Worms Go To School

Composting Cafeteria Food Waste in Hawaii's Schools:

An Innovative Approach to Organic Waste Disposal

by Piper Selden

Executive Summary
Waste reduction is a growing environmental and financial concern for Hawai'i schools. Organic waste, in particular, makes up one of the largest components of the state's solid waste stream. Due to our geographic location, Hawai'i has added incentives to find innovative strategies for waste reduction; it costs us more for garbage disposal. And because of our distinction as one of the nation's largest school districts, we should incorporate earth-friendly policies which supports environmental stewardship. In the great State of Hawai'i, we have a unique opportunity to utilize a form of composting; we can divert large amounts of organic and paper waste from island landfills and incinerators with the use of worms.

Worm composting, also called vermicomposting, offers a wealth of learning opportunities for students, parents, faculty, and administrators. A broad range of teaching possibilities exist for a new **Worms Go To School** curriculum. Not only would students in Hawai'i learn more about the environment, but money for the school system would be saved. It might even be a source of local fundraisers for the district.

The Hawai'i Department of Education should work with local schools and teachers to establish a pilot project for **Worms Go To School.** After the successful completion of the pilot project, a statewide program should be established. For each project, a Principal Investigator (PI) would be hired to oversee the day to day vermicomposting operation, maintain quality controls, coordinate efforts with local and school officials, file reports, and train school faculty and students.

INTRODUCTION

Background
The State of Hawai'i is beautiful and diverse. The islands are home to a stunning array of tropical plants, a rich cultural heritage, and a thriving economy. But our beautiful and lush environment is in danger: As the population increases, so does the amount of garbage that is generated in the state. In particular, Hawaii's urban and rural ecosystems are faced with mounting problems associated with the disposal of organic waste, estimated at about half of the state's solid waste stream ("Backyard Composting" 1). This garbage poses a serious threat to the environment--the same environment we would like to leave as a legacy for our children. Vermicomposting, a method of feeding food scraps to worms to process organic waste, is a possible solution. Perhaps we could start in schools to help create a new legacy for our children.

Hawai'i has just one statewide school district, making it approximately the tenth largest in the United States ("About Us" 1-2). Enrollment increases each year. Sustainable waste management, in schools and elsewhere, helps to protect the environment and is achieved by the three Rs of conservation: Reduce, Reuse, and Recycle. Hawai'i public schools can help promote and practice sustainable waste management by adding the 3 Rs of conservation (reduce, reuse, and recycle) to the three Rs of education: Reading, wRiting, and aRithmatic.

A Serious Problem for Hawaii's Schools
Waste disposal rates are rising as Hawaii's population increases statewide. Located in the middle of the Pacific Ocean, Hawaii's geographic isolation makes garbage disposal more costly. We aren't able to truck our rubbish to a nearby state without barging it several thousand miles first. Many schools which

are already struggling financially face growing waste disposal costs. Currently, most schools in Hawaii throw cafeteria food waste directly into the garbage. In one school surveyed, seven of ten large trash bags generated each day contained cafeteria waste. Two of the three remaining trash bags were mixed paper (Thatcher).

Taking Out the Trash
Not only is waste disposal getting more expensive in Hawai'i, but it poses environmental and health concerns as well. Burying waste in landfills is not a long-term sustainable plan for Hawai'i. Landfill space is filling up and is costly to maintain. Burning waste in incinerators, known as HPOWER in Hawai'i, is also costly and affects air quality. Both create pollution problems of one type or another (Baer 1-2). Clearly, we have a serious garbage issue. Over 160,000 tons of garbage was thrown away in Hawai'i County alone in 2000. The amount of solid waste has been increasing steadily, about 5 percent a year since 1995 ("Update" 16).

We need to address the problem of responsible solid waste disposal to avoid long-term damage to the environment and our economy. Let's start now.

Purpose: An Innovative Approach
An innovative approach is needed to help organizations, like schools, deal with the growing waste disposal problem without compromising the environment. Composting organic waste with worms, also known as vermicomposting, is the best approach. This report will show that vermicomposting is a proven, environmentally-sound method of recycling organic wastes, particularly food waste. Not only will waste be reduced in the state's schools, but children will gain a better understanding of earth science, ecology, and sustainable living through the study of school worm composting units. Composting with worms is a cost-effective, educational, and Earth-friendly method of cafeteria food waste disposal. The Department of Education in the state of Hawai'i should consider the recommendations in this report and start a **Worms Go To School** program to compost organic waste in island schools.

