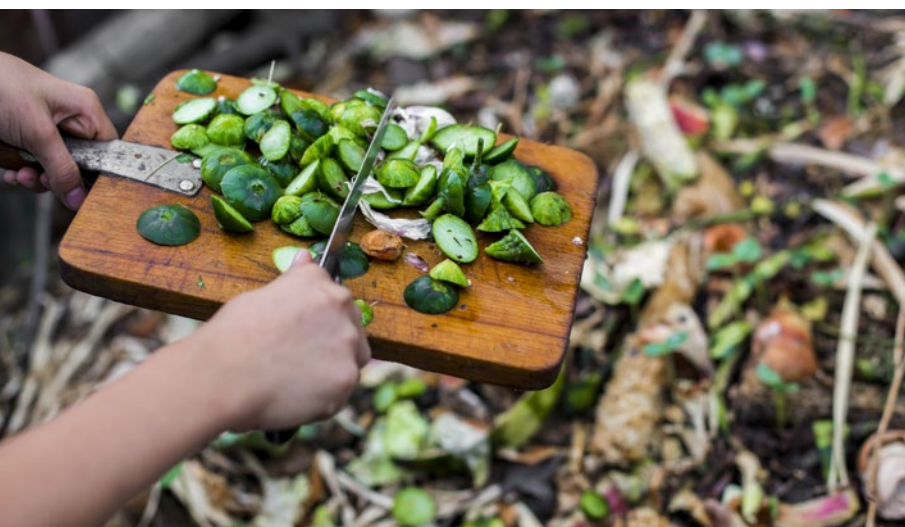


Understanding and Making Compost



OVERVIEW

LEARNING OBJECTIVE

Gardeners will have a good understanding of the importance of composting for soil health and the environment. Gardeners will discuss different methods for composting and how to troubleshoot common problems with compost making. They will also practice building a hot compost pile.

DURATION



MATERIALS NEEDED









- Flipchart and markers
- 6 large sacks of brown, dry organic material
- 3 large sacks of green, wet organic material
- A pile of large, coarse sticks
- One 20 L bucket/jerrycan of manure or good topsoil
- Three or four 20 L buckets/jerrycans of water
- A machete or hoe to chop the material into small pieces
- Several shovels



KEY CONCEPTS

- Compost can improve soil health by providing food for soil life and improving soil structure, texture, and ability to hold water.
- Composting is an excellent way to use organic waste products in the homestead and return nutrients to the soil for plants to use.
- Produce a rich compost by adding the right balance of brown and green materials to the pile and then maintaining the right moisture and air levels.

TRAINING AGENDA

1	Introduction and warm-up	 DISCUSSION	10 min
2	What is composting and how does it help our soils?	 DISCUSSION	30 min
3	Selecting a good site for our compost	 DISCUSSION	15 min
4	How does composting work?	 DISCUSSION	1 hour
5	Different types of composting	 DISCUSSION	30 min
6	Dealing with common compost problems	 DISCUSSION	30 min
7	Demonstration of hot compost technique	 PRACTICAL ACTIVITY	1 hour
8	Closing discussion	 DISCUSSION	10 min

10 min

1. Introduction and warm-up

Welcome gardeners to the training. Do a brief introduction to today's topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator's Guide: Encouraging Learning through Participant Engagement.

30 min

2. What is composting and how does it help our soils?

INTERACTIVE DISCUSSION

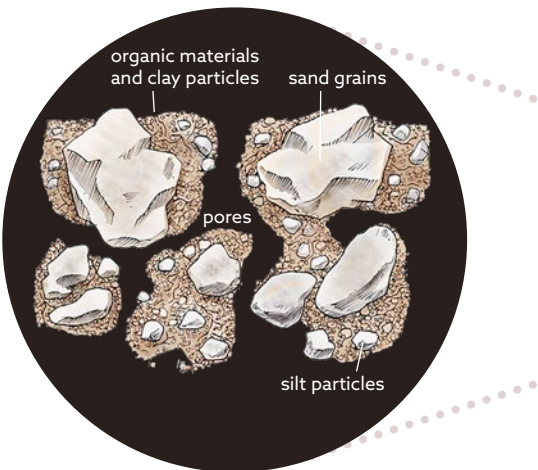
GOAL OF THE DISCUSSION: Gardeners will understand how composting can help our soils and our broader environment.

