Green Jackets

Emily Crawford & Sarang Pujari

Implementing an in-house composter on Georgia Tech's campus

Carbon Savings

6,646,000 lbs/year

Initial Investment

$154,950

Cost Savings

$110,000/year

Payback Period

17 months

Net Present Value

$1.34 million

Return of Investment

124%

Background and Motivation

Our Stakeholder:

Georgia Institute of Technology

- ★ Currently pays CompostNow $100,000/year to compost approximately 700 tons of campus waste every year
- ★ Maximum waste diversion: 7000 compostable tons
- ★ Only a small percentage of campus buildings have access to compost services

Our Proposition:

Implementation of Earth Flow-8016 composting vessel on campus

- ★ Allows expansion of composting services across campus
- ★ Compost produced can be used for on-campus soil amendments
- ★ Potential to compost 40 tons/week
- ★ Increase student involvement

Carbon Analysis: Transportation Emissions

Vehicle: Flatbed truck
Mileage: 20 miles/gallon
Fuel: Diesel
Distance: 50 miles
Frequency of waste pickup:
5 days*52 weeks => 260 days/year
Conversion rate:
10,180 grams of CO_2 emissions per gallon of diesel consumed

Calculation

Total miles travelled to pick up waste from Georgia Tech:
260 days / year * 50 miles/day = 13,000 miles / year
Gallons used for 13,000 miles of travel:
13,000 * 1/20 = 650 gallons
Carbon emission for 13,000 miles of travel:
10,180 grams of CO_2/gallon * 650 gallons = 6,617,000 grams of CO_2

14,588 lbs of CO_2 emissions saved/year

Carbon Analysis: Waste diversion

Location	Waste that can be composted (tons/year)	Carbon Savings (tons of CO_2E*/year)
Academic	1500	3900
Athletics	50	130
Dining	400	1040
Greek & Faith based housing	450	452.6
Housing	3000	7800
Other buildings	1500	3900
Total:	**6900**	**17222.6**

Although this is our maximum expansion, the proposed Earth Flow unit can potentially compost 2,080 tons/year. This is equivalent to saving 5,400 tons of CO2 every year.

1 unit of waste diverted to compost ⇒ **2.6 units** of CO_2 emission reduction

Carbon Analysis: Waste-to-Energy Facility Benefit

- **1 ton** of garbage processed by EFW (waste to energy facilities) saves approximately **1 ton** of CO_2 emission.

- We have **2,080 tons** of waste processed by EFW, which **currently** saves **2,080 tons** of CO_2

- With estimated **5,400 tons** of CO_2 emissions saved through composting, and **2,080 tons** of CO_2 of current savings, we get to save 5,400-2,080 = **3,320 tons of additional CO_2 emissions that can be prevented**

Carbon Analysis: Energy Usage from Earth Flow Unit

- Power requirement for EF-8016: 30A 3 phase 208V
  - Kilowatt-hours required= 20-24 kWh/day
  - kWh required per year= **8,760 kWh/year**

- According to the US Energy Information Administration (EIA), approximately 0.92 lbs of carbon dioxide is produced for every kilowatt hour of energy generated.
  - 54,660 kWh/year * 0.92 lbs CO2 = **8,060 lbs CO2/year** (approx. 4 tons)

6,646,000

lbs of CO_2 saved per year

Equivalents:

722 cars off the road

1,330 acres of trees planted

Cost Analysis

	Initial Investments	Year 1	Year 2	Year 3
Costs				
EF-8016 Base Price	$119,950	$0	$0	$0
Extended Parts Warranty	$0	$2,980	$2,980	$2,980
Vessel Construction*	$35,000	$0	$0	$0
Labor** (including benefits)	$0	$66,000	$66,000	$66,000
Electricity	$0	$1,150	$1,150	$1,150
Total Costs	**$154,950**	$70,130	$70,130	$70,130
Savings				
Compost Now Services		$100,000	$100,000	$100,000
Landscaping***		$80,000	$80,000	≥ $80000
Total Savings		$180,000	$180,000	≥$180,000
Total Monetary Benefit	**-$154,950**	$109,870	$109,870	≥$109,870

*** Estimated price for a 100'x20' ventilated greenhouse**

**** Salary estimate from https://hr.gatech.edu/staff-job-descriptions-and-salary-structures**

*****Georgia Tech's goal for soil amendments is 100 acres. Compost can cost $25-35 per cubic yard (The Daily Gardner 2019), but this cost can be avoided.**

Monetary Benefits

Payback Period

17 months

Return of Investment

124%

15 year lifespan

Net Present Value

$1,340,000

assuming a 1.2% discount rate

Student Involvement

Survey Results Regarding Student Interest on Campus

Most popular survey responses:


Demonstration sessions


Educational sessions for young students in Atlanta


On-campus gardens


Training/encouragement from RA/FASET leaders


Competitions between residence halls


Paid student assistant positions

Co-Benefits

Research &
Living-Learning Labs

Awareness Raising

Green Space &
Food Production

Institute Strategic
Plan Alignment

Progress and Next Steps

Refine carbon and cost analysis

More accurate estimates with better information about composting system

Unique discussions with experts and other universities

Lisa-Marie Godfrey- Institute Budget Planning
Madison Crittenden- GMT Support Manager
Steve Place- Kendeda Horticulturist

Permit requirements

Contact the GA EPD to learn about PBR and other permits

Submit budget proposal

Deadline in February

Sources

- https://www.compostingtechnology.com/cut-sheets/
- https://www.fb.org/market-intel/reviewing-u.s.-carbon-sequestration
- https://ourworldindata.org/food-waste-emissions
- http://www.fao.org/fileadmin/templates/nr/sustainability_pathways/docs/FWF_and_climate_change.pdf
- https://uspirg.org/reports/usp/composting-america
- https://www.sanjoseca.gov/home/showpublisheddocument?id=198#:~:text=For%20example%2C%20every%20metric%20dry,6%20metric%20tons%20of%20CO2.

Thanks!

Any questions?

greenjackets@groups.gatech.edu