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P2I

New York State
Pollution Prevention Institute

Food Waste

A Q&A GUIDE FOR NEW YORK STATE BUSINESSES, MUNICIPALITIES, AND COMMUNITIES

ABOUT THIS RESOURCE

The New York State Pollution Prevention Institute (NYSP2I) partners with businesses, municipalities, and communities in New York State to identify practical, cost-effective solutions for managing the impacts of food waste through prevention, donation, and recycling. Our work is funded by New York State's Environmental Protection Fund as administered by the New York State Department of Environmental Conservation (NYS DEC).

We created Food Waste: A Q&A Guide for New York State Businesses, Municipalities, and Communities as an easy-to-use resource with answers to the most common questions we have been asked in our work with over 75 clients since launching our food waste program in 2016. We intend this to be a great starting point for anyone considering a strategy for managing food waste.

HOW TO USE THIS RESOURCE

Here are three things you need to know about this resource:

1. This is not a “book.” It’s a how-to manual packed with everything you need to know about food waste and sustainable food systems.
2. It uses a question-and-answer format. Find the question that best matches what you have in mind and go to that section. If you don’t see what you’re looking, let us know nysp2i@rit.edu.
3. It is a starting point. If you need further information or support, each section gives links to additional resources or contact information for specific services.

ABOUT NYSP2I

People across New York State want to make the places where they live and work more sustainable—but they don’t always know where to start. NYSP2I gives Empire State businesses, communities, and nonprofits the practical tools and solutions they need to realize the benefits of sustainability for our economy, environment, and our society as a whole.

Learn more about NYSP2I <https://www.rit.edu/affiliate/nysp2i/about/overview>

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Understanding Food Waste

What is food waste and why does it matter?

Forty percent of all food in the United States never gets eaten. That waste might be excess food that gets thrown out, products that aren't bought by their sell-by date at grocery stores, or food scraps from restaurants.

Food waste is about more than just losing out on those delicious leftovers we never got to or that expensive salad mix we forgot about in the fridge—everything that goes into growing or producing that food is wasted, too. Food waste has significant impacts on our economy, environment, and our communities.

Economic impact

Every piece of food that gets thrown away embodies all the energy and resources that went into to making or growing it. These embedded costs add up—over \$165 billion are lost globally through food waste every year.

Consider the following statistics:

- 10% of the energy consumed in the United States goes into transporting food
- 50% of land in the United States is dedicated to food production
- 80% of freshwater in the United States is used to grow and produce food

Environmental impact

Food waste also impacts heavily on our environment. Food in landfills releases methane gas, a greenhouse gas that is 28 times more powerful than CO₂ as a heat-trapping gas. Much of that food doesn't need to be there—20% of food purchased in the US never gets eaten.

Social impact

What more, food waste is a missed opportunity when it comes to feeding Americans. One out of every seven Americans is food insecure, meaning that they don't always have access to enough nutritionally adequate food. But 90% of us throw away food before it has gone bad.

<https://www.rit.edu/affiliate/nysp2i/food/food-waste-info>

What are common sources of food waste?

As the food we eat is grown, processed, manufactured, distributed, and consumed, waste is created. Below outlines the different types of food waste that is created at key points in the food supply chain.

Farms

Often times, farms face low market prices and stringent cosmetic standards, making it harder to justify harvesting their entire crop. It is common practice to leave unharvested crop on the field to be tilled back into the soil. Since most food that is wasted at the farm level stays on-site, little data has been collected on the associated quantities.

Some common causes of food waste at the farm level include the following:

- selective harvesting: Produce is not harvested that is close to or below minimum quality and cosmetic standards.
- culling: Food is discarded based on quality or appearance criteria.
- spoiling: Food is thrown out due to improper or extended storage and handling.

Food processing and manufacturing

At an estimated 95%, food processing facilities have the highest rates of food recycling of any stage along the food chain. They are generally well-managed and efficient enough that waste generation is kept low. Their consistent waste-stream content makes finding stable recycling outlets easier for any waste and or byproduct produced.

Some common causes of food waste at the processing level include:

- trimming: Edible portions of food (skin, peels, and end pieces) and inedible portions (bones or pits) are removed. production line changes: Food scraps may be left in machinery and added to the waste stream upon cleaning.
- Resource deficiency: There is a lack of accessible recycling options available.

Food retail and service

Due to a high demand for freshness and variety by consumers, food retail and service businesses are pressured to write off products prematurely. In addition, customers expect shelves to be fully stocked, which drives over-stocking of products and leads to more waste.

Some common causes of food waste at the retail and service level include the following:

- overstocking
- confusion about difference between sell-by and use-by dates
- damaged packaging, outdated products, and unpopular items
- food safety regulations
- rejected shipments
- oversized servings

There are several reasons why a business may have food that is perfectly good to eat, but that cannot be used or sold. Over-preparing and over-purchasing are significant reasons, but not the only ones. Others include the following:

- short-coding / short-dating of products
- cosmetic damage
- mislabeled or non-labeled items
- discontinued, test-market, and private-label brands
- customer returns
- surplus products
- creating promotional items
- new product introductions

Residential

Most food waste occurs at the household level. Over-purchasing groceries is common for a number of reasons, including lower pricing on bulk purchases, poor planning and impulse buying, and a desire for variety. Poor storage techniques also play a role in accelerating waste generation. In addition, confusion regarding the difference between sell-by and use-by dates leads many consumers to dispose of food before it is actually unsafe to eat.

Some common causes of food waste at the residential level include the following:

- confusion about the difference between sell-by and use-by dates
- rotting and spoiling use of inadequate storage techniques
- purchasing perishable items in bulk

What is a sustainable food system?

