out sponge. Adding a little garden soil or leaf mold to the bedding will provide microorganisms for the composting process and grit for the worms' gizzards. Check your bedding at least once a week to make sure it stays damp. Add water if necessary by misting with a spray bottle.

After spreading the bedding over the bottom of the bin, you're ready to add worms! What worms do you buy? Of the 17 species available in North America, you want red worms or red wigglers. You can buy them at a bait shop or through mail order. You want redworms because they can process large amounts of kitchen scraps, don't mind confined spaces, reproduce well in culture and tolerate a wide range of temperatures. For the bin described above, you'll need about 2 pounds (about \$25-\$35). You'll get between 600 and 1,200 worms per pound. They will be red and from 2 to 4 inches long. Put your worms on top of the bedding and watch them quickly burrow to escape light.

Now comes the fun part, feeding your worms. Put leftover kitchen scraps into the bin: vegetables, fruit rinds and peelings are great. Bread, coffee grounds, cereal, crushed eggshells, pasta or rice and houseplant clippings are also okay. Food should be cut into small pieces and buried in the bedding every few days. By covering food waste with a few inches of bedding, you avoid odors and pests (like fruit flies). Rotating the burial places in the bin will provide your worms with a balanced diet of kitchen scraps and bedding. As with outdoor compost, you want to stay away from meat, bones, oils and dairy products.

After 6 or 8 weeks of feeding the worms, most of the bedding should be gone and a dark, crumbly soil-looking material should be in its place. Now it's time to harvest. Do this by pushing the nearly finished compost to one side of the bin. Put fresh moistened bedding with some fresh garbage in the vacant side. Over the next few weeks the worms will migrate to the new bedding, and you can harvest. Take the finished compost out, and put fresh bedding in, starting the cycle all over again.

On occasion, unpleasant odors may waft from your bin when it is overloaded with food waste. If this occurs, gently stir up the entire contents to allow more air in. Stop adding food waste until the worms and micro-organisms have broken down what is in the bin. If that doesn't solve the problem, check the drainage holes to make sure they are not blocked. Drill more holes if you need to. If the moisture level seems right, the bedding may be too acidic due to a lot of citrus peels and other acidic foods. Adjust by adding a little lime and cutting down on acidic wastes.

Discourage fruit flies by always burying food scraps and not overloading the bin. If flies persist, move the bin to a location where the flies will not be bothersome.

Commercial vermiculture

Considering the worm business? Here are a few hints and cautions. Please read our [Home Vermicomposting](#) article as a preface to this one. Send your worm farming questions to tom@acmewormfarm.com

growing worms

Methods of growing worms are only limited by your imagination. Some growers have their worm bedding in windrows inside or outside a building. If you feed one side of the windrow (making it wider), the worms will eventually migrate out of the original bedding. This will take a while because they will go back and forth as the original bedding continues to decompose, making new food available. This method has the advantage of requiring less start-up cost and being less labor intensive than nonautomated worm bins if you have a tractor to feed the worms and scoop up the castings. It has the disadvantage, though, of requiring more space between the beds. This means that if you have your windrows inside a building, you won't be able to grow as many worms inside. Some growers have their bedding in trenches in the ground. This is cheaper than building a worm bin, but it makes it easy for the worms to run away. It also makes them easier prey for rodents and other animals. Drainage can also be a problem. Some growers have their bedding in bins that have a screen bottom where the castings come out. These can be expensive to build. Other growers use bins made out of plywood, concrete, or concrete blocks. These can be built so that the bottom of the bin is a concrete floor or a concrete slab. Using a raised plywood floor will minimize heat loss to the ground in the winter. If using concrete blocks, they do not necessarily have to be mortared together.

