

A University-Wide Compost Facility: Second-year Summary

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Summary and Implications

The University Compost Facility opened late in 2008 and now has completed two full years of operation. This report is for the 12-month period of November 1, 2009 through October 31, 2010. The facility receives manure and biomass from several ISU facilities: the Dairy Farm, Animal Science Teaching Farms, including the horse barns, Campus Services (yard and greenhouse waste), ISU Dining (food waste), Ag Engineering/Agronomy Farm, BioCentury Research Farm, Plant Introduction Station, Reiman Gardens, Horticulture Station, and others. A total of 8,245 tons were received in the 12-month period (Table 1). About 77% of the incoming material came from the Dairy Farm. The facility generated compost and amended soil primarily for campus use. A total of 5,495 tons was outgoing from the facility (Table 1), of which 2,234 tons was low quality compost or manure that was applied to cropland in spring 2010. The severe winter prevented this material from composting completely. The primary product of the facility was amended soil; approximately 2,751 tons of amended soil was generated. Amended soil is a blend of compost, soil and sand. The ISU Compost Facility continues to serve a unique and vital role in assisting ISU be “greener” and more sustainable. The staff continues to learn how to improve the management of the compost to benefit the university.

Introduction

The University Compost Facility opened late in 2008 and now has completed two full years of operation. This report is for the 12-month period of November 1, 2009 through October 31, 2010. The facility is managed by the College of Agriculture and Life Sciences’ Research Farms and has a separate revolving account that receives all fees and sales, and pays all expenses. The facility is designed to be self-supporting, i.e. not receive allocations for its operations. The facility consists of seven, 80 x 140 ft hoop barns with paved floors. The central hoop barn is the receiving hoop with six composting or storage hoops. Using the current pull-type turner, there are three windrows per hoop. The facility also has a Mettler-Toledo electronic scale with a 10 ft x 70 ft platform to weigh all materials. The facility is adjacent to the ISU Dairy Farm on 260th Avenue, south of campus.

Key machinery is 1) compost turner, a used pull-type Aeromaster PT-170, 14 ft wide made by Midwest Biosystems, Tampico, IL; 2) manure spreader, a Meyer 3750 tandem axle spreader used to construct windrows; 3) telehandler, Bobcat V-723FL with cab and 3.25 cubic yard bucket, and 4) tractor, John Deere 7520 (125 hp) with IVT (Infinite Variable Transmission) and front-wheel assist used to pull the turner and spreader.

The compost blend targets are a Carbon:Nitrogen ratio of 25-30:1 and a moisture of 45–50%. Other parameters considered are porosity and structure. Porosity and structure both affect how well oxygen flows into the pile and its availability to the microbes.

After a windrow is made with the manure spreader (without beaters), the windrow is allowed to settle and start composting. Later it is turned periodically. The composting process takes about 12 to 16 weeks with 10 to 15 turns of the windrow. The frequency of turning is determined by windrow temperature and oxygen measurements. Turning provides mixing and aeration. When the oxygen level in the windrow falls below atmospheric oxygen levels, then the windrow will benefit from turning. The porosity of the windrows is related to moisture content and structure from particles like cornstalks.

Results and Discussion

The facility receives manure and biomass from several ISU facilities: the Dairy Farm, Animal Science Teaching Farms, including the horse barns, Campus Services (yard and greenhouse waste), ISU Dining (food waste), Ag Engineering/Agronomy Farm, BioCentury Research Farm, Plant Introduction Station, Reiman Gardens, Horticulture Station, and others. A total of 8,245 tons were received in the 12-month period (Table 1). About 77% of the incoming material came from the Dairy Farm. The facility generated compost and amended soil primarily for campus use. A total of 5,495 tons was outgoing from the facility (Table 1), of which 2,234 tons was low quality compost or manure that was applied to cropland in spring 2010. The severe winter prevented this material from completely composting. The primary product of the facility was amended soil, approximately 2,751 tons of amended soil was generated. Amended soil is a blend of compost, soil and sand.

During the year, composting progressed well until an early December 2009 blizzard followed by extreme cold. This event effectively stopped new composting during the winter months. Dairy manure was stockpiled until spring. Crows and starlings became a nuisance on the compost windrows during the winter when there was widespread snow cover. The birds came to pick at the compost particularly after turning. Noise cannons were used to scare the birds away.

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In December 2009, the cover on one hoop barn was torn by wind. The damage may have been related to an earlier tear and repair. This left one hoop barn only half covered until a replacement tarp was installed during summer 2010. In June 2010, a lightning strike on the bare steel hoop arches resulted in five of the concrete piers to partially explode. The tarp was replaced and the piers are slated for repair.

Hoop barn usage during 2010 was: 1) the central hoop barn was used for receiving, which was modified by adding flat corrugated steel bin sheets above the concrete side walls to allow piling of incoming material, 2) one hoop was used for storing finished compost and soil, 3) one hoop was dedicated to composting separator solids for dairy bedding, and 4) the remaining four hoops were dedicated to general composting. The ISU Compost Facility continues to serve a unique and vital role in assisting ISU be “greener” and more sustainable. The staff continues to learn how to improve the management of the compost to benefit the university.

Acknowledgements

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The authors also sincerely acknowledge the major ISU users: Animal Science Farms, BioCentury Research Farm, Ag Engineering/Agronomy Research Farm, Dairy Farm, Reiman Gardens, Design and Construction Services, Horticulture Station and Campus Services, as well as other governmental users, e.g. Iowa Veterans Cemetery, Van Meter, IA.

Mention of a trade name, proprietary product, or specific equipment does not constitute a guarantee, warranty, or endorsement by Iowa State University and does not imply approval at the exclusion of other products that may be suitable.

Table 1. ISU Compost Facility: incoming and outgoing materials report November 1, 2009 through October 31, 2010.

<u>Incoming</u>	<u>Tons</u>	<u>% of Total</u>
Dairy Farm scrapings	3,613	43.8
Dairy separator solids	1,744	21.2
Dairy bedding pack	996	12.1
Subtotal at Dairy Farm	6,353	77.1
Animal Science Teaching Farms manure	208	2.5
ISU Dining – food waste	326	3.9
Campus yard and greenhouse waste	617	7.5
AEA, Plant Intro, biomass, other	741	9.0
Total incoming tons	8,245	100.0
<u>Outgoing</u>	<u>Tons</u>	<u>% of Total</u>
Compost sales	381	6.9
Low quality compost	2,234	40.7
Amended soil	2,751*	50.1
Bedding	129	2.3
Total outgoing tons	5,495**	100.0

*Approximately one half is compost.

**Note: Differences between incoming and outgoing is a result of natural composting mass reduction and changes in inventory. Also incoming sand and soil for amended soil mix is not considered.