

2013

The ISU Compost Facility after Four Years

Steve J. Jonas

Iowa State University, sjonas23@iastate.edu

Timothy R. Goode

Iowa State University, trgoode@iastate.edu

Kapil Arora

Iowa State University, pbtiger@iastate.edu

Mark S. Honeyman

Iowa State University, honeyman@iastate.edu

Follow this and additional works at: http://lib.dr.iastate.edu/farms_reports



Part of the [Agricultural Science Commons](#), [Agriculture Commons](#), [Animal Sciences Commons](#), and the [Bioresource and Agricultural Engineering Commons](#)

Recommended Citation

Jonas, Steve J.; Goode, Timothy R.; Arora, Kapil; and Honeyman, Mark S., "The ISU Compost Facility after Four Years" (2013). *Iowa State Research Farm Progress Reports*. 1886.

http://lib.dr.iastate.edu/farms_reports/1886

This report is brought to you for free and open access by Iowa State University Digital Repository. It has been accepted for inclusion in Iowa State Research Farm Progress Reports by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.

The ISU Compost Facility after Four Years

Abstract

The University Compost Facility has completed four full years of operation. The facility is managed by the ISU Research Farms and has a separate revolving account that receives fees and sales and pays expenses. The facility is designed to be self-supporting, i.e. not receive allocations for its operations. The facility is located at 52274 260th Street, Ames, Iowa.

Keywords

RFR A12117, Animal Science

Disciplines

Agricultural Science | Agriculture | Animal Sciences | Bioresource and Agricultural Engineering

The ISU Compost Facility after Four Years

RFR-A12117

Steve Jonas, ag specialist
Tim Goode, superintendent
Kapil Arora, field extension ag engineer
Mark Honeyman, professor

Introduction

The University Compost Facility has completed four full years of operation. The facility is managed by the ISU Research Farms and has a separate revolving account that receives fees and sales and pays expenses. The facility is designed to be self-supporting, i.e. not receive allocations for its operations. The facility is located at 52274 260th Street, Ames, Iowa.

Materials and Methods

The ISU Compost Facility consists of seven, 80 × 140 ft hoop barns and a 55 × 120 ft hoop barn, all with paved floors. The facility also has a Mettler-Toledo electronic scale with a 10 ft × 70 ft platform to weigh all materials.

Key machinery at the Compost Facility is 1) compost turner, a used pull-type Aeromaster PT-170, 14 ft wide made by Midwest Biosystems, Tampico, IL; 2) a converted dump truck trailer used to construct windrows and haul material; 3) a telehandler, Caterpillar TH407 with cab and 2.75 cubic yard bucket; and 4) a tractor, John Deere 7520 (125 hp) with IVT (Infinite Variable Transmission) and front-wheel assist used to pull the turner and dump trailer.

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

After a windrow is made with the dump trailer, the windrow is turned to mix all materials thoroughly. Within three to four days the windrow heats to 140-160 degrees Fahrenheit. Later it is turned 1 to 2 times a week. The composting process takes about 12 to 16 weeks with 15 to 20 turns. 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 benefits 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 7,119 tons were received in the 2012 (Table 1). This is 9 percent less than 2010 and 2011, which may be partially related to a much drier year in 2012. About 79 percent of the incoming material came from the ISU Dairy Farm.

The facility generated compost and amended soil primarily for campus use. A total of 5,586 tons were outgoing from the facility, which was similar to prior years (Table 2). About 353 tons of compost and 5,233 tons of amended soil were marketed. The primary outgoing product was amended soil. Amended soil is a blend of compost, topsoil, and sand.

The winter of 2011–2012 was mild and composting was able to continue throughout the winter. Crows and starlings were a

nuisance on the compost windrows during the winter. The birds came to pick at the compost, particularly after turning, and sit on the warm windrows. Noise cannons were used to scare the birds away.

The side curtains were showing significant wear, therefore were replaced with concrete toe walls with white steel side walls above on three hoops in 2012. More replacements will occur in 2013. It has become obvious that the side curtains and roof vents are not needed for air movement and will be gradually eliminated as covers are replaced.

The decreased rainfall of summer 2012 did not cause major problems for the composting operations, but water was added with the turner to increase moisture lost from the hotter, drier weather. The decreased rainfall made the incoming manure somewhat drier, which saved cornstalks and other carbon for windrow construction rather than using them for moisture absorption. The drier manure was easier and less time consuming to pile.

During 2012 the hoop barns were used as follows: 1) the central hoop barn was used for receiving, mixing, and storage of raw materials; 2) one hoop was used for storing finished compost, topsoil, and mixing/storage of amended soil; and 3) the remaining five

hoops plus the smaller hoop 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 improve the management of the compost to benefit the university.

Acknowledgements

The authors gratefully acknowledge the support and interest of the Iowa DNR, ISU College of Agriculture and Life Sciences, ISU Extension, Leopold Center for Sustainable Agriculture, and ISU Research Farms.

The authors also sincerely acknowledge the major ISU contributors and users: Animal Science Farms, BioCentury Research Farm, Ag Engineering/Agronomy Research Farm, Dairy Farm, Reiman Gardens, Design and Construction Services, ISU Dining, Athletic Department, Horticulture Station, and Campus Services.

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 inputs.

	2012	2012	2011	2011	2010	2010
	tons	% of total	tons	% of total	tons	% of total
Source						
Dairy manure ¹	3,395	47.7	3,984	51.0	3,772	48.7
Dairy solids ²	1,220	17.1	3	0.0	1,392	22.2
Dairy pack ³	992	13.9	1,150	14.6	964	10.1
Dairy subtotal	5,607	78.7	5,137	65.6	6,128	80.8
Campus ⁴	557	7.8	936	12.0	616	6.8
An Sci manure	205	2.9	491	6.2	214	5.5
Dining ⁵	372	5.2	367	4.7	333	1.5
Biomass ⁶	194	2.7	553	7.1	263	3.1
Stalks ⁷	151	2.2	0	0.0	160	1.4
Other ⁸	33	0.5	348	4.4	29	0.7
Total ⁹	7,119	100.0	7,832	100.0	7,743	100.0

¹Semi-solid dairy barn scrapings.

²Solids from the manure separator. Separator was not operative during 2011.

³Bedded packs from dairy barns.

⁴Consists of campus yard waste (leaves, etc.) and greenhouse waste.

⁵Compostable dining hall and kitchen food wastes.

⁶Biomass research wastes, usually corn stalks, switchgrass, corncobs, or similar waste feedstocks.

⁷Cornstalks as a carbon source. In 2011, all cornstalks came as biomass research wastes.

⁸All other sources.

⁹Setup year (2009) not shown.

Table 2. ISU Compost Facility outputs.

	2012	2012	2011	2011	2010	2010
	tons	% of total	tons	% of total	tons	% of total
Amended soil	5,233	93.7	2,117	37.8	2,593	46.4
Compost	353	6.3	3,484	62.2	616	11.0
Stalks	0	0	0	0	39	0.7
Bedding ¹	0	0	0	0	110	2.0
Partial compost ²	0	0	0	0	2,234	39.9
Total ³	5,586	100.0	5,601	100.0	5,592	100.0

¹Dairy separator solids composted and used as bedding for dairy cattle.

²Manure that partially composted and then was field applied.

³Setup year (2009) not shown.