Insulating a bin, of course, will help keep it warm in the winter. Hot water pipes can be run through the beds. Electric heating cables can be used, but this requires quite a large investment. Like any other business, a worm farmer needs to weigh each purchase very carefully. There are some things that will seem like priorities at the time, but will seem like less of a priority later on. Each individual farm has it's own circumstances. You will find yourself needing things that you never even thought of. And you will find that you don't need some things that you thought were a necessity. It takes three to five years for most businesses to break even, and a worm farm is usually not an exception.

You will be able to receive feedstocks for free. Sometimes even the delivery will be free. Manure from most farm animals makes a great feedstock. Be careful with chicken manure, though. It is very "hot." Manure will usually contain some bedding material such as wood shavings. This is a good thing, but try to avoid cedar or redwood shavings. All manure should be aged. Other feedstocks should be mixed about half green and half brown, and should be at least partially composted. If your bins are over a cubic yard, all feedstocks fed during the summer should be completely composted or well aged to prevent heat build up. When you get to the point that you are producing castings for sale, most of your feedstocks need to be hot composted to kill weed seed. Most farm animal manure is full of weed seeds.

marketing

Successful marketing involves finding the right kind of potential buyer. Nurseries specialize in plants and not in soil. You will find a few nurseries, though, that will sell enough bags of worm castings to start getting a few people familiar with your product, and this is a first step. Most of the sales of bagged castings will come from stores like organic food co-ops where you find the customer who is environmentally minded. Organic gardeners are more likely to buy castings in bulk than organic farmers. The organic farmer is just as concerned about cost as the conventional farmer. Even though it takes over two yards of finished compost to make a yard of castings, the farmer still might not think it is cost effective. There are a few who will buy, though. It just takes a little more educating of the buyer. It doesn't take very long before a new worm farmer knows more about worm castings than the crop farmers. Worm castings are a low pressure sell, but it is still a good idea to be armed with information. Ads are a good idea for selling castings, but contacting people directly is even better. You need to get out there and start shaking hands. Before long, you will be known as "The Worm Man" or "The Worm Lady" in your community. Ads might only generate enough business to pay for the ad, but you will get a few lifelong customers, and you will get referrals from these customers. This helps to get the ball rolling.

It is a good idea to find a source of feedstock that is consistent and a large enough supply that you can have castings that are consistent in nutrients. Consistency is probably more important than quality, although quality is still extremely important. Once you have a consistent product, you need to have it tested. Then you will have an idea of what you might be able to add to your feedstock or sprinkle on the beds to help balance nutrients. If you are interested in marketing potting soil, you should be able to come up with a good blend by experimenting with starting seeds and growing potted plants. Pumice is better than perlite and is cheaper. Bone meal is very compatible with worm castings. If you start making enough soil that you are buying large quantities of ingredients, you will be able to resell these as well. This could turn into a branded line of soil products.

Marketing worms is a little different. Occasionally, a composting company decides to add worms to their process. Their business is more vermicomposting than vermiculture. They are more interested in selling castings than worms. Commercial vermicomposting is not another method of composting. It is the addition of another step to the compost process. It is the completion of the compost process where compost is turned into dirt. This dirt is very valuable, but they still need a huge operation to make it feasible. When one of these companies decides to do this, they usually buy so many worms that it takes several growers to supply them. The compost company usually contracts to buy all the worms from one person who acts as a broker. This is usually a worm grower. It's possible to get in on one of these deals if you snoop around, but don't count on it. Another opportunity that comes around every now and then is an institution like a school, hospital, or prison. Every once in a while, one of them will start using worms to process food waste. If you visit a few of these operations and see how they work, it might be possible to sell the idea to other institutions. These are all good possibilities, but it makes sense to hedge your bets. The most important thing you can do is to create a website. It's the cheapest advertising you will ever find as far as the ratio of cost to exposure. Most of your orders will be from home vermicomposters. The demand in this sector of the market is growing fast.

