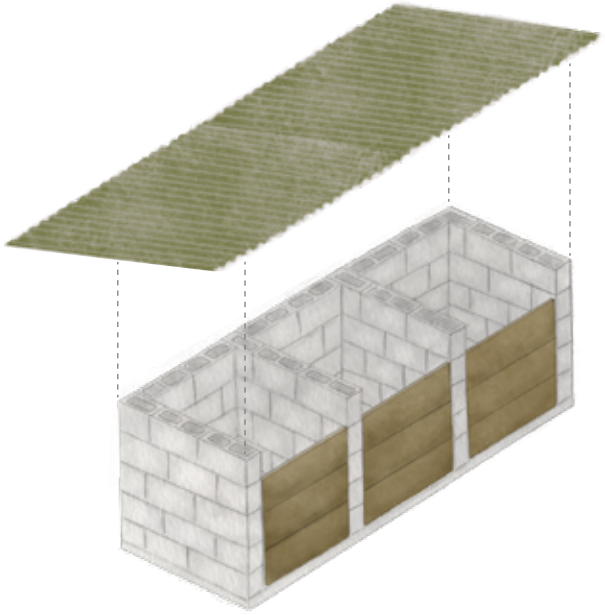
Home Composting Manual for Costa Rica:

Many options to choose from



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Your feedback is welcome: climaticamonteverde@gmail.com

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chapter 1

1. Introduction

Chapter 1

1.1

What is composting?

Composting is a process in which microorganisms break down organic matter, such as food and garden waste, and transform it into a nutrient-rich soil that can be used to fertilize plants.

1.2

How will compost improve your life and the earth?

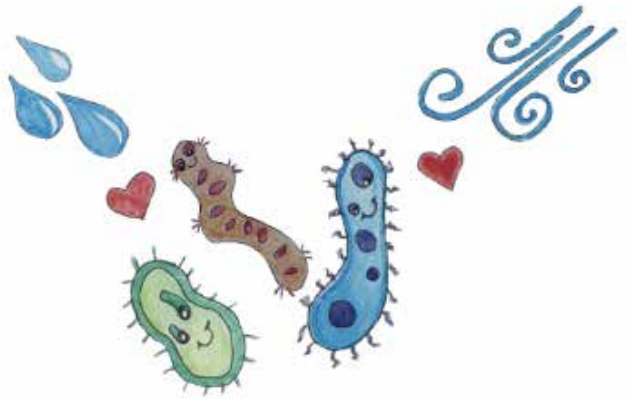
- The garbage you send to the landfill will not smell badly.
- Animals won't try to get into your garbage.
- You will reduce emissions of methane, a greenhouse gas that has a heat trapping capacity that is about 23 times greater than carbon dioxide. When organic matter decomposes without oxygen, as in a landfill, it emits methane. In Costa Rica, about half of all waste sent to landfills is organic. This waste is the second highest source of emissions in Costa Rica after transportation. By composting that waste at home, you will reduce those emissions and the cost of and emissions from transporting that waste.
- You will transform your waste into rich organic fertilizer. By using organic fertilizer rather than chemical fertilizers you are reducing greenhouse gas emissions and improving the structure of the soil. Synthetic fertilizers with nitrogen emit nitrous oxide, a greenhouse gas that is about 330 times more potent than carbon dioxide.

1.3

Compost essentials:

Compost needs a healthy balance of organic matter, moisture, micro-organisms and air:

1. Organic matter: Good compost is made of a balanced mix of "green material" (which is high in nitrogen and moisture) and "brown material" (which is high in carbon and is dryer). This helps to get the right balance of nitrogen, which is more abundant in green material, and carbon which is higher in brown material.



2. Moisture: Compost should be MOIST, not too wet, nor too dry. Water shouldn't drip out when squeezed, nor should it be dry.
3. Micro-organisms will decompose the organic matter. They naturally exist in soil and finished compost
4. Air: The microorganisms need air to breathe.

1.4

What can you put in your compost?

KINDS OF GREEN MATERIAL TO INCLUDE

- Scraps of fruits & vegetables
- Other food residues
- Yard trimmings (that have not been exposed to agro-chemicals)
- Coffee grounds

KINDS OF BROWN MATERIAL TO INCLUDE

- Dead plant matter including brown leaves.
- Cardboard (ripped into smaller pieces)
- Tea bags
- In moderate amounts:
- Paper napkins and other papers (without colored ink)
- Sawdust (without previous contact with oil)
- Egg shells

ONLY INCLUDE IN CERTAIN SYSTEMS

- Bones
- Meat and Fish
- Dairy (milk, yogurt, cheese, etc.)
- Fats/oils/greases
- Manure

NEVER INCLUDE

- Colored paper
- Wood products
- Plastic
- Paper towels with alcohol
- Aggressive weeds (e.g. estrella, ironweed)

OTHER MATERIALS THAT YOU CAN ADD TO YOUR COMPOST INCLUDE:

- Soil, preferable rich dark soil
- Earthworms (see p. 44)
- Solid Mountain Microorganisms (Solid MM) , p. 73
- Liquid Mountain Microorganisms, p. 75
- Wood Ash to add minerals and raise the pH of acid compost
- Pulverized rock for minerals
- Biochar (or charcoal), p. 70
- Chicken or horse manure for nitrogen (green material).
- Rice hulls for additional structure/brown material
- Biol - Liquid Fertilizer from Manure or Whey
- Bokashi, p. 56

HOW TO ADD MATERIALS TO YOUR COMPOST?

- Collect kitchen waste in a receptacle with a secure lid.

Photo by Orlando Calvo

- Optionally, you can chop the vegetable waste into smaller pieces to help it break down more quickly, but this is not necessary.

Photo by Orlando Calvo

- When full, empty the container into the compost system, washing the container each time.
- For most systems, it is recommended to add a layer of an equal amount of brown material after adding the kitchen residues.

- Occasionally sprinkle the compost with a scoop of soil or compost or sprinkle it with solid or liquid microorganisms. This will kick-start and accelerate the rate at which the organic material decomposes. You may add other materials from the list above, as needed.
- Continue to alternate each green layer with a layer of brown material.

Note: Vermiculture, Bokashi and Takakura have different systems with additional inputs.

HOW TO MAINTAIN THE RIGHT MOISTURE?

Compost systems need to be damp but not wet. If it is dry to the touch, sprinkle it with water. If it is wet, add more dry brown material. Water shouldn't drip out when squeezed, nor should it be dry.

Photo by Katy VanDusen

Outdoor compost systems do best in an area that receives some sunlight but is also shielded from the rain. Adequate drainage is essential.

COMPOST PILES WILL HEAT UP

When a compost system has the right balance of ingredients, heat is generated as microorganisms decompose the material. As the pile warms up, the microorganisms become even more active. Larger systems will generate more heat.

Photo by Katy VanDusen

HOW WILL I KNOW WHEN MY COMPOST IS DONE?

Compost needs a few weeks to sit and mature. When ready, it will be dark brown, crumbly, and have an earthy smell. You may find small remnants of eggshells, pits, peels, or seeds but your compost is still ready for use and they will disappear with time.

Photos by Katy VanDusen

You will need more than one unit.

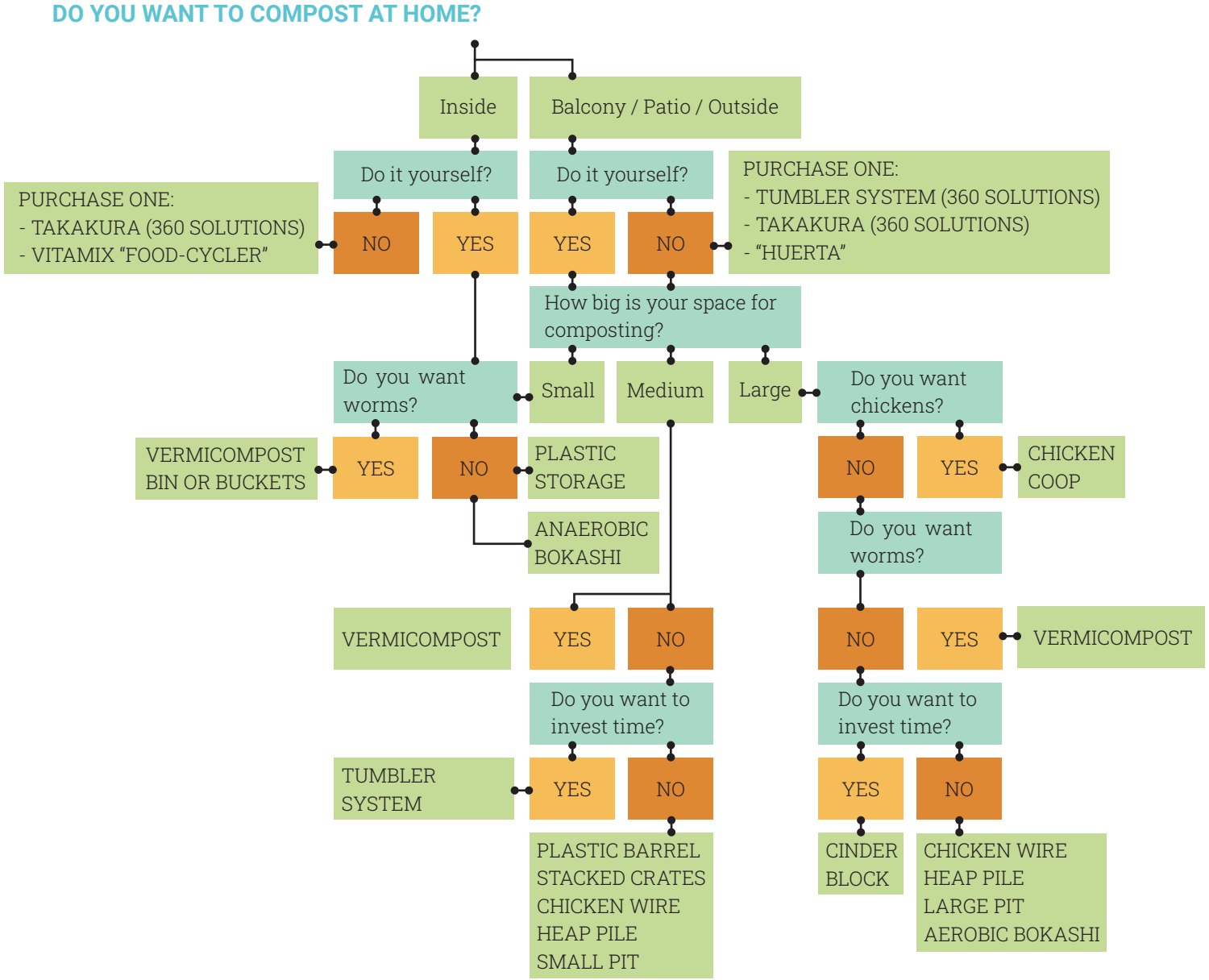
Compost needs a few weeks to sit and mature. When ready, it will be dark brown, crumbly, and have an earthy smell. You may find small remnants of eggshells, pits, peels, or seeds but your compost is still ready for use and they will disappear with time.

Tutorial:

¿Cómo hacer compost en casa? de Costa Rica Regenerativa.