Manufacturers, grocery stores, schools, and many other stakeholders in communities all play a part in our food system, whether they know it or not. Our most common food system follows a linear supply chain that connects producers with consumers. As a food item makes its way along the supply chain, it relies on a variety of resources: labor, packaging, transport, and many more besides. When that item ends up in a landfill, all of the money and energy it required to be produced and distributed go to waste with it.

A sustainable food system not only provides the food we need, it also expands our economy and increases the resilience of the entire food system without compromising the natural resources we depend on. It is designed to recapture the value that is lost at key points along a supply chain. What is typically understood as a problem or waste becomes an opportunity when considered from the sustainable food system perspective.

Losses occur at each stage of a food system's supply chain—about 95% of these losses end up in landfills. In a sustainable food system, the goal is to reduce, reuse, or recycle all organic waste that is generated.



Managing Food Waste

What are the best methods for managing food waste?

Managing food waste can be broken into three basic categories: food waste prevention, excess food distribution (donation), and food waste recycling. Below is detailed information on each.

Food waste prevention

The most effective method for managing food waste is preventing it from happening at all. Although techniques for doing so can be time-consuming and difficult to implement, once a prevention approach is established, it achieves the best results from both a sustainability and a cost-effective perspective.

See “[Preventing Food Waste](#)” for more information on this topic.

Excess food distribution

Many businesses and institutions end up with food that is perfectly good to eat but that they cannot use. The most common way of keeping this excess food from going to waste is by donating it to food banks, food pantries, or other local or regional programs that support people in need with groceries or meals.

See “[Donating Excess Food](#)” for more information on this topic.

Food waste recycling

Most people don’t realize that organic material—food—can be recycled. Uneaten food can be converted into a variety of resources, including new food products (e.g., dehydrating a manufacturing byproduct into a different product), animal feed, fuel, soil, and more. To do this, businesses, municipalities, schools, hospitals,

nonprofits, and similar organizations can partner with third-party service providers to process food waste. Large businesses and institutions that recycle food waste often have specialized equipment for processing what they can’t use or sell on-site, which can make working with outside service providers more efficient.

See “[Recycling Food Waste](#)” for more information on this topic.

How can I get started managing food waste?

Sixty-three million tons of food waste are created in the United States each year. If your organization is ready to begin managing food waste, consider the steps below.

Step 1:

Set your goals and build your team.

People are the most important resource behind a successful food waste management program because they are the ones who will make it happen. Involving key stakeholders in your planning will help build organizational buy-in and make long-term success more likely.

Step 2:

Estimate how much food waste you generate.

Before you can begin effectively planning, you need to determine how much food waste you need to manage. The tool below is designed to help you to do that.

- Access the NYSP2I food waste estimator <https://www.rit.edu/affiliate/nysp2i/food-waste-estimator>

Step 3:

Identify the types of food waste you create and how it's created.

Knowing the type of food waste your organization generates is key to narrowing down what management methods are best. Every business or institution creates unique a type of waste. A restaurant may have mostly prep waste and plate waste, while a grocery store may have packaged food and produce as well.

NYSP2I developed a food waste self-audit tool to help organizations make informed first steps towards a food waste management plan. See below.

- Access the NYSP2I food waste audit tool now https://www.rit.edu/affiliate/nysp2i/sites/rit.edu.affiliate.nysp2i/files/docs/resources/Food_Waste_Self-Assessment_How-to%20Guide_NYSP2I.pdf

Step 4:

Evaluate your data and consider whether a food waste prevention plan is possible.

The outcomes of your research (outlined above) will inform your next steps. Your first consideration should be whether your food waste can be prevented from happening in the first place. Prevention is by far the best route for zeroing out negative environmental impacts and for avoiding the high costs that come with food waste. Yet NYSP2I's work with many different clients have shown that organizations tend to implement food waste recycling methods before adequately considering whether a food waste prevention plan is feasible.

See "[Preventing Food Waste](#)" to learn more about building a prevention plan.

Step 5:

Decide on a food recycling or donation plan.

When food waste prevention is unfeasible, you will need to evaluate whether a food donation or recycling program is suitable for your organization.

- Excess food distribution—which is food donation—requires a partnership with local or regional food donation agencies like food banks or food pantries.
- Food waste (a type of organic material waste) recycling is a large category. Determining a recycling pathway that is right for your organization depends on a number of factors, including what type of food waste you produce, how near to food waste recycling facilities your organization is, and what funds are available for the purchase of equipment or services from third parties. NYSP2I offers a database that lists all active organic waste recycling facilities within New York State.
- Access the NYSP2I organic resource locator now <https://www.rit.edu/affiliate/nysp2i/resources/organic-resource-locator>

Step 6:

Start source separating your food waste.

Behind all successful food waste diversion is an organized system of collecting food waste. The diversion facility you work with will likely have recommendations on what type of collection bins to use and may even provide them. Obtaining the bins is the first step, to source separation, but you'll have to work internally to set up a system that works for your business. Read more about how to do this on the source separation page.

- Download best management practices to source reduction of food waste https://www.rit.edu/affiliate/nysp2i/sites/rit.edu.affiliate.nysp2i/files/docs/resources/Source_Reduction_of_Food_Waste_Best_Management_Practices.pdf

Step 7:

Start managing your food waste sustainably.

Achieving a sustainable food system can seem daunting. However, a thought-out, planned approach can breakdown that barrier to map out a reasonable, budget-friendly road to success. And it's worth the work—organizations with sustainable food systems realize [an average return of \\$14 for every dollar invested into food waste management activities](#). Plus, they are helping to relieve a source of one of the most significant stresses on our environment and communities.