Scope
This report explores responsible waste disposal methods for schools in the State of Hawai'i, particularly organic waste. A general introduction to the science and methodology of vermicomposting is also contained in this report.

DISCUSSION

Understanding
Worms?
Studies show organic waste in Hawai'i as half or more of the state's solid waste stream ("Backyard Composting" 1). Composting organics, such as cafeteria waste, could divert a great deal of material from landfills or incinerators and save on waste disposal costs for schools. Composting with worms, specifically, is an economical way to compost food waste. Paper waste from the school can also be composted, and used as bedding for the worms (Appelhof, *My Garbage* 31-32).

Composting with worms is called "vermicomposting." The process uses earthworms to quickly break down organic waste. Many schools across the U.S. are composting cafeteria and paper waste with worms ("Worm Composting" 1-2) ("Worms Turn" 1). In addition to being a good waste reduction method, composting with worms provides valuable educational opportunities for students, school staff, and parents (Appelhof, *Our Garbage* Prologue and Introduction).

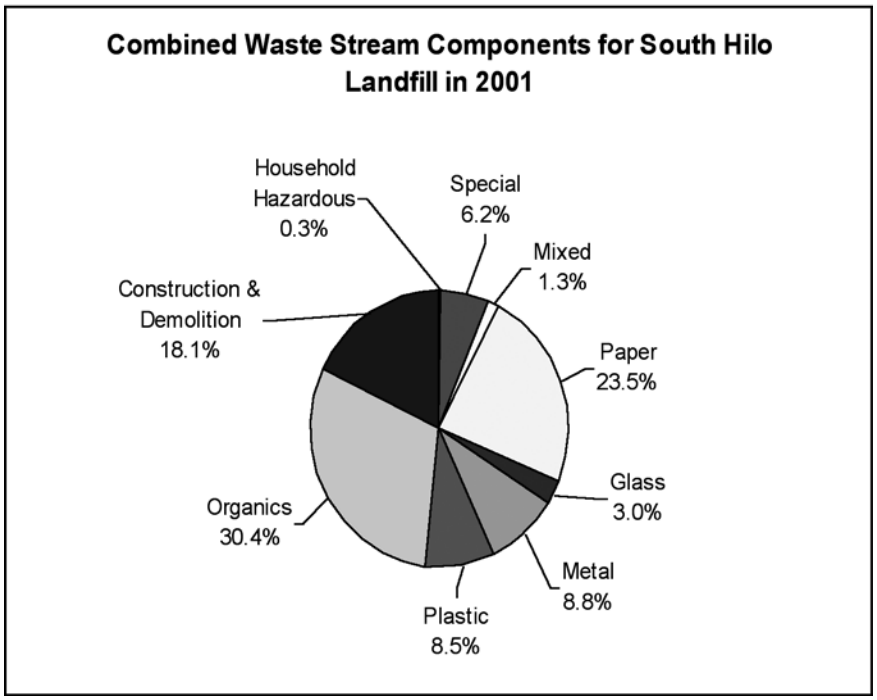
Waste is a management issue for state and county agencies, but it is the responsibility of all who contribute to the problem. Composting with worms provides a good solution for a difficult problem. Mary Appelhof, famed environmental educator and worm enthusiast wrote, "Worms have been converting organic residues to again usable form for 300 million years. We bypass this natural recycling process when we flush garbage down the drain, incinerate it, or bury it in landfills where it may not decompose for decades" (Appelhof, *Our Garbage* Prologue)

Science and Policy
Garbage to Gold
Solid waste is studied as science and argued as policy. Solid waste, commonly called garbage, can be grouped into general categories for analysis and does not usually include materials that have been diverted by composting or recycling efforts.

Figure 1 shows the combined organic and paper waste in South Hilo Landfill at 53.9% in 2001 ("Update" 19).

Schools generate a lot of garbage, including food and paper waste. Combined organic and paper waste can be composted... or thrown into the trash. The choice is ours. Schools have a golden opportunity to help

Figure 1: Solid Waste South Hilo 2001



teach future generations more about the environment and about sustainable ecological responsibility. Why not begin near the source--at school? Several methods for organic waste reduction in Hawaii will be discussed here.

METHODS

Same, Same...

