

CLEANING UP COMPOST

Coffee grounds, soiled disposable diapers, eggshells, cucumber skins, soggy paper towels, used cat litter, holiday wrapping paper, dessicated Christmas trees, chicken bones, empty cereal boxes, the fat trimmed from last night's roast — the United States generates roughly 124 million tons of such largely organic garbage annually. That averages out to 2.6 pounds per day for every man, woman, and child in the country.

The venerable tradition of landfilling these gooey, smelly, often rotting materials has come under increasing criticism: Not only do chemicals in buried wastes frequently migrate into air and groundwater, but land for solid-waste burial also commands a premium price — one many communities cannot easily afford. So solid-waste managers have been struggling to find new ways of coping with these organic discards.

Many who looked to Mother Nature for inspiration are now investigating municipal composting. Though most older, mixed-waste compost programs have provoked strong criticism from environmental groups, several pilot projects now under way have begun transforming the image and economics of this rotting business.

These experimental "source-separated" programs require homeowners to segregate compostables from other household garbage before setting either out for trash haulers. It may not seem like a big deal, but this in-home trash segregation departs significantly from most existing municipal composting schemes and goes a long way toward ensuring a cleaner, "greener" product.

Like the backyard compost heap, municipal composting relies on naturally present bacteria to break down food scraps, wood, and paper. To nurture those microbes, compost managers regularly turn the wastes — ensuring thorough aeration and providing the bacteria access to all the wastes. Maintaining a relatively high humidity and temperature — 50° to 60°C for at least three days — speeds breakdown of the wastes and kills resident pathogens.

Thanks to all those food scraps, the resulting crumbly, humus-like compost is high in nutrients and makes a rich soil amendment for farmers, gardeners, and plant nurseries.

Community composting in the United

Municipal waste managers see hot prospects in rot

By JANET RALOFF

States evolved largely from programs designed to manage yard wastes — leaves, grass clippings, sticks, and wood chips. By diverting such materials from burial, communities can cut their tipping fees — per-ton payment to landfill operators — by as much as 20 percent.

As communities sought further methods for cutting their hefty solid-waste-management budget, several began diverting high-value noncompostables — typically glass, metal, and plastics — to recycling. But the recent recession has forced additional belt tightening and prompted more than a dozen communities to add food and paper composting to their waste-management programs.

Most of these programs collect compostables mixed with other household trash, observes Jan Beyea, chief scientist with the National Audubon Society in New York City. Waste programs later cull the materials to be composted at a central facility. Unfortunately, Beyea notes, no proven means exists for reliably removing all hazardous materials from clean compostables once they have been mixed. Consequently, worrisome levels of toxic contaminants frequently lace resulting composts.

Donald J. Lisk of Cornell University's Toxic Chemicals Laboratory in Ithaca, N.Y., scouted for such contaminants in composts from 26 different programs. To conduct his spectrometric studies, he burned each sample to ash. The starting composts included seven derived from yard wastes only, three from sewage sludge, four from municipal solid wastes (MSW), two from a mixture of MSW and yard wastes, one from a sludge-MSW mix, and two from a mix of all three sources.

In the April 1992 ARCHIVES OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY, Lisk reports that in contrast to composted sludge and yard wastes, MSW-derived composts invariably contained polychlorinated biphenyls. MSW-based composts also contained levels of toxic heavy metals that matched or exceeded those from sewage sludge. In fact, MSW-derived composts tended to lead the pack in levels of lead and sodium.

But when people sort compostable wastes at their source — the home or business — prior to trash pickup, the metal content of the resulting compost drops dramatically, notes Jackie Prince, a staff scientist with the Environmental Defense Fund in Washington, D.C. In the July 1992 RESOURCE RECYCLING, she compares North American and European data on composts made from source-separated municipal wastes and those derived from wastes culled at a central facility after pickup. Overall, Prince reports, levels of lead and other toxic metals tend to run 60 to 80 percent lower in composts from source-separated wastes.

Lisk's data also indicate that asbestos is "a widespread contaminant in all kinds of municipal composts," ranging from trace amounts to 1 percent of the volume in ash. The source of this carcinogen? Most likely brake linings and construction materials, he says.

Currently, notes Ellen Z. Harrison of Cornell's Waste Management Institute, "we have no national standards for compost quality, and there are standards in only a handful of states." Concludes Lisk, "[W]ithout evaluating the composition of these composts and without adequate regulations forcing such analyses, we're facing a widespread and potentially serious problem."