How can communities and municipalities manage food waste?

Local engagement is an important part of food waste management. Initiatives vary by region and town. Contacting your county's solid waste department is a good place to start if you want to know more about local activities.

A few inspiring examples include the following:

- Tompkins County Food Waste Prevention Grant: Tompkins County received a grant through the NYSP2I Community Grants to generate and distribute material to prevent waste within the County. The County intends to reduce food waste generation as a part of the county wide goal to be at 75% waste diversion by the end of 2016.
- Check out a case study of the project here, and the full manual created through the project here https://www.rit.edu/affiliate/nysp2i/sites/rit.edu.affiliate.nysp2i/files/docs/resources/Tompkins_County_Solid_Waste_Management_Division_Focuses_on_Food_Waste.pdf
- Onondaga County Food Waste Composting: The non-profit organization Onondaga County Resource Recovery Agency was formed at the request of the county legislature to manage the county's solid waste. The organization now operates two compost sites that process organic waste for generators within and outside the county.
- See the case study here <https://ocrra.org/how-do-i-get-rid-of/food-waste/>

Need help getting started as a municipality? NYSP2I published a guide to help municipalities develop food waste management plans.

- Access NYSP2I's "Municipality Planning Guide: Food Waste Management in Your Community" <https://indd.adobe.com/view/9fc8e807-cbd4-4751-869c-e1d68090de6b>

Also consider our guides for resident that you can use as education tools to support your food waste management plan.

- Access NYSP2I's "Easy Tips for Reducing Wasted Food at Home" https://www.rit.edu/affiliate/nysp2i/sites/rit.edu.affiliate.nysp2i/files/docs/resources/Easy_Tips_for_Reducing_Waste_Food_at_Home.pdf
- Access NYSP2I's "Resources for Preventing and Recycling Food Waste at Home" https://www.rit.edu/affiliate/nysp2i/sites/rit.edu.affiliate.nysp2i/files/docs/resources/Resources_for_Preventing_and_Recycling_Food_Waste_at_Home.pdf

What are ways that food waste can be managed in retail?

There are over 1,100 food retail stores in New York State (including grocers, convenience stores, big-box stores, and supermarkets) that generate two or more tons of food waste per week. They are responsible for three quarters of all food waste that is produced by large organizations across the state. The average amount of waste per store is estimated to be 57.5 pounds per employee per week, which is about two tons of food waste per week for stores with at least 70 full time employees.

Below are some key observations about the food waste generated at a retail store.

- Produce dominates the food waste generated by department in stores by a significant margin.
- Grocery stores especially have a heavy mix of food waste streams. Each store department's food waste has different characteristics (e.g., volumes, nutritional properties, variability, and packaging types) and reasons for being wasted (e.g., trimmings, quality standards, or shelf life).
- Food packaging can determine how much of your food waste can be easily recycled.
- Food waste types and volumes can vary greatly throughout the year because of seasonal holidays and themed displays (e.g., Halloween candy or Thanksgiving turkeys).

Food waste source reduction opportunities in the retail sector

- Redesign product displays with less excess.
- Write down what food you have left over at the end of the night from prepared foods and use that information to help determine how much food to make for the next day.
- Train staff on knife skills to improve yield when preparing ingredients and meals.
- Cook or freeze foods that are approaching the end of their peak freshness.
- Utilize blemished or discolored produce in prepared meals at the store.
- Communicate with suppliers to update frequency and reduce the size of orders—more frequent/smaller orders will lessen inventory on hand and therefore reduce the potential for food to be wasted.
- Food waste donation and recycling opportunities in the retail sector
- Stores often donate edible food from produce, bakery, and shelf stable products to local rescue organizations.
- Often much of the food that a store can no longer sell

are packaged products that are still edible, making them well-suited for donation.

- Many retailers provide local farms with certain types of food scraps for use as animal feed at low or no cost to the store.

How can food waste be managed in a healthcare setting like a hospital or nursing home?

The healthcare sector includes hospitals, nursing homes, and other care facilities. In all of these places, food preparation and service are important, everyday activities.

In New York State alone, there are over 220 hospitals, with over half of them generating two or more tons of food waste per week. There are about 630 nursing homes, 70 of which generate at least two tons of food waste each week. At about 24 pounds of food waste generated per week for every occupied bed, hospitals generate twice as much food waste per bed compared to nursing homes. Combined, the large hospitals and nursing homes (those producing more than two tons of food waste a week) are



responsible for generating a total of over 550 tons each week.

Food waste source reduction opportunities in the healthcare sector

- Implement trayless dining in the cafeteria to encourage customers to take only what they know they will eat.
- Cook made-to-order patient meals to help reduce the amount of food waste returned on patient trays.
- Repurpose leftover food from one meal service to the next when possible.
- Utilize a first-in / first-out sticker system to note which items should be used first.
- Track (manually or electronically) preparation and overproduction wastes for a simple and inexpensive way of finding opportunities to reduce food waste.

- Food waste donation and recycling opportunities in the healthcare sector.
- Pilot food waste collection and recycling techniques in the area of the hospital that generates the most food waste first before rolling out to other food prep and service areas.
- Eliminate disposable plate and silverware in the cafeteria to make it much easier for customers to source separate their food scraps before leaving the cafeteria.

What laws and regulations should I be aware of when building a food waste management program?

New York City Commercial Organics Recycling Mandate

New York City's larger food waste generators of different types across all sectors are subject to the New York City Commercial Organics Recycling Mandate. Under the law, the covered facilities must either set up collection for or manage processing their organics on-site.