the hype

Beware of the company that makes it sound like worm farming is a surefire way to get rich quick with little effort. Neither are true. There are people making good money at this, but it's because they are good at marketing, not because they bought the magic beans. It's easy to work full time and take care of a hundred pounds of worms at the same time, but it's a different story when they multiply to several thousand pounds. At the point when you need to quit your job, you should have some money saved to live on while you are out scrounging up business. Some of these companies will tell you that your worm population will double every thirty days. Not true! They will double in population at a rate more like every sixty to ninety days. The big scam for a lot of animal breeders is selling breeding stock. Some of them will sell ordinary animals at an inflated price to get the next breeder started. It's even worse in the worm business. My *Eisenia fetida* are the same as your *Eisenia fetida* and the same as the next guy's *Eisenia fetida*. They aren't worth any more for breeding stock than they are for the neighbor who has a worm box in her basement.

Home vermicomposting

What does home vermicomposting involve? **Acme Worm Farm's** wormkeeper, Tom French provides some answers. Send your vermicomposting questions to tom@acmewormfarm.com

the worm bin

Your worms don't need to be in a box, but it makes it easier to keep them in a herd. The best materials are wood or plastic. Metal gives off poisons as it reacts with the moisture and acids in the bedding. The bin should be at least eight inches deep, preferably 12-16 inches, and should be wider than it is deep. A good working size is two feet by three feet by one foot deep. Drain holes are needed in the bottom to insure that the bedding doesn't become saturated with water. They also help increase airflow through the bedding. If you are using a plastic tub, drill a 1/4 inch hole every 3 inches both directions. You won't need any screen to keep the worms in. If there is something wrong with the bedding, they will find another way out, or even crawl through the screen if they have to. Put something under each end or corner of the tub so air can get to the bottom. **DO NOT USE THE PLASTIC LID.** Cover the bedding with a piece of burlap or cardboard. If you use cardboard, cut it so there is a 1/2 inch space all the way around for air to enter. An even better option is to stretch a piece of burlap over a wood frame, and set it on top of the bin. You can go one step further, and keep the burlap moist by sprinkling water on it. The worms will like the humid atmosphere as they crawl around on top of their food at night.

Although plastic tubs will work, and are commonly used, worms like wood better. One advantage of wood is that it breathes. As moisture wicks through the wood, air is drawn into the bedding. Either drill a 1/4 inch hole every 3 inches both directions on the bottom, or drill a 1-inch hole for every square foot. If you go with 1-inch holes, staple a little piece of plastic window screen over each hole.

The bin pictured is made with 2x12" sides and a 3/4" plywood bottom. You can build the same bin for a fraction of the cost by using 1/2" plywood for both the sides and bottom, and it will last for about three years. Half inch OSB is even cheaper, and works just as good. If you use plywood or OSB, you will need 2x2s or 2x4s to fasten the bottom to the sides. The strongest design would have the 2x2s fastened along the bottom of the sides under the plywood floor. 2x4s work good for the legs. Use screws designed to resist corrosion. All of these materials can be had for free from scrap piles at construction sites.



the bedding

It is extremely important to have some compost in the initial bedding. This cannot be stressed enough. Aged manure makes great compost. If you want, you can lighten it up a little by adding some peat moss or [coconut fiber](#) (up to half by volume). It's a good idea to soak the peat moss or coconut fiber in an excess of water and then squeeze the water out to reduce the acidity. The bedding should be almost soggy. A few drops of water should come out of a handful when squeezed. If ordering worms through the mail, make sure the bin is ready before the worms arrive. There is no way of knowing how long they will live in their packaging after they arrive. It might be a few days or a few minutes. Start with about six inches of bedding. When the worms arrive, dump the worms, and the bedding they were packed in, in the center of the bin. After the worms crawl in, spread out the pile of bedding, and feed the little guys right away.

feeding

Ideally, kitchen scraps should be partially composted before going in the worm bin, but this is not always feasible, and not really necessary. Do not put any meat or dairy products in the bin. No hot spices, and absolutely no salt. Fruit and veggie scraps should be cut into 1/2 inch strips. This allows more aeration than dicing or blending. If you are using a large bin like the one below though, there is no need to cut up your worm food, or to mix with fiber. Mix the scraps you cut up with your worm food, or to mix with fiber. Mix the scraps you cut up with your other suitable worm food like coffee grounds and tea bags, and add about 30% shredded paper, or brown leaves, straw, grain chaff, hardwood shavings, ripped-up coffee filters and napkins, or some other high carbon material that will aid in aeration. Because the carbon will speed up decomposition, it could cause the bin to heat up if overfed.