Beyea and other environmentalists agree and have argued strongly against policies that encourage the production of municipal composts from mixed wastes. Indeed, Beyea observes, Audubon and representatives of the Cincinnati-based Procter and Gamble (P&G) Co. "were going head-to-head with each other on this very issue at the Recycling Advisory Council [RAC]," a division of the 3-year-old National Recycling Coalition, headquartered in Washington, D.C. It was a real battle, he recalls, and the public opposition it threatened to spawn risked derailing composting as a viable municipi-

pal-waste strategy.

So RAC made Beyea and Bruce Jones of P&G cochairs of its subcommittee on composting and encouraged them to thrash out their differences. Instead, they decided to join forces and forge a technology both could live with. Those efforts culminated in a 30-day experiment last spring involving roughly 300 households in Fairfield and Greenwich, Conn.

Both towns had been separating household wastes for recycling. Now volunteers were asked to segregate "wet" compostable materials (food scraps, soiled paper products, and so on) for a separate trash pickup. In addition, three McDonald's restaurants agreed to sort their compostable "behind-the-counter" wastes. On average, 40 percent of the participants' wastes were recycled, another 30 percent composted. This 70 percent diversion from landfills is "particularly impressive," program organizers note, since it does not include leaf and yard wastes, "which represent nearly 20 percent of solid waste in many communities."

Trash haulers loaded bags of compostables, collected weekly, into a chipper along with yard wastes, which served as a bulking agent, and ground the mix into pieces small enough to fit through a 4-inch mesh screen. They then fed the shredded wastes into the end of a 220-foot-long indoor concrete trench. Ducts in the floor of the trench sucked air through the windrow of wastes at rates regulated by temperature sensors in the trench walls.

Four times a week, a paddle-wheel-like agitator straddling the windrow turned the wastes. During each agitation cycle, the wastes were shoved farther down the trench. By the end of a month, the compost had reached the end of the trench, where it was screened for plastics and other noncompostable debris. With up to eight weeks' further storage in tarp-covered outdoor windrows, the compost cured into a finished product.

According to an interim report on the project released in November, levels for each of 23 measured elements — mostly metals — generally fall well below the NOAEL (no observable adverse effects level) set by the Environmental Protection Agency for land application of sewage sludge.

Results of initial field tests by the Connecticut Agricultural Experiment Station in New Haven, to be published soon, also suggest that the compost may prove a boon to crops. Compared to

conventionally fertilized fields, those amended with an additional 50 tons per acre of this compost yielded 38 percent more tomatoes. This reflects "a 25 percent increase in the number of tomatoes per plant and an 11 percent increase in the average weight of each tomato," notes soil chemist Charles R. Frink.

If applications of compost are repeated this spring, as expected, "we'd anticipate seeing an even greater effect in the next few years," he says, since the value of such soil amendments tends to be cumulative. Overall, he says, the higher yields can be attributed to the compost's liming effect (its pH is slightly higher than that of normal soil), to the food-waste-derived nutrients that the compost imparted, and to the improved soil structure produced by adding this easily crumbled organic matter.

"We've also been looking at this compost as an affordable replacement for sphagnum peat moss in potting soil," Frink says, "and it does quite well." His state has a large potting-soil and nursery industry, he notes, and the price of peat moss is escalating.



Upper photo: Garbage-pickup day in Park Slope, Brooklyn. Residents place metal, glass, and plastics to be recycled in blue bins, clean paper for recycling in green bins, and compostables in black ones. Lower photo: Truck dumps organic garbage for composting at Fresh Kills.

New York City is also studying source-separated composting at its Fresh Kills landfill site on Staten Island. Unlike the Audubon-P&G program, New York's residential compost project does not accept disposable diapers, pet wastes, cardboard (which is recycled), or coated papers. This experiment is also lower tech: Wastes decompose in uncovered, outdoor windrows. Even its compost recipe is different. While the Connecticut compost derives from a mixture of three parts household waste to one part filler, New York's comprises two parts leaves and two parts chipped Christmas trees to one part municipal waste.

But the ongoing New York program is 15 months old and large — it picks up wastes from 3,500 Brooklyn households. Moreover, notes Thomas Outerbridge, the project's coordinator, it's just the first of many composting programs New York City is developing. Earlier this month, his office initiated a six-month venture collecting food wastes for composting from eight Staten Island institutions, including a hospital, psychiatric institute, and

prison. Also planned: an indoor composting system to manage the organic wastes associated with feeding 17,000 inmates on Rikers Island, and a large, full-scale plant elsewhere to compost wastes collected from institutional and commercial facilities.

