Managing Waste Wisely

How to return materials safely back into a circular economy

Goals	Indicators	Evaluation Tools
• Return materials to productive use	• Percentage of waste landfilled or incinerated	• Suspra Solid Waste Log

Composting 001: Safety

How to stay safe while composting

- Wear gloves or wash hands after handling organic waste
- Wear dust protection (N95 mask) when handling dry materials
- Use proper lifting technique when moving large amounts of materials
- Keep your tetanus vaccination current within 10 years

Composting 002: Collecting Kitchen Waste

How to collect kitchen waste for composting

Equipment & Materials

- Container for collecting scraps
- Cutting board
- Knife
- *Optional: Compost pail (1-2 gallon) with tight-fitting lid*
- *Sink basket*
- *Paper bags*
- *Basic kitchen scale (1g precision)*
- *Compost pail filter*

Steps

1. Observe composting safety practices
2. Place container, such as your compost pail, near kitchen sink
3. *Optional: place sink basket in sink to collect scraps before putting them in compost pail*
4. *Optional: place a paper bag or a layer of shredded junk mail inside empty compost pail to make cleaning easier*
5. Use cutting board and knife to cut large scraps into 2-inch pieces to speed decomposition
6. Put scraps in container; if using a compost pail, put lid on tightly
7. *Optional: weigh compost pail when full and record data in your solid waste log*
8. Empty container when full (where to empty depends on how you compost)
9. Clean container to prevent odors and pests
10. *Optional: replace compost pail filters as necessary to prevent odors and pests*

Discussion

Collecting kitchen scraps is a fundamental building block for many composting practices. You can use a mixing bowl if you'll empty it right away; a dedicated compost pail can be emptied

after a few days. Metal compost pails are the most sustainable, being durable, easy to clean, and fully recyclable. A good compost pail has a tight-fitting lid that allows air flow and may have a filter to prevent odors and deter fruit flies. Depending on what you eat and how you compost, you will keep some or all organic matter out of your garbage. Putting a paper bag or shredded junk mail into the compost pail before adding kitchen scraps will help keep waste from getting stuck to the bottom and sides, making it easier to clean.

Definitions

- Compost pail: a metal, plastic, or ceramic container for collecting kitchen scraps
- Decomposition: breaking down organic matter into simpler substances by microorganisms, fungi, and other decomposers
- Kitchen scraps: organic matter including waste produced preparing meals and uneaten food
- Organic matter: material that comes from living organisms, containing carbon
- Sink basket: a metal basket or filter placed in the corner of a sink, handy for scraping off plates and keeping small items placed in the sink from going down the drain

Troubleshooting

Problem	Solutions
Odors	Clean your compost pail or replace the filter.
Fruit flies	Clean your compost pail or replace the filter. Place dishes of vinegar with a dash of dish soap to catch flies.
Waste sticks to bottom and sides of pail	Place a paper bag in the pail before adding waste. Place a layer of shredded junk mail in the pail before adding waste.
Not sure what to collect	Based on how you compost, create a YES and NO list to put on your pail.

Limitations

- Collecting kitchen scraps only prepares you to compost; next, you will need to decide how to compost what you collect.
- Fruit flies can be difficult to prevent entirely if you eat fresh fruit.

Related Practices

- All composting practices that provide a way to compost kitchen scraps.

References and Further Reading

- Kitchen Compost Bins We Love, New York Times Wirecutter
- Managing Fruit Flies in Your Kitchen Compost Bin, Charleston Composts

Composting 003: Collecting Household Waste

How to collect compostable household waste for composting

Equipment & Materials

- Containers, such as paper bags or waste paper bins, for collecting compostable waste

Steps

1. Observe composting safety practices
2. Place containers in bathrooms, bedrooms, and offices
3. *Optional: label bins for compostable waste with a green square, bins for landfill waste with a red diamond*
4. Empty container when full (where to empty depends on how you compost)

Discussion

Collecting compostable household waste outside of the kitchen is a fundamental building block for many composting practices. The highest volume of this waste is paper and cardboard, but it also includes natural fibers, leather, and wood. You can use paper bags or waste paper bins to collect this waste separately from plastic and other non-compostable waste. You will keep compostable organic matter out of your garbage that you send to a landfill or incinerator.

Definitions

- Compostable: items that are made entirely of organic matter without preservatives
- Organic matter: material that comes from living organisms, containing carbon

Troubleshooting

Problem	Solutions
Not sure what to collect	Paper that soaks up water is compostable. Modern soy-based inks are compostable.

Limitations

- Collecting compostable household waste only prepares you to compost; next, you will need to decide how to compost what you collect.
- Many household items are a combination of paper and plastic; only the paper in these items will compost, the plastic will not.

Related Practices

- All composting practices.

References and Further Reading

- Can You Compost Tissues?, Greenwashing Index

Composting 004: Collecting Leaves

How to collect and store leaves for composting

Equipment & Materials

- Rake
- *Optional: Electric leaf blower*
- *Tarp*
- *Wheelbarrow*
- *Electric string trimmer*
- *Electric lawn mower*

- *Garbage can*
- *Paper leaf bags or large plastic garbage bags*

Steps

1. Observe composting safety practices
2. Rake or blow leaves into a pile
3. *Optional: place leaves on a tarp or in a wheelbarrow so you can move them in batches*
4. *Optional: put leaves in a garbage can and use a string trimmer to shred them*
5. *Optional: put leaves in a pile and use a lawn mower to shred them*
6. *Optional: store shredded leaves under a tarp or in bags under cover so they dry out*

Discussion

Collecting leaves is a fundamental building block for many composting practices. Collect leaves in the fall and use them all year. Shredding reduces storage volume and quickens composting. Storing dry leaves provides a ready source of "browns" (material relatively low in nitrogen and high in carbon) to mix with "greens" from your kitchen to maintain optimal conditions for odor-free composting.

Definitions

- String trimmer: a handheld power tool that uses a spinning monofilament to cut groundcover; also known as a "weed wacker"

Troubleshooting

Problem	Solutions
Too many leaves	Shred to reduce volume. Use some as mulch.
Leaves are diseased	Compost separately from healthy leaves; sun dry finished compost. Compost in a "hot" pile.

Limitations

- Collecting leaves only prepares you to compost; next, you will need to decide how to compost.
- Leaves are only available if you have trees on your property.

Related Practices

- All composting practices.

References and Further Reading

- How to Collect and Use Leaves for Composting, Ground to Ground

Composting 101: Using a Single Pile

How to compost yard waste, such as leaves and grass clippings, in a single outdoor pile

Equipment & Materials

- Yard waste such as leaves, grass clippings, branches, etc.

- *Rake (optional)*
- *Pruners*
- *Tarp*
- *Wheelbarrow*
- *Electric string trimmer*
- *Electric lawn mower*
- *Pitch fork*
- *Wire fencing*
- *Compost thermometer*

Steps

1. Observe composting safety practices
2. Move yard waste into one pile directly in contact with soil
3. *Optional: Use pruners, a string trimmer, or a lawn mower to cut or shred material into pieces*
4. *Optional: Construct a frame using wire fencing, use a garbage can with the bottom cut off, or buy an "Earth Machine"-type composter to contain the pile*
5. Water the pile as you add layers so all material is completely soaked
6. *Optional: Turn over material in the pile every few weeks*
7. *Optional: Water pile to speed up decomposition*

Discussion

All organic material eventually decomposes. Cutting or shredding material into smaller pieces, consolidating material into one pile, and providing water for the organisms that do the decomposing speeds up the process. You can use a compost thermometer to determine if composting is happening; measuring temperature inside the pile that is higher than ground temperature next to the pile indicates that composting organisms are active. Alternating "browns" (dry leaves, etc.) with "greens" (fresh grass clippings, etc.) and mixing material produces better results more quickly. At the end of the composting process, a much smaller amount of dark humus material will remain.

Definitions

- Aerobic: in the presence of oxygen molecules (O_2)
- Browns: organic matter that has a low nitrogen to carbon ratio and low moisture content
- Compost thermometer: a metal probe with thermometer, used to measure temperature in a pile
- Composting: decomposing in a controlled manner using aerobic organisms
- Decomposition: breaking down organic matter into simpler substances by microorganisms, fungi, and other decomposers
- Greens: organic matter that has a high in nitrogen to carbon ratio and high moisture content
- Humus: dark, rich material that forms in soil when organic matter decomposes
- Organic matter: material that comes from living organisms, containing carbon

Troubleshooting

Problem	**Solutions**
Pile doesn't break down	Add water. Cut up or shred material in the pile. Add more greens. Wait.

Pile smells bad.	Turn pile. Add more browns.

Limitations

- Woody pieces take much longer to decompose.
- An uncovered pile is unsuitable for composting kitchen scraps due to the risk of pests.