- Learn more about the law
<https://ilsr.org/rule/food-scrap-ban/nyc-organics-recovery/>

New York's state-wide food waste rule (as of 2022)

In April 2019, the New York state legislature passed a law that large organizations that produce more than two tons of food waste in a week to put into place a food waste management plan. Specifically, the law requires that edible excess food is sent to donation centers and inedible waste and food scraps are processed through recycling on-site or at third-party facilities. The law will be effective as of January 1, 2022.

- Learn more about the law
<https://legislation.nysenate.gov/pdf/bills/2019/S1508C#page=42>

Legal considerations when donating food

The following factsheets provide a good foundation for understanding laws governing food donation in New York State:

- Liability protections
https://www.rit.edu/affiliate/nysp2i/sites/rit.edu.affiliate.nysp2i/files/docs/resources/NY_Liability_Legal_Fact_Sheet.pdf
- Date labeling
https://www.rit.edu/affiliate/nysp2i/sites/rit.edu.affiliate.nysp2i/files/docs/resources/NY_Date_Labeling_Legal_Fact_Sheet.pdf
- Tax deductions
https://www.rit.edu/affiliate/nysp2i/sites/rit.edu.affiliate.nysp2i/files/docs/resources/NY_Tax_Incentive_Legal_Fact_Sheet.pdf



Preventing Food Waste

What are the benefits of preventing food waste?

A preventative approach to managing food waste is the best way to eliminate the physical amount of food that gets wasted and to improve the cost-efficiency of an organization's food preparation and service.

Reducing food waste will have a higher benefit to your bottom line than any other technique. This is because food that is wasted is expensive—all of the purchasing costs, labor, and energy associated with unpacking, storing, and preparing it is lost. By implementing a food waste prevention strategy, an organization can realize simple and effective improvements to its budget and productivity.

How can I prevent food waste?

Every step that food goes through from farm to fork requires resources, which in turn impact the environment in some way. The best way to reduce those impacts is to make sure that the food we produce gets eaten.

Food waste prevention is a way of building a picture of the waste your organization produces by collecting objective data. By knowing how much waste is being produced, what type of food is being wasted, and which activities create the most waste, identifying practical solutions becomes much easier. Possible solutions may require refining purchasing practices, improving storage techniques, training staff, and redesigning your menu.

Since source reduction is a preventative measure, it is

considered the highest priority as a method for addressing waste.

How can I find out how much food waste I am creating and where it is coming from?

The types of food waste you identify through self-audits or tracking will help determine what source-reduction efforts to use. While some food waste is unavoidable, like vegetable peels or animal bones, most can be prevented. NYSP2I developed a food waste self-audit tool to help organizations make informed first steps towards a food waste management plan. See below.

- Access the NYSP2I food waste audit tool now https://www.rit.edu/affiliate/nysp2i/sites/rit.edu.affiliate.nysp2i/files/docs/resources/Food_Waste_Self-Assessment_How-to%20Guide_NYSP2I.pdf

What types of food waste are easiest to prevent?

Some common sources of food waste that can be strategically prevented include the following:

- unprepared food that spoils in storage
- food prep waste
- imprecise trimming of vegetables, fruit, and meats prepared but never served
- excess, uneaten food from self-service hot and salad bars prepared foods that are kept in storage too long.

- customer plate waste
- edible food that touches a customer's plate
unprepared, back-stock food that spoils

I'm thinking about putting in place a food waste prevention plan. What's a good first step?

A food waste prevention approach can be more time consuming to implement and less easily scaled than other methods. However, they should still be considered first due to the substantially higher benefits they can deliver.

Before beginning source reduction efforts, you should gain an understanding of where food waste is being generated in your operation as well as the types and amounts. With this information, you can decide where you want to focus reduction efforts first. Consider the three points below.

1. Trying to tackle all the food waste at once can be overwhelming and result in less-successful results. Focusing on reducing food waste with either high cost or high volume is a great place to start.
2. Food waste audits are a practical first step to identify opportunity areas. Use this tool from NYSP2I to conduct an audit for your organization https://www.rit.edu/affiliate/nysp2i/sites/rit.edu.affiliate.nysp2i/files/docs/resources/Food_Waste_Self-Assessment_How-to%20Guide_NYSP2I.pdf
3. A daily food waste tracking program can provide similar benefits to conducting a food waste audit, but provides these benefits on a daily basis rather than once in a while. It offers a much more comprehensive view of your waste stream over weeks, months, and years, which enables fine-tuning of your efforts to match real time feedback.

How much does a food waste prevention plan cost?

The best way to save money and resources when it comes to food waste is to not create it at all. Putting in place a food waste prevention strategy will give your bottom line the biggest lift when compared to recycling or donation methods. Why? Food production, packaging, distribution, and retail all incur expenditures—labor, energy, time, and storage are significant costs. All of this means that when food is wasted, incredible amounts of value are lost.

Scoping out and implementing a food waste prevention plan for your organization requires what may call for a large initial investment of money and staff resources. However, the long-term savings and efficiency benefits that it will help realize certainly make it well worth the effort.

Donating Excess Food



How does food donation work?

Most of the food that we throw out is still edible while many people remain food insecure in the United States.

Under the guidance and support of [Feeding America](#) a network of food banks, rescue operations, and food pantries across the US collects donations of nutritious foods from farmers, food processors, and retail institutions. Each organization distributes food, such as fresh produce, prepared meals, or non-perishable items, directly to people in need. Three billion meals worth of food are distributed annually. In addition to donating to regional food banks, there are many smaller, locally focused food shelters, pantries, and soup kitchens that accept donations directly.

