UNIVERSITY CLOSES THE LOOP

FOOD SCRAPs TO COMPOSTING ... AND BACK TO FOOD

Since the program began, more than half a million pounds of food residuals have been diverted from dining facilities at the University of New Hampshire. Finished compost is used in a campus garden, with produce coming back to the dining halls.

Jenna R. Jambeck, Elisabeth W. Farrell and Sara M. Cleaves

The University of New Hampshire (UNH) in Durham has closed the loop on food scraps recycling. Food waste is collected from the dining halls and several Durham businesses, and composted at the UNH College of Life Sciences and Agriculture’s Kingman Farm. The compost is sold locally and used by the UNH Organic Garden Club to grow vegetables in the campus organic gardens. These vegetables are sold on campus, used in the dining halls and in fun-filled Durham community dinners open to the public.

The program’s roots go back many years, when now retired UNH plant biology professor George Estes wanted a location to conduct research on composting. The Compost Technology Center was born at Kingman Farm. Both Estes and Civil Engineering Professor Tom Ballestero conducted research at the site in the 1990s. Original feedstocks included manure from the UNH Equine Center, poultry manure, and liquid dairy manure from the Dairy Research Center. The goal was to achieve a C:N ratio of 35-40:1 initially, with a final product having a C:N ratio of about 15:1. The research was successful and produced two Masters theses and a Ph.D. dissertation.

In 1998, the UNH Office of Sustainability worked with UNH Hospitality Services (now UNH Dining) and the staff at Kingman Farm to add food scraps from the dining halls to the composting mix. At the time, the food residuals were “managed” through a garbage...
disposal, but there was a desire to change this since it added a large organic load to the wastewater treatment plant. Composting meant the organics in the waste stream would be beneficially used instead of being a burden to the wastewater stream. The UNH composting program is now a strong and successful partnership of the UNH Office of Sustainability, UNH Dining, the UNH College of Life Sciences and Agriculture (COLSA), Kingman Farm, and the Durham community.

Since the program began, more than half a million pounds of food waste have been diverted from the waste stream and composted. The primary goals of the program are to manage waste in an environmentally sound and sustainable manner, to beneficially use the organic waste to create a quality soil amendment, and to increase awareness of the food cycle. "Composting is a clear example of the ecological cycles that sustain our quality of life and a great way for students to connect with the soils that support local agriculture and healthy foods," explains UNH Office of Sustainability Director Tom Kelly.

Besides composting, UNH also has a well-developed recycling program. Contracts with Waste Management are setup to collect waste and recyclables weekly. Cardboard, paper and commingled containers (plastic/glass) are recycled in all academic buildings and residence halls for a total of 597 tons of materials being recycled in FY 2006. Figure 1 illustrates the university-wide waste diversion initiatives.

**PLATES TO PULPER TO [COMPOST] PILES**

During the academic year, UNH Dining serves approximately 75,000 meals/week. A wide variety of foods are offered, many prepared to order in front of the guest. A 1999 UNH food waste study conducted by dietetic interns in the Department of Animal and Nutritional Sciences indicated that a total of four ounces of pre and post-consumer food residuals are generated per meal served, resulting in approximately 9,750 pounds (more than 4 tons) per week. In response to that study, and as part of its commitment to the Local Harvest Initiative to be as sustainable as possible (see sidebar), UNH Dining decided to invest in the compost operation.

"UNH Dining is committed to operating in a sustainable manner, and the compost program is just one facet of that commitment," says Rick MacDonald, Assistant Director of University Hospitality Support Services. "We have been a partner with the Office of Sustainability since its inception; we have committed intellectual capital as well as dollars and cents in the pursuit of making UNH a true leader of the realm of sustainable colleges and universities."