1.5

How to choose the best composting system for you?



chapter 2

2. Basic composting systems

Chapter 2

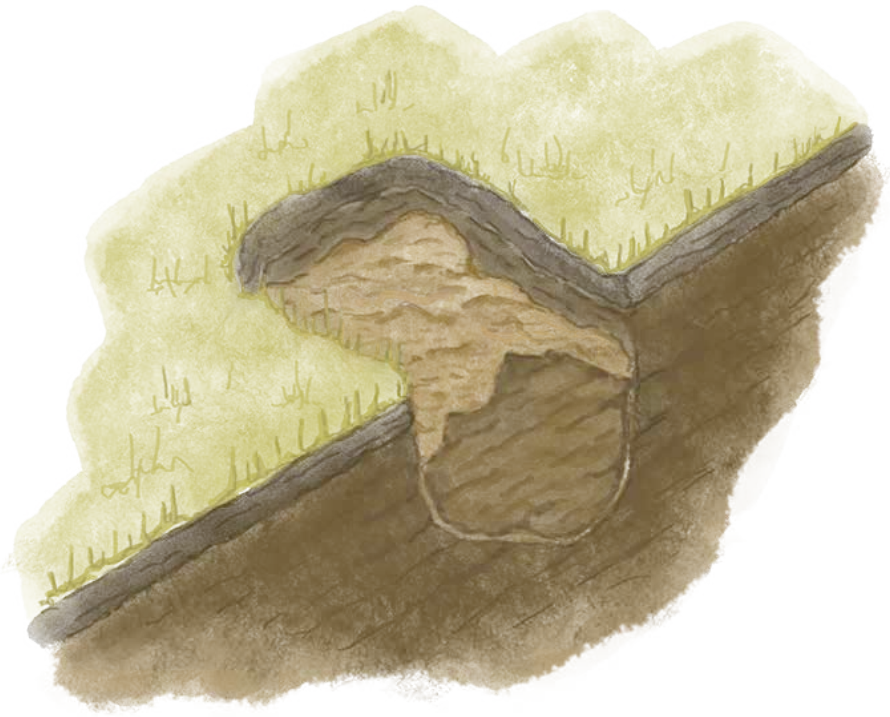


Illustration by Paula Vargas

2.1

Pit Compost System

System Size: Medium to Large
Level of Difficulty: Very easy
System Locations: Outside
Cost: Low

Pros: This is extremely easy and can fit almost anywhere in your garden. Each place a compost pit is made will create fertile ground for whatever is planted there.

Cons: During periods of intense rain, the pit can fill with water and saturate the compost. It is difficult to turn and aerate. Also, this method can attract coatis, opossums, and other critters to your garden. Both of these problems can be addressed by having a good fence or top. Weigh the top down with blocks if animals are an issue.

Materials and tools:

- Shovel and an open space.
- Optional: materials for a fence or a top.

This pit system has chicken wire around it (to deter animals from entering) and bananas planted next to it. Photo by Katy VanDusen

CONSTRUCTION INSTRUCTIONS

Dig a hole betwen 50 to 80 cm square and between 30 and 80 cm deep. It should be shallower in clay soils with poor drainage and can be deeper in sandier soils with better drainage. When you are digging, keep in mind that you will regularly need to turn the compost. This will be easier in a shallower pit. The dimensions of your pit will also depend on the quantity of organic waste that you produce and your available space.

Alternatives:

- Put chicken wire around the pit to deter animals from entering.
- Dig the pit by a bush, banana or fruit tree that you would like to fertilize.
- Build a cover with wood, Tetra brik plywood, or other materials.

A moveable compost pit cover made with a tire and heavy metal . Photos courtesy of Silvia Santamaría, AgroSosi S.A.

HOW TO USE YOUR PIT SYSTEM

1. Spread your compost material in the pit.

2. Add some brown leaves and sprinkle with soil.

3. Turn your compost about once a week.

4. When it is close to full, let it mature until it is ready to use. Rather than removing the compost, one can just cover it with soil and plant bananas, bushes or trees next to the pit or on top of it.

Illustration by Paula Vargas

2.2

Heap Pile

System Size: Large
Level of Difficulty: Easy
System Locations: Outside
Cost: Low

Pros: Creating a heap pile is very simple, does not require many materials and works well when you have a large amount of green and brown yard waste at one time.

Cons: This composting system may require a more careful balance of greens, browns and moisture because all ingredients are added at once. This type of compost heap needs to be able to heat up through the decomposition process. If it has kitchen waste, it might attract animals that can get into the pile. This system should be covered by plastic, a tarp, cardboard, banana leaves or a roof to shield it from the rain, and keep it moist.

Materials and tools:

- Shovel or pitchfork;
- tarp, plastic sheet, banana leaves or roofing material

HOW TO CONSTRUCT AND USE THE HEAP PILE SYSTEM

1. Define an area of a minimum of a square meter where you wish to compost.
   Optional: Build a base layer of small branches to aid in adequate aeration and drainage
2. Put down an initial base of soil. Then add a layer of dry materials such as leaves, thin branches and/or cardboard and/or egg cartons cut into strips or medium-sized pieces. The thickness of each of the layers should be at least 5 cm.
3. On that base, add the green material and cover it with another layer of brown material.
4. Use a shovel to place a 2cm layer of soil or finished compost on top of the brown material.
5. Dig a small trench around your heap pile. This will prevent the pile from taking in too much water.
6. If it is not under a roof, cover it with plastic, a tarp, cardboard or banana leaves to prevent it from drying out or getting too wet.
7. Continue adding layers, alternating green and brown material, occasionally sprinkling soil or finished compost into the mix. Ideally, your heap will be at least 1 meter tall.
8. Turn your compost once every week until it is ready.

   Tip: You can add a mixture of microorganisms, molasses, and/or manure to speed up the decomposition process.

Photo by Katy VanDusen

Illustration by Paula Vargas

2.3

Plastic Container System

System Size: Small
Level of Difficulty: Easy
System Locations: Indoors or Outside
Cost: Very low

Pros: This compost system is extremely economical and very easy to make.

Cons: It will not be big enough if you do produce a large amount of organic waste.

Materials and tools:

- Four identical plastic storage bins or buckets that hold approximately 18 liters (5 gallons) with one tightly fitting lid,
- A drill with small-medium sized bit, or a hammer and nail

CONSTRUCTION INSTRUCTIONS

1. Drill 8-10 small holes in the top and bottom of two of the containers, or hammer holes with a nail.
2. Place the containers with the holes inside the containers without holes.

HOW TO USE YOUR STORAGE COMPOST BIN

1. In one of the sets of containers layer green and brown materials as described on pages 3 - 6.
2. Stir your compost once a week to ensure that it has enough air.
3. Once the container is almost full, leave it to sit for four to six weeks and start using the other pair of containers
4. If you clean the barrel before re-starting the composting process, just use water. Be sure not to use any soap, detergent or other chemicals that could affect the functionality of the microorganisms in your next batch of compost.

Video tutorial:
Cómo hacer compost en un balde de cinco galones.

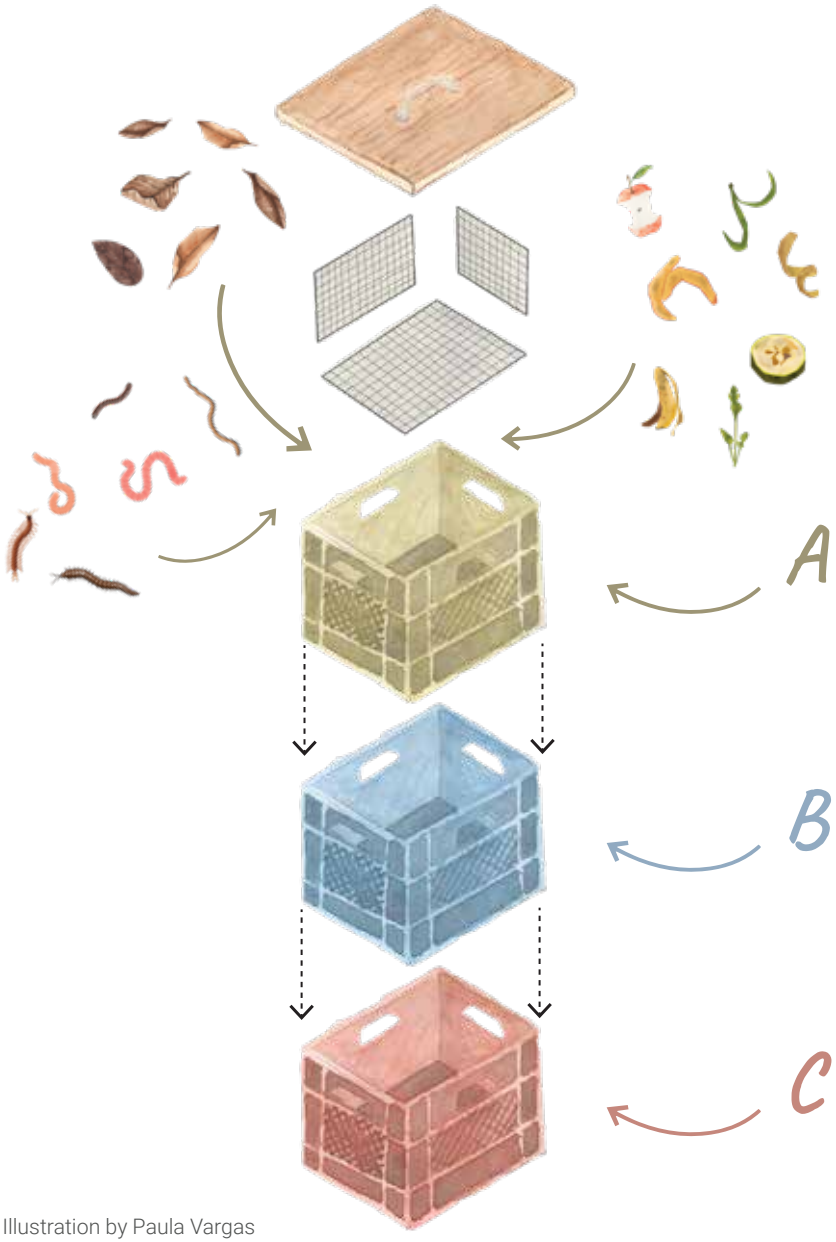


Illustration by Paula Vargas

2.4

Vertically Stacked Plastic Crate System

System Size: Medium
Level of Difficulty: Easy
System Locations: Outside or on a patio
Cost: Low

Pros: This system is easy to make and is good if you produce a medium amount of food waste. The crates drain excess liquid well.

Cons: If you use feed sacks, you might need to replace them. Raccoons or other bigger animals can knock over this system and get into it if the top is easy for them to remove.

Materials and tools:

- 3 stackable plastic crates. Avocado crates, or more sturdy fruit or vegetable crates work well. They are usually available at supermarkets or hardware stores
- scissors
- landscape cloth, feed sacks or cardboard
- material for a lid to keep rain and animals out

CONSTRUCTION INSTRUCTIONS

1. Line the inside of each crate (5 sides) with landscape cloth or feed sacks.
2. Tie the landscape cloth or feed sacks to the sides to prevent them from falling in.
3. Optional: If not placing your crates directly on the ground outside, place the crates on a tray or container to contain leaks.
4. Stack the boxes and place the lid on top.

HOW TO USE YOUR STACKED CRATE SYSTEM

1. Begin filling the top crate (crate A) with your organic waste. Start with a thin bed of brown material and soil mixed together. Then add a green layer.
2. Be sure to add a layer of brown material each time you add green.
3. Once crate A is ¾ of the way full, mix the contents up and move it to the bottom.
4. Crate B will be on top. Put new organic material into it, repeating steps 1 and 2.
5. Once unit B is ¾ of the way full, mix the contents and move that crate to the bottom, crate A to the middle, and Crate C to the top. Repeat steps 1 and 2 for crate C.
6. Once crate C is full, crate A should be ready for use. If not, add an additional crate.

