Training Guide

Small Scale Food Waste Composting

IWRC
Iowa Waste Reduction Center

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Introduction

Composting food waste has many benefits. Not only does composting food waste reduce methane emissions associated with anaerobic conditions in a landfill; composting food waste also results in a product that provides many benefits. Did you know using compost on lawns and in gardens can make a big impact?

- Compost reduces soil erosion
- Compost increases water holding capacity to make moisture available to plants for a longer period of time
- The process of composting kills many pathogens and weed seeds
- Compost reduces overland flow during storm events and can help manage stormwater
- Compost improves soil health, soil structure and also improves plant nutrition for higher quality produce and lawns
- Composting reduces waste headed to the landfill thus reducing greenhouse gasses while combating climate change
- Using compost provides an opportunity for carbon sequestration
- Compost reduces reliance on chemical fertilizers
- Composting saves money by reducing disposal costs and costs associated with fertilizers

It just makes good sense to use your food waste to produce compost rather than pay to toss it with a plethora of benefits available to take advantage of.

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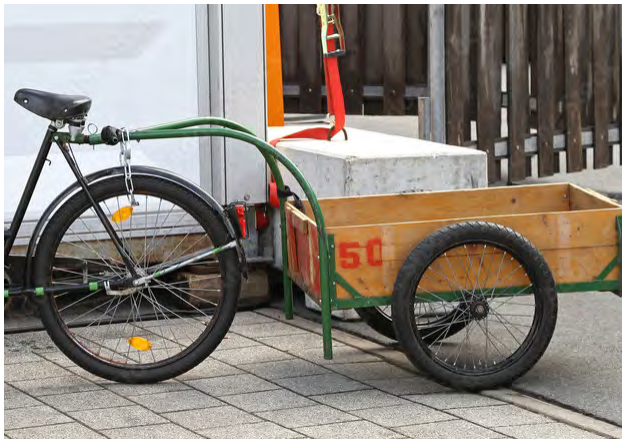
Collection of Food Waste for Small Scale Composting

If you are just starting out building a small composting project to recycle food waste, you'll need to figure out where your feedstocks will come from and how you will get them to your site. Once you identify your source of food waste, carbon and bulking agent, how will it be transported? Will you hire a hauling company? Or will you provide a subscription service for your customers that includes hauling food waste and/or yard waste at their curbs in residential areas? Maybe you just want to provide this service to a local business district or K-12 school district.

Take into consideration how often you will pick-up, how many pick-ups you will make, how heavy the pick-ups will be, and how far the pick-ups are from your composting site. These will help you decide on a transportation method. Then consider what it will cost you to haul food waste for customers including the cost of the vehicle (or bicycle), gas, driver's paid time, maintenance of your vehicle, and insurance. Of course, you can always have your customers bring food waste to your site for drop-off. Either way, providing hauling for your customers will add a level of convenience that has the potential to increase your customer base.

Microhauling

Microhauling is going to make you fit! Using a bicycle, food waste and/or yard waste is put in a trailer behind the bicycle and hauled to the composting site. This is small scale community composting at its best. Generally, this method doesn't work in winter where it is cold and snowy.

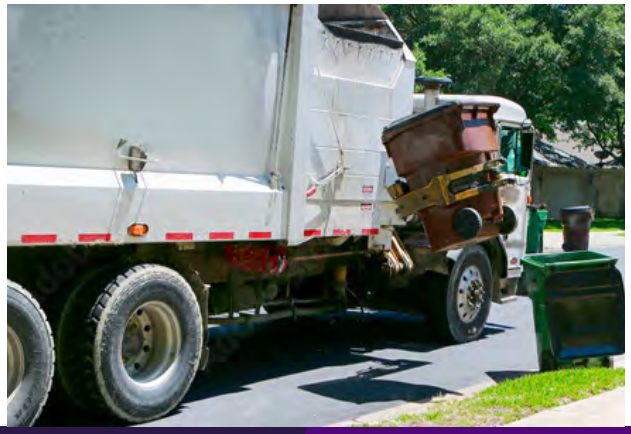


Vehicle or Pick-up Truck Hauling

Using a truck with a bed or a vehicle with a large cargo area is adequate for smaller composting projects. Generally, this is more expensive than microhauling, but can be done all year round. This method of hauling is great for picking up food waste in 5-gallon buckets or larger.