MATERIALS NEEDED: Flipchart and markers

1. Ask gardeners what composting is and how it helps the soil.
2. Ask gardeners why practicing composting helps not only our gardens but also our environment.
3. Have gardeners share their experiences composting with the rest of the group. What methods worked well for participants? What challenges did they have?

KEY MESSAGES

- Compost adds soil organic matter to the garden, which provides nutrients to plants, supports microorganisms in the soil, and improves soil texture and water holding capacity.
- Compost can trap the nutrients from inorganic fertilizers so they do not leach away.
- Compost helps to keep clay soil from compacting and adds structure to both clay and sandy soils.
- Compost recycles organic waste and turns waste into useful materials to improve soil health.
- When kitchen scraps are not composted properly, they produce gases that give a bad smell (and can harm the environment).



3. Selecting a good site for our compost

INTERACTIVE DISCUSSION

GOAL OF THE DISCUSSION: Gardeners will understand how to select the best site for their compost pile.

MATERIALS NEEDED: Flipchart and markers

1. Ask gardeners to have a brief discussion with their neighbor on the key considerations for choosing a site for a compost pile.
2. After five minutes, ask gardeners to share what they have discussed. Write the main messages on the flipchart and add anything that was not said.

KEY MESSAGES

Consider...

- ...finding an upland site where compost piles can drain away from water bodies.
- ...wind direction to avoid odors bothering you or your neighbors.
- ...avoiding high water tables that have the potential to flood your compost pile.
- ...avoiding areas that are tough to access and difficult to carry materials in and out of.
- ...placing compost piles in many strategic locations so that it is easy to gather organic materials together and then use that compost in nearby fields.

4. How does composting work?

INTERACTIVE DISCUSSION

GOAL OF THE DISCUSSION: Gardeners will understand how soil organisms recycle organic wastes through decomposition and what materials to use—and not use—in compost.

MATERIALS NEEDED: Flipchart and markers

1. Ask gardeners if they know what decomposition is and how to tell if decomposition is happening in your compost.
2. Ask gardeners if they know what decomposers are and if they can name or describe some of them.
3. Tell gardeners that there are two broad categories of materials that should be used for composting: 'brown' and 'green.'
4. Have gardeners work in pairs to make a list of locally available 'brown' and 'green' materials. When the pairs are done working, ask one pair to start by writing their list on a flipchart. Ask the next pair to share any new materials they have listed. Continue until all pairs have shared their lists.
5. Ask the group why we add both brown and green materials to a compost pile. Discuss the right balance of brown to green (2 buckets of brown for every 1 bucket of green) and why we want to diversify the materials we add as much as possible.
6. Ask gardeners if they can think of any material that is brown or green, but CANNOT go into a compost. List what they share on your flipchart and discuss why not.

KEY MESSAGES

What is decomposition?

Decomposition is the breakdown of any organic material (leaves, branches, roots, grass, manure, or food waste for example) into smaller and smaller pieces until they are ready to be reincorporated into the soil. As materials break down, the nutrients in them are released and become available to plants. Decomposition is already happening all over the natural environment. When we build compost piles, we are creating conditions that encourage this natural process to occur quickly and in a controlled fashion so that we can reap the benefits more easily. Decomposition speeds up when water levels are right (not too dry and not too wet) and the right mixture of "food" is available (a balanced mix of brown and green material).

Decomposers are the organisms living in the compost pile that break down organic materials when they consume them. This includes organisms that are too small for us to see, such as bacteria, fungi, and very small insects. It also includes larger organisms like worms, ants, millipedes, and other bugs. As decomposers eat the material in your compost pile, they will transform it into an earthy, sweet-smelling material that is full of nutrients and a gummy substance that improves soil structure and water holding capacity.