Tip:
You can paint your crates to soften their appearance. Darker paint will attract more heat and increase the speed of your system.

Three stages of stacked crate compost.
Photos by Paula Vargas.

For more information:
https://www.instructables.com/id/Milkcrate-Composter-vertically-stacked/

Illustration by Paula Vargas

2.5

Plastic Barrel Compost System

System Size: Medium
Level of Difficulty: Easy
System Locations: Outside
Cost: Low - Medium

Pros: This system is cost effective, easy to use, and keeps animals out.

Cons: Adequate space and strength is needed to roll the barrel. It may leak liquids.

Materials and tools:

- A plastic barrel with a secure lid that will not fall off when the barrel is on its side,
- a drill with a large drill bit

CONSTRUCTION INSTRUCTIONS

1. Drill 3 rows 6 inches apart all around the side of the barrel.
2. Drill several holes in the bottom of the barrel for proper drainage.
3. DO NOT drill holes in the top of the barrel to prevent rain from getting in.

HOW TO USE YOUR STACKED CRATE SYSTEM

1. After adding layers of soil (or compost), green and brown material, secure the lid of your system, tip it over on its side, and roll it in order to mix the compost.
2. Once your container is three quarters full, leave it to mature.
3. Set aside a small portion of your completed compost for use as the base of the next batch.

Tip:
If You are not able to roll your barrel, you can use a compost roller tool. In this case, you could use a plastic garbage receptacle with a top instead of a barrel with a secure lid.

Photo by Frank Joyce

Drawing by Naomy Vargas

Photo by Katy VanDusen

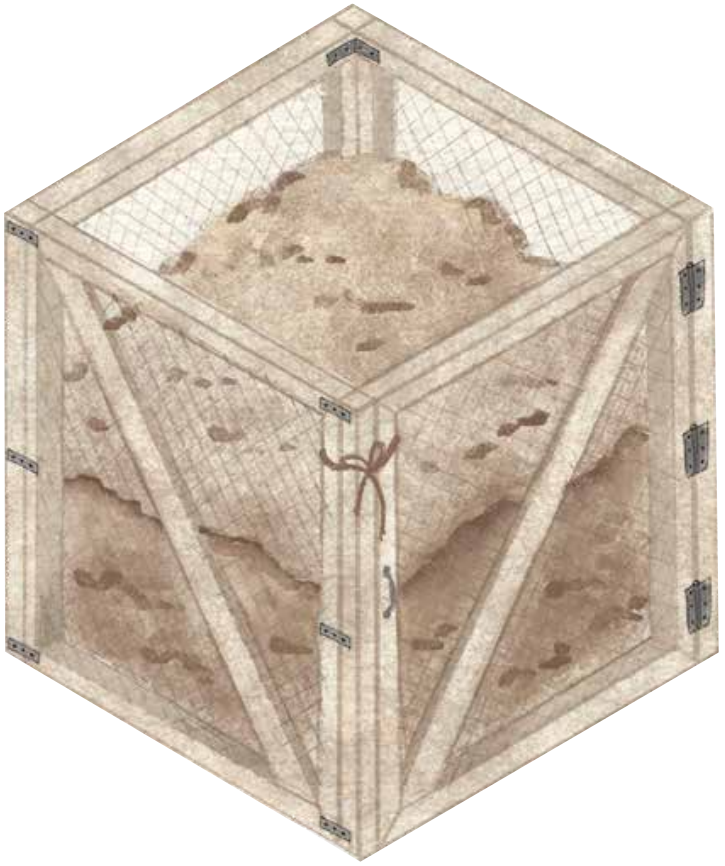


Illustration by Paula Vargas

2.6

Chicken Wire Composting System

System Size: Medium
Level of Difficulty: Medium
System Locations: Outside
Cost: Medium

Pros: This system is extremely easy to build and easy to manage. The chicken wire will keep many animals out.

Cons: This system will begin to degrade over time as the wood rots and the wire rusts. Thus, you will likely have to reconstruct this system every few years. Wire covered with plastic will last longer. It is also slightly more challenging to turn your compost as you will be required to untie the wire cage each time. Some wildlife will still be able to get into this system.

Materials and tools:

- wire mesh (chicken wire). Mesh with smaller holes will better contain the compost
- twine or a rope
- pliers
- gloves
- rebar or wooden stakes
- mallet or hammer
- optional: a tarp or to protect it from the rain if it is not under a roof

CONSTRUCTION INSTRUCTIONS

This system can be built with or without a frame.

If you are building it without a frame:

1. Roll out and cut at least 1.5 meters of chicken wire. Increase the amount of wire if you produce a large amount of organic waste.
2. Connect the ends of the wire to form a circle and tie the ends together with string.
3. Use your mallet to force the rebar or wooden stakes into the ground. This is important for proper support for your system.
4. Wrap your wire around the stakes and tie them together with twine. Make sure you tie the twine in a way that it can be untied to allow easy access for turning and removing the compost.

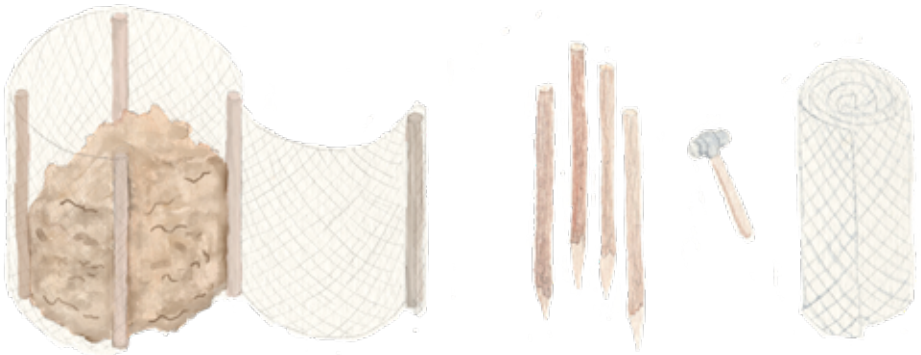


Illustration by Paula Vargas

CONSTRUCTION INSTRUCTIONS

If you are building it with a frame:

1. Make 4 frames of equal size with wood
2. Stretch the chicken wire on the inside of the frames and attach them with staples.
3. Place three of the frames in a “U” shape and use rope, wire, nails or screws to attach them together at the corners.
4. Hold up the remaining frame to the others to determine the best location for the hinges or rope in order to create a gate.
5. On the other side of the gate, install a picaporte, rope, or something else to secure it closed.

HOW TO USE YOUR CHICKEN WIRE SYSTEM

1. Put down an initial base of soil. Then add a layer of dry materials such as leaves, thin branches, cardboard and/or egg cartons cut into strips or medium-sized pieces. The thickness of each of the layers should be at least 5 cm.
2. On that base, add the green material and cover it with another layer of brown material.
3. Use your shovel to place a 2 cm layer of soil or finished compost on top of the green material.
4. Repeat this layering process each time you add waste.
5. Optional: cover it with a tarp.
6. Turn your compost once every week.
7. Once your pile is full, allow your compost to mature.

Photo by Orlando Calvo

Tip:

Take care that there are no exposed rough edges of wire that might cause injury.

Alternatives:

- Put a roof on your chicken wire compost bin.
- Use finer chicken wire to keep out small animals.
- Build the frame and doors with welded metal and the base with blocks

Photos by Orlando Calvo

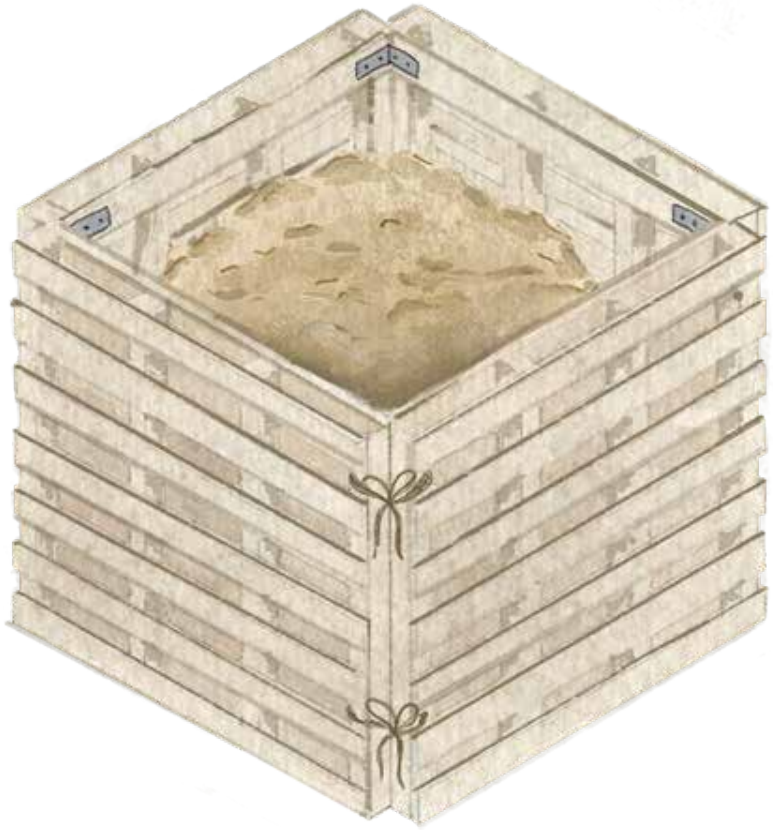


Illustration by Paula Vargas

2.7

Wood Pallet Compost System

System Size: Large
Level of Difficulty: Medium
System Locations: Outside
Cost: Medium

Pros: This system can be aesthetically pleasing, is relatively inexpensive, and has the capacity for a large amount of organic waste.

Cons: Damp wood degrades within a few years, thus, it will need to be replaced.

Materials and tools:

- 4 wooden pallets
- rope or wire to connect the pallets
- two large hinges with screws for a gate
- a latch or something else to secure the gate closed such as
- a rope
- optional: material for a tarp or a roof to protect it from the rain

- Alternative Materials: Use any scrap wood available.

CONSTRUCTION INSTRUCTIONS

1. Place three of the pallets in a “U” shape and use rope or wire to secure them together at the corners.
2. Hold the remaining pallet up to the others to determine the best location for the hinges or rope in order to create a gate.
3. On the other side of the gate, install a picaporte, rope, or something else to secure it closed
4. Optional: Cover with a tarp or roofing.

HOW TO USE YOUR STORAGE COMPOST BIN

1. Put down an initial base of soil. Then add a layer of dry materials such as leaves, thin branches, cardboard and/or egg cartons cut into strips or medium-sized pieces. The thickness of each of the layers should be at least 5 cm.
2. On that base, add the green material and cover it with another layer of brown material.
3. Use your shovel to place a 2 cm layer of soil or finished compost on top of the green material.
4. Repeat this layering process each time you add waste.
5. Turn your compost once every week.
   Optional: You can turn it less often if you insert PVC tubes with holes into the compost for aeration.
6. Once your pile is full, allow your compost to mature.

Tip:
Grow flowers or vines along the lattice to improve the appearance.

Photo by Katy VanDusen

Illustration by Paula Vargas

2.8

Tumbler System

System Size: Mediano
Level of Difficulty: Difficult
System Locations: Outside or on a Patio
Cost: Medium

Pros: This system keeps the compost contained, protected from animals and it is very easy to maintain. Wheels ensure that the system is very easy to mix, which also accelerates the quick maturation process. The system does not take up much space, but it can produce large amounts of compost depending on the barrel size. It is useful to make a strong wooden stand to raise it off the ground, to be able to put a wheelbarrow underneath and remove the contents once the compost is ready (as shown in the image).

