

# Cornell Farm Services Compost Facility

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## Overview/History

The compost program at Cornell University was started to manage manure from livestock in Cornell's care. In the past, when manure could not be daily spread, it was piled and spread when weather conditions improved.



*Cloth and gravel pad.*

These piles were unsightly, had no leachate control, and produced objectionable odors when spread. In 1992, Cornell Farm Services started composting the manure and bedding from the large animal hospital at Cornell's College of Veterinary Medicine.

The compost site was engineered by the Department of Biological and Environmental Engineering starting out as a 1.4 acre pad with a leachate collection pond for runoff. A berm built from topsoil that was cleared from the site, surrounds the pad and keeps water from the slope above the site and off the pad, out of the leachate collection system. The cloth and gravel pad surface was prepared by removing the top soil, then geotextile was rolled out and covered with 12-18" of crushed gravel. The surface was compacted with a vibratory roller making it ready to receive manure and bedding from the veterinary hospital, the Department of Animal Science's teaching barn (cows, sheep and goats), poultry facilities and horse barn.

The liquids from the leachate ponds are used to irrigate surrounding hay crop fields at appropriate times of the year. Liquids are also used to incorporate water into the piles when needed, although it is hard to wet active piles. The solids are scooped out of the pond each fall to make sure full pond capacity is available through the winter months. They are either put back in active compost windrows or used to strengthen the berms.

In 1997, when landfill rates increased, the University was looking at ways to save money, so they looked into composting food scraps from 5 dining halls. By the time they started, the rates had dropped again, so, although it did not necessarily save any money, it was the right thing to do. In 1999, the pad was increased to 1.7 acres and

### **Objectives**

- Compost livestock manure from Cornell farms.
- Provide a value-added product that can be applied to the 1000+ acres owned by Farm Services. This agricultural amendment improves soil used for livestock crop production.
- Improve quality and marketability of compost.
- Compost Cornell Dining food scraps.
- Divert material from landfill.
- Educate the public about the values of composting.
- Provide a good business model for other farms and universities to emulate.
- Provide a site for research in compost production and produce compost for use in research projects.



*Compost site before expansion.*



an additional 224,000 gallon retention pond was created above the site so that when leachate could not be land applied, it could be stored in that pond. It has not been needed to date. In 2000, plant material and soils from Cornell greenhouses, Plant Breeding, the Department of Crop and Soil Sciences and Cornell Plantations were brought



*Compost site today.*

to the site to be composted. By 2003, the “All-You-Care-to-Eat” dining facilities and several of the take-out facilities run by campus dining were separating food scraps for composting.

Up until then, Cornell’s compost was used to supplement nutrients on field crops (field crops are tolerant of composts that are 3/4 finished) and to generally improve the soil as well as for research in compost quality and use. A decision was made to use more compost on campus and to sell some locally. In order to produce stable, mature compost, the pad was enlarged to the current size of 4.0 acres in 2003. As of 2008, there are 11 dining halls on campus that have their organics picked up by Farm Services for composting. Cornell is composting approximately 850 tons of pre and post-consumer food scraps and compostables, 3,300 tons of animal manure and bedding and 300 tons of plant material and soil which had previously been sent to a landfill. The food waste and veterinary hospital manure are composted separately and used on Cornell’s agricultural fields. The rest is managed for sale and used in research.

## **Separation**

Prior to composting food scraps, all of the “All-You-Care-to-Eat” dining halls on Cornell’s campus, except one, had installed pulpers which ground up food scraps prior to sending them into the wastewater waste stream. When the decision was made to start composting, this made post-plate separation at these dining halls easy. Students need only bring their plates to the dish collection area where CU staff scrape the remains into a trough which leads directly to the pulper. The pulped scraps then travel down a pipe from the dish room to a dewatering machine. Once dewatered, the solids are collected in 32-35 gallon yellow plastic barrels on casters and the water goes down the drain. Note that food scraps can be composted whole or pulped but this system was in place before composting. Pre-consumer food scraps and other compostables are also collected in the yellow plastic barrels and wheeled down to the loading dock for pick-up by Farm Services. The cans are washed by CU staff with a can washer. The custodians who bring the barrels down to the loading dock police them for items that do not belong. If they see something that does not belong, they will take care of it. If it becomes consistent, or there is too much to take care of, they will bring it to the manager’s attention and it will be discussed at the daily staff meeting. In addition to collecting compostables, the dining halls also collect recyclables in blue plastic barrels, and trash in gray plastic barrels.