When the materials in our compost pile are decomposing rapidly, our compost pile is very hot. Use a spade or a stick to investigate if your compost is hot towards the center of the pile.

What 'brown' and 'green' materials are good for composting?

Green materials for composting are fresh and contain moisture: freshly pulled weeds or crop residue, fruit peels, kitchen scraps, raw manure, or other wet materials. Green materials are oftentimes green in color, but not always. Green materials will supply most of the nutrients that will make your compost good for your garden.

Brown materials for composting are dry or woody: dried leaves, sawdust, rice husks, bean coats, small sticks, and dried manure are all considered brown materials. Often, these materials are brown, which is why we call them brown material. Brown materials absorb the moisture from the wet materials, create air pockets in the pile, and add body to the compost pile.

The same material can start out as a green material (freshly cut corn stalks) and change to a brown material (dried corn stalks) depending on if it is wet or dry when added to a compost pile.



Examples of Brown and Green Compost Materials

Brown		Green	
 Dried leaves	 Small dried sticks	 Fresh garden waste	 Grass clippings
 Wood chips	 Dried corn stalks	 Weeds that have not yet set seed	 Fresh animal manures (cow, pig, chicken, rabbit, sheep, goat, horse)
 Newspaper, shredded	 Very dried animal manures (cow, pig, chicken, rabbit, sheep, goat, horse)	 Clover	 Human and animal urine
 Sawdust and wood shavings	 Peanut shells, rice and wheat husks	 Green wood	 Coffee grounds
 Pine needles	 Kitchen ash	 Fresh corn stalks or other fresh crop residues	 Egg shells
 Straw and hay	 Dried weeds	 Kitchen and food waste (peels, skins, pits, stalks, rotting vegetables and fruits, uneaten cooked food)	
 Cardboard, shredded	 Good topsoil, leaf litter, or soils from termite nests		

Balancing brown to green material



The right balance of brown to green material is **2 buckets or sacks of brown material to 1 bucket or sack of green**. This balance of browns to greens helps to create a pile that decomposes quickly and is not too wet or too dry. Brown and green material work together to create the right environment for decomposition. It is important to start with the right balance of materials and then continue managing the pile's moisture level and exposure to air. It is also important to chop materials into smaller pieces so they decompose faster.

A good practice is to add as many different kinds of brown and green materials to your pile as are available. A compost pile made with a diversity of materials will be richer in nutrients since every material will contain something different.

What materials should NOT be added to compost piles?

- Residues from crops known to be diseased or under severe insect attack. Composting can kill some types of insects and diseases, but not all. It is best to remove these materials from the garden site so that they cannot affect other plants.
- Weeds that have set seed; adding these plants to your compost may distribute weed seeds throughout your garden beds.
- Perennial, invasive weeds and their root systems, such as grasses. These plants can easily grow again from only a tiny stem or root, so gardeners should avoid chopping these plants up. Perennial weeds should be dried and burned.
- Plants that are toxic to other plants and microbial life, such as hemlock, juniper, citrus, castor bean, and eucalyptus. If gardeners notice that other plants do not grow around the base of a particular species, they should not use material from that species in their compost piles.
- Soap, which can kill microorganisms
- Oil, which makes it difficult for air to freely circulate
- Meat or animal bones, bread, cooked rice or other cooked food. These can attract rodent pests and do not decompose well.
- **Manure from meat-eating animals, like cats and dogs, and human excrement. These contain pathogens that can make you sick.**

5. Different types of composting

INTERACTIVE DISCUSSION

GOAL OF DISCUSSION: Introduce gardeners to different forms of composting.

MATERIALS NEEDED: Flipchart and markers

1. Ask gardeners what different types of composting they know. List their suggestions on a flipchart. When gardeners have given their input, suggest types of composting that may be missing.
2. Explain the basics of each type of composting. Assist gardeners' understanding by drawing pictures and discussing how to build each type of compost.