Cons: The system is more challenging to construct and requires a strong support structure. When the barrels are full, they might require more strength to turn.

Video tutorial:
How To Make A Compost Tumbler from Days Well Spent

MATERIALS AND TOOLS

Tools:

- drill
- drill bits: one a bit larger than the screws and one the size of the smallest screws
- Phillips drill bit
- safety goggles
- thin saw blade, preferably with a mini hacksaw or jigsaw
- measuring tape
- marker and pencil
- white wood glue
- metal file or sandpaper to smooth the edges
- wrench or pliers to turn the screws

Materials for the barrel:

- barrel of the desired size (the blue ones are ideal since they are larger and stronger). One that is 100-200 liters is recommended.

Paddles to mix up the contents of the barrel:

- one PVC pipe the width of the barrel
- 8 1-inch screws
- 8 nuts
- The door
- 2 hinges about 2 inches long
- 12 1-inch bolts
- 12 nuts
- 2 bolt locks
- 12 1-inch bolts
- 12 nuts
- a piece of plastic the width of the door (to prevent the door from moving inward)
- 4 1-inch screws
- 4 nuts

Materials for the wooden stand:

Legs:

- 3 meters of 2 x 3 inch wood, cut into 4 pieces 75 cm each
- 16 screws for the joints with the beams

Wheel stand:

- 2 x 3 inch wood, twice the width of the barrel plus 20 cm, cut
- into 2 pieces, each the width of the barrel plus 10 cm
- 10 2-inch wood screwscrews

Supports for the legs:

- 2 meters of 2 x 1 inch wood, cut into 4 pieces, each 50 cm long

Diagonal braces:

- 1 meter of 1 x 2 inch wood, cut at a 45 degree angle on each
- side, cut into 2 pieces, 50 cm each, cut at a 45 degree angle on
- each side
- 8 3-inch wood screws
- 4 2-inch casters
- 16 1-inch screws

CONSTRUCTION INSTRUCTIONS

Steps to build the barrel:

1. Clean the barrel inside and outside.
2. Using the measuring tape and market, mark the spot for the door (approximately 24 cm x 24 cm) at the center of the barrel. Mark the spots for attaching the hinges on the top side of the door, for the two bolt locks at the bottom corners of the door, and 4 holes along the bottom edge for the plastic piece that stops the door.
3. Mark the spots for 4 holes to hold the PVC pipe for the paddles. On the opposite side of the barrel, mark 4 more spots for holes for the second pipe. Make sure that these holes are not on the wheels' path. This will make it easier to turn the barrel.
4. Mark spots for aeration holes all over the barrel except the door.
5. Make holes on all the marked spots. Make sure that the holes for screws are big enough that the screws get through easily.
6. With the smaller drill bit, drill holes at each corner of the door. Use the mini hacksaw or jigsaw to cut the square for the door. Smooth the edges with the file or sandpaper.
7. With the screws and bolts, attach the hinges. Then attach the bolt locks.
8. Cut a 2-inch x 30 cm piece of plastic that will be used to stop the door. This can be cut from a wide PVC pipe, a leftover piece of a rain gutter, or something else. Place this piece at the bottom edge of the door, attaching it with 4 screws.
9. For the paddles, mark two lines down the length of the PVC tube, on opposite sides. Mark the spots for 4 holes on each half of the PVC tube to fit with the holes made on the barrel to attach the paddles to.
10. Use the drill with the drill bit that fits the screws to make holes on the marked spots on the pipe. Cut the PVC pipe in half lengthwise with the mini hacksaw or jigsaw.
11. Attach the two halves of the PVC pipe to the inside of the barrel with the nuts and bolts. Ensure that the two paddles curve in opposite directions (one curves up, one curves down)

Photos by Teagan Benavidez

Steps to build the wooden stand:

1. Using measuring tape and a market, mark and cut the pieces of wood as mentioned on the list of materials for the wooden stand.
2. To make the supports for the legs, put together 2 legs with 2 horizontal pieces for the leg supports. Use glue at each joint and make two holes at each joint with the drill and finer drill bit. Then, use 2 screws at each joint with the Phillips drill bit. Repeat this step with the other two legs and supports to have two frames.
3. Join together the two frames with the legs at the top, with two horizontal pieces of wood for the wheel stand. One of the beams for the wheel stand should be at the back edge and the second should be at a distance that works well for holding the barrel. At the joints, use glue and make two holes at each joint with the drill. Use the screws to attach them.
4. Attach the casters to the beams that were just placed. The casters should not be too close to the edge of the barrel to avoid the barrel coming off.
5. At the back side of the structure, place the two braces diagonally at each of the top corners, joining the supports for the legs with the horizontal beams of the wheel stand. Use glue and make two holes at each joint. Use screws to attach the diagonal braces.
6. Place the barrel on the structure and it is ready to make compost!

Photos by Virgilio Brenes

Photos by Paula Vargas

HOW TO USE YOUR TUMBLER SYSTEM

1. Initiate your system as described on pages 3 - 6
2. Roll your tumbler each time you add compost.
3. Once your container is ¾ of the way full, leave your compost to mature until it is dark brown in color, crumbly, and has an earthy smell.

ALTERNATIVES

1. Weld a stand and put a strong metal pole in the middle on which to rotate it.
2. Put a separator inside to sift mature compost from newer compost.
3. Beautify your tumbler system by painting it.

1.

2.

Photos by Katy VanDusen

3.

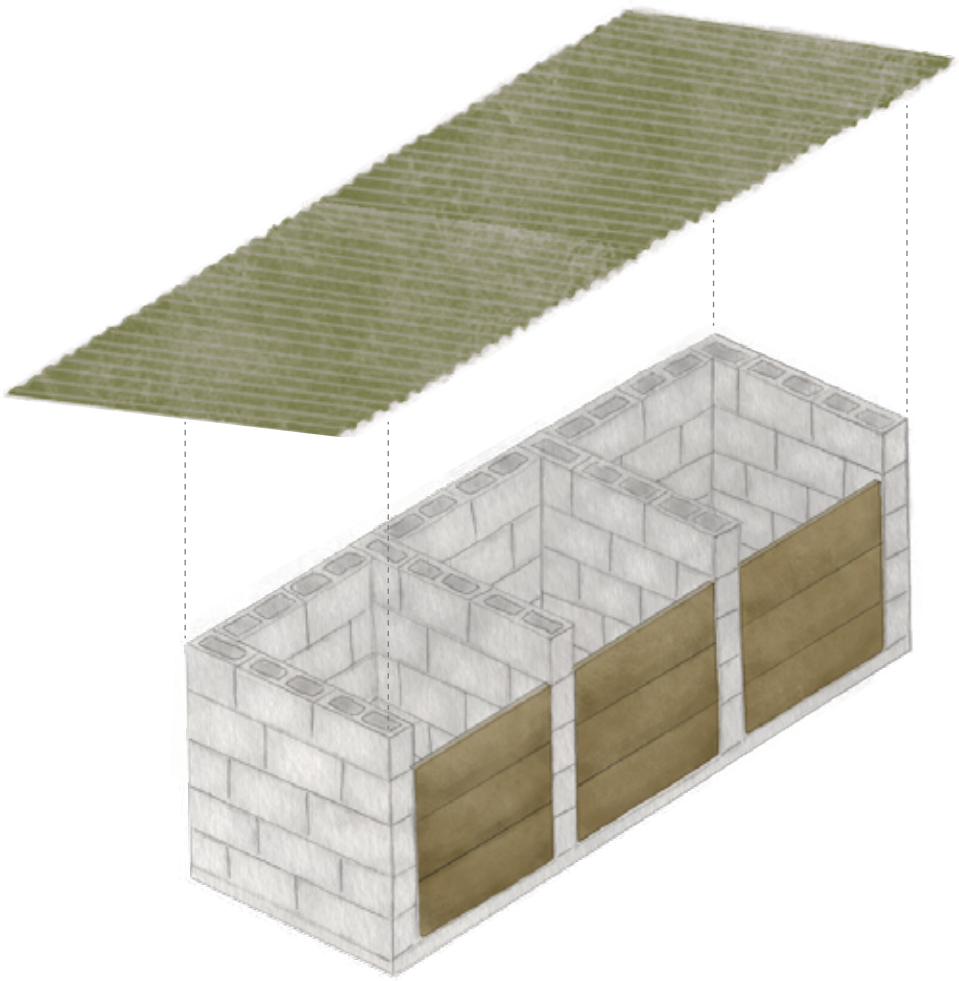


Illustration by Paula Vargas

2.9

Concrete Block Compost System

System Size: Large
Level of Difficulty: Medium
System Locations: Outside
Cost: High

Pros: The concrete structure is durable and accommodates a large amount of organic waste.

Cons: Concrete blocks are more expensive than chicken wire or wood, and need to be covered with roofing to avoid excess water and animals from entering the system.

Materials and tools:

- Cinder blocks (the number depends on the size of your system)
- Rebar stakes to stabilize the blocks. The stakes need to be
- the height of the stacked blocks with an additional 30 cm
- or more to insert in the ground.
- Cement
- roofing material (optional)
- doors with latches (optional)

CONSTRUCTION INSTRUCTIONS

Note:

The size of this system can vary based upon how much organic waste needs to be processed. We recommend a minimum of two sections so that you can rotate between the two.

1. Optional: pour a concrete base to accommodate the size.
2. Create the back row by placing four cinder blocks in a row for each section. Leave 2 cm of space to allow for airflow in between each one.
3. Place four more blocks perpendicular to and at the end of each side of the first row. Again, leave 2cm between each block which will allow for air flow.
4. Add a second layer, staggering the blocks to increase the stability of the structure.
5. Repeat this process for a total of 4 rows and 4 columns, staggering the blocks as you stack them. Remember to leave 2 cm of air between each block when you stack them.
6. Place two rebar stakes through the cinder blocks along each side to stabilize the bin.
7. If the system is not under a roof, attach a roof to the top.
8. To keep animals out, we recommend attaching a door to the front of each section.

Photos by Alex Reep

HOW TO USE YOUR CONCRETE BLOCK SYSTEM

1. Put down an initial base of soil. Then add a layer of dry materials such as leaves, thin branches, cardboard and/or egg cartons cut into strips or medium-sized pieces. The thickness of each of the layers should be at least 5 cm.
2. On that base, add the green material and cover it with another layer of brown material.
3. Use your shovel to place a 2 cm layer of soil or finished compost on top of the green material.
4. Repeat this layering process each time you add waste.
5. Turn your compost once every week.
6. Once your pile is full, allow your compost to mature.
7. Repeat steps 1 to 6 in the next compartment

Tip:
Soften the industrial appearance of the bin by growing vines around the outside of the blocks.

2.10

Get-creative-with-what-you-have Systems

Do you have a container that does not exactly fit the description of the systems described above?
As long as you follow the basic concepts in Compost Essentials on pages 3 - 6, there are infinite possibilities.
Here are some photos of what others have done in Monteverde:

Photos by Katy VanDusen

The compost system above at Life Monteverde is made from an old refrigerator from which all the refrigerant gasses have been carefully extracted by a professional and disposed of properly. In this case it was important to have holes in the sides for aeration and at the base for good drainage.