Related Practices

- Composting 102: Burying Organic Waste
- Composting 203: Using Three Bins

References and Further Reading

- "How to Make Compost the Easy Way – Composting 101", Homesteading Family <homesteadingfamily.com/how-to-make-compost-the-easy-way/>
- Earth Machine Compost Bin <www.orbiscorporation.com/en-us/products/environmental-recycling-and-waste/>
- "How to Build and Use a Trash Can Composter" by Colleen Vanderlinden <www.thespruce.com/how-to-make-trash-can-compost-2539476>

Composting 102: Burying Organic Waste

How to compost organic waste, such as kitchen scraps, used tissues, hair or bones, by burying it

Equipment & Materials

- Garden shovel or trowel
- Bucket or container for collecting organic waste
- Garden gloves
- *Optional: Marker or small stakes to mark burial spots*
- *Garden journal or map*

Steps

1. Observe composting safety practices
2. Collect organic waste following the practices for collecting kitchen waste or collecting household waste
3. Choose a suitable location in your yard or garden where:
    - The soil is workable (not too rocky or compacted)
    - You won't disturb existing plant roots
    - You won't be planting vegetables within four months (for food safety)
    - Water doesn't pool after rain
4. Dig a hole approximately 8-12 inches (20-30 cm) deep
5. Place your organic waste in the hole, filling it no more than 2/3 full
6. Cover the waste with at least 6-8 inches (15-20 cm) of soil, mounding it slightly to allow for settling
7. *Optional: Mark the location with a small stake or marker*
8. *Optional: Record the location and date in a garden journal*
9. Allow the buried waste to decompose for four months before planting in that spot
10. For your next burial, choose a different location at least 12 inches (30 cm) away

Discussion

Burying organic waste, sometimes called “trench composting” or “dig and drop composting,” is one of the simplest forms of composting, requiring minimal equipment and maintenance. This method uses the natural soil ecosystem to break down materials while enriching the surrounding soil.

The process works because soil contains a rich ecosystem of bacteria, fungi, invertebrates, and other decomposers that break down organic matter. As the materials decompose underground, they release nutrients directly into the soil where plants can access them. The burial method also helps retain moisture and prevents odors that might attract pests.

This method is particularly suitable for people who:

- Don’t have the space or time for a traditional compost pile
- Have only small amounts of compostable material
- Want to enrich soil in specific areas of their garden
- Need to compost materials that might be problematic in an open pile (like meat scraps, bones, or oily foods)

For gardeners, a strategic approach is to dig trenches between rows of plants or in areas where you plan to plant next season. The buried organic matter will decompose over several months, enriching the soil for future plantings.

Definitions

- **Aerobic decomposition**: Decomposition that occurs in the presence of oxygen
- **Anaerobic decomposition**: Decomposition that occurs in the absence of oxygen (happens more in deeper burials)
- **Biodegradable**: Materials capable of being decomposed by bacteria and fungi into simpler substances
- **Decompose/Decomposition**: The process of breaking down organic materials into simpler substances by microorganisms and other decomposers
- **Organic matter**: Material derived from living organisms containing carbon compounds
- **Trench composting**: A variation of burial composting where a longer trench is dug and gradually filled and covered over time

Troubleshooting

Problem	**Solutions**
Animals dig up the buried waste	Bury waste deeper (at least 8 inches/20 cm). Cover with a heavy stone temporarily. Add a layer of twigs before the soil to discourage digging.
Waste isn't decomposing	The hole may be too deep causing anaerobic conditions. Ensure the waste isn't buried more than 12 inches (30 cm) deep. Add some garden soil before covering to introduce more microbes.

Problem	Solutions
Unpleasant odors	Cover with more soil (at least 8 inches/20 cm). Avoid burying large amounts of meat or dairy. Mix in some dry leaves or shredded paper with wet kitchen scraps.
The burial site is sinking	This is normal as materials decompose. Add more soil to maintain ground level; Mound soil slightly when burying to account for settling.
Not enough space for burying	Use smaller, deeper holes rather than wide ones. Rotate through your garden systematically. Consider other composting methods like vermicomposting for periods when burying isn't feasible.

Limitations

- Not suitable for large volumes of waste unless you have significant land area
- Buried waste takes longer to decompose than in active compost piles (3-6 months minimum)
- Certain materials (large branches, woody materials) will decompose very slowly when buried
- Not recommended for use in areas where the water table is high or flooding is common
- Not ideal for urban areas with limited garden space
- Temporary reduction in nitrogen availability to nearby plants as decomposition occurs

Related Practices

- Composting 002: Collecting Kitchen Waste
- Composting 003: Collecting Household Waste
- Composting 101: Using a Single Pile
- Composting 203: Using Three Bins
- Composting 303: Using a Buried Chamber

References and Further Reading

Books

- *Let It Rot!: The Gardener's Guide to Composting* by Stu Campbell
- *Teaming with Microbes: The Organic Gardener's Guide to the Soil Food Web* by Jeff Lowenfels and Wayne Lewis
- *The Complete Compost Gardening Guide* by Barbara Pleasant and Deborah L. Martin
- *Worms Eat My Garbage* by Mary Appelhof

Websites

- Cornell Composting <compost.css.cornell.edu>
- Oregon State University Extension: “Garden soil and compost” <extension.oregonstate.edu/gardening/soil-compost>

Composting 201: Curbside Composting

How to compost using a curbside composting service

Equipment & Materials

- Curbside compost bin provided by your municipality or service
- Kitchen compost container for collecting scraps (1-2 gallon capacity)
- *Optional: Compostable bin liners*
- *Small kitchen scale to record data*
- *Compost pail with activated carbon filter*
- *Freezer storage container for odorous scraps*
- *Newspaper or brown paper bags to wrap wet food scraps*
- *Service pickup schedule/calendar*

Steps

1. Observe composting safety practices
2. Research and sign up for a curbside composting service available in your area
    - Check with your municipality for existing programs
    - Research private services if municipal options aren't available
3. Set up your kitchen collection system
    - Place your kitchen compost container in an accessible location
    - Line with a compostable bag or newspaper if desired
    - Post a list of accepted materials near your collection container
4. Collect food scraps and other compostable materials in your kitchen container
    - Check your service's guidelines for accepted materials
    - Cut larger scraps into smaller pieces to speed decomposition
5. Empty your kitchen container into your curbside bin when full
    - If using compostable bags, include the bag with your compost
6. Place your curbside bin at the designated pickup location on collection day
    - Follow local requirements for bin placement and timing
7. After collection, rinse or clean your curbside bin as needed
    - Use vinegar or mild soap if necessary to control odors
8. *Optional: In your solid waste log, track the weight of materials you compost*

Discussion

Curbside composting services are for people who want to compost but lack the space, time, or ability to manage a home composting system. These programs collect compostable materials and process them at industrial-scale facilities that can handle meat, dairy, and compostable packaging. Industrial composting facilities typically maintain higher temperatures than home systems, enabling them to break down materials more quickly and kill pathogens that might survive in lower-temperature home systems. Many facilities use advanced techniques like forced aeration and regular turning to create finished compost in weeks rather than months.

The primary environmental benefits of curbside composting include:

- Reducing methane emissions from landfills

- Creating valuable soil amendments for agriculture and landscaping
- Conserving landfill space
- Reducing the need for chemical fertilizers

When investigating curbside composting services, you might encounter different models:

- **Municipal programs**: Run by local governments, often included with regular waste service
- **Private subscription services**: Fee-based services in areas without municipal programs

Definitions

- **Curbside composting**: Collection service that picks up compostable materials from residential properties
- **Compostable**: Materials that will break down safely and completely in a composting system
- **Compostable bags**: Bags made from materials certified to break down completely in industrial composting facilities
- **Industrial composting**: Large-scale composting operations that can process diverse materials at higher temperatures
- **PFAS**: Per- and polyfluoroalkyl substances, “forever chemicals” that contaminate compost

Troubleshooting

Problem	**Solutions**
Odors in kitchen container	Empty containers more frequently. Use a container with a tight-fitting lid and carbon filter. Freeze particularly smelly scraps until collection day. Sprinkle baking soda in the bottom of your container. Wrap wet food scraps in newspaper or a paper bag.
Fruit flies	Empty containers more frequently, especially in warm weather. Keep container lids closed at all times. Clean containers thoroughly after emptying. Store containers in the refrigerator or freezer between additions.
Uncertainty about acceptable materials	Keep a list of accepted materials near your compost container. When in doubt, check your service provider's website or app. Remember “if it grows, it goes” for most programs, though there are exceptions.
Missed pickups	Set calendar reminders for collection day. Check the service provider’s holiday schedule. Sign up for pickup reminders if offered by your service.

Problem	Solutions
Animals getting into bin	Ensure the bin lid is securely closed. Use a bin with a locking mechanism if provided. Store the bin in a garage or secure area until collection day.