KEY MESSAGES

Organic waste can be composted in many different ways:

- Cold composting
- Hot composting
- Pit composting
- Container composting
- Vermi-composting
- Dig-and-drop composting

COLD COMPOSTING is an 'add as you have it' approach. You simply keep layering on browns and greens as you keep producing them and then wait. This takes longer to produce compost than hot composting, but requires minimal effort.

HOT COMPOSTING is a way to produce compost quicker. Hot composting builds up heat quickly because an optimal balance of brown to green material is used. The center of the compost pile will be the hottest because that is where decomposition is happening the most. The edges of the pile will decompose slower and not get as hot since they are exposed to lots of air and light. Because the center and the edges of the pile are decomposing at different speeds, a gardener will have to periodically mix the materials so that material from the outside edge of the pile find their way into the center of the pile and can also decompose.

PIT COMPOSTING is good for arid climates. Simply dig a pit and put the compost waste in the pit, taking care to still balance browns and greens. In areas with heavy rainy seasons this method is not advisable as there is no way to control moisture levels within the pit.

CONTAINER COMPOSTING is good for making small amounts of compost. Mix 1 part green material with 3 parts brown material inside a container, such as a bucket or barrel. Turn the compost once per day and keep the compost damp, but do not allow water to pool at the bottom of the container. Container compost will be ready in 30 days.

VERMI-COMPOSTING uses worms to decompose organic materials. Composting materials are placed in a container along with worms. This type of composting requires extra attention and care, but produces a highly nutritious compost and liquid that can be used as a foliar fertilizer.

DIG-AND-DROP COMPOSTING involves digging a hole, dropping the organic material into the hole, and replacing the soil. It is simple and requires no further attention or care as the organic materials decompose underground. Try dig-and-drop composting on a fallow field or area where you intend to plant in the future.

6. Dealing with compost problems

INTERACTIVE DISCUSSION

GOAL OF DISCUSSION: Gardeners will understand how to identify and address common problems with compost.

MATERIALS NEEDED: Flipchart and markers

1. Ask gardeners what problems they may have experienced with composting in the past. Make a column on the flipchart for each challenge identified.
2. Ask gardeners how each problem can be remedied. Write down their suggestions in the appropriate column on the flipchart. When gardeners have finished giving their input, add key things that may be missing.

KEY MESSAGES

Why does my compost pile have flies?

Flies are attracted to the food, such as kitchen scraps, in compost piles. When flies recognize a good food source, they lay their eggs in the same area to try and guarantee a food supply for their young. This means the fly population will grow and grow until the problem is fixed.

To reduce flies in a compost pile, try:

- Burying green, or wet, materials that flies like to eat underneath a layer of brown material or soil. If manure and rotting vegetables are not on the top of the pile, the flies cannot reach them and lay their eggs in them.
- Turn the pile on a regular basis. This will encourage decomposition faster and keep the pile hotter than flies like.
- Keep the pile level and do not let it get taller in the middle. An un-level pile will have incomplete decomposition towards the edges of the pile, so more rotting food will be available for flies to eat and lay eggs in. Use a rake or shovel on the top of the pile to even it out after turning.

Why does my compost pile smell bad?

A compost pile can occasionally get a little smelly. This can happen if a pile is too wet or too compacted. When there is too much water, or too little air, the materials inside will get slimy and smelly instead of decomposing into an earthy, sweet smelling substance.

To reduce the odor of your compost pile, try:

- Reflecting on the balance of brown and green material in your pile. Too much green material will make your pile too wet and prone to compaction. The next time you turn your pile, add dried brown material, like leaves or straw. Try to add brown material that is “fluffy” to create air pockets in the pile.
- Protecting the pile from rainwater. If it is frequently rainy and you see more than one drop of water from a handful of squeezed material, cover your compost pile with an old plastic sheet, banana leaves, or other water-resistant leaves to protect it from rain. Turn the pile and add more brown material to correct the moisture level before covering it.
- Reflect on the size of your green and brown layers. If your green layers are too big, they will not properly mix with brown materials and create pockets of slimy material that smells. Turn the pile to properly mix material and check the moisture level of the pile.
- Burying rotting food. Rotting food will smell, so make sure it is buried under dry brown material or soil rather than on the top of the pile.