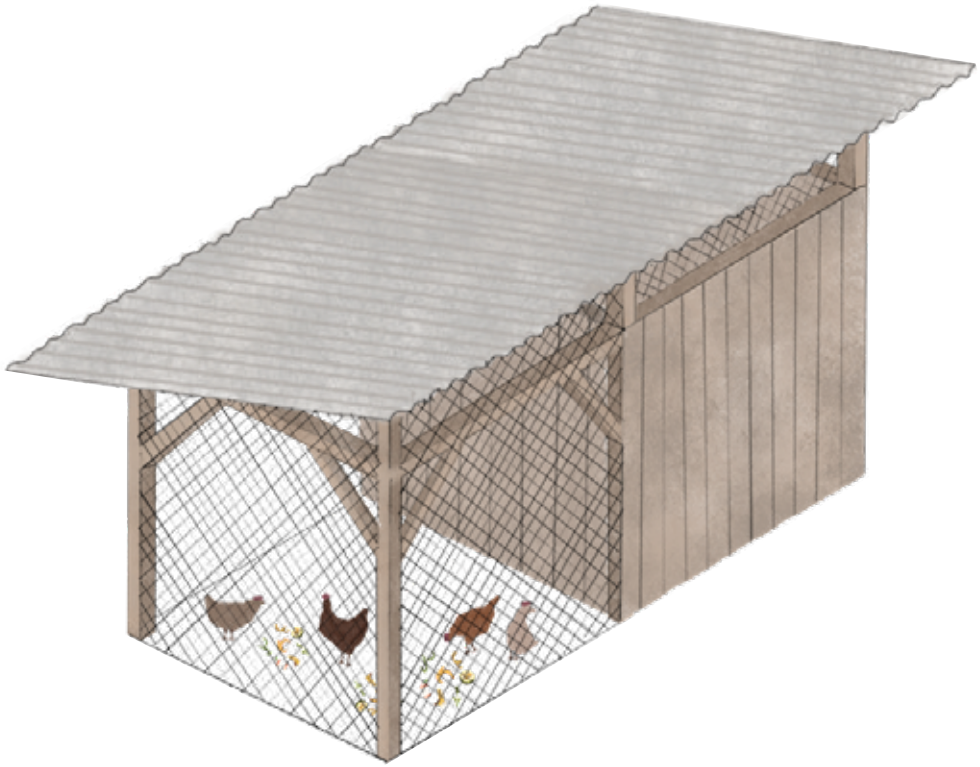


Illustration by Paula Vargas

2.11

Chicken Coop Compost System

System Size: Large
Level of Difficulty: Medium
System Locations: Outside
Cost: Medium

Pros: You will be feeding your chickens at the same time you are producing compost. Chickens love maggots, so they keep down flies. The chickens scratch and dig the compost, mixing and aerating it. It is high in nitrogen because of the manure.

Cons: If you have free range chickens, they will need to be confined to the chicken coop some of the time. The organic material might attract predators that are already attracted to chickens. Be extra careful not to put anything in the compost that might be toxic for the chickens.

INSTRUCTIONS

1. Put the compost system directly in the base of the chicken coop. The sides of the base of the coop should be deep enough to add both dry bedding (brown material) and the fresh organic waste (green material).

2. Be sure the chicken coop is secure so that animals that prey on the chickens cannot break in.

3. When the bedding gets wet or ripe, simply add more dry bedding, rather than removing the older bedding. The compost can build up for several weeks before removing it.

4. The larger the compost pile is, the hotter the compost will be and the faster the organic matter will break down.

Photo by Edwin Santamaría

chapter 3

3. Takakura

Illustration by Paula Vargas

3.1

Takakura System

System Size: Small. This system works well for about 500-750 grams of organic waste per day.

Level of Difficulty: Medium. Easy to maintain once the seed has been prepared.

System Locations: Takakura takes up only a small amount of room and can be placed under any sink or area inside or outside your home.

Cost: Low - Medium

Pros: This system can easily be put together in a cost-effective manner, and virtually all types of food wastes can be put into this system, so it does not require extensive knowledge about how to compost. When it is well maintained, no liquid needs to be drained. Since it does not smell bad or take up a large amount of space, it is possible to keep this system in your home in the laundry room, under a sink, or on the patio.

Cons: Organic waste should be chopped before added. Purchasing of microorganisms may be necessary to speed up the decomposition process. If not well maintained, sludge can accumulate in the bottom of the bin and it will need to be drained.

WHAT CAN YOU INCLUDE IN YOUR TAKAKURA SYSTEM?

DO INCLUDE GREEN MATERIAL

- Fruits & vegetables
- Yard trimmings (that have not been exposed to agro-chemicals)
- Coffee grounds
- Dairy (milk, yogurt, cheese, etc.)
- Meat and Fish

DO INCLUDE BROWN MATERIAL

- Dead plant matter
- Paper (not colored/without ink)
- Sawdust (without previous contact with oil)
- Egg shells
- Tea Bags
- Cardboard (must be ripped into small pieces)

DON'T INCLUDE

- Bones
- Colored paper/Wood
- Plastic
- Fats/Oils/Greases
- Weeds with seeds (i.e. estrella, ironweed)

THE FERMENTED LIQUIDS

Takakura uses two fermented liquids to prime the system so it can decompose waste quickly. Making these liquids can take several days.

Step 1: Make Sugar-Water Base Liquid

Materials:

- a 3 liter plastic bottle
- a funnel
- a cup
- 12.5 g (2.5 tablespoons) brown sugar
- 50 g (3.5 tablespoons) plain yogurt
- approximately 3 Tablespoons of sour cream or crumbled
- cheese
- 20 g (4 Tablespoons) yeast
- About 3 liters of warm water

1. Clean the bottle/jug, funnel and cup thoroughly before beginning. Be sure they have no detergent residue.
   To activate the yeast, dissolve it in warm water in the cup. After
2. 5 minutes, add the sugar. The yeast should form bubbles.
3. 3. Add the yeast to the mixture of sugar and water and stir it.
4. 4. Stir the yogurt and other dairy ingredients into the mixture until it looks milky.
5. 5. With the funnel, add this solution to the bottle.
6. 6. Finish filling the bottle with water and mix thoroughly.
7. 7. Set the mixture in a dark place for 3 to five days.
8. 8. Each day open the top to let the gas escape. The solution should have a sweet and sour smell, like citrus or yeast. If there is a bad odor, begin the process again, cleaning and rinsing the bowl and jug more thoroughly.

Step 2: Make Salt-Water Base Liquid

Materials:

- a 3 liter plastic bottle
- 5 g of sea salt
- 1 liter of water
- Skins of fruits (for example: oranges, guayaba, papaya,
- eggplant, cucumber, squash, lettuce)

1. Put the water and the salt in the bottle, leaving space for the fruit skins.
2. Add the fruit skins to the salt water, mixing it well.
3. Divide the salt water solution into two jugs, cover them well, and shake well.
4. Leave the solution in a dark area to settle for 3-5 days If your solution starts to smell like alcohol, then you have a good fermented liquid. During this decomposition process, open the jug each day to let the gasses escape and avoid having the liquid erupt when the jug is opened after several days.

Step 3: Prepare the compost container

Materials:

- plastic cable ties
- container with holes for ventilation, for example, a plastic vegetable crate, a wooden box, or a cardboard box
- cardboard or landscape cloth
- If being used indoors, cloth can be used to cover the box, such that air can get in, but not unwanted insects. If the system will be used outdoors, it is advisable to use a heavy lid made from wood or some water resistant material that keeps animals out.

1. Cover the base and sides of the container with landscape cloth for protection against insects. Alternatively, cardboard can be used to avoid leakage.
2. Attach with plastic cable ties.

Photos by Irene González

Photos by Katy VanDusen

Step 4: Make a Fermented Bed (also known as seed)

Ingredients:

- rice hulls to fill a quarter of the box (other alternatives are
- coffee husks, sawdust, ashes, coconut fiber, or wood shavings)
- semolina or wheat bran to fill a quarter of the box
- dirt, leaf litter, and twigs with white mold (mycelium) to fill a
- quarter of the box
- 2 cups of charcoal

1. Put all of these ingredients into the Takakura box.
2. Start adding in the fermented liquids from the bottles of sugar water and salt water solutions over the ingredients until the mixture starts to form clumps. If it does not form clumps, add equal amounts of the solutions. If liquids drip out when the mixture is squeezed, add more of the dry ingredients.
3. Use your hands or a shovel to mix well. Gloves are not necessary.
4. Cover the box with the wooden lid or a breathable cloth.
5. When the contents are covered in white mold (about 5 days), the mixture is ready to be used.

Photos by Daniel Vargas

Step 5: Use your Takakura System

Materials:

1. Once your bed is prepared, add your organic waste as you generate it. Chop all organic waste before putting it into the system. The system works best when the organic matter is finely chopped.
2. Mix the seed together with the organic waste each time it is added.
3. When the container is full, take out half of the contents inside the plastic crates and transfer it to a second crate to mature for 2 weeks.
    a. There should be no chunks of organic material in your decomposed waste as they can damage your plants if applied. If pieces of organic material persist, your compost is not ready.
    b. Use the contents in the original crate as a base for your next round of compost.

chapter 4

4. Vermicompost

Chapter 4

4.1

Vermicompost

Vermicompost includes all of the aspects and benefits of traditional composting, with the addition of red earthworms to break down organic waste. The fully decomposed end product is more nutrient rich than traditional compost. California Redworms (Eisenia fetida), are not native to Costa Rica. Thus, one needs to collect them from someone who already has a vermicompost system.

Vermicompost is a complex system. It requires an investment of time and needs good management. In addition, it must be located in a place that is protected from animals, rain and sun. The worms are delicate, and if they are not kept under the right conditions they will die.

CONDITIONS FOR THE WORMS TO WORK WELL

- a temperature of about 20° C.
- about 80% humidity. Be very careful with water. Add water little by little so as not to saturate the system. If you can squeeze water out of the compost, it is too wet. If you add a lot of water at once, it will be very difficult to bring the system back into balance.
- a pH between 6.5 and 7.5
- Low light. Ultraviolet rays will kill the worms.

Photos by Katy VanDusen

WHAT CAN YOU INCLUDE IN YOUR VERMICOMPOST SYSTEMS?

DO INCLUDE GREEN MATERIAL

- Non-acidic fruits & vegetables
- Yard trimmings (that have not been exposed to agro-chemicals)
- Coffee grounds

DO INCLUDE BROWN MATERIAL

- Dead plant matter
- Paper (without ink or color)
- Egg shells
- Tea Bags
- Cardboard in small pieces

DON'T INCLUDE

- Acidic Fruit and Seeds (eg. Pineapple and citrus)
- Meat or Bones
- Colored paper/Wood products
- Plastic
- Fats/Oils/Greases
- Weeds with seeds (eg. estrella, ironweed)

Illustration by Paula Vargas

4.2

Vermicompost Bin System

System Size: Medium

Level of Difficulty: Medium

System Locations: Inside or outside. Vermicompost bins must be placed in completely covered areas, with minimal to no direct sunlight. When choosing a location, bear in mind that this system needs to have a way to catch the slurry which drains from the bins.

Cost: Low - Medium

Pros: There is no need to purchase additional worms because they will quickly reproduce.

Cons: This system requires more maintenance than other composting systems. The worms must be removed from the compost and rotated to different sections of the vermicompost bin to maintain the system.

Materials and tools:

- A plastic bin that is wider than it is deep
- a drill
- bedding: dry materials such as newspaper, dead leaves, old
- coffee grounds, clean sawdust, bits of straw, or fallen bark
- soil
- California Redworms (Eisenia fetida).