Limitations

- Not all areas offer curbside composting services
- Private services may have monthly fees
- Programs vary widely in what materials they accept
- Apartment buildings and multi-family housing may have limited access to services
- Requires consistent participation to realize environmental benefits
- Industrial composting causes transportation emissions
- Some “compostable” products may not fully decompose even in industrial facilities
- Contamination with non-compostable materials can reduce the quality of finished compost
- Materials with PFAS (from food packaging) may contaminate compost

Related Practices

- Composting 002: Collecting Kitchen Waste
- Composting 003: Collecting Household Waste
- Composting 101: Using a Single Pile
- Composting 202: Municipal Composting
- Composting 204: Using a Kitchen Appliance
- Organizing Waste 101: Sorting Into Five Streams
- Organizing Waste 401: Neighborhood Composting

References and Further Reading

- Best practices for Increasing Curbside Collection of Residential Organic Waste <metrostor.us/best-practices-for-increasing-curbside-collections/>
- BioCycle Nationwide Survey: Residential Food Waste Collection Access In The U.S. <www.biocycle.net/residential-food-waste-collection-access-in-u-s/>
- Compost Crew <compostcrew.com>
- Composting Maps: Urban Access <sustainablepackaging.org/our-work/public-resources/mapping-urban-access-to-composting-programs/>
- Garbage to Garden <garbagetogarden.org>
- Municipal Curbside Compostables Collection: What Works and Why? <www.c40knowledgehub.org/s/article/Municipal-Curbside-Compostables-Collection-What-Works-and-Why>
- The Community Zero Waste Roadmap <ecocycle.org/content/uploads/2021/04/Toolkit-Community-Zero-Waste-Roadmap.pdf>

Composting 202: Municipal Composting

How to compost using a drop-off municipal composting facility

Equipment & Materials

- Container for collecting kitchen scraps (compost pail or bucket with lid)
- Reusable container, bin, or compostable bags for transporting waste
- Vehicle to transport compostable materials (car, bike with trailer, etc.)
- Rake or shovel (for yard waste)
- *Optional: Paper for collecting and wrapping food scraps*
- *Dedicated bin for storing yard waste before transport*
- *Gloves*
- *Tarp for collecting and transporting large amounts of yard waste*

Steps

1. Observe composting safety practices
2. Find a municipal composting facility near you:
    - Check your city or county website
    - Call your local waste management department
    - Search online for “municipal composting” or “food waste drop-off” in your area
3. Learn the facility’s specific guidelines:
    - Accepted materials
    - Drop-off hours
    - Fees (if any)
    - Container requirements
4. Collect compostable materials:
    - For kitchen scraps, use a compost pail as described in collecting kitchen waste
    - For yard waste, collect leaves, grass clippings, and small branches
5. Prepare materials for transport:
    - Transfer kitchen waste to a sealed container for transport
    - Bundle yard waste in manageable portions
    - Remove any non-compostable contaminants
6. Transport materials to the municipal facility:
    - Follow facility's schedule for drop-off times
    - Bring identification or proof of residency (if required)
    - Follow signs to the appropriate drop-off area
    - Empty your containers into the designated bins or areas
7. *Optional: Record your contribution in your waste management log*
8. Clean your collection containers thoroughly after each drop-off to prevent odors and pests

Discussion

Municipal composting facilities are for people who want to compost but lack space, time, or ability to maintain a home composting system. These facilities often accept meat, dairy, and diseased plants. Advantages of municipal composting include:

- **Higher processing capacity**: Industrial facilities can reach and sustain higher temperatures than home systems, allowing for more complete decomposition and pathogen elimination.
- **Broader range of acceptable materials**: Many facilities accept meat, dairy, compostable serviceware, and other items challenging for home composting.
- **Professional management**: The composting process is monitored and managed by professionals, ensuring optimal conditions.
- **Reduced home maintenance**: You don't need space or time to maintain your own compost pile.

Municipal composting transforms organic waste into humus that can be used in public parks, sold to farmers, or sometimes given back to residents. Using these facilities creates a circular system where waste becomes a resource rather than a problem. Compost produced at municipal facilities may be tested for safety. Municipalities may give finished compost back to residents for free or at a discount, allowing you to return nutrients to your own yard or garden.

Definitions

- **Biodegradable**: Materials that break down naturally but may require specific conditions or longer timeframes than a composting facility provides
- **Compostable**: Materials that will fully break down in an industrial composting facility
- **Contamination**: Non-compostable materials that can ruin a batch of compost
- **Feedstock**: Raw materials accepted by the composting facility
- **Municipal composting**: Large-scale composting operations run by local governments or contracted waste management companies
- **Tipping fee**: A charge assessed for dropping off materials at a composting facility

Troubleshooting

Problem	Solutions
Facility doesn't accept certain materials	Keep a separate container for these items and explore alternative disposal methods such as home composting or specialized collection services.
Odors during transportation	Use sealed containers. Double-bag food scraps in paper bags. Transport materials promptly rather than letting them sit. Sprinkle baking soda in transport containers.
Inconvenient drop-off hours	Freeze food scraps until you can make a trip. Coordinate with neighbors to take turns making drop-offs.
Leaking or messy transportation	Line your transport container with newspaper or a compostable bag. Use sturdy containers with tight-fitting lids. Place the transport container in a plastic bin or tray during transit.

Problem	Solutions
No municipal facility in your area	Contact your local government to express interest. Join or form a community composting initiative. Consider a subscription to a private composting service.
Unable to transport materials regularly	Freeze food scraps to reduce odor and pest issues between trips. Find a neighbor who uses the facility and offer to combine trips.

Limitations

- Not available in all communities
- Requires transportation, which has an environmental impact
- Drop-off hours may be limited to certain days and times
- May require sorting materials differently than for home composting
- Some facilities charge tipping fees
- Residential access may be limited to residents of specific municipalities
- No direct access to the finished compost unless the facility offers a giveback program

Related Practices

- Composting 002: Collecting Kitchen Waste
- Composting 003: Collecting Household Waste
- Composting 004: Collecting Leaves
- Composting 201: Curbside Composting
- Organizing Waste 101: Sorting Into Five Streams

References and Further Reading

- Find a Composter <findacomposter.com>
- MakeSoil <makesoil.org>
- Target Organics: A Compost Program Resource Hub <hub.compostingcouncil.org>

Composting 203: Using Three Bins

How to compost yard waste and kitchen scraps using a three-bin outdoor system

Equipment & Materials

- Lumber for bin construction (untreated wood or cedar recommended)
  - 12 posts (4x4 inches, 3-4 feet long)
  - Planks for sides (1x6 inches, quantity depends on bin size)
  - *Optional: use shipping pallets instead of build your own sides*
- Hardware
  - Screws or nails
  - *Optional: Hinges for lids*
  - *Optional: Wire mesh (hardware cloth, 1/4 to 1/2 inch)*
- Tools

    - Drill with screwdriver bits
    - Saw
    - Hammer
    - Level
    - Measuring tape
    - Post hole digger or shovel
- Garden gloves
- Dust mask
- Composting materials
    - “Browns” (carbon-rich materials): dry leaves, straw, shredded newspaper, cardboard
    - “Greens” (nitrogen-rich materials): kitchen scraps, fresh grass clippings, plant trimmings
- *Optional: Garden fork or pitchfork*
- *Compost thermometer (for monitoring composting conditions)*
- *Garden hose with spray nozzle*
- *Wheelbarrow or garden cart*
- *Tarp (for covering bins)*

Steps

1. Observe composting safety practices
2. Select an outdoor location for your three-bin system
    - Choose a level area with good drainage
    - Ensure easy access for adding materials and turning compost
    - Consider proximity to garden and kitchen
    - *Optional: Choose a shaded location to prevent compost from drying out*
3. Determine dimensions of each bin (typically 3-4 feet wide, 3-4 feet deep, and 3-4 feet high)
4. Construct the bins
    - Option A: Build three adjacent bins
        - Dig post holes at corners and between bins
        - Set corner posts in ground, ensure they're level and sturdy
        - Attach side planks to posts, leaving 1-2 inch gaps between planks for airflow
        - For the front of each bin, make removable slats or a hinged door for easy access
    - Option B: Use pallets
        - Arrange three pallets in a square (minus one side for access)
        - Secure corners with wire, screws, or rope
        - Create three such units side by side
5. *Optional: Line the side and bottom of bins with wire mesh to deter rodents*
6. Understand the system
    - Bin 1: Add fresh materials to this “collection” bin
    - Bin 2: Help materials break down in the “active composting” bin
    - Bin 3: Allow finished compost to mature in the “curing” bin
7. Add materials to Bin 1
    - Chop or shred larger materials to speed decomposition

    - Layer browns and greens in approximately 3 browns to 1 green ratio
    - Water layers as you add them (should be damp like a wrung-out sponge)
8. When Bin 1 is full (usually after 1-3 months):
    - Transfer contents to Bin 2 by turning and mixing thoroughly
    - This aeration accelerates the decomposition process
9. Continue adding fresh materials to Bin 1
10. Monitor Bin 2
    - Turn materials every one or two weeks for faster decomposition
    - Add water to keep moisture level similar to a wrung-out sponge
    - *Optional: Check that contents heat up (130-150°F in center indicates active composting)*
11. When Bin 2 shows signs of being mostly broken down (dark, crumbly, earthy smell):
    - Move contents to Bin 3 for final curing
    - At this point, Bin 1 may be full again and ready to move to Bin 2
12. Allow compost in Bin 3 to cure for one or two months
    - Turn occasionally during this time
    - Finished compost is dark, crumbly, and has an earthy smell
13. Harvest finished compost from Bin 3
14. Repeat the cycle as Bin 1 continues to fill

Discussion

The three-bin system efficiently manages the composting process through different stages: collecting fresh materials, actively decomposing, and curing finished compost. You can continuously add new materials while removing finished compost. The system promotes aerobic decomposition, where microorganisms break down organic matter in the presence of oxygen. Watering the compost keeps microbes alive. Turning the compost introduces fresh oxygen, which speeds decomposition and helps raise temperatures to kill weed seeds and pathogens.