Actual food residuals tonnages are not as high as the 1999 study estimated. They average around 200,000 lbs/year or about...
When divided over 52 weeks, 2 tons/week is 104 tons per year. During the summer months, material is collected two times/week versus five times/week during the school year. All UNH dining halls (total of three as well as the faculty dining room and banquet facilities at Huddleston Hall and the Food Court at the Memorial Union Building) divert food waste for composting. Food residuals also are picked up from several local businesses including The Bagelry, Durham Marketplace and Breaking New Grounds.

At the dining halls, students load trays on a specially-designed conveyor system leading directly to the dishroom. The food is scraped into a trough of running water leading to a pulper (Somat, Super 60). The pulper reduces the food waste into very small pieces and extracts the liquid, which is recycled back into the trough system, with fresh makeup water added as needed. Periodically, some water is discharged to the wastewater system; there have been no organic loading issues to date. The pulped waste is a dry oatmeal-like material that composts quickly due to increased surface area. Increasing the speed with which the food waste decomposes helps eliminate the problem of odor at the compost site. Pulped material goes directly into a plastic garbage can. In Holloway Commons — the largest and newest dining hall on campus and designed and constructed with the composting operation in mind — the cans are stored in a dedicated refrigerator until picked up for transport to the compost site. At other dining halls and the local businesses, the waste is stored outside in the cans (all cans are covered).

From its inception in 1998 until the summer of 2006, the UNH Office of Sustain-

How Much Wood Can You Grind In A Day?

4012FL Industrial Tub Grinder: Built to grind, built to shred. It pulverizes and reduces trees, branches and stumps into usable organic material or reduces the amount of waste going into a landfill. It’s powered by an electronic 650hp or an 860hp CAT diesel engine. Equipped with a fluid clutch, an enclosed engine compartment with the lowest decibel reading in its class, and a self-cleaning air intake system, it takes on heavy-duty jobs with the highest level of productivity.

2009 Industrial Tub Grinder: Made to grind or regrind, it’s the most economical grinder on the market for jobs that don’t need high horsepower. With a 325hp CAT diesel engine, a self-adjusting clutch with push-button start and a self-cleaning air intake system, it’s both efficient and affordable.

3010P Industrial Tub Grinder: It can take in stumps, logs, branches, pallets and green waste, turning them into mulch and compost in no time. Powered by a CAT C-15 475 or 540hp Tier III diesel engine and outfitted with a 30” wide oscillating stacking conveyor, this machine can take on the toughest of jobs.

BioCycle  DECEMBER 2006  31
A tractor with a bucket is used to dig a hole in the windrow into which the food waste is poured and then covered (below). Compost is screened each spring (right).

ability managed the compost program. In the summer of 2006, UNH Dining took over management of the front end of the program by taking responsibility for collecting and delivering the waste to the farm. Dining interns and staff load the food waste onto the compost truck and take it out to Kingman Farm, located three miles away from campus. Kingman Farm is the University's 350-acre agronomy research facility and home to eight large compost windrows, each measuring 200 yards in length. Manure, sawdust, plant materials, and organic waste collected at UNH are also composted there.

A tractor with a bucket is used to dig a hole in the windrow into which the food waste (after being weighed) is poured and then covered. Once the pulped organics are deposited in the windrow and covered, the collection buckets are washed and returned to their original sites. In the past, the Office of Sustainability compost interns and Kingman Farm staff tested using compostable plastic bags to line the carts in order to minimize washing, which...
Compost is sold in bulk and bags under the name “U Doo.” In fiscal year 2005, 134 tons were produced. is very time consuming. At the time, the bags were found to not break down quickly enough; however, UNH Dining is now conducting a pilot study using compostable plastic bags from a new vendor to see if they will break down more quickly.

COMPOST USE AND DISTRIBUTION

The compost operation is managed by Stephen Bunker, with the assistance of Farm Services, paid by Agricultural Experiment Station (AES) funding. Each spring, farm employees, led by Bunker, gather and screen the compost for retail sale as “U Doo” (named for the original materials composted) to area farmers and gardeners. The popularity of “U Doo” has grown tremendously over time. In fiscal year 2005, 134 tons of compost were generated at UNH and beneficially used.