Guidelines around donations near or past their sell-by and best-by dates vary by each individual program. Some will accept shelf-stable food regardless of expiration dates while others will do so only within a certain window of time. There is much more stringent guidance on donating perishable foods, but, if the food is not spoiled, it will likely be accepted as a donation.

**Note that not all food banks/rescues accept prepared food donations.*

See “[What laws and regulations should I be aware of when building a food waste management program?](#)” to learn about laws and policies governing food donation.

What types of food can be donated?

Many types of foods can be donated through the network of food banks and pantries operating across New York State. Below is a general list.

- dry-store goods (bread, flour, grains)
- refrigerated items (dairy, meats, prepared foods*)
- non-perishable items (cereals, pasta, canned goods, jarred goods, mac&cheese)
- frozen perishable food (vegetables, meals, meats)
- bulk and raw ingredients (rice, spices)
- beverages (protein shakes, juice, tea)

**A note on prepared foods*

Some food donation organizations accept prepared food, often requiring that it has been frozen for at least 24 hours before it is donated. If this is an avenue your organization would consider, you will need to consider that there is enough freezer storage available at your facility.

Are there practical benefits to donating food that I use to convince decision makers at my organization?

The sustainable benefits of donating excess food are clear: it diverts what would be waste towards helping people who are experiencing food insecurity. However, a food donation program also offers many practical benefits, especially for businesses.

- Donating food is usually the second most cost-effective method of mitigating food waste. The only fees a company may incur from making food donations are those associated with the transport to a drop-off location. Even so, many food banks offer pick-up services. Food that is donated does not incur any disposal fees.
- Many costs associated with making a food donation (including purchasing and handling food) are tax deductible.
- Donating food offers an outlet for inventory that is difficult to move.

How do I find a food bank or food pantry?

The best place to start is by contacting your regional food bank or more local food donation distribution programs when that is not possible. Consult the resources below to find places to donate food.

Use our food bank locator to find a food bank near you
<https://www.rit.edu/affiliate/nysp2i/resources/organic-resource-locator>

Use these websites to search for food pantries operating near you:

- Apple Harvest
<https://ampleharvest.org/pantry-map/>
- Find a Food Pantry
<http://www.findafoodpantry.org/index.php>
- New York Food Pantries
https://www.foodpantries.org/st/new_york



Recycling Food Waste

How is food waste recycled?

Food that is no longer fit for human consumption may have valuable agricultural or industrial uses.

Agricultural use

Some food waste can be a valuable commodity for farmers. Most commonly, farms can use food scraps that humans cannot eat to feed animals. Doing so redirects a major stream of organic material into landfills, offsetting a major source of a potent greenhouse gases (methane).

Industrial use

Food scraps and post-use fats, oils, and greases can be used as a raw energy source to make biodiesel or as a material for making products like soap or soil amendments.

Where should I start if I want to begin recycling food waste?

A successful food waste recycling program starts with what is called “source separation.”

Source separation refers to the practice of separating materials at their source of generation. In the context of food, this means separating food waste from trash and recycling items wherever it is created at your organization.

Separating materials directly at their point of origin is much simpler and takes a lot less time and resources than doing so later on. What more, it is almost always required if you are planning to send the food and other organics to

a recycling facility, and it helps haulers and processors do their job more efficiently. That being said, some haulers and recyclers offer de-packaging services. If you have packaged food waste, it may be worth considering any companies with this capability in your area.

An effective source-separation process is key to successful food waste recycling. When it is not done properly, contamination from other non-food waste streams can cause equipment to break and downtime, all leading to huge costs.

Aspects of a successful source-separation strategy are outlined below.

Use of bins

- Collection bins should be as consistent in color, style, and signage as possible. For example, designating green totes for food waste only helps to eliminate confusion.
- Mark all food waste collection bins with consistent color and visual graphics whenever possible. For example, avoid using a normal trash can as a food waste collection bin.
- Bins should be placed in locations that are intuitive and frequently used. It is common to have certain bins that “float” around where needed, but try to keep the “core” bins in the same locations.
- Make sure you have enough bins for the amount of food waste that your organization generates. Keeping

at least one bin in key areas, such as the dishwashing station or vegetable prep station, is a good idea.

- If you are working with space constraints, consider keeping small bins at points of waste generation and emptying these into larger bins kept elsewhere.

Clear signage

- Wherever there is a collection bin, there should be a sign clearly stating what can go in it. This is especially important for front-of-house collection bins because customers need to be able to quickly discern which materials should go where.
- Signs should include pictures of what can (and cannot) be thrown into bins. If possible, take pictures of foods and containers that are actually used at your business, so everything is easily recognizable.

Staff and stakeholder training

- Explain to your employees what can and cannot be thrown in the separation bins. This could be as simple as a group meeting at the beginning of your program's roll out, with all new employees and periodically thereafter.
- Continually monitor the contamination levels in your bins, especially during the early stages of your source separation program. If there are high levels of contamination in back-of-house bins, reiterate the source-separation guidelines with staff.
- Consider designating one or two employees as "trainers." If you have a large staff, it could be beneficial to carefully train this small group of employees who are then responsible for training the remaining staff on a day-to-day basis. This "train the trainer" approach helps to relieve some of the time commitment associated with training from the managers and high-level management.

Timing

- Stage out implementation. Depending on the size of your organization, it may be daunting to try to implement a source-separation and recycling program all at once. Consider focusing on only for back-of-house food operations first.
- Starting with the back of the house allows for a more controlled training environment for employees where they can become comfortable with new procedures. It also allows an opportunity to work out "kinks" on a small scale before rolling out a program to your whole organization.

What is a food waste hauler and how can my organization work with one?

If you decide that having your food waste recycled at an off-site facility best matches your organization's needs and resources, you will need to consider how the organic material you generate will be transported to it. Enter the food waste hauler.