For optimal composting:

- Maintain a good carbon-to-nitrogen ratio (roughly 3:1 browns to greens)
- Keep compost moist but not soggy
- Turn regularly to introduce oxygen
- Monitor temperature in the active bin; 130-150°F indicates vigorous microbial activity
- Locate bins in a partially shaded area to prevent excessive drying

With proper management, a three-bin system can keep organic material out of landfills, processing yard and kitchen waste into rich, garden-ready compost every few months.

Definitions

- Aerobic decomposition: Breaking down organic matter in the presence of oxygen
- Browns: Carbon-rich materials like dry leaves, straw, and paper that provide energy to decomposer organisms
- Compost thermometer: A long probe thermometer designed to measure internal temperatures of compost piles

- Curing: Final stage of composting where the broken-down materials mature into usable compost
- Greens: Nitrogen-rich materials like kitchen scraps and fresh grass clippings that provide protein for decomposer organisms
- Hot composting: Process where compost reaches temperatures of 130-150°F, killing pathogens and weed seeds
- Turning: Process of mixing and aerating compost to introduce oxygen and speed decomposition

Troubleshooting

Problem	Solutions
Compost isn't heating up	Add more greens (nitrogen-rich materials). Make sure piles are large enough (at least 3x3x3 feet). Check moisture level; add water if too dry. Turn the pile to introduce oxygen.
Compost smells bad (like ammonia)	Too much nitrogen. Add more browns (carbon-rich materials) like dry leaves, straw, or shredded paper. Turn the pile to introduce more oxygen.
Compost smells bad (like rotten eggs)	Pile is too wet or compacted, creating anaerobic conditions. Add dry browns and turn thoroughly to introduce oxygen. Ensure adequate drainage at bottom of bins.
Compost is too wet	Add dry brown materials. Turn piles more frequently. Consider covering bins during heavy rain.
Compost is too dry	Add water while turning piles. Aim for a moisture level of a wrung-out sponge. Consider adding a cover to prevent excessive evaporation.
Pests (rodents, flies) in compost	Avoid adding meat, dairy, oils, or fatty foods. Cover fresh kitchen scraps with browns. Ensure bins are secured with hardware cloth if rodents are persistent. Turn piles more frequently to discourage nesting.
Compost is breaking down very slowly	Chop or shred materials into smaller pieces. Ensure proper moisture levels. Turn more frequently. Balance greens and browns better. Check that pile is large enough to retain heat.

Limitations

- Initial setup requires carpentry skills and materials
- Requires more space than single-bin or tumbler systems
- May not be suitable for very small urban yards
- Involves moderate physical labor for turning and moving compost between bins

- Requires ongoing management and monitoring for optimal results
- May attract pests if not properly maintained
- Not ideal for composting meat, dairy, or oily foods unless using hot composting techniques
- Takes up to nine months for complete composting cycle, depending on conditions

Related Practices

- Composting 001: Safety
- Composting 002: Collecting Kitchen Waste
- Composting 004: Collecting Leaves

References and Further Reading

Articles

- "Composting 101" by Shelia Hu <www.nrdc.org/stories/composting-101>
- "Setting Up a Three-Bin Compost System" by Mark Dwyer <www.finegardening.com/article/setting-up-a-three-bin-compost-system>

Books

- *The Rodale Book of Composting, Newly Revised and Updated: Simple Methods to Improve Your Soil, Recycle Waste, Grow Healthier Plants, and Create an Earth-Friendly Garden* edited by Grace Gershuny and Deborah L. Martin

Websites

- Small Scale or Backyard Composting - Cornell Waste Management Institute <cwmi.css.cornell.edu/smallscale.htm>
- Composting - Oregon Metro <www.oregonmetro.gov/tools-living/yard-and-garden/composting/>
- <HowToCompost.org>

Composting 204: Using a Kitchen Appliance

How to compost using an electronic kitchen appliance

Equipment & Materials

- Electric kitchen composter
- Available power outlet or portable power station
- Carbon additives (included with most composters or available for purchase)
- Garden gloves
- *Optional: Kitchen waste bin for collecting scraps*
- *Kitchen scale to measure materials composted*
- *Small container for storing finished compost*

Steps

1. Observe composting safety practices
2. Set up your composter in a convenient location with electric power and good ventilation
3. Read the manufacturer's instructions, as specific operation varies by model

4. Collect kitchen scraps
5. Add scraps to the composter according to the manufacturer's guidelines
    - Some units require chopping larger items into smaller pieces
    - Most units have maximum fill lines that should not be exceeded
6. Add carbon additives if recommended by your composter's manufacturer (often these are specially formulated pellets or sawdust mixes)
7. Start the composting cycle according to your device's instructions
    - Cycles typically range from four to 24 hours
8. Allow the unit to complete its cycle
    - Most units have automatic shut-off features
9. Remove the processed compost according to the manufacturer's instructions
    - Some units have removable bins, others require scooping out the finished material
10. Use the finished product as a soil amendment
11. Clean the unit and reset for the next batch according to the manufacturer's instructions

Discussion

Electric kitchen composters provide a quick, convenient way to process rather than landfill food waste, especially for apartment dwellers or those with limited outdoor space. Outdoor composting can take months to produce usable compost, whereas electric kitchen composters accelerate the breakdown process through heat, aeration, and sometimes grinding mechanisms. These devices typically reduce food waste volume up to 90% and produce a nutrient-rich soil amendment that can be used immediately. The resulting material is often drier and more concentrated than traditional compost but works well for houseplants, container gardens, or outdoor garden beds.

Most electric composters combine heat, agitation, and aeration to speed up the composting process. Some models primarily dehydrate and physically break down material, while others use microorganisms and enzymes for decomposition. The resulting product varies, ranging from a dry, coffee ground-like material to a more traditional compost texture. Electric composters can often handle small meat scraps, dairy, and cooked foods. Check your specific model's guidelines, as capabilities vary.

Electric composters typically emit little to no odor during operation when used properly, making them suitable for indoor use. Most units have carbon filters to mitigate smells. Regular cleaning and proper maintenance as specified by the manufacturer should ensure odor-free operation. While electric composters require an initial investment and use electricity, reducing their net environmental benefit, they are an effective way to keep organic material out of landfills where it would produce methane.

Definitions

- **Carbon additives**: Materials high in carbon added to balance nitrogen-rich food waste; in electric composters, these are often specially formulated pellets or sawdust mixtures
- **Composting cycle**: The period during which the electric composter processes food waste

- **Electric kitchen composter**: A countertop or under-counter appliance that accelerates the decomposition of food waste through heat, grinding, aeration, or a combination methods
- **Finished compost**: The end product of the composting process; in electric composters, this is typically a dry, nutrient-rich material that can be used as a soil amendment
- **Methane:** a greenhouse that forms when organic materials are buried in sanitary landfills
- **Soil amendment**: a substance that improves the properties of soil

Troubleshooting

Problem	Solutions
Composter emits unpleasant odors	Check that you're not overloading the unit. Clean the machine thoroughly according to manufacturer instructions. Replace carbon filters if your model uses them. Add carbon additives if recommended. Ensure proper ventilation around the unit.
Finished compost is too wet	Add more carbon additives to balance moisture. Avoid adding very wet food scraps without draining excess liquid first. Run an additional drying cycle if your model offers this feature.
Unit won't start or stops mid-cycle	Check that the unit is properly plugged in and the outlet is functioning. Ensure all components are properly assembled. Check for error codes and consult the manual for troubleshooting specific to your model. Contact the manufacturer if problems persist.
Compost isn't breaking down properly	Ensure you're not adding prohibited items. Cut larger scraps into smaller pieces. Check that the unit is operating at the correct temperature. Clean any clogged air vents or stirring mechanisms.
Noise during operation	Some noise is normal, but excessive or unusual sounds may indicate an issue. Check for loose components or foreign objects that might be causing vibration or obstruction.
Pests attracted to the unit	Ensure the unit is properly sealed during operation. Clean the exterior of any food residue. Store finished compost in sealed containers if not being used immediately.