Although not the best alternative, we should begin with the easiest: to continue the practice of throwing most of our cafeteria food waste into the garbage. Rising prices for waste collection, growing environmental concerns, and a reduction in landfill space show that this solution is not the best long-term waste disposal plan. Landfills are expensive to operate and maintain. Incineration carries hazardous environmental risks (Baer 2). Neither is a good option for the long run.

Pig Farmers

Many years ago, Hawai'i disposed of much of its organic food waste, especially from schools, by giving it to local pig farmers. Farmers used the food waste as feedstock for their animals. Sadly, the number of pig farmers in the state has reached an all time low. The decline of pig farming in Hawai'i in recent years makes this method of food waste disposal unreliable or unavailable in many areas of the state (DuPonte). There are simply too few pig farmers to accommodate the growing number of schools.

Traditional Composting

Another method of organic food waste disposal utilizes traditional composting methods. Composting recycles organic material, including food waste, and produces a product full of nutrients for the soil ("Backyard Composting"). However, according to the Composting Handbook prepared by the Natural Resource, Agriculture and Engineering Service (NRAES) Cooperative Extension service, there are several disadvantages to traditional composting methods, including space, cost, and foul smells ("On Farm Composting Handbook" 5). Any of these factors could make the traditional composting method difficult in a school setting. The Cooperative Extension Service from the University of Manoa notes that vermicomposting is, "faster than traditional composting methods." ("Small-Scale" 1).

Composting with Worms

Composting with worms highlights the three Rs of conservation: Reduce, Reuse, and Recycle. It helps to reduce the amount of organic food and paper waste from Hawaii's public schools into the waste stream, saving valuable landfill space. The vermicomposting process reuses organic waste as a feedstock for composting worms, transforming the waste into a nutrient-rich compost product. Finally, worm composting adds humus (a stable material formed in the breakdown of organic materials) to the soil for healthier plants. (Applehof 110-111) The only drawback for this method has been the commercial

availability of worm producers. As importing worms into the State of Hawai'i is illegal, with a fine up to $200,000, local breeders were needed before large-scale composting of this type could occur ("Importing Plants" 1) ("Plant Quarantine: Penalties" 1). Fortunately, supplies of legal composting worms are now commercially available from a variety of sources.

The Best Waste Alternative

Composting with worms is the most effective and suitable method of organic waste disposal for schools in the State of Hawai'i. Researched methods and curriculum have been established to ensure proper composting techniques. Units also come in small, medium, and large sizes to accommodate individual school needs.

The following figures show different commercial worm composting units and their target populations. Figure 2 is an example of a small unit. It stands just 16 inches high and could easily serve a small home school environment. Figure 3 is a medium size unit and could accommodate a school of medium size. This particular unit is three feet high. Several bins this size could be used to accommodate larger schools. A college or university would best be served with an industrial size unit, like Figure 4. Units like these stand approximately five feet high and range from six feet to forty-eight feet long.

Pricing for commercial worm composting units varies by supplier, but building plans are also available. A unit could be constructed in a wood shop or science class. Purchased or handmade, worm composting units accomplish the same task: converting organic school waste into a valuable compost product.

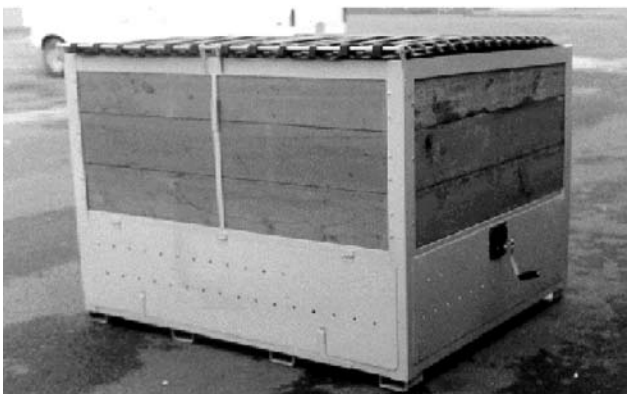
A Popular Choice

Not only is classroom vermicomposting an efficient method to divert organic waste from the solid waste stream, vermicomposting is fun. It is one of the hottest trends in environmental education. The State of California, in cooperation with the California Integrated Waste Management Board, recently adopted a statewide vermicomposting program as a part of waste management and energy reduction ("The Worm Guide" i). By creating a curriculum for vermicomposting in schools, the state hopes to inspire, inform, and encourage school districts to undertake waste reduction projects, like worm composting. The development of similar Earth-centered projects will help school children, parents, school boards, administrators, and teachers learn more about their environment.