In the retail dining facilities (i.e. a la carte dining and takeout services), only pre-consumer organic material was being composted until 2006. During the academic year of 05-06, a student decided to set up post-consumer composting at one of the dining halls as a project for a class. The project turned out to be too big for one person, so she encouraged CU Dining to hire students to run post-consumer composting at these facilities. In the fall of 2006, Cornell Dining hired two students as Sustainability Coordinators. They have been very busy organizing, setting up and educating dining establishment patrons on post-consumer separation.



*Return tray station and food scrap trough.*



*Pulper.*



*Dewaterer (left) and can washer (above).*

Each of these facilities has a post-consumer separation station set up where patrons separate the compostables, from the recyclables, from the trash. The Student Sustainability Coordinators have awareness campaigns at the dining halls for a week at a time to help teach patrons what is compostable and what is not. There is also extensive signage above the stations. At Martha's, a retail dining establishment that just started post-consumer separation, a new separation station was put in which coordinators feel may help improve separation. The space for food scraps and serviceware collection is set apart from the rest of the spaces by being labeled in yellow with a big yellow circle around where compostables are deposited. In addition, they have changed the word "trash" to "landfill" to help bring home the idea of where non-compostables are going.

Cornell Dining is committed to reducing its carbon footprint. This prompted going "trayless" at select dining locations, which has significantly reduced food waste and water usage, and making available Freshtake Grab-'n'-Go products, which are packaged using compostable containers and labels. In addition, they are using



*Separation station.*

compostable plates and cups and are looking into corn and potato-based plastic to stock utensil dispensers. Cornell has a green purchasing task force to help get better rates for compostables. The things that are not compostable at Cornell Dining are third party food products such as sushi containers, potato chip bags and the plastic/foil packets containing some condiments. The plastic tops and straws for fountain drinks are also not compostable.



In 2007, the Cornell Sustainability Council pushed for the Statler Hotel, independent of Cornell Dining, to compost. There are 4 kitchens at the Statler which prepare meals, and staff and students sort in the kitchen. They also use a color-coded bin system: yellow for compostables, blue for recyclables and gray for trash. Student training consists of a broad overview when they come to work in the kitchen and “on the job” training. Servers



*Food scraps and other compostables in the Statler kitchen.*

sort from the trays, cooks sort when they cook and dish machine operators sort when they clean up. Patrons also sort using separation stations.

In 2008, a new café opened in Mann Library called Manndible that is run by an independent business renting space at CU. If Cornell had not had something in place for composting already, Manndible would have had their compostables picked up by Cayuga Compost. Most everything at Manndible is compostable. Consumers tend to get confused with the take-away containers; i.e. is this one compostable, or is it plastic? Signage has helped, but many people still tend to miss it.

### Collection and Mixing

Five days a week, Monday through Friday, a Cornell Farm Services staff member picks up the compostables from dining facilities. Some get the service 3 times a week, and others five. Prior to starting off on the pick-up, the truck is lined with six to eight inches of bedding material consisting of sawdust and horse manure. This material is built into a dam at the rear of the truck bed to prevent liquid leaving the truck. The dump truck they use has a lift onto which the yellow “compostables” barrel is strapped and the contents are dumped into the truck. The first run on Mondays, in which they pick up from 7 of the 11 dining halls and retail facilities, takes about an hour and a half and yields around 3.5 tons of organics. This is unloaded at the compost site next to the end of the windrow where a pile of sawdust, straw and chips (carbon source) is ready for later mixing. The second run takes approximately one hour and yields around 2.5 tons for a total of 6 tons of food and compostable items.

Food scraps and compostables are added daily to the existing windrows. A Farm Services employee uses a front end loader to create a trench in the carbon source at the end of the windrow. He then scrapes up the organics from the pile and puts them into the trench. Finally, he covers them with additional carbon. Food scraps are about 6-8% of the organics that are composted at Cornell. The other feedstocks are piled at the end of the windrow being built and incorporated by the turner. Farm Services is a self-sustaining entity. A per ton tipping fee is charged to all programs that use the facility. The food service programs, the greenhouses and some barns have regular collection provided but most others deliver their organics as they are accumulated. To keep its exempt status Cornell composts only organics generated in their own operations.