Most businesses, nonprofits, and municipal institutions generally lack the capacity to do so and instead hire food waste haulers to pick up and transport their waste to a recycling facility.

Contacting food haulers: What to know

Below are questions you should answer before approaching a hauling company about food waste transport. Having this information on hand will help make for as productive and useful a conversation as possible.

- How much waste do you produce? If you need help calculating this amount, use the NYSP21 food waste estimator <https://www.rit.edu/affiliate/nysp21/food-waste-estimator>
- Where are your nearest organic material recycling facilities located? To find out, use this interactive map to locate resources in your region <https://www.rit.edu/affiliate/nysp21/resources/organic-resource-locator>

Using your current hauler

Your organization may already work with a hauler for your general waste generation. They may offer organic material hauling, which would require only an update to your current contract with them. It's a good idea to check with them first before approaching new vendors.

Find out where your food waste will go

Once you find a hauler that is able to take your organic waste, verify where they will take the waste to. It is not uncommon for an organization to discover, after months or longer, that the hauler they've contracted has been delivering their waste to a landfill, not a recycling facility. Avoid this tragic end to all the effort that goes into a maintaining a sustainable food system by identifying and confirming a partner facility as part of your initial agreement with a hauler.

Other important considerations when signing a contract

- How should the waste be prepared for pickup?
- Are specific containers required?
- What labelling is required, if any?
- What is their pickup schedule?
- Do they provide any staff training on source separation?
- Is there any initial setup of equipment or process required on your premises?
- Can they offer any advice for sourcing contamination-free material?

How can my business recycle food waste on-site?

Managing food waste for your business doesn't always mean sending it off-site to be processed. There are options available for both pre-processing and fully processing food waste on-site, either of which may be the right choice depending on the situation.

Pre-processing food waste on-site

Food waste can be pre-processed at a business, municipal facility, hospital, or other organization in order to more efficiently divert it and to reduce costs associated with volume. To do this effectively, special equipment is needed.

Pre-processing equipment is used by restaurants, hospitals, and grocery stores, as well as by haulers and waste processors. The equipment described below are examples of the main types in service today. The information below contains high level summaries of various equipment types based on our industry experience at NYSP2I, talking with industry experts and drawing from available research. Specific pieces of equipment and/or manufacturers of that equipment are mentioned for illustrative purposes and do not represent the only products available on the market. NYSP2I does not endorse any specific solution for managing your food waste.

De-packaging units

Cost: \$\$ - \$\$\$

De-packaging units separate packaging material (e.g., plastic and aluminum) from organic material. If packaged food is not suitable for donation, it will need to be de-packaged before the organics can be recycled. Mechanisms employed to perform this separation vary from human labor to high-tech equipment. Each option comes with its own benefits and challenges, including cost, allowable packaging types, throughput, and contamination rates.

General notes:

- Better suited for larger volumes
- Technologies and brands differ on what types of packaging/product they accept.
- Glass is challenging.
- Equipment is used with both uniform, single-stream applications as well as with heterogeneous, co-mingled food scraps

Operations:

- Typically water and power are required.
- Some models come with automated feed features, but many will require operational oversight during processing.
- Drain access might be valuable depending on cleaning needs and how you plan to manage end products.
- Equipment can be very noisy.

Space:

- Requirements vary.
- In addition to the equipment footprint, space is also needed for equipment loading and staging of incoming and outgoing material.
- Unless compacted, packaging coming out of de-packaging equipment can take up a lot of space.

Typical applications:

- Primarily transfer stations and end sites
- Manual de-packaging is not practical for extracting highly valued and/or high volumes of packaged goods.
- Ideal for reducing contamination by "dirty" (unpackaged) feedstocks.

Examples of de-packaging equipment:

- Scott Equipment Company – Turbo Separator
<http://www.scottequipment.com/turborecycling/>
- Ecoverse – Tiger Depackaging System
<http://www.ecoverse.net/products/tiger-depackaging/>
- Sebright Products, Inc. – X3Cycler
<https://www.sebrightproducts.com/products/bright-technologies/x3-cycler>
- Twister Depackager & Separator:
<https://www.twisterseparator.com/>

Pulpers and shredders

Cost: \$ - \$\$

Pulping and shredding equipment are both used to physically break down food waste into a slurry. Most often, this mechanical process is coupled with dewatering, which can remove up to 90% of the slurry's water content.

General notes:

- Sizes vary.
- Often used in kitchens to process pre- and post-consumer food scraps.
- Some equipment will accept non-organics as well, but their inclusion will limit your available options for end use.

Operations:

- Power and water hook ups are generally required.
- Drain access might be valuable depending on cleaning needs and how you plan to manage end products.
- Large volumes of water are typically removed, but still need to be managed.
- The food waste volume reduction due to water removal can help lower hauling costs.
- End product slurry still needs to be stored, handled, and disposed of as you would with raw food waste—it is not in a stable condition.

Space:

- Most equipment requires less space than other technologies as they are often installed in kitchens.

Typical applications:

- Commercial kitchens
- Facilities where hauling or processing fees necessitate volume reduction at a generator's site.
- The end product is typically sent to be processed into animal feed, composting, or anaerobic digestion.

Examples of pulping and shredding equipment:

- Emerson – Grind2Energy
<http://www.emerson.com/en-us/commercial-residential/grind2energy-food-waste-solution>
- Somat – Close-Coupled Pulper
<https://somatcompany.com/products/close-coupled-pulpers/>

Dehydrators

Cost: \$ - \$\$\$

Dehydration units use mechanical techniques and thermal energy to remove moisture contained in food waste. Heat is applied to evaporate water, and most units also use mechanical means to tumble, rotate, or move the material as it dries. End products are usually sent for secondary processing (e.g., composting) or used as animal feed. The most applicable end site is depends on the characteristics of the feedstock used. Dehydrated food waste is not typically suited for direct application as a soil amendment without additional processing.