Limitations

- Initial cost investment ranges from $300 to $1,000 depending on the model and capacity
- Requires electricity to operate, adding to energy consumption
- Limited capacity compared to outdoor composting systems (typically processes two to five liters of food waste per cycle)
- Some models may have limitations on what types of food waste can be processed

- Carbon filters need regular replacement (typically every 3 to 6 months) to maintain odor control
- Some models can be noisy during operation
- Finished product may differ from traditional compost in texture and appearance
- May require specialized carbon additives that need to be purchased regularly

Related Practices

- Composting 002: Collecting Kitchen Waste

References and Further Reading

Articles

- "5 Best Electric Kitchen Composters, Tested and Reviewed" by Sarah Gregory <www.goodhousekeeping.com/appliances/g60373874/best-countertop-composter/>
- "Digging in the Dirt: 4 Home Composters Reviewed and Rated" by Richard Baguley <www.wired.com/story/home-composters-buying-guide/>

Devices

- beyondGREEN <byndgrn.com/products/kitchen-composter>
- Lomi <lomi.com>
- Reencle Home Composter <reencle.co/products/reencle-food-waste-composter>
- Vitamix® FoodCycler® Eco 5 <www.vitamix.com/us/en_us/shop/foodcycler-eco-5>
- Vitamix® FoodCycler® FC-50™ <www.vitamix.com/us/en_us/shop/foodcycler-fc-50>

Composting 301: Fermenting First

How to ferment waste using the bokashi method before composting it

Equipment & Materials

- Bokashi bucket with tight-fitting lid and spigot (or two 5-gallon buckets with lids, one with a spigot installed at the bottom)
- Bokashi bran (inoculated wheat bran with effective microorganisms)
- Plate, disk, or plastic sheet that fits inside the bokashi bucket to press down waste
- Spray bottle
- 1 tablespoon measuring spoon
- Regular compost bin or soil burial location
- *Optional: Kitchen scale to track waste amounts*

Steps

1. Observe composting safety practices
2. Set up your bokashi bucket in a convenient indoor location (under sink, in pantry, etc.)
3. Add a layer of bokashi bran (approximately 1-2 tablespoons) to the bottom of the empty bucket
4. Add a one or two inch layer of food scraps to the bucket
5. Sprinkle one tablespoon of bokashi bran evenly over the food scraps
6. Press down firmly on the food scraps using a plate or plastic disk to remove air pockets
7. Cover with the tight-fitting lid

8. Drain liquid from the spigot every two or three days (this is bokashi tea)
9. Dilute bokashi tea 1:100 with water and use as a fertilizer, or pour down drains as a cleaner
10. Repeat steps 4-8 each time you add scraps until the bucket is full
11. When full, seal the bucket and let ferment in a warm location for 10 to 14 days
12. After fermentation is complete, either:
    - Bury the fermented waste in a garden bed (8-12 inches deep)
    - Add to a regular compost pile
    - Mix with soil in a separate container and let sit for two to four weeks

Discussion

Bokashi composting is an anaerobic fermentation process that originated in Japan. Unlike aerobic composting, bokashi uses beneficial microorganisms (primarily bacteria and yeasts) to ferment organic matter without producing foul odors. The primary advantages of bokashi are:

- It accepts ALL food waste including meat, dairy, and oils (items that can attract pests in outdoor composting systems)
- It's faster than traditional composting (two to four weeks versus months)
- It can be done indoors in a small space with no odors when sealed properly
- It retains more nutrients than traditional composting
- It creates a liquid fertilizer (bokashi tea) as a beneficial byproduct

While bokashi isn't technically composting but fermentation, it’s an excellent first step that prepares organic matter for more rapid decomposition in soil or a traditional compost pile. Fermented materials become highly bioavailable to soil organisms, improving soil health and plant growth.

The bokashi process creates an acidic environment (pH around 3.5) where food waste is preserved rather than rotted. This acidic pre-compost material neutralizes quickly once buried in soil. The microbes added through the bokashi bran help accelerate the breakdown of the waste. For apartment dwellers or those with limited outdoor space, bokashi provides a viable solution for processing food waste sustainably without odor issues or attracting pests.

Definitions

- **Anaerobic**: A process that occurs without oxygen
- **Bokashi**: Japanese term meaning "fermented organic matter"
- **Bokashi bran**: Wheat bran, rice bran, or sawdust inoculated with effective microorganisms
- **Bokashi tea**: Liquid that drains from fermenting materials, rich in nutrients and microorganisms
- **Effective microorganisms (EM)**: A specific blend of beneficial microbes that aid in fermentation
- **Fermentation**: Process where microorganisms convert organic compounds into simpler substances in the absence of oxygen

- **pH**: Measure of acidity or alkalinity; bokashi creates an acidic environment with pH of 3.5

Troubleshooting

Problem	Solutions
Foul odor from bokashi bucket	Make sure the lids are sealed properly. Add more bokashi bran. Ensure you're draining liquid regularly. Make sure materials are pressed down to remove air pockets.
Mold in the bucket	White/blue-white mold is normal and harmless. Black, green, or blue mold indicates problems; add more bokashi bran and press materials down better.
Not enough bokashi tea being produced	Some materials produce less liquid than others. Vegetables typically produce more liquid than dry bread or grains. Add more bokashi bran to encourage microbe activity.
Bokashi materials not breaking down after burial	Soil may be too cold. Try burying in warmer weather or add to a hot compost pile. Ensure burial location has active soil biology.
Pests (fruit flies, etc.) getting into bucket	Check the seal on the lid. Make sure the bucket is closed immediately after adding waste. Consider keeping a small bowl of vinegar near the bucket to attract flies away.
Bokashi tea smells very foul	This is normal. Dilute before use (100 parts water to 1 part tea).

Limitations

- Requires specialized bokashi bran (you can make your own)
- Not a complete composting solution; requires a second step (burial or traditional composting)
- Initial setup cost is higher than some other composting methods
- Takes up some kitchen space
- The acidic fermented material will harm plants if used directly; process further for safety
- Not ideal for large volumes of yard waste like leaves and branches

Related Practices

- All composting practices

References and Further Reading

- “A Guide to EM Bokashi” by Marlborough District Council <www.marlborough.govt.nz/environment/environmental-education/living-more-sustainably/a-guide-to-em-bokashi>
- “Bokashi 101: Everything you need to know to get started” by Love Food Hate Waste NZ <lovefoodhatewaste.co.nz/bokashi/>

- *Bokashi Composting: Scraps to Soil in Weeks* by Adam Footer
- "Bokashi Composting: Step by Step Guide" by Jennifer Posivak <clarkcountycomposts.org/images/bokashicomposting.pdf>
- "Compost Guide: Bokashi" by Arizona Department of Environmental Quality <www.azdeq.gov/bokashi-compost-guide>
- "How To Make DIY Bokashi Flakes" by the Compostess <thecompostess.com/2015/04/22/how-to-make-bokashi/>
- The Bokashi Bucket <thebokashibucket.com>

Composting 302: Using a Tumbler

How to compost in an enclosed tumbler

Equipment & Materials

- Compost tumbler
- "Browns": Carbon materials (shredded paper, dried leaves, or cardboard)
- "Greens": Nitrogen materials (green grass clippings, vegetable scraps)
- Garden gloves
- Water source (hose or watering can)
- *Optional: Compost activator/starter*
- *Thermometer designed for composting*
- *Small container for collecting kitchen scraps*
- *Pruning shears or scissors for cutting large pieces*

Steps

1. Observe composting safety practices
2. Set up your tumbler in a location that:
    - Receives partial sun (some sun helps maintain heat)
    - Has a level surface
    - Is accessible for turning and harvesting
3. Collect a good balance of "browns" (carbon-rich materials) and "greens" (nitrogen-rich materials) to fill at least one-third of your tumbler
4. Add materials to the tumbler, mixing browns and greens
5. Add water as you go to achieve the moisture level of a wrung-out sponge
6. *Optional: Add a handful of finished compost or commercial compost starter to introduce beneficial microorganisms*
7. Close the tumbler securely
8. Turn the tumbler five complete rotations every two days
9. *Optional: Check internal temperature with a compost thermometer; 120-150°F (49-65°C) indicates active composting*
10. Continue adding materials as they become available, maintaining the brown-to-green ratio
11. When the tumbler is nearly full, stop adding new materials and continue turning regularly
12. Allow materials to decompose (can take from 3 to 8 weeks depending on conditions)

13. Harvest finished compost when it appears dark and crumbly with an earthy smell
14. *Optional: If some larger pieces remain incompletely composted, sift them out and return them to the tumbler for the next batch*

Discussion

Compost tumblers provide a convenient, enclosed system that deters pests, contains odors, and can accelerate decomposition through improved aeration when turned regularly. Tumblers are designed to be rotated easily, which mixes materials thoroughly and introduces oxygen throughout the pile. The tumbling action solves the need to turn the pile with a pitchfork or shovel. Simply rotating the tumbler a few times achieves the same effect with much less effort. This frequent turning accelerates the composting process, potentially producing finished compost in as little as three weeks under optimal conditions, though eight weeks is more typical.

