

**UF/IFAS Sumter County Extension Service**  
**Susan Kelly, County Extension Director**  
**352-793-2728**  
**FORCE Project Final Report**  
**April 1-June 30, 2006**

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**Section I – Project Name & Overview**

Project Name: Sumter County Extension Service Composting Unit Field Trial and Demonstration Project

Project Description:

The Sumter County Extension Service proposes to conduct a series of field trials at the Sumter County Youth Center on a pre-selected small-scale composting vessel. Compostable organic materials will be collected by local volunteer groups and will serve as the feedstock for the compost unit field test. Testing will take place to determine the effectiveness of a composting unit known as the Earth Tub composting vessel. The Earth Tub composting vessel was selected for this study by the Florida Organics Recycling Center for Excellence (FORCE). Testing and data collection will include; type and quantity of feedstock; elapsed time to compost various feedstock; weekly temperature readings and compost analysis by a private laboratory.

To create awareness of the program and to provide educational opportunities, a composting informational kiosk will be created to showcase composting techniques and the results of the Earth Tub demonstration. Children and adults will learn about composting while visiting the Sumter County Youth Center and educational publications will be available to for home, school, office or business application. A promotional publication will be created to promote composting as well as create interest in the FORCE sponsored composting unit field trial.

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d. Principal Investigator/Project Manager/Staffing

Susan Kelly                      Sumter County Extension Director  
Wendel Martinkovic        Sumter County Extension Agent-Horticulture

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- e. Project Duration: Fall 2005 – June 30, 2006
- f. Partner Organizations
  - a. In-Kind Contributions:
    - i. Sumter County Youth Center - electricity, water and site
    - ii. Master Gardener Volunteer- assistance and feedstock collection assistance
    - iii. UF Extension- project management
  - b. Matching Funds
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- g. Project Deliverables:
  - Quarterly status reports of project progress
  - Final report on Earth Tub evaluations and comparisons with selected feedstocks including private laboratory analysis.
  - Copy of all educational and promotional materials developed during the duration of the project

**Section II – Project Progress With Time Line**

- September 27,2005 - Written approval of grant funds from FORCE Program to UF/IFAS Sumter County Extension Service.
- October 20, 2005 - 25' x 25' concrete slab is poured at demonstration site.
- November, 2005 - Earth Tub composting vessel is delivered to the demonstration site by Sumter County Public Works.
- November 16, 2005 - 24' x 24' pole barn is back ordered with Bushnell Truss, Inc. Expected arrival date is January, 2006.
- November 29-30 - Trench is dug for 220V electrical wiring from Youth Center to demonstration site.
- December, 2005 - Copper wire is installed from the Youth Center to the demonstration site; organic feedstock collecting started by Master Gardener volunteers and; informational kiosk design is started by Master Gardener volunteers.
- December 15, 2005 - Thirty-two children from the Youth Center are taught about composting and also about the functions of the Earth Tub composting vessel.
- December, 2005 - A swiveling top to guide the power cord for the auger is made to minimize the power cord for the auger getting wrapped around the Earth Tub.

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Background: This problem was identified in the Earth Tub Trouble Shooting literature. The Earth Tub must be mixed ~3x/week with the auger running to mix the food scraps with the bulking agents. This is done by starting the auger and then rotating the tub for two complete rotations (one clockwise and the other counterclockwise). During the rotation, the cord often gets wrapped around the side of the Earth Tub and restricts further movement.

- From January 10, through January 27, 2006, horse manure was added to the Earth Tub composting vessel; a total of 1910 pounds of horse manure was added to the Earth Tub. The horse manure is very fresh and contains a great amount of saw dust. Approximately 100 pounds of oak leaves were added to the Earth Tub in an effort to achieve the 30:1, C:N ratio. In retrospect, the oak leaves were probably not needed. The Earth Tub was mixed approximately every third day and temperatures were taken before each mixing.
- Due to a crack in the threaded fitting in the Tub port 00 and difficulty fixing or replacing this threaded fitting, the aeration system (including the bio-filter) was not used in the first batch of compost. Based on the temperatures observed while composting as well as the compost analysis (see Table 2 below), the lack of aeration did not hinder the composting process. If the threaded fitting can be replaced, the aeration system will be used in future batches of compost.
- On January 20, 2006, an Earth Tub Compost System Operations and Maintenance Manual (32 pgs.) was obtained from Stacie Stokes.
- During the week of February 6, 2006, a 25' x 25' pole barn kit from Bushnell Truss was installed over the concrete slab and the Earth Tub.
- On February 10, 2006, while rotating the Earth Tub, the aluminum roller channel, located under the auger motor, broke into pieces. This cannot be replaced nor repaired at this time.
- On February 13, 2006, met with Stacie Stokes at the Sumter County Youth Center. During this meeting we decided that some moisture should be added to the contents of the Earth Tub. On February 16, approximately 100 gallons of water was sprayed onto the contents of the Earth Tub.
- On February 22, 2006, 23 new Sumter County Master Gardener trainees received 1.5 hours of training on composting including a tour of the Earth Tub project at the Sumter County Youth Center.
- On March 14, 2006, a sample of compost from the Earth Tub was mailed overnight to Woods End Research Laboratory. Results of this analysis are found in Table 2.