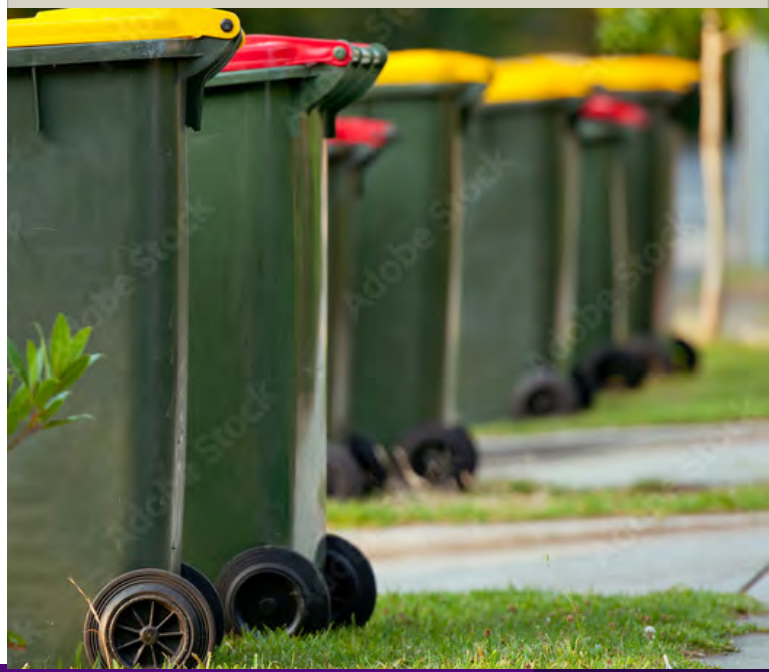
Garbage Trucks for Organics Collection

Extremely expensive for a small composting project, however a partnership with your community or municipality can help defer some of the costs. This is a great option if you are picking up food waste in larger containers such as garbage cans at the curb.



Bins and Collection Containers

Once you've decided on your method to haul feedstocks, you will need to provide collection bins to your customer base. Figuring out how much food and/or yard waste you will be picking up from each customer will help you identify the number and size of containers you'll need to provide them. When you pick up their food waste, will you be taking the entire bin, or dumping it into one collection container? If you are picking up entire bins, you will need to leave behind clean bins so they can continue to collect food waste. You will also need to make certain you have the capacity to wash out each bin you collect. Finally, many times these bins are stored outside, so it may be beneficial to include bins with animal-proof latches and locks?



The Rules:

SETTING UP A SMALL SCALE FOOD WASTE COMPOSTING PROJECT

Depending on the state you live in, setting up a small scale food waste composting project is simple but requires compliance with state regulations. We aren't looking at a permitted site, which can be arduous and expensive to get approved by your state's regulating authority, we are looking at permit exempt sites where a permit is not needed. Generally, non permitted sites composting food waste must remain small and under feedstock thresholds while following site selection criteria.

Illinois

In Illinois for example, collection of feedstocks for composting can either be a one-day event with a 40 cubic yard maximum, or a permanent drop-off location that has a maximum capacity of 10 cubic yards. The compost site must be located on a farm where the compost will be applied and must be operated by the farmer of the property. Additionally, the on-farm compost site can be no larger than 2% of the total acreage of the farm site. Finally, the farmer must register with the Illinois EPA by January 1 following commencement of the operation.

Wisconsin

In Wisconsin, a small food waste composting site can recycle 5,000 cubic yards or less of source separated compostable material including food waste, compostable packaging, yard waste, farm crop residuals, fish harvesting, chipped wood, sawdust etc. Both new and expanding operations must first contact the Wisconsin Department of Natural Resources (DNR) with site information and must notify the DNR to request an initial site inspection with a $550 fee. After the inspection, an application must be submitted to the DNR that includes details about the site operations, a map of neighboring properties, as well as procedures for controlling run-on and run-off from the location. Once approved by the DNR, they will send a license application.

Iowa

In Iowa, small scale food waste composting operations must follow requirements when selecting a site that includes distances from water sources, property boundaries, wells, and etc. The Iowa Department of Natural Resources (DNR) must be notified in writing prior to commencing operation with specific information such as description of the location, landowners name and contact information, method of composting, feedstock sources, etc. Feedstocks are limited to two tons per week and includes grass, food waste, and carbon sources but does exclude bulking agent (clean wood waste) from this limit. Additionally, a sign must be posted at the site and an annual report must be sent to the DNR each year in July.