CONSTRUCTION INSTRUCTIONS

1. If your receptacle does not already have drainage holes, drill one hole at the bottom edge of the bin. Cover the drainage hole with a fine plastic mesh to prevent the worms from leaving and other insects such as flies from entering. One way to attach the mesh is with silicon glue.

2. Before putting materials into the bin, wash it with a small amount of soap and remove any stray plastic pieces from the bin.

3. Line the bottom of the bin with no more than six inches of torn up pieces of moist newspaper, cardboard or other dry material. Moisten it until it is as wet as a damp sponge.

4. Place the bin above a receptacle that can catch the liquids that will drain from the system. This slurry is highly nutritious for plants. One option is to put a shut-off valve in the drainage hole. If you do this, it will be important to drain the slurry into a receptacle on a daily basis.

5. If the compost is not in a closed space protected from animals and the bins do not have secure tops, gather material to cover it with so that animals cannot get in. This can be landscape cloth or cardboard, covered with wooden or fiber boards:

Photos by Katy VanDusen

STARTING THE VERMICOMPOST PROCESS

1. If you have time, chop the organic waste into smaller pieces to help the microorganisms break down the waste more quickly.
2. Add the worms to the top of the bedding in one corner of the bin.
3. Lightly cover the worms with organic waste. Add more bedding and a few handfuls of soil on top of both the organic waste and the worms.
4. The next batch of organic matter can be added about a week later. This will depend on the number of worms and the amount of organic matter. The worms "crawl" towards the fresh organic matter as you add it. Because this system is “trailing” it is important to give the worms time to transform waste into compost. Check the system at least every other day to observe their progress and add organic matter as they move.
5. As the worms work, the material accumulates, sideways and upwards. The recommended average depth for easy handling is about 20 centimeters.
6. After a few weeks you will be able to start collecting compost at the end where the whole process began. Put the compost into a separate container and manually remove the worms that are still there, placing them in the organic matter that is still actively decaying.
7. Once you have harvested the compost, you can fill that space with a thick layer of compost and fresh organic matter and begin the process again.
8. We recommend waiting a month or so before using the compost and checking to be sure that all the worms were captured. Any worms remaining in the system should be put back into the compost system.
9. Collect the slurry that drains from the system to use as a liquid fertilizer for your garden.

Tip:
If your household produces a lot of organic waste, you may want to consider adopting a larger system with more worms, an additional worm system or a complementary small traditional composting system from those listed above.

Photos by Katy VanDusen

Illustration by Paula Vargas

4.3

Vermicompost: 5-gallon Bucket System

System Size: Medium
Level of Difficulty: Medium
System Locations: Indoors or outdoors. It must be placed in a completely sheltered area, with minimal to no sunlight.
Cost: Low

Pros: It can be placed in a small space. The vermicompost is a high-quality fertilizer. If the system works efficiently, the worms will reproduce and it will not be necessary to buy more worms.

Cons: This system requires more maintenance than other composting systems. It has to be placed in an area protected from the rain, sun and animals, including rats, mice, flies and ants. This system is not appropriate for citrus, fats or dairy products. Earthworms must be purchased or obtained from someone with an existing vermicompost. If you produce large amounts of waste from your kitchen, an extra system will probably be needed to manage your waste.

Materials:

- Three 5-gallon buckets that nest inside each other and one lid.
- a drill with a 1/4" drill bit
- bedding: dry materials such as dead leaves, old coffee grounds, clean sawdust, bits of straw, dry used tea bags, or egg cartons (all in small pieces).
- soil
- about 150 or 250 grams of California Redworms (Eisenia fetida).
- A tight lid or a piece of landscape cloth or fabric large enough to cover the top of the bucket with an extra two inches on each side and a bungee cord or used bike inner tube to attach the cloth to the top bucket
- An extra 5-gallon bucket (or any other container) with a lid to store your vermicompost and harvest remaining worms.

CONSTRUCTION INSTRUCTIONS

1. Wash the buckets with a small amount of soap and remove any chemical residue. Label the buckets A, B and C.
2. Drill about 20 holes in the bottom of bucket A and B to drain the system and to allow the worms to move from bucket to bucket. The amount of holes will depend on the size of the drill bits. Bucket C must not have holes as it will be used to contain the drained liquids from the other buckets.
3. Attach a piece of breathable cloth on top of bucket A with the bungee cord or used bike inner tube.
4. Stack bucket A on C.

1.

2.

3.

4.

Photos by Orlando Calvo

USING YOUR VERMICOMPOST BUCKET SYSTEM

1. Place a 5 to 10 cm layer of moistened bedding in bucket A, depending on the amount of worms you have.


2. Add the worms on the top of the bedding in bucket A. Do not spread them out. They will spread themselves out.



3. Lightly cover the worms with organic waste. We highly recommend chopping the organic waste into smaller pieces. This will help the worms and microorganisms break down the waste more quickly. This organic waste adds humidity to the system. Worms like humid, but not wet, environments.


4. Add more bedding and/or a few handfuls of soil on top of the organic waste (this helps reduce smells and fruit flies).

Photos Orlando Calvo

5. Cover bucket A with the landscape cloth or place the lid tightly on top.

6. Continue to monitor the system daily or at least every other day. Let the worms work for a week and then, with a small shovel, gently move the material to check the worms, the decomposition rate and the humidity. In good conditions, the worms will transform the kitchen waste into small black particles of vermicompost. Depending on the decomposition rate, gradually add waste. Don't add too much at once, a 5 cm layer or less is enough. The thicker the layer is, the more time it will take for the worms to transform the material. Everytime you add new waste, remember to cover it with soil or bedding material.

   The material should be the consistency of a moist sponge. If the material is too dry, the worms will go to the bottom of the bucket and will not eat the dryer material, in this case add water and/or new fresh material. If the system is too wet, it will smell badly and the worms could drown and die. If this is the case, add some dry material such as leaves or shredded cardboard to help the system dry out.

7. Regularly remove the excess liquid from bucket C. This liquid, also known as worm manure tea, is a rich organic fertilizer. It can be used directly on garden soil or diluted with 20 parts water to one part liquid to spray on plants.

8. Once your system has been working for 3 to 5 weeks, the worms will move up, following the fresh organic waste. The bottom of bucket A will have the vermicompost, a few worms and their eggs.

9. Once Bucket A is filled to the point where the base of bucket B just rests on the top of the compost in bucket A. Put Bucket B inside Bucket A and repeat steps 1 to 8.


Photos Orlando Calvo

10. The worms will gradually move from bucket A to bucket B using the holes drilled at the bottom. This will take several weeks. Over time the material in bucket A will reduce in volume.
11. After three weeks, regularly check the abundance of worms in bucket A. Once there are fewer worms and no fresh organic waste, the vermicompost is ready for harvest. Take bucket A out of the system, empty the material into an extra container and gently remove the remaining worms from the compost and put them into Bucket B.
12. Trap the remaining worms by adding 2 to 3 cups of kitchen waste in the material, all in one spot. The worms will move towards it. Then gather those worms and place them in bucket B.

Your vermicompost is ready to use!

OTHER EXAMPLES OF BUCKET SYSTEMS

The bucket vermicompost system at Finca Life Monteverde.

Photos by Orlando Calvo

4.4

Medium and Large Vermicompost Systems

These systems managed in the same way as the bin system and 5 gallon bucket systems, but on a larger scale. One option is to reuse avocado crates with landscape cloth, horizontally or vertically. The crates need good support as they become heavy with the worms and organic waste. Be aware that the worms always come out at the bottom of the crates. It is important to protect the top of the crates or containers from wild animals.

Photos by Orlando Calvo

Another option is to use a cement trough. In this case you can remove the worms from the more mature compost by putting an avocado crate with fresh organic material on top to attract the worms.

chapter 5

5. Bokashi

Chapter 5

5.1
Bokashi

Bokashi can be made either in an anaerobic system, without oxygen, or in an aerobic system that is well aerated. Fermented (or Anaerobic Bokashi) is a pre-composting system for harder-to-compost materials. Aerobic bokashi cannot compost those harder-to compost materials and does not need additional composting before it is applied near plants.

For more tips about bokashi you can visit:
https://bokashiliving.com/

Source:
https://deepgreenpermaculture.com/diy-instructions/bokashi-composting-how-to-process-waste-that-cant-go-in-your-compost-or-worm-farm/

WHAT CAN YOU INCLUDE IN YOUR BOKASHI SYSTEM?

DO INCLUDE GREEN MATERIAL

- Fruits & vegetables
- Yard trimmings (that have not been exposed to agro-chemicals)
- Coffee grounds
- Dairy (milk, yogurt, cheese, etc.)
- Meat and Fish
- Fats

DO INCLUDE BROWN MATERIAL

- Dead plant matter
- Papers (without colored ink)
- Sawdust (without previous contact with oil)
- Egg shells
- Tea Bags
- Cardboard (must be ripped into smaller pieces)
- Bones

DON'T INCLUDE

- Colored paper/Wood products
- Plastic
- Oils
- Liquids
- Pesticides
- Soaps
- Paper towel with alcohol gel

Illustration by Paula Vargas

5.2

Fermented Bokashi System

Fermented bokashi, unlike other composting systems, requires a tight container without oxygen. Unlike other systems, it can handle almost any type of kitchen waste (with the exception of oils) and it does not require the addition of brown material. This is a pre-composting system which requires at least 15 days for the fermentation process and another 15 to 30 days for decomposition either directly in the soil or in a separate composting process. As it is quite acidic, it should not be directly applied to plants for at least one month after fermentation.

System Size: Small
Level of Difficulty: Medium - difficult
System Locations: Indoors or outdoors.
Cost: Low - Medium

Pros: This decomposition method can handle virtually all types of food wastes, with the exception of oils.

Cons: Obtaining a Bokashi Mix is necessary to drive the fermentation process. Liquids need to be drained frequently.

Materials:

- Two identical 5 gallon plastic buckets or stacking bins that can neatly fit inside each other with one good lid with an airtight seal
- a spigot
- silicone or another sealant
- fine plastic mesh
- screws
- Bokashi mix

CONSTRUCTION INSTRUCTIONS

1. Drill 20 to 30 holes with a ⅛ or ¼ inch drill bit on the bottom of one of the buckets.
2. Securely attach the spigot as low as possible on the side of the other bucket. Seal the spigot with silicone or other water-tight fitting to prevent leakage.
3. Cut the fine plastic mesh to fit inside the base of the bucket with holes.
4. Place the bucket with holes inside the bucket with the spigot.

HOW TO USE YOUR BOKASHI SYSTEM

1. Add 1/3 cup (80 ml) of the Bokashi mix on the bottom mesh.
2. Incorporate your food waste as you produce it throughout the day.
3. At the end of the day, compress the food waste to remove air pockets. This can be done with a plate used specifically for this purpose. Then add another cup (80 ml) of the mix.
4. Repeat the above processes each day until the container is full.
5. Drain your system using the spigot as needed. The frequency will depend on the moisture content of your food waste.
6. The extracted liquid is extremely rich in nutrients and microscopic organisms. Put about two teaspoons of liquid for each liter of water and apply this mixture to the soil under plants in your garden.
7. When the Bokashi container is full, let it sit for ten days to two weeks, draining the excess liquid every other day.
8. At the end of this time, the Bokashi may still have some chunks of bone. This is normal.
9. Place the Bokashi in a fallow section of your garden or into a larger compost pile. At this point it is quite acidic and should not be placed directly on plants. Wait at least a month before planting where Bokashi has been added.
10. Rinse out the container with water and let it dry. DO NOT use detergent as it may affect the processing of the next batch of organic waste.