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- **Table 1 - The date and weight of ingredients added to the Earth Tub and the temperature of the compost.**

<b>Date</b>	<b>Weight of Horse Manure And Oak Leaves (lbs)</b>	<b>Temperature of Compost (F°)</b>
01/10/06	Manure 125	71°
01/13/06	Manure 197	86°
01/20/06	Manure 598	111°
01/23/06	Manure 576	114°
01/27/06	Manure 414	119°
01/27/06	Oak leaves ~100	120°
02/01/06		122°
02/04/06		121°
02/07/06		124°
02/10/06		125°
02/13/06		124°
02/16/06		125°
02/19/06		129°
02/22/06		132°
02/25/06		134°
02/28/06		133°
03/02/06		127°
03/05/06		123°
03/08/06		118°
03/10/06		113°
03/13/06		106°
03/15/06		103°
03/18/06		99°
03/21/06		96°
03/24/06		90°
03/27/06		88°
03/30/06		84°

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- **Table 2 - Analysis of Compost in Earth Tub Composting Vessel by Woods End Analytical Laboratory, taken on March 14, 2006 (Copy of Lab Analysis is attached in a PDF file)**
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<b>Variable Measured</b>	<b>Unit</b>	<b>Dry basis</b>	<b>As is basis</b>	<b>Notations</b>
Density	lbs/cubic ft	-	42	1129 lbs/yd <sup>3</sup>
Solids	%	100	55.1	1102 lbs/ton
Moisture	%	0	44.9	108 gals/ton
Est. water holding capacity	%	96	49	117 gals/ton
Inert & Oversize matter	%	~	0.6	12 lbs/ton
pH	-logH <sup>+</sup>	~	7.41	Med-Ideal
Free Carbonates	Rating	~	1	None
Organic matter	%	25.8	14.2	284 lbs/ton
Conductivity	mmhos-cm <sup>-1</sup>	~	2.4	Med-Low
Carbon:Nitrogen Ratio	w:w	22.5	22.5	Med-High
Solvita Carbon Dioxide Rate		~	7.00	Low
Solvita Ammonium Rate		~	5.00	Absent
Maturity Index		~	7	Mature
Total Nitrogen	%	0.620	0.342	6.8 lbs/ton

- The broken aluminum roller channel under the auger motor is a sign that the Earth Tub cannot be turned by a single person despite a manufacturer picture depicting a single person mixing the Earth Tub. After the breakage of the aluminum roller channel on February 10, all rotating of the Earth Tub has been done by a minimum of 2 people.
- On April 10, 2006, Master Gardner volunteers helped remove and weigh 1,346 pounds of compost from the first batch of compost produced in the Earth Tub vessel. All compost was applied to the garden beds of the children's garden at the Sumter County Youth Center.
- On April 18, 2006, Wendel Martinkovic met with Stacie Stokes and Jackie Jackson at the Earth Tub site to monitor the progress of the research.
- From April 20 through April 28, 2006, horse manure was added to the Earth Tub composting vessel; a total of 2090 pounds of horse manure was added to the Earth Tub. The horse manure is very fresh and contains a great amount of saw dust. The Earth Tub was mixed approximately every third day and temperatures were taken before each mixing.