Guelph, Ontario, has an even older source-separated pilot study of municipal-waste composting. Begun in August 1989, it now services 825 households. And next

month, the city expects approval from the Canadian government for the construction of a permanent facility to compost and recycle wastes for all 90,000 Guelph residents. Like the Audubon-P&G experiment, the Guelph program collects a wide range of household organic materials, including diapers and pet wastes. Unlike the New York and Connecticut programs, however, recyclable wastes are not source-separated.

Explains Leah Bozic, "results from our pilot study have shown that 67 percent of residential waste is either compostable or recyclable." However, when residents were left to decide how to apportion their wastes — among bags destined for composting, recycling, or the landfill — many erred in favor of the landfill.

"We found about 40 percent of the garbage [destined for landfills] could have been composted or recycled," Bozic says. Now Guelph uses mechanical means at a central facility to sort out

Outerbridge

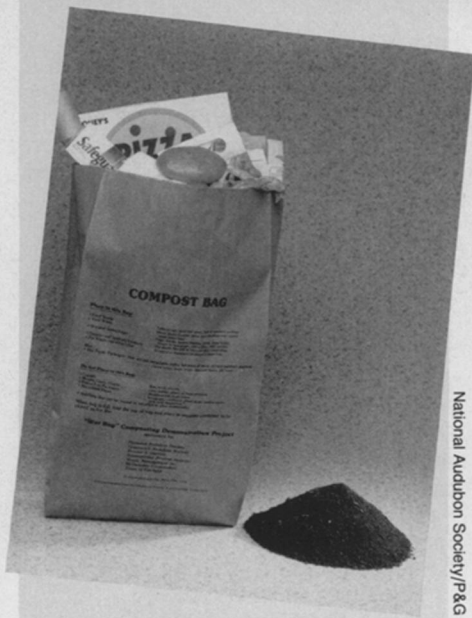
recyclable wastes from debris intended for burial. What's more, she adds, the two-phase, wet-dry (compostable-everything else) collection scheme is more economical because a single truck can pick up both.

Indeed, collection logistics—what type of truck to use, how many runs must be made through a neighborhood each week, how many categories of waste should be source-separated—remain major unresolved issues for most municipalities experimenting with composting.

In the past, composting has “always been a kid brother to conventional recycling,” observes Randy Monk of the Alexandria, Va.-based Composting Council. “Only now is it starting to get its own recognition.” And the result, he says, “is that it's really starting to take off.”

Monk says there's “a rule of thumb that when [tipping fees] hit \$50 a ton, you start thinking about composting.” And by that yardstick, he argues, much of the Northeast and most large U.S. urban communities qualify.

But “source-separated composting is still in its infancy,” Monk maintains. Even in Holland, Denmark, and Germany, where community composting is far more established, he says, “you probably can't point to more than half-a-dozen communities each [with source-separated pro-



Compostables in one of the bags issued to Connecticut volunteers in the Audubon-P&G experiment and a sample of resulting compost.

National Audubon Society/P&G

grams].” But composting and other, more traditional forms of recycling may not always prove the best option for organic wastes, maintains Ingrid Komar of the Institute for Local Self-Reliance, a Washington, D.C.-based research center focusing on waste issues. “Our goal is to derive the highest possible value from discarded materials,” she says. For instance, “it is possible to manufacture things like ethanol, a cleaner burning fuel than gasoline [from wood and yard wastes]. And that would be better than compost.”

BioEnergy International, L.C., of Gainesville, Fla., holds the patent on a process for fermenting organic wastes into ethanol. To date, the company has marketed its technology mostly to companies that generate large quantities of paper and agricultural wastes. However, notes Philip Horton, the company's vice president of engineering, the process should prove economical for yard wastes and certain portions of municipal solid waste. In fact, his company is currently investigating pilot-scale studies to ferment wastes from potato- and other food-processing industries.

“Composting is not a magic bullet,” Cornell's Harrison cautions. “Done wrong, it is an expensive way to reduce the volume of wastes going to the landfill.” But “done right,” she says, “it holds promise for a significant part of our municipal solid waste.” □

grams].”

Source separation appears to have a growing following, however, partly because of the new pilot programs and data they are generating. Next month, the Recycling Advisory Council will sponsor a symposium to highlight such data.

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