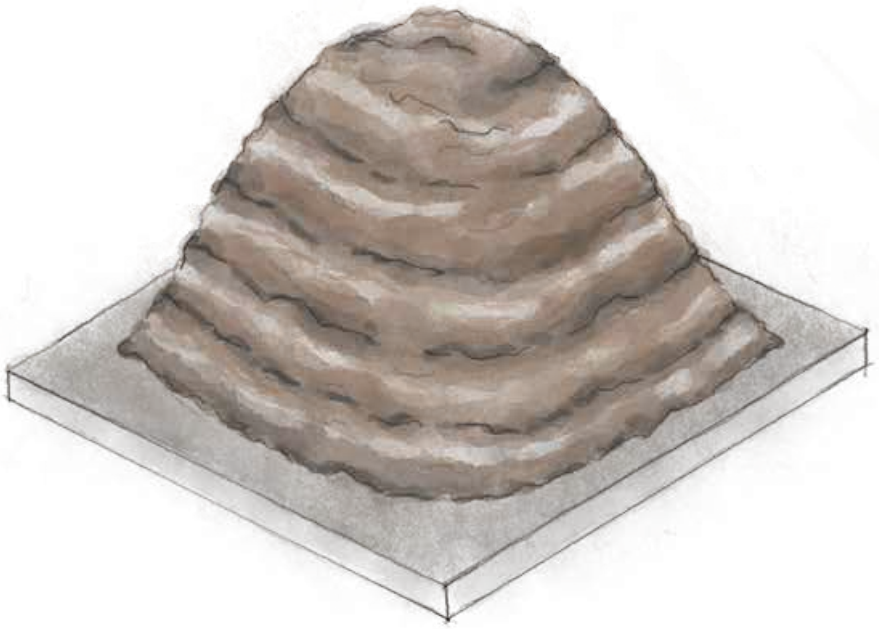


Illustration by Paula Vargas

5.3

Aerobic Bokashi System

Aerobic bokashi, unlike fermented Bokachi, does not require a tight container. It has very specific ingredients, but does not include food waste. Once aerobic bokashi is no longer hot, it can be applied directly to growing plants as long as it does not touch the stem directly.

System Size: Medium - Large
Level of Difficulty: Easy
System Locations: This system is best made in a pile outside, under a roof
Cost: High

Pros: This does not need a sealed container or a special bokashi mix.

Cons: The materials that one can put into aerobic bokashi are not as flexible as for compost or fermented bokashi.

Materials:

	larger amount	smaller amount
chicken manure	4 sacks	1 sack
soil	4 sacks	1 sack
rice hulls	3 sacks	¾ sack
biochar or ground charcoal	1 sack	¼ sack
liquid mountain microorganisms	3 liters	¾ liter
semolina	½ sack	⅛ sack
whey or sour milk	1 liter	250 ml
wood ash	1 kilo	250 grams
rock minerals (optional)	1 kilo	250 grams

INSTRUCTIONS

1. Start placing the solid materials in layers on the ground, starting with the soil.

Photos by Katy VanDusen

2. Mix the materials.

3. Dissolve the molasses in water and add the liquid M.M. Moisten the mixture evenly.

4. Do a squeeze test, so that it is moist but not wet.

5. Make a heap no more than 80 cm high, cover with sacks, and allow to ferment for 12 days or until it reaches ambient temperature.

Photos by Justin Welch

4. In case it heats to over 50° C, mix to aerate and cool.

5. Store in sacks covered from sunlight and rain.

6. Keeps for 4 months.

chapter 6

6. Systems you can buy

Chapter 6

DO YOU WANT TO COMPOST, BUT DON'T HAVE TIME TO MAKE YOUR OWN SYSTEM? CHECK OUT THESE COMPOSTING SYSTEMS THAT YOU CAN PURCHASE!

6.1

360 Soluciones Verdes Takakura

System Size: Small, for 1 to 3 people, about 4 kilos of compost per week.

Level of Difficulty: Easy

System Locations: This system requires a shaded area and well ventilated place, inside or outside.

Cost: High

Description: Two options: wood or plastic. It includes activated substrate to begin composting, a hand rake, and training and follow-up on proper use of the equipment. It is ideal for homes and apartments with 1 to 2 people. It also works as a container to store and mature the harvested compost. The box has a geotextile lining inside that allows the compost mixture to breathe and stay well aerated. This Japanese composting technique promotes the production of efficient microorganisms capable of carrying out the composting process efficiently and odor-free in a small space.

Photos from 360 Soluciones Verdes

INSTRUCTIONS FOR USE

1. Chop the waste into small pieces (4 cm or smaller).
2. Add the organic waste like food, fruit, and vegetable waste to the composter.
3. Add dry material, like sawdust wood pellets, paper, cardboard, or dry leaves.
4. Stir the composter contents to mix and aerate the mixture. Repeat daily.
5. Harvest the pre-compost: after two weeks, transfer the pre-compost to a box or container where it can mature for another two weeks. Leave a 2 cm layer to keep the microorganisms in your composter.
6. Restart the cycle: you can start to add waste to the Takakura box on a daily basis.
7. Harvest the compost: after at least two weeks of maturing, the pre-compost becomes a mature compost that can be used for your plants and garden.

Available in Costa Rica from:
360 Soluciones Verdes

Photos from 360 Soluciones Verdes

6.2

360 Soluciones Verdes Tumblers

System Size: There are different sizes you can purchase based on your needs.

Level of Difficulty: Easy

System Locations: This system requires a shaded area and well ventilated place outside.

Cost: High

Description: Each size of these containers has a double chamber that allows you to add new materials in one compartment, while the other compost matures. Choose between recycled plastic and painted metal. These systems are completely closed, resistant to high temperatures, and include a lever for ease of rotation. It contains side vents for proper aeration, and is perfect if you don't have a lot of time to compost.

Available in Costa Rica from:
360 Soluciones Verdes

Image from Mileniotres

6.3

Huerta

System Size: There are different sizes you can purchase based on your needs

Level of Difficulty: Medium

System Locations: This system requires a shaded area on top of grass or outdoor ground.

Cost: High

Description: This system does not require any tools; however, it does require assembly. The thick walls ensure it is stable and allows for the use of garden tools for turning without the risk of breaking it. The lower portion allows you to use mature compost, while adding new compost to the top in the same system.

Available in Costa Rica from:
Mileniotres: http://mileniotres.cr/composteras/

Image from Vitamix

6.4

Vitamix FoodCycler

System Size: Small
Level of Difficulty: Easy
System Locations: In a kitchen or elsewhere indoors where there is an electrical outlet.
Cost: High

Pros: The Vitamix FoodCycler reduces the volume of food waste by up to 90%. It can be used anywhere indoors where there is an electrical outlet. It is easy to operate. It produces dry compost in 4 to 8 hours. It will processes most table and refrigerator scraps including chicken bones`

Cons: The bucket is extremely small, only half a gallon. It works best if you have a variety of waste (not homogenous) and if you chop it up first, especially stringy material like celery. It would need to be imported to Latin America.

Description: The Vitamix Food Cycler, like other electric kitchen compost machines first blends and then dries the organic waste in your kitchen. The dried waste can be gradually mixed with soil or added to a separate compost pile.

Available from:
Introducing the Vitamix® FoodCycler® FC-50!

chapter 7

7. Additives to improve your compost

Chapter 7

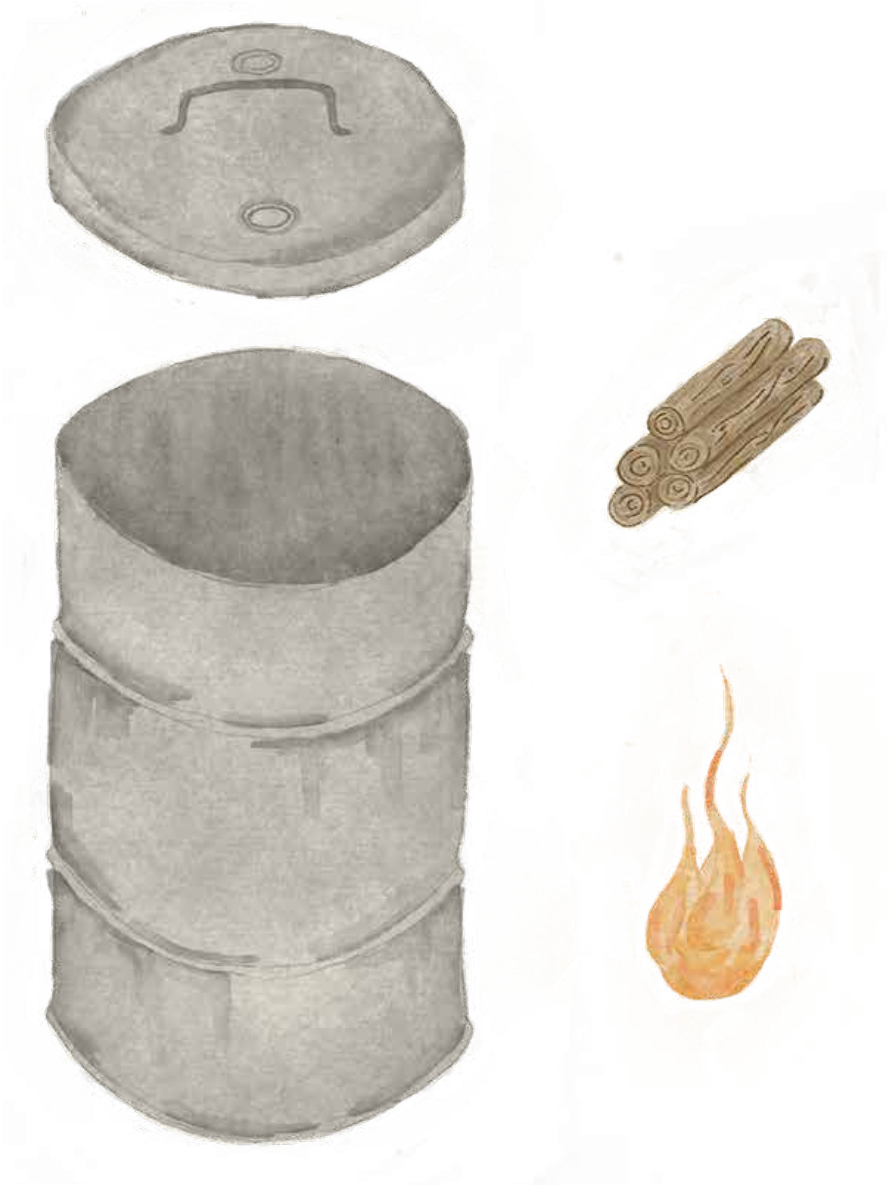


Illustration by Paula Vargas

7.1
Biochar

Biochar was inspired by terra preta, the rich black soils created by indigenous peoples in Amazonia (https://warmheartworld-wide.org/biochar). The process of burning wood in the absence of oxygen creates pyrolyzed carbon which is very resistant to decomposition.

Biochar improves soil in many ways:

- Biochar is especially good at fixing carbon in the soil and in turn mitigates climate change.
- Biochar increases the soil organic material content, which improves physical soil structure and aeration, allows the soil to absorb rainwater and eases root growth. This allows plants to grow faster.
- Biochar is to micro-organisms as coral reefs are to fish; there are more micronutrients because it is a great habitat for them.
- Biochar's charged surfaces hold nutrient particles on the surface in a way that is very easy for plants to pull them off and absorb them, compared to the surface of clay which is more difficult for plants to access. If the particles do not absorb to the surface of soil or biochar particles they are permanently lost by leaching, thereby reducing soil fertility.