Tumblers work best when filled to the right capacity—not too empty (which limits heating) and not too full (which limits tumbling effectiveness). Starting with a batch that fills about one-third to one-half of the tumbler allows room for turning while providing enough mass for heating. The enclosed design also helps retain heat and moisture, making composting possible year-round in many climates.

For best results, maintain a ratio of approximately three parts carbon-rich "browns" (dried leaves, paper, cardboard, wood chips) to one part nitrogen-rich "greens" (food scraps, fresh grass clippings, coffee grounds). This balance provides the optimal conditions for decomposer organisms. If your compost smells bad or isn't heating up, adjusting this ratio usually solves the problem.

Definitions

- **Aeration**: The process of introducing air into the compost pile, necessary for aerobic decomposition
- **Browns**: Carbon-rich materials like dried leaves, paper, cardboard, and woody materials that provide structure and energy to composting organisms
- **Compost activator/starter**: Material containing microorganisms that help jump-start the composting process
- **Compost tumbler**: An enclosed container designed to rotate, mixing compost materials and introducing oxygen
- **Greens**: Nitrogen-rich materials like food scraps, grass clippings, and plant trimmings that provide protein for composting organisms
- **Thermophilic**: Referring to the high-temperature phase of composting when heat-loving microorganisms thrive (typically 120-150°F)

Troubleshooting

Problem	Solutions
Compost is too wet	Add more dry browns (leaves, shredded paper). Leave the tumbler open in dry weather.

Problem	Solutions
Compost is too dry	Add water. Add more greens.
Bad odor (rotten eggs)	Too wet or compacted. Add browns, turn more frequently, ensure drainage holes aren't blocked.
Bad odor (ammonia)	Too much nitrogen. Add more browns, turn more frequently.
Not heating up	Insufficient volume, too dry, or wrong green-to-brown ratio. Add more materials, check moisture, or adjust ratio.
Difficult to turn	Tumbler is too full. Remove some material or wait for contents to shrink as decomposition progresses.
Pests attracted to tumbler	Ensure the tumbler is securely closed. Bury fresh food scraps in the center of existing materials. Avoid adding meat, dairy, or oils.
Slow decomposition	Add water. Add more materials. Add more greens. Turn more frequently. Add an activator. Move the tumbler to a sunnier location. Wait for warmer weather.

Limitations

- Limited capacity compared to larger composting systems
- Can be difficult to turn when completely full
- May not reach high enough temperatures in cold climates during winter
- Quality tumblers can be a significant investment compared to simple bin or pile systems
- Not suitable for large volumes of yard waste
- Some designs do not allow continuous addition of materials

Related Practices

- Composting 002: Collecting Kitchen Waste
- Composting 003: Collecting Household Waste
- Composting 004: Collecting Leaves
- Composting 301: Fermenting First

References and Further Reading

Articles and Books

- *Build a Compost Tumbler* by Tracy Abell
- *How to Make and Use Compost: The Ultimate Guide* by Nicky Scott

Tumblers

- Envirocycle <www.envirocycle.com/product/composter/>
- Jora Composters <www.joracomposters.com>
- Mantis CT02001 <mantis.com/products/composters/ct02001-composter/>
- Sun-Mar Garden Composters <usa.sun-mar.com/garden-composters/>

Composting 303: Using a Buried Chamber

How to compost pet waste and other material in a partially-buried chamber

Equipment & Materials

- Buried chamber system (Green Cone, Doggie Dooley, or similar)
- Shovel
- Pickaxe or mattock (for hard soil)
- Garden gloves
- Compostable pet waste bags or newspaper
- Bucket with lid for temporary waste collection
- Water
- *Optional: Compost thermometer*
- *Hose with spray nozzle*
- *Compost accelerator/activator or septic starter*
- *Gravel or small rocks (for drainage in poorly draining soils)*
- *Cardboard, wood chips, or straw (for carbon-rich materials)*
- *Wood ash or garden lime (to control odor)*
- *Power drill (if modifications are needed)*
- *Hardware cloth (to deter pests)*

Steps

1. Choose location and system
    - Choose a location that receives sunlight (to promote microbial activity)
    - Ensure the location is well-drained and not in a low spot that collects water
    - Select a spot at least 10 feet from any vegetable garden and 3 feet from property lines
    - Keep system away from wells, streams, or other water sources (at least 100 feet)
    - Choose a location with easy access for adding waste materials
2. Prepare the site
    - Dig a hole according to manufacturer's instructions (typically 18-24 inches deep)
    - For poor-draining soils, add 2-3 inches of gravel at the bottom for drainage
    - For very wet areas, consider excavating a larger area and adding drainage material
3. Install the system
    - For Green Cone systems:
        - Place the black base in the hole, ensuring the rim sits at ground level
        - Fill in soil around the base, packing firmly
        - Attach the green outer cone and inner basket according to instructions
        - Secure the lid
    - For Doggie Dooley systems:
        - Place the unit in the hole according to manufacturer's instructions
        - Backfill soil around the unit, packing firmly
        - Attach lid and ensure it closes properly
4. Activate the system
    - Add a compost accelerator, activator, or septic starter according to package instructions

    - Add two gallons of water to moisten the system and activate microbes
    - For DIY systems, add a shovelful of garden soil to introduce microorganisms
5. Use the system
    - For pet waste:
        - Collect pet waste in biodegradable bags or newspaper
        - Open the lid and add waste to the chamber
        - Optionally sprinkle a small amount of accelerator after adding waste
        - Keep lid closed when not in use
    - For food waste:
        - Add fruit and vegetable scraps, eggshells, coffee grounds, and tea bags
        - Avoid adding meat, dairy, oils, or large amounts of citrus
        - Chop or break down larger items for faster decomposition
        - Keep lid closed when not in use
6. Maintain the system
    - Add water periodically to maintain moisture, especially during dry periods
    - Add compost accelerator monthly according to manufacturer's instructions
    - During cold weather, expect slower decomposition
    - If odor develops, add a small amount of garden lime or wood ash
    - Monitor fill levels and ensure proper drainage
7. Managing the finished material
    - For Green Cone and similar systems:
        - Material naturally filters into surrounding soil
        - No removal or harvesting required
    - For Doggie Dooley and similar tank systems:
        - After two years, check if system is near full capacity
        - If needed, install a new system in a different location
        - Allow the full system to continue decomposing for an additional year
        - Use resulting material only for ornamental gardens, never food crops

Discussion

Buried chamber composting systems handle materials that are typically challenging to compost in traditional systems, particularly pet waste and food scraps that might attract pests in open compost piles. These systems use a combination of anaerobic (without oxygen) and aerobic (with oxygen) decomposition processes to break down waste materials. The two main types of buried chamber systems serve slightly different purposes:

Green Cone systems are primarily designed for food waste disposal. These digesters feature a double-wall construction with an inner and outer cone. The outer cone is partially buried and allows the sun to heat the chamber, accelerating decomposition. The inner cone allows waste to break down and slowly release nutrients directly into the surrounding soil. Green Cones can process large amounts of food waste without requiring emptying, as the decomposed material filters directly into the soil.

Doggie Dooley systems are specifically designed for pet waste disposal. These are essentially mini-septic tanks that use bacterial action to break down pet waste. They're particularly useful for households with multiple pets where waste accumulation is significant. Some models require occasional emptying while others allow waste to percolate into the surrounding soil.

Both systems rely on beneficial bacteria and other microorganisms to break down the waste material. The decomposition process is accelerated by warmth, moisture, and the addition of compost activators or accelerators that contain bacterial cultures. In warm weather, waste can decompose within weeks, while in colder conditions, the process may slow significantly or even temporarily halt. Unlike traditional composting systems, buried chambers don't require the careful balancing of carbon-rich "browns" and nitrogen-rich "greens," though adding some carbon materials like shredded paper can help with odor control and decomposition.

The main advantage of these systems is their ability to safely dispose of materials that would otherwise go to landfills, reducing methane emissions and returning nutrients to the soil. They also provide a hygienic way to handle pet waste that minimizes health risks to humans and animals.