Among the end uses is the campus organic gardens operated by the UNH Organic Garden Club (OGC), a student-run organization established in 2003. OGC is part of the Food & Society Initiative of the UNH Office of Sustainability, which seeks to create a sustainable food system at UNH and to integrate issues of sustainable food and agriculture into the curriculum, operations, research, and engagement efforts at the University. OGC maintains a two-acre farm on the Campus-Community Farm, a 30-acre USDA certified organic site. In the winter of 2004, OGC collaborated with UNH’s Students Without Borders to secure a $10,000 grant from the UNH Parents Foundation to create the “built” components of the farm site, including drip irrigation and a shed with solar power. The first growing season was the spring/summer of 2004. Crops harvested at the site are purchased by UNH Dining Services and the New England Center (UNH’s fine dining and conference center), sold at a weekly UNH Durham campus farm stand that runs from late spring through fall, and used to help produce meals at the Crossroads House in Portsmouth, New Hampshire, an emergency and transitional shelter serving eastern New Hampshire and southern Maine.

“We are committed to working hard to be a responsible part of the cycle by utilizing resources that are locally available from the university and providing organic produce to the community,” says Bill Errickson, President of the OGC. “We are effectively reducing waste and fuel consumption while producing food that is fresh, healthy, and delicious!”

The UNH food waste composting program has been around for almost ten years and has lasted through many changes at the university. It continues to evolve, bringing people together across campus around a common cause in which they all

Premier Tech Systems

For more than fifteen years now, Premier Tech Systems has been successful in providing turnkey bag packaging solutions, from the bulk product infeed to the wrapped pallet. Every piece of the packaging line is designed, manufactured and integrated by our own team, ensuring the very best communication between the various systems. Choosing Premier Tech Systems as your unique supplier means choosing to optimize your production and meeting all your dependability and after-sales service expectations.
THE composting program at the University of New Hampshire is part of UNH Dining's Local Harvest Initiative. The Initiative raises awareness and educates students, staff and community members about the university's local agricultural landscape and its role in sustaining physical and economic health and well-being. Other Local Harvest Initiative efforts include serving fair trade coffee and local, cage free eggs, buying local products (including produce from the UNH Organic Garden Club), and hosting a Local Harvest Dinner annually that features food and beverages made from local produce, meats and other local and regional products. For details, go to www.unh.edu/dining/localharvest.htm.

In 1997, UNH began integrating sustainability into the University's identity, practices and land grant mission — an unprecedented commitment to sustainability on UNH's part. To help the university meet this commitment, the UNH Office of Sustainability (OS) was established with a generous gift from an anonymous alumnus to endow the program. OS is charged with collaborating with faculty, staff, administrators and students to integrate the principles and practices of sustainability throughout UNH's "CORE" — curriculum, operations, research, and engagement with local, state, regional, national, and international partners. The longest-standing endowed university sustainability program in the nation, OS has four initiatives: Biodiversity Education, Climate Education, Food & Society, and Culture & Sustainability. (See www.sustainableunh.unh.edu for more details.)

The authors acknowledge the work and input of UNH staff for their past contributions to the UNH Composting Program: former UNH Office of Sustainability staff person Justine Stadler, who now works at the UNH Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET), and Julie Newman, former UNH Office of Sustainability associate director, now Director of the Yale University Sustainability Program. Jenna Jambeck is a Research Assistant Professor of Environmental Engineering at UNH who conducts research in and teaches about solid and hazardous waste management. Elisabeth Farrell is the UNH Office of Sustainability Food and Society Initiative and Culture and Sustainability Initiative Program Coordinator and oversaw compost pick up and the UNH compost interns from mid-2003 to mid-2006, Sara Cleaves is the Associate Director of the UNH Office of Sustainability. Visit the compost program website: www.sustainableunh.unh.edu/fas/food_syst_compost.html.