Try to develop a feel for the right amount of fiber, and the right amount of food at the right time. Put an inch or two of this mixture on top of the bedding. Always wait to feed the worms until they have eaten a good portion of their last feeding. In the meantime, your excess veggie-fiber mixture can be allowed to age for a while, or put in the freezer. Freezing will break the cell walls, speeding up decomposition. Allow this mixture to reach room temperature before feeding to the worms unless the bedding happens to need cooling. Compost type earthworms need lots of calcium. Allow your eggshells to dry, then run them over with a rolling pin, and sprinkle on the worm food every time you feed the worms. If you don't eat eggs, ground up oyster shells will work, and will also supply the needed trace elements. Taste the oyster shells to make sure they aren't salty. A good supplement recipe is eggshells or agricultural lime or just oyster shells.

maintenance

Compost worms are a low maintenance form of livestock. They don't need to be milked twice a day, they are not susceptible to disease, and they won't keep you awake at night. They do, however, need to be kept somewhat happy or they will crawl away while you're sleeping.

The ideal temperature for *Eisenia fetida* is 72-75 degrees Fahrenheit. Reproduction and food consumption drop rapidly at temps below 60. They will survive the cold as long as they don't freeze. If they do freeze though, most of the cocoons usually survive to hatch in the spring. They can survive temperatures up to 90 degrees for short periods of time, but it really stresses them. This of course is the bedding temperature, which is slow to change. Unless you have a small bin sitting in the sun, the temperature will be the same day and night. Decomposition of organic matter, and the activity of the worms, can help raise the bedding temperature during the winter. The flip side of this though, is that large worm beds can become warmer than the average air temperature in the summer. If you live in an area with very hot summers, you might need to keep the bin inside your house. Otherwise, you will need to use some tricks to keep the bin cool.



One way to help ease this situation is to feed the worms compost. It might also be necessary to ration their food. Keeping the bedding on the wet side will slow down the temperature rise from decomposition. Keeping the bin in a well ventilated area will help. Putting frozen food in the bin with the lid on will help. You can also put frozen water bottles in the bedding.

At ideal moisture, there will be very little or no liquid coming out the bottom of the bin. If excess liquid comes out, it won't affect the worms that much, but can make the castings less valuable. It's better for the worms for the bedding to be too wet than too dry, but over-wet conditions are more favorable to pests like flies and mites. Try to maintain the moisture at a level that leachate just barely wants to come out the bottom but doesn't. It's better to water more often, and less at a time. If you are feeding mostly high moisture foods like lettuce and melon, you might not need to water at all. *Eisenia fetida* can tolerate a wide range of moisture, and the only problems will usually be a decreased appetite in an overly dry bin. Use lukewarm water except when the bedding needs to be cooled. Do not use chlorinated water or water from a water softener. An inexpensive charcoal filter will remove chlorine.

When the bin is full, it is time to remove the worm castings. There will be castings throughout the bin, but the highest percentage will be on the bottom, and most of the worms will be near the top. If you take off the top four inches of bedding, you will have removed most of the worms, but it's best to go down 6-8 inches if you want to recover most of the cocoons. A manure fork is best to remove the material off the top, but a garden fork will also work. Dig the worms out fast enough that they don't crawl down before you're done. The material you remove with the worms will fluff up to about 1-3/4 times the volume it was in the bin. Because the worm population will have at least doubled by the time the bin filled up, you can put the worms and bedding back in two bins the same size, or one larger bin, or give some to a friend.