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- On April 27, 2006, children at the Youth Garden helped fill the bio-filter with wood mulch. This second batch of compost will utilize the aeration system although minor leaking still occurs due to a crack in the threaded fitting in the Tub port 00.
- A composting brochure developed by the grantee was submitted and approved by the FORCE Executive Committee (brochure is attached in a separate pdf file).
- A 4'x8' composting sign developed by grantee was submitted and approved by the FORCE Executive Committee (sign is attached in a separate pdf file).
- **Table 3 - The date and weight of ingredients added to the Earth Tub and the temperature of the compost.**

Date	Weight of Horse Manure (lbs)	Temperature of Compost (F°)
04/20/06	Manure 1196	83°
04/28/06	Manure 894	106°
05/01/06		131°
05/04/06		140°
05/07/06		141°
05/10/06		144°
05/13/06		150°
05/16/06		146°
05/19/06		142°
05/22/06		140°
05/25/06		129°
05/28/06		126°
05/31/06		118°
06/03/06		122°
06/06/06		119°
06/09/06		124°
06/12/06		117°
06/15/06		111°
06/18/06		109°
06/21/06		113°
06/24/06		106°
06/27/06		93°

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- **Table 4 - Analysis of Compost in Earth Tub Composting Vessel by Woods End Analytical Laboratory, taken on June 14, 2006 (Copy of Lab Analysis is attached in a PDF file)**

<b>Variable Measured</b>	<b>Unit</b>	<b>Dry basis</b>	<b>As is basis</b>	<b>Notations</b>
Density	lbs/cubic ft	-	40	1078 lbs/yd <sup>3</sup>
Solids	%	100	62.8	1256 lbs/ton
Moisture	%	0	37.2	89 gals/ton
Est. water holding capacity	%	79	44	106 gals/ton
Inert & Oversize matter	%	~	0.6	12 lbs/ton
pH	-logH <sup>+</sup>	~	8.02	Med-High
Free Carbonates	Rating	~	2	Med-High
Organic matter	%	19.6	12.3	247 lbs/ton
Conductivity	mmhos-cm <sup>-1</sup>	~	3.2	Medium
Carbon:Nitrogen Ratio	w:w	18.0	18.0	Medium
Solvita Carbon Dioxide Rate		~	5.97	Medium
Solvita Ammonium Rate		~	5.00	Absent
Maturity Index		~	5.97	Post Active
Total Nitrogen	%	0.590	0.371	7.4 lbs/ton

- On June 28, 2006, Master Gardener volunteers helped remove and weigh 1462 pounds of compost from the Earth Tub vessel. This compost was applied to the garden beds of the children's garden at the Sumter County Youth Center.

**Section III – Evaluation of Compost Produced by the Earth Tub**

- Two batches of compost were produced in field trials with the Earth Tub composting vessel. Fresh horse manure with sawdust was the compostable organic materials used in both batches. Identical organic materials were utilized in both field trials because the aeration system was only used in the second field trial due to a crack in the threaded fitting in the Tub port 00. Based on the temperatures observed while composting as well as the compost analysis, the lack of aeration did not hinder the composting process. The EPA standards of 131° F for three days was achieved in both field trials. The Earth Tub was mixed approximately every third day and temperatures were taken before each mixing.

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- The first field trial ran 80 days reaching a maximum temperature of 134° F on the 45<sup>th</sup> day of the trial. The second field trial ran 67 days reaching a maximum temperature of 150° F on the 23<sup>rd</sup> day. The increase in temperature between the two trials is due, in part, to using the aeration system on the second field trial. Despite the difference in maximum composting temperatures between the two trials, the analyses of the compost from both field trials were very similar. The second field trial ran 13 days shorter than the first trial, possibly due to the higher maximum temperature achieved in the second field trial.
- After the breakage of the aluminum roller channel on February 10 when only one person was turning the Earth Tub lid, all rotating of the Earth Tub lid has been done by a minimum of 2 people. The broken aluminum roller channel under the auger motor is a sign that the Earth Tub lid cannot be turned by a single person despite a manufacturer picture depicting a single person mixing the Earth Tub.
- A crack in the threaded fitting in the Tub port 00 and difficulty fixing or replacing this threaded fitting, even after talking with the Earth Tub manufacturer, caused the Earth Tub to leak compost leachate in the second field trial. The manufacturer has offered to provide the needed tools and new threaded fitting to repair this crack.
- Although odor has often been a problem in other Earth Tub research projects, odor was never a problem in this field trial. Even the compost leachate had minimal odor.
- The Earth Tub composting vessel produced two quality batches of compost that are being used to fertilize the children's garden at the Sumter County Youth Center. Also, children and Master Gardener volunteers that participated in the field trials and educational programs were very interested in composting so some of them were given compost for their home gardens and landscape.