Why is my compost pile not decomposing?

Since decomposers need water to work, too little water can stop decomposition from happening. Gardeners will not see compost piles reduce in size or materials transform to an earthy substance.

- Make sure the moisture level is correct in your pile. You should see some moisture between your fingers when a handful of compost is squeezed, and the handful should slightly stick together instead of falling apart.
- Add more green material, such as fresh grass clippings or manure.
- It can also be helpful to add some handfuls of already decomposed compost to the pile to add microbes.
- Keep the pile in a shady place or put big leaves over the pile to reduce exposure to the hot sun or wind.

Why are there snakes, rodents, scorpions, or centipedes in my compost pile?

These critters are attracted to the food supplies and heat within your pile.

- Avoid putting cooked food or rice in the compost pile as this will attract rodents. Instead, bury food waste underground using dig-and-drop composting.
- If you suspect snakes or scorpions will be a problem in your area, always use a pitchfork or shovel to turn the pile or check its temperature.
- Consider container composting in a container with a tight lid and small air holes if snakes are a serious problem.
- Centipedes can be attracted to the moisture and other insects, spiders, slugs, and worms in compost piles. Large numbers of centipedes indicate that the pile is too wet. Turn the pile well and leave it exposed for an afternoon to encourage birds to prey on the centipedes and dry out the pile.

7. Demonstration of hot compost technique

PRACTICAL ACTIVITY

GOAL OF ACTIVITY: Gardeners will learn how to make a hot compost pile that will be ready in around 18 days.

FACILITATOR PREPARATION: Identify a suitable location to make a compost pile with gardeners. Instruct gardeners before the training to come with the right number of sacks of brown and green material to make the compost pile.

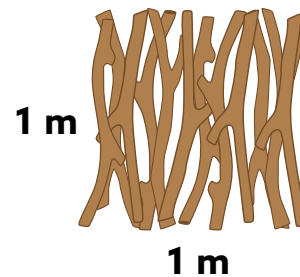
MATERIALS REQUIRED:

- 6 large sacks of brown, dry organic material
- 3 large sacks of green, wet organic material
- A pile of large, coarse sticks
- One 20 L bucket/ jerrycan of manure or good topsoil
- Three or four 20 L buckets/jerrycans of water
- A machete or hoe to chop the material into small pieces
- Several shovels

STEP 1. Ask group to mix the brown materials together into one pile and the green materials into another. The pile of brown material should be twice as big as the pile of green material. As a group, chop up the large pieces of organic material into smaller pieces to speed up the decomposition process, release moisture and nutrients faster, and create smooth layers within the pile.



STEP 2. Ask two members of the group to lay down an initial 1m x 1m layer of coarse sticks. Explain that in order for compost to reach adequate temperature for decomposition, the size needs to be roughly 1m x 1m and that sticks placed at the bottom will help keep air flowing into all sides of the pile.



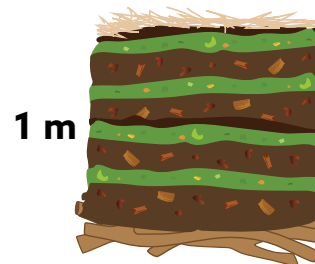
STEP 3. Ask two volunteers to add one layer of brown material on top of the 1m x 1m layer of sticks. Follow this with a layer of green materials that is half as tall as the brown layer.



STEP 4. After adding a few more layers of green and brown material, add a layer of topsoil, manure, or finished compost to the top (approximately 4 large handfuls).

STEP 5. Add water to moisten well.

STEP 6. Continue adding layers of green and brown, followed by a layer of topsoil, manure, or finished compost, until the pile is 1 m wide by 1 m deep by 1 m high.