Figure 2: Worm Composter for very small schools

Figure 3: Worm composter for small to medium size schools

Figure 4: Worm composter for large schools, colleges or universities



Wise waste minimization programs focus on efforts to reduce, reuse, and recycle. While waste cannot be completely eliminated, it can be reduced. Programs that encourage recycling and composting help organizations and individual citizens reduce solid waste. Worm composting recycles food waste and also utilizes a natural scientific process that can be studied in the classroom. In fact, a school science curriculum for worm composting was written by the University of Hawai'i at Manoa (DASH) to study worms and their value in the environment (Thatcher).

Worm composting food waste has proven effective for other organizations throughout the U.S. In 1999, the Branchville Correctional Facility in southern Indiana, successfully processed 21,000 pounds of cardboard, as well as 48,000 pounds of food waste by vermicomposting ("Branchville" 1). Vermicomposting is also widely practiced in public schools in Portland, Oregon, sponsored in part by state funding. Public schools in the Portland area have vermicomposted over 4,500 pounds since 1998 ("Worm Composting" 1).

Bringing it Home
In November of 2002, the State of Hawai'i set a solid waste management goal to divert 50% of the current waste stream to landfills by the year 2008 ("5-Year" 1). At the current rate, we will not reach the statewide goal ("Report Card" 13). We can expect to pay for environmental clean up and restoration projects in the form of higher taxes, now or later.

Supporting an innovative food waste disposal program, such as worm composting, would help save money, teach future generations the importance of Hawaiian ecology (relationships between organisms and the environment), and reinforce state and county efforts to reduce, reuse, and recycle.

Another reason to support worm composting in schools is the possible financial gain: fundraising. Vermicomposting recycles organic and green waste into a valuable soil amendment. Schools might look into a new profit center by selling the compost end-product at school fund-raising events. Studies show that plants treated with compost are stronger and more disease resistant than those that are not (Appelhof, *My Garbage* 111). Schools could help to create a better environment by reducing solid waste amounts and creating nutrient-rich compost in its place.

CONCLUSIONS

Making every day Earth Day at School
Composting cafeteria food waste in Hawaii's schools would be an innovative approach to divert a waste product, keeping it from a landfill or incinerator. Worm composting is an environmentally-sound and responsible choice for school waste reduction efforts. In addition, the waste program would help teach school children about the environment and good stewardship of the land and natural resources. The resulting compost might also benefit the school district by providing much needed income. More than anything, we waste a valuable resource that could enrich our soil and reduce our solid waste stream. More than anything, recycling food waste helps reduce human impact on the fragile environment.

David Orr, a noted professor of Environmental Studies from Oberlin College once said, "Our goal as educators is to present a sense of hopefulness to students, and the competence to act on that hope." Along those lines, all education is environmental education; we must have the wisdom to help show students that they are a part of the natural world, not apart from it. Students today are the future and hope of Hawai'i.

RECOMMENDATIONS

The following are recommended to establish a **Worms Go To School** program to compost organic waste in Hawaii's schools.

- Pilot Project: Initiate a worm composting pilot project at a small to medium size school. Principal Investigator (PI) for the project will be a trained professional and responsible for obtaining necessary permits to operate the facility. PI will also document the type and quantify of cafeteria food and paper waste used during the project. Training materials and curriculum would be ordered and provided for staff and students to learn about worm farming in the schools. Reports will be made to the Department of Education for county waste reduction records. PI will also maintain scientific records including composting conditions (temperature, aeration, moisture, and acidity) and length of composting process. Reports will be submitted quarterly to the Department of Education, Office of the Superintendent, for review.

- Statewide Project: After pilot project data is evaluated and approved for statewide use, the Principal Investigator will work with state, county, and local agencies to begin **Worms Go To School** in all publicly run schools.

- Seek assistance from the state of Hawaii to help fund the **Worms Go To School** project. Establishing and supporting programs, such as this food waste recycling program, are sited in the 1999 "Improving Hawaii's Solid Waste Recycling Rate" recommendations to the Governor ("Report Card" 13).

- PI will prevent and minimize nuisances, including odor, flies, and possible vandalism to the units.

- Compost that is produced will be nonpathogenic, free of offensive odors, biologically and chemically stable, and able to sustain plant growth. To demonstrate that the compost is nonpathogenic, routine sampling and testing will be done. Test results will be submitted, along with the approximate weight of material that was diverted from the waste stream.

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