Materials:

- a metal drum
- kindling such as bamboo, cardboard or other easily burned material
- chunks of wood

Photos by Harriet Joslin

INSTRUCTIONS

1. Cut around the drum 4 inches below the rim to create a lid. Cut slits in the rim of the drum to create a tab, and push them in so the lid will fit over the drum.
2. Add bamboo or other easily burned material to start the fire and keep adding until it gets really hot, leaving the top off.
3. Add chunks of larger wood and give it a chance to start burning
4. Put the top on to create a good seal. The goal is to have enough oxygen to allow the wood to smolder but not burn.

5. The next day take the top off to check on the process. If the contents still seem to be burning, put the top back on. If it seems like most of the wood has been reduced to chunky char, wet it down a bit to stop the burning. This also helps to crystalize the char.
6. Once the biochar has cooled, charge it with micro-nutrients by adding liquid microorganisms or compost tea. Let the nutrient enriched biochar set for a week or two, or until you are ready to use it.
7. To use the biochar, first break it into small pieces to create as much surface area as possible. The more surface area created leads to more capacity of biochar to work its magic.
8. The char needs to be dug into the soil because biochar on the surface can be very easily eroded off the surface and lost from the soil. You can put it on top and then turn the soil over or dig a hole or trench, add soil and mix it together.

Photos by Harriet Joslin

Illustration by Paula Vargas

7.2

Solid Moutnain Micro-organisms (Solid M.M.)

Solid MMs are used to inoculate compost (especially when it is already moist) and to make liquid mountain micro-organisms (see below).

Ingredient	Amount	Input
Semolina	1 ¼ sacks	Carbohydrates
Molasses	8 kg (8 liters)	Energy
Fine charcoal	½ sack	Structure
Forest mulch, rotting leaves	2 sacks	Microorganisms
Water	20 liters (approximately)	Moisture

INSTRUCTIONS

1. Collect forest mulch, preferably at the beginning and end of rainy season
2. Place it on a clean and compact floor (dirt or cement) and add the semolina and charcoal to form a volcano shaped heap.
3. Stir the mixture with the shovel.
4. Dissolve the molasses in the water and moisten the mixture evenly. Do a squeeze test to test the moisture.
5. Start to transfer the mixture to a 200 liter metal barrel, compacting it every 30 cm.
6. Hermetically seal it, label it, and leave to ferment for 25 days in a cool place in the shade.

Keeps for:
8 months

Photos by Katy VanDusen

Illustration by Paula Vargas

7.3

Liquid Mountain Micro-organisms (Liquid M.M.)

Liquid M.M. is used to inoculate compost (especially when it is dry), biol or fermented soil. It can also be used to fertilize soil directly if diluted with water.

Ingredient	Amount	Input
Solid M.M.	6 kg	Microorganisms
Molasses	6 liters	Energy
Water	200 liters	Moisture

INSTRUCTIONS

1. Dissolve the molasses in a barrel of water.
2. Place the solid M.M. in a clean sack or mesh bag.
3. Add the M.M. to the barrel with the bag (like a tea bag).
4. Hermetically seal and allow to ferment for 5 days.
5. On the fifth day, remove the bag with the M.M. and begin to use it.
6. Dilute it with water before applying on the ground, one cup per gallon for vegetables and two cups per gallon for trees. Do not apply on the leaves.

Keeps for:
3 weeks

Photo by Katy VanDusen

7.4

Biol -
Liquid Fertilizer from Whey

Biol is a liquid fertilizer that can be applied to the soil or directly to the leaves of plants.

Ingredient	Amount
Liquid M.M.	180 liters
Milk or whey	120 liters
Molasses	6 kg
Ashes, phosphytes, rock flour	6 kg

INSTRUCTIONS

1. Mix all the ingredients in a 200 lt. plastic barrel
2. Cover hermetically.
3. Leave to ferment for 15 days.
4. Strain and store in a cool place.

Keeps for:
6 months

7.5

Fermented Earth

Fermented earth is a fine fertile soil that is used for seed beds or potted plants.

Ingredient	Amount	Input
Soil	5 sacks	Microorganisms, consistency, texture.
Organic fertilizer	4 sacks	Microorganisms, minerals, nutrients.
Rice hulls	2 Sacks	Aeration, texture.
Semolina	15 kg	Carbohydrates
Ground charcoal (or Biochar)	¼ sack	Structure
Molasses	5 liters	Energy
Liquid M.M.	18 liters	Moisture, microorganisms

Photo by Katy VanDusen

INSTRUCTIONS

1. Layer the solid materials on the soil starting with the soil.
2. Mix the materials.
3. Dissolve the molasses in the water and add the liquid M.M..
4. Moisten the mixture homogeneously. Make the fist test.
5. Create a mound of maximum 60 cm high and leave to ferment for 12 days or until reaching room temperature.
6. In case of exceeding 50 degrees Celsius turn the mixture to aerate and cool.
7. Pack in sacks and store in a place protected from sun and rain.

Keeps for:
4 months

chapter 8

8. Uses for your finished compost

Photo by Katy VanDusen

7.1

Uses for your finished compost

Build a container garden by re-using containers of all kinds:
Reuse your plastic containers, old pots or wooden boxes. Cut holes in the bottom for drainage if they do not already have them. Container gardens are perfect for small spaces including patios, balconies or window sills.

Build a vertical garden:
Vertical gardens can produce smaller vegetables and herbs for your home. They need minimal space, beautify your walls or create a natural divider.

Participate in a Community Garden:
Working with your neighbors to create a community garden is a good way to use your compost and might encourage your neighbors to compost as well.

Sell or give your compost:
If you do not have a use for your compost, you can give or sell it to a neighbor, a farmer or a school!

chapter 9

9. Mostly benefitial organisms you may find in your compost

9.1

Mostly Beneficial Organisms You May Find in Your Compost:

Fruit flies:

Fruit Flies are tiny flies (0.3 cm) with banded or brown spotted wings. They feed on almost any decaying food and reproduce so quickly that they could become a pest. If flies have become a problem in your compost system, see pages 3 - 6.

Photo by Katy VanDusen

Mites:

Mites are tiny (0.01cm-0.6cm) arachnids that break down leaves, rotten wood, and other decomposing organic waste. There are many types of mites. Most are harmless, but some might compete with the worms for the food or prey on fungi, insect larvae, eggs, other mites and springtails.

Drawing by Naomy Vargas

Springtails:

Springtails are small (0.1cm-0.2cm) white insects. They eat dead plant and animal material and graze on the spores of fungi. Springtails add nutrients to the compost via their feces and speed up the decomposition of organic waste.

Drawing by Naomy Vargas

Woodlice:

Woodlice are blue-gray or black-brown terrestrial crustaceans about 1 cm in size. They feed on decaying plants, animal remains, and other organic materials. They thrive in moist conditions and are great for breaking down brown material in your compost. When disturbed, they curl into a ball.

Photo by Katy VanDusen

Snowbugs and pill bugs:

Sowbugs and pill bugs are beneficial to compost, helping to break down the vegetable material and turn it into soil.

Photo by Katy VanDusen

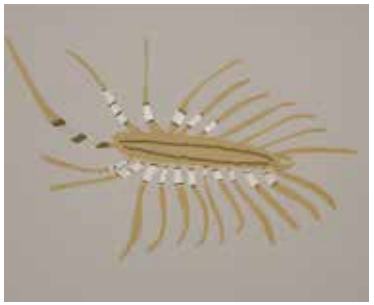
Millipedes:

Millipedes are worms about 2.5 to 5 cm long with a segmented body that allows them to dig through soil with ease. They feed on organic matter and create tunnels, aerating in the compost.

Drawing by Naomy Vargas

Centipedes:

Centipedes (0.4cm-15.2cm) prefer to reside within the top few inches of your compost. They feed on mites, springtails and other living creatures. They also hunt spiders, slugs and worms, which can be problematic.



Snails and Slugs:

Snails have a shell, while slugs do not. Both of these creatures lay eggs in capsules or gelatinous masses. They feed on fresh organic material and plant debris, While they can help in decomposing waste, slugs and snails might start feeding on the plants in the garden. They can grow to 20 cm.

Beetles:

Beetles are easily visible and contain two pairs of wings, one pair that acts as a shield and the other that allows them to fly. Beetles can be found feeding on decaying vegetable matter and preying on other insects, larvae, worms and slugs within your compost. Their presence is a good sign because it means that the compost has many organisms living and feeding on it.

Drawing by Naomy Vargas

Grubs:

Grubs are immature beetles that are small, white, and worm-like. They feed on decaying vegetables and prey on snails, insects, and other small organisms. While they help decomposition in compost, they can be a pest in gardens, eating the roots of plants.

Drawing by Naomy Vargas

Fly Larvae

Fly Larvae, or maggots, often look like grains of rice (0.2cm - 2cm) and develop hard, dark outer shells as they grow. These organisms can feed on any decaying food material.

Photo by Katy VanDusen

Earthworms:

Earthworms are the champions of soil enrichment. As organic matter passes through their digestive system, a nutrient rich enzyme is produced, resulting in the most fertile soil. Earthworms that you find in local soils are a great addition to any composting system.

Photos by Katy VanDusen

chapter 10

10. FAQ and Common Challenges

10.1

FAQ and Common Challenges

Q: What can I do if my compost smells bad?
A: Add more brown material and mix it well to allow for more air to enter the system.

Q: What can I do to reduce the number of fruit flies?
A: Keep the lid on your kitchen container tightly closed, empty it frequently and clean it well with biodegradable soap each time it is emptied. Add an additional layer of brown material on top of your compost each time you add new material.

Q: What can I do if my compost is too dry?
A: Sprinkle it with water. Mix in more green material.

Q: What can I do if my compost is too wet?
A: Mix additional brown material into the system. Make sure excess liquid can drain out. If you have a system with a plastic bin, it may need more and/or larger holes in the bottom.

Q: What can I do if my compost is taking a long time to break down?
A: Mix your compost with more frequency. Add Mountain Microorganisms (see pages 73 - 76), worms (see pages 45 - 55), or more soil. Chop your material more finely before adding it. Crush egg shells before adding them. Move your system to a sunnier spot, if you can. Do not add materials that are not recommended for your specific system. For example, paper towels with alcohol or disinfectant will not break down easily.

chapter 11

11. Glossary

11.1
Glossary

Aeration:
The process of creating air spaces in your compost by turning it.

Aerobic decomposition:
The breakdown of organic material with the presence of oxygen.

Anaerobic decomposition:
The breakdown of organic material without the presence of oxygen.

Compost:
Decomposed organic matter that can be added to soil as fertilizer.

Fermentation:
The chemical breakdown of organic material in a concentrated liquid full of microorganisms.

Fertilizer:
A substance added to a soil bed to make it more fertile.

Microorganisms:
Microscopic organisms, including bacteria and some fungi, that thrive in moist environments like a compost system.

Mountain Microorganisms:
Locally sourced microorganisms that can be added to a composting system in either a solid or liquid form to assist in the breakdown of organic waste and the exchange of nutrients between plant roots and soil organisms.

Orgnaic waste:
The remains of fruits, vegetables, yard waste, other plant material, manure and select paper materials, all of which can be rich in either carbon or nitrogen. Composting systems are fueled by organic waste.

Vermicompost:
A type of compost that uses redworms to break down organic material.

12
Aknowledgements

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Each of you, the users of this manual, also deserve thanks for caring for the earth. Your feedback is encouraged. It will help to improve future editions. Please send your comments and suggestions to climaticamonteverde@gmail.com.

Thank you!