Safety Considerations

- Always wash hands thoroughly after handling pet waste or adding materials to the system
- Keep the lid secured to prevent access by children or animals
- Never use resulting compost on edible gardens or crops
- For pet waste systems, locate away from vegetable gardens and water sources
- Wear gloves when handling the system or waste materials
- Don't use the system for disposable diapers, cat litter, or non-biodegradable materials
- Be aware that these systems may not fully eliminate pathogens, especially in cold weather

Definitions

- **Aerobic decomposition:** Breakdown of organic matter by microorganisms that require oxygen
- **Anaerobic decomposition:** Breakdown of organic matter by microorganisms that don't require oxygen
- **Compost accelerator/activator:** Products containing beneficial bacteria and/or enzymes that speed up the composting process
- **Leachate:** Liquid that drains from decomposing material, containing nutrients and potentially pathogens
- **Pathogen:** Disease-causing microorganisms that may be present in pet waste or spoiled foods
- **Percolation:** The process of liquid slowly filtering through soil

Troubleshooting

Problem	Solutions
System has strong odors	Add garden lime or wood ash to neutralize odors. Add carbon materials like shredded paper or leaves. Check that the system isn't waterlogged.
Waste isn't decomposing	Check if the system is too dry and add water if needed. Add compost activator or accelerator. Ensure the system receives adequate sunlight. In winter, decomposition naturally slows down.
System is attracting flies or pests	Bury fresh waste under a layer of soil or carbon material. Consider installing hardware cloth around the buried portion if rodents are a problem.
System is waterlogged	Improve drainage by adding gravel beneath and around the system. Consider relocating the system to higher ground. Add holes to the buried portion for better drainage.
Contents are freezing in winter	Accept slower decomposition during cold months. Consider insulating the above-ground portion with straw bales in extremely cold climates.
System is full	For Green Cone type systems, contents should reduce in volume over time. For Doggie Dooley types, install a new system and allow the full one to finish decomposing for a year.

Limitations

- Not suitable for large volumes of waste in small yards
- Performance decreases significantly in cold weather
- Not suitable for meat, dairy, bones, or large amounts of oily foods
- Cannot be used for cat litter, even “flushable” varieties
- Requires consistent moisture management
- Contents from pet waste systems cannot be used on food crops
- May be prohibited in some locations, especially in watershed protection areas
- Requires soil with adequate drainage capability
- May not fully eliminate pathogens, especially in cold conditions
- Not suitable for compostable plastics, which require higher temperatures to break down

Related Practices

- Composting 001: Safety
- Composting 002: Collecting Kitchen Waste
- Composting 102: Burying Organic Waste
- Composting 304: Using Worms
- Composting 305: Using Flies

References and Further Reading

Articles

- "Composting Dog Waste" (USDA) <www.epa.gov/system/files/documents/2022-11/Composting-Dog-Waste-Booklet-Alaska.pdf>
- "Big Dog Poop Composter (made From Salvaged Materials)" (Instructables) <www.instructables.com/Big-Dog-Poop-Composter/>

Composting systems

- Doggie Dooley <doggiedooley.com>
- Green Cone <www.greenconeusa.com/green-cone-solar-food-waste-digester.html>

Composting 304: Using Worms

How to compost using worms (vermicomposting)

Equipment & Materials

- Worm bin container (plastic tote, wooden box, or commercial worm bin)
- Red wiggler worms (*Eisenia fetida*) or European nightcrawlers (*Eisenia hortensis*)
- Bedding material (shredded newspaper, cardboard, coir, or aged compost)
- Spray bottle with water
- Kitchen scraps
- Small trowel or garden fork
- *Optional: Thermometer*
- *Small scale to measure material composted*
- *Fine mesh screen (for harvesting)*
- *Tarp or large plastic sheet (for harvesting)*

Steps

1. Observe composting safety practices
2. Prepare the worm bin
    - Drill 8 to 12 small drainage holes (1/8 to 1/4 inch) in the bottom of your container
    - For plastic bins, add 10-20 small air holes (1/16 inch) along the upper sides
    - Place a tray underneath to catch any liquid (worm tea)
    - Position the bin in a location with temperature between 55 and 77°F (13 and 25°C)
3. Prepare the bedding
    - Tear or shred newspaper/cardboard into 1-inch strips
    - Soak the bedding material in water until damp but not soggy
    - Squeeze out excess water (bedding should feel like a wrung-out sponge)
    - Fill the bin 3/4 full with the damp bedding material
    - Mix in a cup of soil or aged compost to introduce microorganisms
4. Add the worms
    - Add one pound of worms per square foot of surface area
    - Gently spread worms on top of the bedding
    - Leave bin uncovered with a light on for first day to encourage worms to burrow down

5. Begin feeding
    - Wait two days before adding first food scraps
    - Bury small amounts of kitchen scraps (1 cup) in one corner of the bin
    - Cover food with 2 inches of bedding
    - Rotate feeding areas throughout the bin for subsequent feedings
6. Maintain the bin
    - Feed worms approximately 1/2 pound of scraps per pound of worms per week
    - Keep bedding as moist as a wrung-out sponge (spray with water if necessary)
    - Cover newly added food with fresh bedding
    - Add fresh bedding material every three months or when bin appears to be filling up
7. Harvest the compost (after six months)
    - Choose a method:
        - **Light method:** Dump contents on tarp in bright light and make small piles. Worms will move to the bottom, allowing you to remove vermicompost from the top.
        - **Side-to-side method:** Push contents to one side of the bin and add fresh bedding and food to the empty side. Worms will migrate to the fresh side over three weeks.
        - **Screen method:** Dump bin contents onto mesh screen over a tarp and sift, allowing finished compost to fall through while worms remain on top.
8. Use the finished vermicompost
    - Apply as top dressing for houseplants (1/4 inch layer)
    - Mix into potting soil (1 part vermicompost to 4 parts potting soil)
    - Brew into “worm tea” by steeping in water (1 cup vermicompost per gallon of water)

Discussion

Vermicomposting uses worms to transform kitchen waste into a nutrient-rich soil amendment, harnessing the digestive systems of worms to break down organic matter quickly and produce castings (worm poop) that are exceptionally rich in beneficial microbes and plant nutrients. Red wigglers (*Eisenia fetida*) are the most commonly used worms for vermicomposting because they thrive in the organic-rich environments of a worm bin, reproduce quickly, and can process approximately half their body weight in food scraps each day. European nightcrawlers (*Eisenia hortensis*) are another good option, especially if you plan to use some worms for fishing as well.

Vermicomposting can be done outdoors during warm weather or indoors year-round. The ideal worm bin maintains consistent moisture and adequate air flow. Plastic storage bins or wooden boxes work well; specialized commercial worm bins with stacking trays can simplify the harvesting process. Regardless of bin type, proper drainage is essential to prevent excessive moisture that can create anaerobic conditions or drown worms. A properly maintained worm bin should not produce unpleasant odors, making it suitable for kitchens, basements, or garages.

Vermicompost is considered superior to traditional compost for many applications because it contains higher concentrations of beneficial microorganisms, enzymes, and plant growth hormones. It also tends to have more readily available nutrients and better soil-building

properties than traditional compost. Liquid from a worm bin ("worm tea") is a valuable fertilizer. Dilute 1 part tea to 10 parts water to use directly on plants.

Definitions

- **Bedding:** Material that provides the living environment for worms, typically high-carbon materials like shredded paper or cardboard that retain moisture and provide air space
- **Castings:** Worm excrement; the finished product of vermicomposting, rich in beneficial microorganisms and plant nutrients
- **Coir:** Coconut fiber, a sustainable alternative to peat moss used as worm bedding
- **Red wigglers:** *Eisenia fetida*, the most common species used for vermicomposting due to their ability to thrive in organic waste and reproduce quickly
- **Vermicompost:** The end product of the breakdown of organic matter by worms, consisting of worm castings, decomposed organic waste, and beneficial microorganisms
- **Worm tea:** Liquid from a worm bin, rich in microorganisms and soluble plant nutrients

Troubleshooting

Problem	**Solutions**
Foul odor from bin	Bin is too wet or anaerobic. Add dry bedding, ensure proper drainage, and avoid overfeeding. Check that air holes aren't blocked.
Worms trying to escape	Bin conditions are unsuitable. Check moisture (too wet or too dry), temperature extremes, or presence of foods worms dislike (citrus, onions, garlic). Ensure the bin is not in direct sunlight.
Fruit flies or other insects	Cover food scraps with at least 2 inches of bedding. Freeze scraps before adding to kill fly eggs. Use a breathable cover like burlap or newspaper. Reduce feeding temporarily.
Mold growing in bin	Some mold is normal. Excessive mold suggests overfeeding or too much moisture. Reduce feeding rate and add dry bedding.
Worms dying	Check temperature (should be 55 to 77°F), moisture level (should be like a wrung-out sponge), and potential toxins (avoid adding citrus, onions, meat, dairy, oily foods).
Slow processing of food	Bin may be too cold, food pieces too large, or the worm population is too small. Chop food into smaller pieces and give the population time to grow. Ensure proper temperature range.
Too wet/leaking	Add more dry bedding and ensure the bin has adequate drainage holes. Place a tray underneath to catch excess moisture.
Too dry	Mist with water from a spray bottle. Add moist (but not soaking) food scraps.

