



Costa Rica

Sustainable Example For Waste Management

EARTH University develops a comprehensive program using appropriate technology and community education.

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EARTH University (Escuela de Agricultura de la Región Tropical Húmeda), located in the humid tropical lowlands of eastern Costa Rica was founded in 1990 as a private, nonprofit international university. It is dedicated to sustainable development in the humid tropics through education in agricultural science and natural resources. Today, the roughly 100 graduates per year who move into professions after their four years of training at EARTH University have the skills and practical experience required for developing and promoting sustainable solutions to important problems, including waste management.

The entire facility of EARTH University encompasses about 8,150 acres. The central campus, with academic buildings, dormitories, laboratories, and dining hall, accounts for a relatively small fraction of the land – about 370 acres. The rest of the land is occupied by a 740-acre academic farm, 740-acre commercial banana farm, 1480-acre forest reserve, and other areas for production of plantain, heart of palm, cattle and timber. Daily operations generate municipal, agricultural and agro-industrial wastes.



The EARTH University campus in Costa Rica includes two farms, a forest reserve along with specialty areas for crop research (above) allowing students (right) to gain much in-the-field experience.



TABLE I. Composition of the gross municipal solid waste at EARTH University

Material	% Of Total (by weight)
Organic materials	62.6
Paper and cardboard	17.2
Plastic	9.1
Metals	1.7
Hazardous materials	1.2
Clothing and shoes	1.1
Glass	0.7
Other materials	6.3
Total	100.0

About 1,125 people contribute to the MSW stream. Of these, about 620 people are permanent residents while the rest are employed at the University but maintain their residence in surrounding communities. Studies showed that the average MSW amount is 1.4 pounds per capita per day. This is twice the 0.7 pounds per day typical of Costa Rican rural towns but comparable to the amount of waste generated in San Jose, Costa Rica's capital city. In total, about 1,600 pounds of solid waste are generated each day. Over 60 percent of this by weight is organic, primarily food residuals, a fraction typical of developing countries (Table 1).

According to Costa Rica law, local governments are responsible for managing their own MSW. To avoid burdening its county government of Guácimo, EARTH University took on the challenge of developing its own collection and treatment service – one that would be consistent with the institution's mission and appropriate for neighboring communities.

Emphasis is on "4 R's" – Reduce, Reuse, Recycle, and Retain. Incineration, while not excluded, is used only as a last resort for dealing with hazardous wastes. When no other options exist, trash is disposed of in a technically designed, sanitary landfill.

Currently, about 60 percent of the gross MSW generated at EARTH University is recovered. Nearly half of the recovered material is food residuals generated in the cafeteria that are fed to hogs on the academic farm. Most of the other half is composed of plastic bottles, glass, paper and aluminum

All students, staff, and faculty are required to separate used clean paper and plastic, glass, and aluminum containers and deposit them in appropriate color-coded receptacles. In the residential area, there is a collection center for every three houses and a contractor is hired to pick up and take the materials to a material recycling facility.

Clean paper is taken to a paper mill run by the University. There it is reprocessed and combined with banana fibers derived

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from residuals of the banana processing plant to manufacture decorative paper used in cards and note pads. Part of the income derived from the sale of the recycled paper/banana fiber products is used to support a scholarship fund for students.

Though most of the food residuals serve as animal feed, residuals collected daily from the University's residential area is processed through rapid fermentation into a compost-like material called "bokashi." These organic materials first are sprayed with "Effective Microorganisms" (EM). EM is a mixed liquid culture of yeasts, actinomycetes, lactic acid bacteria, photosynthetic bacteria, and fungi used as inoculants to influence or manage microbial dominated processes or functions. Relatively little research or testing has been done on EM in the United States, but it is a more widely accepted and utilized management tool in some other countries, particularly in Japan, where the technology originated.

The rapid fermentation takes about two weeks to complete. Experiences so far at EARTH University indicate that the use of EM for processing organic wastes into bokashi can significantly reduce the waste stream into the landfill, eliminate odors and pest problems during processing, and produce a valuable soil amendment. Finished bokashi is currently being applied primarily in the University's organic banana plantings to improve soil fertility and suppress pests.

Over the past decade, EARTH University's integrated waste management program has been transformed from a pilot project into a routine operation providing efficient service. It demonstrates to students how simple and appropriate technology can be used to solve problems in the region. And it demonstrates to neighboring communities that domestic solid waste can be feasibly managed. For more information on EARTH University and its integrated waste management program see www.earth.ac.cr.

Carlos Hernández is professor of waste management at EARTH University in Costa Rica and oversees that program. Jane Yeomans is professor of physics, and environment and sustainable systems, and works with C. Hernández in the program. Sean Clark is assistant professor of agriculture and natural resources at Berea College in Kentucky.



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