

SUI Project Report

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Project: Developing Vermicomposting at Clemson University

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Introduction

In the spring of 2003, a Senior Seminar Class in Biological Sciences proposed constructing a vermicomposting system utilizing cafeteria wastes as the waste source. Vermicomposting utilizes earthworms, *Eisenia foetida*, to digest the waste and convert it into nutrient-rich earthworm “casts” (= earthworm faeces). Compared to traditional composting, the rate of waste conversion is much accelerated, and the nutrient value of the resulting compost is higher.

In conjunction with Dr. Tom McInnis, Professor of Biological Sciences, the class developed a proposal and submitted it to the SUI Committee at Clemson University, which approved its funding.

The goals of the project entitled, “Developing Vermicomposting at Clemson University” were:

1. To demonstrate vermicomposting as an alternative disposal method for campus cafeteria waste and other campus organic wastes.
2. To increase public awareness, both on campus and in the surrounding community, of vermicomposting as a method to reduce the environmental impact of organic wastes.

Project Accomplishments

Vermicomposter. Initially, the purchase of a small vermicomposting bin of sufficient capacity to convert a significant amount of wastes (up to 50 lbs./month) was contemplated. Due to the generous support of Joan Williams of the South Carolina Department of Health and Environment Control Solid Waste Management Program, we were loaned a “Worm Wigwam” composter (Worm Works, Inc.) valued at \$500. The composter was sited in the Clemson Bottoms, under the farm equipment shed. This site provided shade for the composter and a source of water. Using funds provided by SUI, we purchased earthworms, a pH meter, a leaf shredder, a soil thermometer, and topsoil to establish the system. We also hired an undergraduate student worker to service and maintain the composter. The compost substrate is composed of soil, “bedding” (shredded paper, cardboard, wood chips, etc.) and water. Twenty-five hundred earthworms were added initially. Worm reproduction negated the need for further worm additions.

Organic wastes (all plant material) were provided by ARA Dining Services Schilletter Dining Hall Cafeteria (David Raiger, Dining Services Manager) and the

Sustainable Agriculture garden located in the Calhoun Fields Laboratory. Initially, five pounds of plant waste was added weekly until the worms began feeding steadily, gradually increasing the amount to up to 25 pounds a week.

There were several setbacks in establishing a stable system. The amount of water added was gradually adjusted to provide sufficient moisture to favor worm survival and reproduction, yet not cause the soil to become too soft to be retained in the composter. A steel grid with 4" by 4" openings supports the bottom of the compost bed. Too much or too little water caused the compost bedding to fall through the grid (cave-ins) unexpectedly, necessitating rebuilding the substrate. By the fall, the system was stabilized and we gradually reached our goal weight of waste conversion.

During the winter, the composter temperature was not maintained at the optimum temperature for earthworms (60 – 80 F) as we had hoped. The microbial and earthworm metabolism could not generate sufficient heat alone and supplemental heating was necessary.



Worm WigWam



Access for Harvesting



Bagged Vermicompost for Sale

In January 2004 we purchased a thermostated heating pad from the Wigwam manufacturer, which helped maintain an acceptable minimum temperature. In addition, we were able to move the Wigwam into an enclosed storage building, space provided by Dr. Geoff Zehnder and the Sustainable Agriculture Program. This provided a more stable

environment and allowed better temperature control. By the Spring 2004, we were converting 25 – 30 pounds of waste per week

In March 2004 we began harvesting castings. The Wigwam is constructed with a metal blade that can be drawn over the underside of the grid by turning a crank. This scrapes off the lowest most layer of the substrate, which is essentially all earthworm castings, with a little residual undigested food, bedding and soil. Additional soil and bedding is added to replace the harvested material, maintaining a constant substrate volume. The castings were air-dried, sieved to remove coarse undigested materials, and bagged. Beginning in late April, bags of compost were then sold at the Calhoun Fields Laboratory Farmer's Market in Hendrix Student Center at \$5.00 per 4 lb. bag.

At this time, we have not been harvesting compost long enough to calculate an accurate cost/benefit analysis of using vermicomposting as an alternative to landfills for organic waste disposal. However, figures from the vermicomposting unit at the Medical University of South Carolina show that after six years of operation, amortization of the initial capital investment and sale of castings will allow vermicomposting to become cheaper than tipping costs for handling all dining hall organic wastes (pers. comm. Christine von Konitz, MUSC).

Community Outreach. We have participated in several campus and community events to disseminate information about vermicomposting during the past year. We developed a poster display that explained vermicomposting and wrote instruction sheets describing how to establish small home systems to compost kitchen scraps. The poster was used at the following events:

- Clemson University Earth Day, on campus. Displayed poster, distributed brochures on vermicomposting, and answered questions.
- "Clemson Outdoors", held at Clemson Elementary School (same as above). Over 1000 attendees.
- Sprouting Wings summer camp led by Susan Valentine of the Sustainable Agriculture Program. This day camp at Clemson University involved elementary age students learning about various aspects of sustainable agricultural techniques, of which vermicomposting is a part. Jesse Woodard, the vermicomposting student assistant, participated in this event. Other Sprouting Wings camps across the state were held with vermicomposting included in the activities.
- Sprouting Wings of Clemson and Seneca held a workshop over a two-week period in the fall to promote sustainable vermicomposting at two different sites. The Seneca Sprouting Wings group included nearly twenty elementary age students who worked on the construction of their own vermicomposting system to manage cafeteria waste from the school and the snacks from the after-school program. The Clemson program operates out of the SC Botanical Gardens Learning Classroom and nearly fifty elementary students worked over several days to construct a large bed in order to compost the waste from their own gardens and from their after-school snacks. Both groups were given a short lesson on the importance of sustainable usage and instructed on how to successfully manage a vermicomposting system.

Project Status and Future Plans

The WigWam Composter is operational and will continue to operate as long as funding is provided to support student labor. As of this date, there is still \$5,850 remaining the project account. Since I retired in May of 2003, I recommend that the project control and remaining funds be transferred to Dr. Geoff Zehnder of the Sustainable Agriculture Program. He has expressed interest in continuing the project under the auspices of sustainable agriculture. He proposes to move the composter to the new Calhoun Fields Laboratory Classroom Building now under construction.

Credits

- Special thanks to Joan Williams of SC DHEC for the use of the WigWam vermicomposter unit.
- Dr. Geoff Zehnder, Coordinator of SA Program, for use of the storage building.
- Susan Valentine for collaboration with the “Sprouting Wings” program
- David Raiger and ARA Dining Services for providing dining hall food wastes.
- Jesse Woodard and Ryan Pierce, Undergraduate Student Assistants