*Signage for separation at Manndible.*



*Dumping food scraps in truck.*



*Horse manure and bedding are used to keep the liquid in the truck.*

## Compost Method

Considering the amount of organic material that Cornell needs to manage, a turned windrow system was chosen. The compost windrows are nearly the size of a football field in length (270 feet), 6 to 8 feet tall, and 14 to 16 feet wide. The windrows are turned based on the internal temperature. The piles should range from 50 to 65 degrees Celsius (122 to 150 degrees Fahrenheit) when they are working most efficiently. If the temperature drops below 50 C or increases above 65 C the piles are turned; Cornell does not generally turn on weekends or holidays. Turning is done regularly from April until November, but not generally during the winter months. During the winter months, windrows are built by entities dropping the material off; it is then turned in spring. If materials are deposited in a windrow shape some passive composting will naturally occur. Originally, turning was done by a self powered elevating face turner that turned a pile in approximately 15 minutes. When the facility expanded, a 400 HP self-propelled straddle turner was secured since it is larger and saves staff time.



*Unloading food scraps at the compost site.*

The entire composting process occurs in approximately 6-9 months after which it is used on Cornell farm fields and in campus construction projects, or moved to a curing area to mature. The compost produced at Cornell is generally too wet to screen. Most of what is sold is going into topsoil mixes and then screened by the purchaser. Testing is periodically done for compost parameters. Results have shown that the compost has remained consistent over the years (the table below shows some average values). The compost site is a 365 day operation with animal manures delivered every day. Food waste, greenhouse waste, and other organics are delivered Monday through Friday. It takes the equivalent of 1.5 full time employees to collect organics and manage the compost site.

## Environmental and Public Impact

The Cornell compost site is a model for other composting facilities. To make the compost facility even greener and cleaner, all of Cornell Farm Services' 20-plus vehicle fleet of trucks, tractors, and other farm equipment has been running on B20 biodiesel (20% biodegradable fuel made from soybean or canola oil) exclusively since 2006. Tours and demonstrations help other programs make decisions to meet their needs. It is not regulated by NYS Department of Environmental Conservation (NYSDEC), due to Cornell's exempt status as an institution.



*Incorporating food scraps into a trench in the windrow.*



*Covering the food scraps with carbon material.*

Compost Parameter	2003	2004	2005	Average
Solids (%)	32.5	28.5	32.0	30.7
Bulk Density (lb/yd <sup>3</sup> ) as is	1013	1061	1135	1081
pH	7.9	7.6	7.8	7.8
Soluble Salts (mmhos/cm)	2.9	2.7	2.5	2.6
Organic Matter (%) as is	18.5	17.3	16.1	17.1
Total Nitrogen (%) as is	0.5	0.5	0.6	0.5
Ammonium Nitrogen (mg/kg) as is	2.7	4.9	3.6	4.0
Carbon:Nitrogen ratio	19.4	19.2	16.3	18.1
Phosphorus (%) as is	0.6	0.6	0.4	0.4
Potassium (%) as is	0.7	0.8	0.6	0.6

However if the site causes air, water or soil contamination, NYSDEC would step in. Often times, odors, noise, dust and groundwater contamination can be associated with compost sites, yet there have been no complaints from neighbors since Cornell began composting there, even though the site is 600 feet from a major trailer park. It is also in close proximity to a class 1 stream, which has shown no contamination with regular testing. The location is not ideal. However, with berms, cloth and gravel pad surface, leachate collection ponds and good operation and maintenance, it is a productive site. The compost site is used for teaching and research and has many visitors. On-going research includes weed seed viability studies, pathogen studies, compost use trials on fruit, vegetables turf and horticulture crops, animal mortalities demonstrations and avian vector studies. Perhaps the greatest benefit of the site is that it shows the potential for other facilities to replicate and create a compost site to meet their individual needs.



*Turning the windrow.*

**For more information:**

- Cornell Farm Services - <http://cuaes.cals.cornell.edu/farms/farm-services>
- Cornell Sustainable Campus - <http://living.sas.cornell.edu/dine/whoweare/sustainability/index.cfm>
- Cornell Dining - <http://living.sas.cornell.edu/dine/whoweare/sustainability/compostrecycle.cfm>

*This document was developed by the Cornell Waste Management Institute in cooperation with Cornell Farm Services, Cornell Dining, Statler Hotel, and Mandible Café.*

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