



The garden and greenhouse (left) are located next to the Berea College Campus, close to food service operations and many customers who buy organically-grown greens. (Below) Students collect food residuals from the service area daily, taking them to the gardens for composting with bulking agents that include leaves and wood chips.



DIVERSE, PROFITABLE LEARNING

COLLEGE COMPOSTING PROGRAM MATURES

IN 1998, Berea College in Kentucky embarked upon a pilot program to compost food residuals to generate an organic soil amendment and demonstrate the feasibility of responsible waste management. Since then, the program has become a fundamental part of the College's garden and greenhouse program, the horticultural component of its 500-acre educational farm. The modifications in management made over the years have not only improved the utility and efficiency of the composting program, but provided educational and research opportunities to students and the community.

Although most of the students working in this operation are majors in the Department of Agriculture and Natural Resources, students from other disciplines are also employed here, such as art, political science, and international studies, creating a rich and diverse learning environment. About a dozen students work five to 10 hours per week in the program in any given semester.

All horticultural enterprises are managed as businesses and evaluated on their poten-

To meet the need for quality compost, Berea College now processes 35 tons of food residuals each year, providing jobs for students and nutrients for crops.

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tial to provide educational experience and generate an income adequate for self-sufficiency. The enterprises currently include production and sale of salad greens, herbs, perennials, annuals, vegetable transplants, honey and mushrooms. The greens are sold locally during the fall and spring through wholesale and retail marketing. The other products are sold through direct marketing with local delivery and seasonal farmers markets. All production has been under organic management since 1998.

COMPOSTING PILOT PROGRAM

The food residuals composting program was initiated because we needed compost, and there were no local sources. Moreover, such a program taught students about waste management, recycling, nutrient cycling, and other environmental-science topics. The program started with a small budget and a group of dedicated students. Initially, the work was labor-intensive and time-consuming, and the quality of the finished compost was variable (see, "Multipurpose Program At Kentucky College," *BioCycle*

cle, September 2000).

Pre- and postconsumer food residuals generated by Berea College's food service facility, which feeds about 1,200 students during the academic year, amounted to just under 1 lb/student each day. The pilot program started by collecting only preconsumer residuals. But in fall of 2000, two years after the program began, collection receptacles and informational posters were installed in the dining area to collect all postconsumer residuals as well, more than doubling the total food residuals for composting. This phase of the program was discontinued after a year due to excessive contamination of food residuals with noncompostable materials, such as utensils, plates, cups, and plastic wrappers.

Once food residuals were collected, they had a number of different uses: 1) Feed for free-range chickens, ducks, and geese that partially processed the materials; 2) Feedstock for a small vermicomposting system; 3) Raw material high in nitrogen and water to be mixed with straw, leaves, or chipped wood for composting; and 4) Source of heat and carbon dioxide for plants when composted inside a greenhouse or cold frame. The finished compost produced was used either as a soil amendment in the two acres of vegetable gardens or as a part of a greenhouse potting medium, composing 50 to 75 percent of the mix.



Students are responsible for all aspects of production and sales. Plants grown in the greenhouse are started in a potting medium made from 100 percent compost.

HONING THE PROCESS

The somewhat idealistic visions of a small-scale farming operation that shaped the goals of the gardens and greenhouse operation in the late 1990s were tempered by practical constraints, such as economics, student labor capabilities, and a need for a consistent supply of compost suitable as a complete or nearly complete potting medium. Therefore, in the early 2000s, some changes were made to improve the composting program.

The most important modification was the method and frequency of turning the compost. Turning by hand was soon replaced with use of a tractor and front-end loader. A stationary manure spreader is now used to get more complete mixing and aeration. Over the course of several months, composting material is passed through the manure spreader two or three times. After about six months, finished compost is consistent and ready for use.

Screening the compost prior to use as a potting medium is still done by hand, but different sizes of screen mesh are used to accommodate different needs. Small-seeded crops, such as lettuce, mustards, basil, tomatoes and peppers, require screening the compost through a one-quarter inch mesh. Larger-seeded crops and transplants only need a half-inch mesh, reducing processing time. By giving the composting and curing process

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Although the program collects about 35 tons of food residuals each academic year, it barely keeps up with demand for high quality compost by the garden and greenhouse operations.

Table 1. Chemical and physical characteristics of the two composts and the commercial potting medium evaluated for producing lettuce and tatsoi, Berea, Kentucky, 2002.

Potting Media Treatments	pH	EC (dS m ⁻¹)	C %	N %	C:N Ratio	Bulk Density (g cm ⁻³)
Food residuals compost	6.6	2.9	28.8	1.97	14.6	0.27
Horse bedding compost	8.0	8.5	29.6	2.16	13.7	0.34
Commercial peat-based potting medium	5.6	0.7	42.6	0.89	47.9	0.11

about six months, rather than only three or four, the compost passes through the screen more easily and doesn't require processing through a chipper-shredder prior to screening as it sometimes did in the past. The potting medium used now consists entirely of compost and results in very good germination and plant growth. Compost applied to the garden soils is not screened at all.

RECENT RESEARCH

The performance of the College's food residuals compost was evaluated in 2002 in a replicated comparison that also included a regionally-available compost produced from horse bedding, several compost mixtures (each of the two composts diluted with a filler consisting of bark, peat, and sand), and a commercial peat-based potting medium consisting of peat, perlite, a wetting agent, and synthetic fertilizer. Two test crops were used: lettuce and tatsoi.

Although the two composts had relatively similar total N contents, C:N ratios, and bulk densities, they performed quite differently as potting media (Table 1). In fact, only the treatments with 100 percent food residuals compost and the commercial potting medium with synthetic fertilizer had acceptable plant germination and growth during the study. Crop production in these two treatments was statistically similar.

The differences in plant growth among the treatments were apparently due to salinity and mineral N availability. Net N mineralization, measured in laboratory incubations, was high in the food residuals compost but negative in the other compost, perhaps due to the high salinity. Because the commercial potting medium has added inorganic N fertilizer, N mineralization was not expected to be indicative of its performance. The compost mixtures all showed inadequate N mineralization for acceptable plant growth.

The conclusion from this research was that the food residuals compost, used at 100 percent, performs as well as the commercial peat-based medium for plant production,

but is somewhat more expensive. However, the slightly higher cost is acceptable because it can be passed along to the consumer with the strong demand for organic produce.

CONTINUING CHALLENGES

Although the composting program collects about 35 tons of food residuals each academic year (fall and spring semesters combined) from the College food service, it barely keeps up with the demand for high quality compost by the garden and greenhouse operation. Options in the future could include expanding the collection of food residuals to local restaurants, but since this would also increase costs, a careful economic analysis would be necessary first.

Another challenge has been maintaining a consistent supply of a suitable and clean bulking agent to mix with the food residuals for composting. Over the years the bulking agents have included rotting straw bales, municipal leaves, wood chips, and spoiled silage. Each of these materials has pros and cons. The leaves work well but often arrive contaminated with noncompostable trash that must be separated out by hand. By contrast, wood chips are usually quite clean but require a longer composting time and more effort in screening prior to use. Farm wastes, such

as spoiled silage and straw, compost quickly but can include significant amounts of weed seeds that are not completely destroyed during the composting process. This requires hand weeding later that is tedious and time consuming. Future research is being planned to evaluate practical ways of pasteurization to reduce or eliminate weed seeds before using the finished compost as a potting medium. ■



As part of the "Hoophouse Harvest," students gather and wash greens several times each week for delivery to local customers.

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