Missouri

Missouri describes composting facilities as those that accept yard waste, tree waste, brush, grass, and garden debris, while those that accept food waste and animal manure are considered co-composting facilities. The Missouri Solid Waste Management Law and regulations allow compost facilities to operate with an exemption from meeting some of the legal requirements once initial conditions are met and an approval of operations has been granted. Even farmers composting their own organic waste that are exempt from permitting must comply with requirements of the Missouri Clean Water Law by contacting the Missouri Department of Natural Resource's (DNR) Water Protection Program to delve into stormwater and wastewater management. After discussing and determining stormwater and wastewater needs with the Missouri DNR's Water Protection Program, the next step is to contact the Waste Management Program of the Missouri DNR to determine if the operation needs a solid waste processing facility permit or is permit exempt.

Minnesota

Minnesota allows non-permitted food waste composting sites to collect up to 120 cubic yards including all feedstocks. Meat, dairy, fats, animal manure, and sanitary products are some materials that are not allowed at small composting sites. Even though these sites are exempt from permitting, following all Minnesota groundwater quality, surface water quality, air quality and soil protection rules is required. All sediment, solid waste, and leachate must be contained within the compost site while any run-off must be controlled. Delegated by the Minnesota Pollution Control Agency, feedstocks that can be accepted includes food scraps, yard waste, non-recyclable papers, compostable plastics, and poultry litter (if the finished compost is used on-site only).

Best Management Practices When Composting

Keeping your compost operation healthy and active is important to prevent environmental degradation, limit wildlife feeding off your compost piles, and prevent offensive odors that could potentially shut down your operation. It's much easier to learn how to prevent such issues rather than correct issues that have already occurred.

Feedstocks and Carbon to Nitrogen Ratios

Your optimal carbon to nitrogen ratio should be about 30:1. Each feedstock you use has its own C:N ratio, some are considered carbon sources because they are high in carbon, while others are considered nitrogen sources because they are low in carbon. Feedstocks that are considered carbon sources include wood chips, shredded cardboard, and corn stalks while feedstocks considered high in nitrogen include food waste, grass clippings, manure and weeds. Finding the ultimate recipe of 30:1 carbon to nitrogen ratio when combining feedstocks can be estimated using a simple equation:

$$\frac{(\text{Carbon Value of Feedstock A} \times \text{Weight of Feedstock A}) + (\text{Carbon Value of Feedstock B} \times \text{Weight of Feedstock B})}{\text{Weight of Feedstock A} + \text{Weight of Feedstock B}}$$

Mixing

Making certain to mix feedstocks well limits anaerobic conditions, methane pockets, and pockets of offensive odors and excessive heat that may cause fires. Mixing also helps your feedstocks breakdown quicker. Turning and mixing can be done every 2 - 5 weeks and everytime new feedstocks are introduced into the pile. But please note that mixing during cold winter months will cool down your pile so it's not recommended to mix compost much in the winter.

Moisture

A compost pile needs moisture to create a thriving habitat for microorganisms. Generally, 40-60% moisture is ideal. You can gauge your moisture content by grabbing a handful of compost and squeezing it. A squeezed handful of compost should drip water, but shouldn't drip a steady stream of water. Nor should a handful be so dry that not even a few drops of water escape when squeezed. You can also buy a moisture meter to find a more exact percentage of water in your compost pile. Not enough moisture will slow or halt decomposition while too much moisture can cause odor issues and anaerobic conditions.

Air

Your compost pile needs air to keep microorganisms alive and thriving. Air also prevents anaerobic conditions that generate methane and offensive odors. The best way to get air into your compost is to have properly sized bulking agents that promote air flow into the pile while limiting compaction. Bulking agents are carbon sources that can include wood chips, sawdust, corn stalks, and twigs. A mixture of different sized bulking agents is optimal, but experimentation for the best recipe is essential when using different sources of bulking agent.

Temperature

Optimal temperatures that facilitate breakdown of materials is anywhere between 135-165° Fahrenheit. You will notice that as you add feedstocks to your pile, especially those high in nitrogen, your compost pile will heat up as microorganisms get to work breaking down materials. Once you stop adding feedstocks to your pile, the temperature will gradually decrease but will still be breaking down until you finally get to the curing stage.

Curing

Once you stop adding feedstocks to your pile, and the temperature of your compost is getting closer to ambient temperature, and the pile is about half as big as it was initially, you may be nearing the curing phase. To check if compost is ready to use, plant a few radish seeds and check the health of emerging seedlings.