General notes:

- De-packaged organics
- Equipment is used with both uniform, single-stream applications as well as with heterogeneous, co-mingled food scraps

Operations:

- Power hookups are required.
- Drain access might be valuable depending on cleaning needs and how you plan to manage end products.
- Most dehydrators are set up for batch processing, typically lasting eight hours or more.
- Some users report a burnt or cooked odor during processing.

Space:

- Space varies widely based on the unit's capacity (pounds to tons per cycle) and dehydration method (tray drying, drum drying, etc.).

Typical applications:

- To reduce the volume of food scraps in order to lower hauling or tip fees.
- To create new end-products like fish food, dehydrated fruit, or whey protein powder.

Examples of dehydrating equipment:

- Somat – Dehydrator System
<https://somatcompany.com/products/dehydrator-system/>
- IVS – Ecovim-66
<http://www.ecovimusa.com/>
- EnviroGlobal – Enviro 2000
http://www.enviropac.no/en/products/food_waste_systems/food_waste_system_enviro_2000/

Liquefiers and biodigesters

Cost: \$ - \$\$\$

Unlike previously mentioned processes, food waste that is run through liquefiers or biodigestors will go through a biological change. Enzymes and/or microbes are used to accelerate decomposition in these systems. Some models pump the end product into a holding unit for removal, but these units are considered down-the-drain technologies.

It is important to know before purchasing this type of technology what the end product will look like, where it will be going, and what the local regulations/recommendations are related to disposal. For example, discharge may not fall within the allowable limits at your local municipality, so you may incur an additional cost.

General notes:

- Organics only
- Certain food waste items may be difficult to break down in these systems (e.g. large bones).

Operations:

- Models may be set up for batch or continuous feeding.
- Power and occasionally water hookups are required.

Space:

- Varies, depending on the application.
- Many sizes are available.

Typical applications:

- Useful when a hauling service is not feasible.
- Space or labor is constrained to manage organics through other means.

Examples of liquefying and digesting equipment:

- Biohitech – Revolution Series Digesters
<http://digesters.biohitech.com/platform/digesters>
- Power Knot – LFC Bio-digester
<http://www.powerknot.com/lfc/>
- Totally Green – Orca Model OG100
<http://www.feedtheorca.com/models>

Fully processing food waste on-site

There are a number of factors to consider when making the decision to fully process food waste on-site, and it is important to understand your business's needs and the available options so that you can make an informed decision about whether on-site processing or pre-processing is the right option for you.

Pros

Processing food waste on-site may

- lower hauling fees due to volume reductions or complete on-site treatment;
- create a useful byproduct (soil amendment or fertilizer product) that could be used on-site;
- be ideal for rural areas where food-waste hauling may not be a cost-effective option;
- reduce concerns associated with odors;
- allow a business to benefit directly from the output material (e.g., producing compost on-site that can be used on the grounds of the facility); and
- keep food waste material closer to the point of generation than traditional hauling.

Cons

Processing food waste on-site

- requires an initial investment in technology, ongoing equipment maintenance and operation costs, and labor costs of running and maintaining the equipment;
- makes a business responsible for managing the output material;
- requires trained and capable staff who can use processing equipment;
- needs dedicated facilities (amount ranges drastically);
- adds a new branch of operations to the business; and
- may require a permit.

More food recycling resources for businesses

- Looking for support recycling food waste at a restaurant? Download NYSP2I's how-to guide for restaurants
https://www.rit.edu/affiliate/nysp2i/sites/rit.edu.affiliate.nysp2i/files/docs/resources/Restaurant_How_to_Guide_Diverting_Food_Waste.pdf
- Use this self-assessment guide to see if on-site food processing is right for you
https://www.rit.edu/affiliate/nysp2i/sites/rit.edu.affiliate.nysp2i/files/docs/resources/Food_Waste_Self-Assessment_How-to%20Guide_NYSP2I.pdf

How can food waste be used for animal feed?

Low-moisture content food (e.g., bakery waste) is well suited for conversion to animal feed because the energy required for drying it is low. However, only one facility currently provides this service in New York State. Higher moisture content food can be fed directly to animals, but there are strict state regulations on what types of food are suitable for direct animal feeding.

Sending food waste to farms and animal-feed-processing facilities is often less expensive than sending it to a landfill. What more, farmers can save money because it means purchasing less traditional animal feed. Diverting food waste to farms also helps to counter the greenhouse gas emissions generated by the fertilizer that is used to grow crops for traditional animal-feed production.

Types of food waste that be used as animal feed

- high-moisture, pre-consumer foods like vegetables and fruit
- low-moisture food products like bakery waste, potato chips, and pasta

Types of food waste that are not suitable for animal feed use

- plate waste, scraps (meat and produce), prepared foods (like soups)

Before you consider this avenue, take a look at our legal fact sheet below to learn about the relevant laws and policies governing this type of food waste recycling.

- Access “New York Food Donation: Feeding scraps to animals” legal fact sheet
https://www.rit.edu/affiliate/nysp2i/sites/rit.edu.affiliate.nysp2i/files/docs/resources/NY_Animal_Feed_Fact_Sheet.pdf

What is anaerobic digestion?