STEP 7. Cover the top of the pile with a layer of topsoil and a layer of dry grass to keep moisture in the pile.

STEP 8. Ask the gardeners to share their observations and experience.

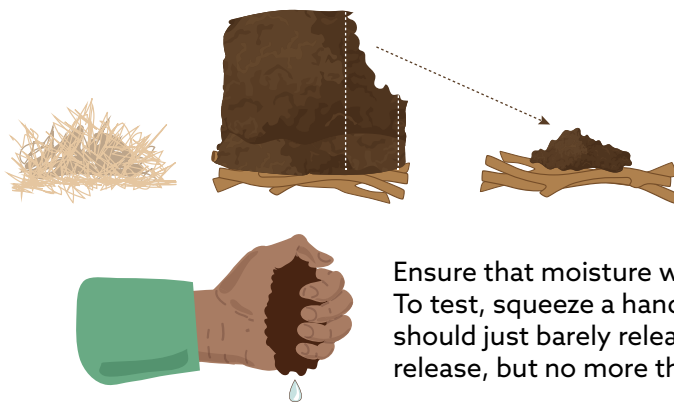
STEP 9. Ask a volunteer from the group to summarize the process to the whole group.

STEP 10. Explain next steps in the process by drawing on a flipchart:

Day 1-4 Let the compost sit for 4 days without turning it.



Day 5



Mix the compost pile so that the material on the outside is now inside the pile and the inner material is now on the outside. To do this, remove the outer layer of dry grass and place to one side. Place new sticks on a spot on the ground next to the old pile. Use a spade to transfer the pile to the new location, taking care that the outer material goes into the center of the new pile.

Ensure that moisture within the pile is enough, but not too much. To test, squeeze a handful of the compost materials. The handful should just barely release any water. You might see some water release, but no more than one drop.

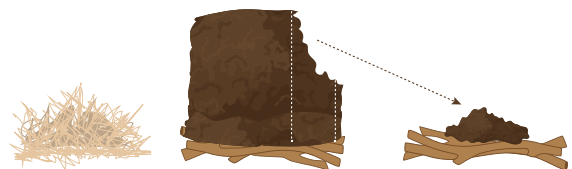
Day 7

The compost pile should reach its maximum temperature around this day. Measure the temperature of the compost pile by removing material with a spade and carefully inserting your arm. If you can put your arm into the compost up to the elbow – it is not hot enough! The middle of the compost should feel hot when the compost pile is most active. Take note: does the pile need more water? Less water? Do you see decomposition starting to happen?



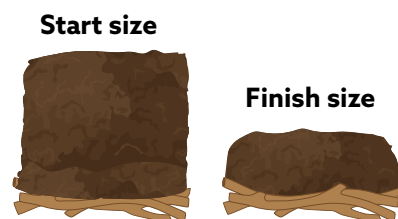
Following days

Turn the compost pile every two days and check the temperature on the days the compost is resting.



Around day 18: finished compost

Finished compost looks like rich brown soil and smells earthy. The original ingredients cannot be identified, and the pile will be about one-third the original size.



KEY MESSAGES

- A properly made compost pile contains the right balance of brown to green material: two buckets or sacks of brown for every bucket or sack of green.
- Make sure all materials are chopped up and shredded well. This provides more surface area for the decomposers to do their work. This is the same principle we use when we chop up vegetables to cook a meal: if we cook using evenly chopped vegetables, everything will finish cooking at the same time. However, if some pieces are big and some are small, the cooking process will be uneven and the big pieces will cook much slower than the small pieces.
- Sticks placed at the bottom help aerate the pile from below. Keeping the pile roughly 1m x 1m helps ensure the compost pile gets hot enough for full decomposition and is easy enough for gardeners to mix using hand tools. If the pile is smaller than 1m x 1m, it may not decompose properly.

7. Closing discussion

Ask gardeners to summarize their key insights around composting.

10 min