Limiting Odors

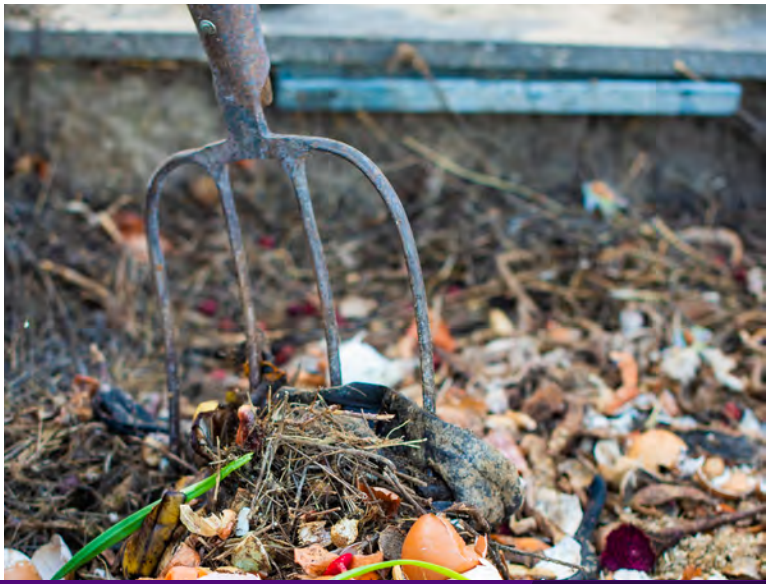
It is very important to limit offensive odors that can shut down your compost site. It is a great idea to cover mixed compost piles with 6 inches of finished compost to minimize odors. Of course, odors arise for various reasons and figuring out the solutions should be fairly simple.

- Too much moisture - wet and soggy compost piles get stinky when anaerobic conditions are favorable. Adding newspaper, cardboards, or straw can help soak up excess moisture
- Too much nitrogen - too much nitrogen such as food scraps can emit foul odors. Adding additional carbon sources and mixing well is a good rule of thumb
- Not enough airflow - in this scenario, not enough air space can cause anaerobic conditions that smell bad. Adding bulking agent that is course enough to allow air to infiltrate the pile is a great practice to limit odors caused by compaction
- Not mixed well enough - compost piles that aren't thoroughly mixed can develop pockets of densely matted nitrogen material such as grass clippings that smell bad. Make sure to mix your feedstocks thoroughly to limit odors.

Limiting Leachate Contamination

Leachate is liquid that seeps out of your compost pile during the decomposing process of feedstocks. Leachate can also seep out of your pile after rain events. While the high heat from the composting process neutralizes most contamination, leachate from unfinished compost can be highly toxic as your feedstocks carry bacteria, fungi, pathogens, parasites and sometimes chemicals. It is essential that leachate is controlled and prevented from running off your site to contaminate both ground and surface water as well as soils, gardens, and other potential sources that can cause dangerous levels of contamination. Additionally, composting manure can be problematic if leachate runs off your site to contaminate surface and groundwater or soils as E.coli and/or salmonella can also be present in compost leachate. Leachate must be mitigated as soon as you notice standing liquid around your pile or running off your pile.

- Turn and mix your compost piles if you notice standing water/leachate after a rain event while trying to soak up the standing water/leachate
- Tarp your compost pile before rain events to keep the water out and leachate from running out of your compost piles.
- Place bales of straw/hay on top of standing water/leachate puddles to soak up the moisture, then mix into your compost pile.
- Place windrows perpendicular to the slope of the land to act as a barrier for runoff.
- Add more carbon and/or bulking agent to your compost pile to help soak up excess moisture and potential leachate runoff.



Conclusion

Composting is a great method to reduce greenhouse gasses associated with landfilling organics while creating a carbon sink when the resulting compost is used to improve plant growth and health. Using compost not only reduces costs and reliance associated with traditional fertilizers, it also reduces erosion associated with rain and wind events and helps limit surface and groundwater pollution. But one of the most impressive benefits when starting a composting business or municipal composting project are the job opportunities that have the capacity to improve the local economy while developing a skilled labor force. Either way you dice it, composting has a plethora of benefits!

If you'd like additional information or assistance, please contact Jennifer Trent at jennifer.trent@uni.edu.

This material is based upon work supported under a grant by the Rural Utilities Service, United States Department of Agriculture. Any opinions, findings, and conclusions or recommendations expressed in this material are solely the responsibility of the authors and do not necessarily represent the official views of the Rural Utilities Service.

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