Limitations

- Cannot process large volumes of waste quickly without a large worm population
- Temperature sensitivity limits outdoor use in extreme climates
- Not suitable for meat, dairy, oils, citrus, or onion family scraps
- Requires more monitoring and management than traditional compost piles
- Harvesting the finished vermicompost can be labor-intensive
- Initial cost of worms can be higher than starting a traditional compost pile
- Not ideal for yard waste like branches or large amounts of leaves

Related Practices

- Composting 002: Collecting Kitchen Waste
- Composting 003: Collecting Household Waste
- Composting 204: Using a Kitchen Appliance
- Composting 305: Using Flies

References and Further Reading

- Uncle Jim's Worm Farm <unclejimswormfarm.com>
- Urban Worm Company <shop.urbanwormcompany.com>
- *The Worm Book: The Complete Guide to Gardening and Composting with Worms* by Loren Nancarrow and Janet Hogan Taylor
- *Worms Eat My Garbage* by Mary Appelhof, Joanne Olszewski, and Amy Stewart

Composting 305: Using Flies

How to compost using black soldier flies

Equipment & Materials

- Composting bin with lid (plastic tote, wooden box, or specialized black soldier fly bin)
- Black soldier fly (*Hermetia illucens*) starter larvae or eggs
- Drill (for making ventilation and drainage holes)
- Mesh screen (1-2 mm openings)
- Container for collecting leachate
- Small ramp inside bin for adult flies to exit
- Food scraps (vegetable, fruit, grains, small amounts of meat or dairy)
- Garden soil or finished compost (as starter material)
- Spray bottle with water
- *Optional: Harvesting containers for larvae*
- *Thermometer*
- *Pitchfork or turning tool*
- *Small LED light to attract adult flies*

Steps

1. Observe composting safety practices
2. Choose location for your black soldier fly (BSF) composting bin

    - Select a warm, partially shaded area (65 to 85°F or 18 to 29°C)
    - Place it where some odor won't be problematic
    - Ensure accessibility for adding scraps and harvesting compost
3. Prepare the composting bin
    - Drill 16 small drainage holes (1/4") in the bottom
    - Drill 1/4" ventilation holes around the upper sides
    - Cover drainage holes with fine mesh to prevent larvae escape
    - Place bin on blocks above a tray to catch leachate
4. Prepare the bedding
    - Add three inches of moistened soil or finished compost
    - Mix in some shredded cardboard or coco coir
    - Spray with water until damp but not soaking (similar to a wrung-out sponge)
5. Add food waste
    - Start with two pounds of kitchen scraps
    - Chop larger pieces into 2" or smaller pieces
    - Mix into the top layer of bedding
    - Cover with a thin layer of dry bedding material
6. Attract or introduce black soldier flies
    - Option 1: Add purchased BSF larvae or eggs
    - Option 2: Place bin outdoors in warmer months where flies naturally occur
    - Option 3: Add some material from an existing BSF system
7. Maintain proper conditions
    - Keep moisture levels appropriate (65-70%)
    - Maintain temperature between 65 and 85°F (18 to 29°C)
    - Add food scraps regularly but avoid overfeeding
    - If material becomes too wet, add dry bedding
    - If too dry, mist with water
8. Continue adding food waste
    - Add new food scraps every other day
    - Bury scraps under a thin layer of bedding to reduce odors and deter pests
    - Avoid overfeeding; wait until most previous scraps are consumed
9. Harvest compost and larvae
    - After three months, stop adding food to the active side of bin
    - Mature larvae will self-harvest by crawling up ramps
    - *Optional: Collect migrating larvae in collection containers*
    - *Optional: Use larvae as animal feed or fishing bait*
    - Allow remaining material to cure for four weeks
    - Remove finished compost from bottom of bin
10. Start a new cycle
    - Leave some larvae and eggs in the bin to process new waste
    - If system is properly maintained, the colony will be self sustaining

Discussion

Black soldier fly (*Hermetia illucens*) composting transforms food waste into nutrient-rich compost using insect larvae rather than primarily relying on microorganisms. This method is particularly effective for processing high-nitrogen materials, including meat and dairy.

The life cycle of black soldier flies makes them ideal for composting. Adult black soldier flies live only five to eight days, don't eat, don't bite, and aren't considered pests. The female lays about 500 eggs near decomposing material. The eggs hatch into larvae that consume organic matter voraciously—they can eat twice their body weight daily. In three weeks, larvae grow from tiny hatchlings to approximately 1 inch long. When larvae are ready to pupate, they naturally migrate upward and out of the composting material, making collection relatively easy if you design your system with this behavior in mind.

The products of BSF composting include:

1. Nutrient-rich compost
2. Protein-rich larvae that can be used as feed for chickens, fish, or other animals
3. Liquid fertilizer (leachate) that can be diluted 1 part leachate to 9 parts water for use on plants

BSF composting offers several advantages over traditional composting:

- Processes food waste much faster (days instead of months)
- Significantly reduces volume (up to 95% reduction)
- Can safely process meat, dairy, and oily foods
- Requires less space and turning than traditional compost
- Produces minimal odor when managed properly
- Creates protein-rich larvae in addition to compost and leachate

The system works best in warmer climates or during warm seasons, as black soldier flies are most active at temperatures between 65 and 85°F (18 to 29°C). In colder climates, the system can be moved indoors during winter or supplemented with purchased larvae to maintain the colony.

Definitions

- **Bioconversion**: The process of converting organic waste into valuable products (in this case, compost and insect protein)
- **Black soldier fly (BSF)**: *Hermetia illucens*, a non-pest fly species whose larvae efficiently consume organic waste
- **BSF larvae**: The immature form of black soldier flies; voracious eaters of organic matter
- **Leachate**: Liquid that drains from the composting material; can be used as liquid fertilizer when diluted
- **Pupation**: The transformation stage between larva and adult fly
- **Self-harvesting**: The natural behavior of mature BSF larvae to crawl out of the composting material before pupation

Troubleshooting

Problem	Solutions
Few or no flies appearing	Check the temperature (may be too cold). Add purchased larvae. Ensure the bin is in a location accessible to wild BSF. Add a small amount of fish or meat to attract flies. Use LED light near system to attract adults
Foul odors	System is likely too wet or overfed. Add dry bedding material. Reduce feeding rate. Ensure proper drainage. Mix contents to increase aeration.
Other insects or pests invading	Ensure the lid is secure. Reduce feeding rate. Bury food waste more thoroughly. Check for gaps in the container. Add protective screens to entry points.
Larvae dying	Check moisture (should be like a wrung-out sponge). Verify temperature range. Ensure proper ventilation. Avoid adding toxic materials like citrus peels in large quantities.
Too much leachate	System is too wet. Add more dry bedding. Reduce watering. Ensure proper drainage.
Larvae escaping	Install better barriers around edges. Improve the self-harvesting ramp design. Check for cracks or holes.
Slow decomposition	Temperature may be too low. May need more larvae. Food pieces may be too large. System may need more diversity of food waste.
White mold appearing	Normal in BSF systems. If excessive, reduce moisture and improve ventilation.

Limitations

- Not suitable for individuals uncomfortable with handling insect larvae
- May attract unwanted wildlife if not properly secured
- Requires temperatures between 65 to 85°F (18 to 29°C) to function optimally; significantly slows or stops below 60°F
- May need to purchase starter larvae in regions where BSF aren't native or during cold seasons
- Not as accepted as traditional composting methods; may be banned in some settings
- Requires more active management than traditional composting
- Less effective at processing large amounts of carbon-rich materials like leaves and branches
- Higher initial setup cost than simple compost piles

Related Practices

- Composting 301: Fermenting First

- Composting 302: Using a Tumbler
- Composting 303: Using a Buried Chamber
- Composting 304: Using Worms
- Composting 401: Neighborhood Composting
- Growing Food 302: Raising Chickens (as BSF larvae can be used as chicken feed)

References and Further Reading

- BioPod Plus <vermitek.com/biopod.html>
- "Black Soldier Fly Composting Guide" by Catherine Terrell and Laura Ingwell <https://extension.entm.purdue.edu/publications/E-276/E-276.html>
- "Conversion of organic material by black soldier fly larvae: establishing optimal feeding rates" by Stefan Diener, Christian Zurbrügg, and Klement Tockner <pubmed.ncbi.nlm.nih.gov/19502252/>
- "Rearing methods for the black soldier fly (Diptera: Stratiomyidae)" by D Craig Sheppard, Jeffrey K Tomberlin, John A Joyce, Barbara C Kiser, and Sonya M Sumner <pubmed.ncbi.nlm.nih.gov/12144307/>