In New York State, anaerobic digestion is the most common type of industrial use in practice for processing general food waste. Theoretically, any type of food waste can be sent to an anaerobic digester. However, not all facilities will accept any type of food waste for several reasons, including the following:

- lack of pre-processing capability (sorting, grinding, and mixing)
- lack of de-packaging equipment (mechanical or manual)
- labor constraints
- digester capacity
- location
- hauling constraints

It is highly recommended that you contact your local

facility to learn their specific requirements.

Common feedstock types for anaerobic digestion include the following:

- food scraps
- manure and animal slurry
- biosolids
- fats, oils, and grease
- slaughterhouse and meat-packing waste
- dairy-factory waste
- brewery and distillery waste

Use the NYSP2I Organic Resource Locator map to find an anaerobic digester facility near you

<https://www.rit.edu/affiliate/nysp2i/resources/organic-resource-locator>

What do I need to know about composting?

Food scraps that are not fit for human or animal consumption can often be used for compost. Composting is the process of recycling the nutrients in organic materials (like food waste) back into the soil. It is the most widely known and utilized food waste recycling pathway in New York State. Successful composting involves the controlled decomposition of organic materials under aerobic conditions to produce a stable, nutrient-rich soil amendment.

Composting can take anywhere from several weeks to a year to complete, depending on the method used. It is considered finished when the organic material has fully decomposed and reached a stable state.

- Access the NYSP2I organic resource locator to find composting services near you
<https://www.rit.edu/affiliate/nysp2i/resources/organic-resource-locator>

Foods that can be composted

If it is organic material, it can be composted. There are misconceptions that certain foods like meat, dairy, and seafood cannot be composted, because it is not recommended to do so on a backyard-composting scale. However, most industrial scale compost facilities will accept any type of food.

Paper, napkins, compostable bags, and biodegradable flatware and cups are not universally accepted at compost facilities, so be sure to check that your local facility accepts these materials, especially before making an investment in compostable ware.

Benefits of composting

- Reduced methane emissions: When food waste decomposes in the absence of oxygen (like in a landfill), it gives off methane gas, a powerful greenhouse gas many times more potent than CO₂.

- Better soil: Compost increases moisture retention in soil; reduces the risk of erosion; supports soil health; boosts crop yields; suppresses plant diseases, weeds, and pests; and reduces the need for chemical fertilizer.

Types of composting

aerated static-pile composting

Aerated static-pile composting involves layering organic materials with bulking agents in a large pile that has pipes running underneath it for aeration. This type of composting is suitable for large volumes of homogenous waste, but not for animal byproducts or grease. Less land is required for static pile composting than for windrow composting (described below) because the piles can be taller.

in-vessel composting

In-vessel composting is a method that is suitable for small or large volumes of waste and can handle almost all types of organic waste. Large-scale in-vessel composting can be faster but more expensive than other forms of composting due to the equipment required to aerate and handle the compost.

aerated windrow composting

Aerated windrow composting involves long rows of compost that range from 14-16 feet wide and 4-8 feet tall. The piles are turned periodically to ensure adequate oxygen flow to the pile. This method of composting is suitable for large volumes of organic waste from communities and food-processing businesses and can even handle grease and animal byproducts. Aerated windrow composting requires a large amount of land and the leachate produced may contaminate surface and ground water. However, both of those concerns are easily handled with proper infrastructure.

vermicomposting

Vermicomposting uses worms to aid the decomposition of organic material. They provide aeration by burrowing through the pile. This type of composting is more suitable for smaller quantities of organic waste and has the most restrictions for types of food waste.

Further reading

- United States Composting Council
<http://compostingcouncil.org/>
- Cornell University composting resources
<http://cwmi.css.cornell.edu/composting.htm>
- US EPA
<https://www.epa.gov/recycle/composting-home>
- USDA Natural Resources Conservation Service
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/newsroom/features/?cid=nrcs143_023537

What are some other techniques for recycling food waste?

Rendering

Rendering is the processing of fats, oils, greases, and other high concentrations of animal tissues. Though some of these materials can come from the food retail and service sector, most are a byproducts of food manufacturing.

Feedstock can be rendered into either edible or inedible products. Edible-product-rendering plants, which are usually operated in conjunction with meat-processing plants, process fatty animal tissue into edible fats and proteins. Inedible rendering produces products like high-protein meal, tallow, and grease that are used in animal feed, soaps, and fatty-acid production. These facilities are usually run independently and accept a wider range of feedstocks than edible processing plants.

Fats, oils, and greases are useful for certain industrial uses that general food waste cannot be used for. For this reason, they should be collected separately from a general food waste stream.

Biofuel made from food waste

Fats, oils, and greases from food service can be converted to an alternative fuel called biodiesel through a process called transesterification. First, the waste is purified to remove impurities and water. Then the purified feedstock is reacted with alcohol, producing biodiesel and byproducts, including glycerol, alcohol, and water. Once these byproducts are removed, the biodiesel can be used as a fuel.

Do municipalities offer food waste recycling services?

Municipalities (e.g. counties, cities, towns, and villages) and the services they provide can play a significant role in establishing and running food waste management programs, including educating residents on food waste management and diversion, and, in some cases, operating food waste recycling facilities. According to a survey of New York State municipalities, 88% of those surveyed said that the issue of food waste is important to them, despite only 4% reporting that food waste is being adequately addressed in their communities.

If you represent a municipality and are interested in launching a food waste recycling program, NYSP21 published a useful guide for municipalities.

- Access NYSP21's "Municipality Planning Guide: Food Waste Management in Your Community" <https://indd.adobe.com/view/9fc8e807-cbd4-4751-869c-e1d68090de6b>

If you are a resident, see "[How can communities and municipalities manage food waste?](#)" for a list of resources on how you can take advantage of food waste recycling services offered by your local municipality.