

Composting on Campus

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Report



Overview of current composting practices on university campuses across Canada. Review of financial analyses, important considerations, and barriers to a composting program.

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Introduction

Most Canadian Universities have some form of composting on campus, whether small or large scale, on- or off-campus, paid or volunteer. Many are working towards full composting of food and landscaping waste and a few, like UBC Vancouver, have already reached that milestone. Composting is an attractive waste management strategy. It can divert a significant amount of waste from landfills, thereby reducing waste management tipping fees while supporting institutional goals relating to environmental sustainability. Furthermore, “GHG emissions from waste decomposition are greatly higher for landfills than for composting system” (Lou & Nair, 2009). Therefore a composting program decreases greenhouse gas emissions as well as reduces the amount of waste being sent to landfills. The 2008 TRU Waste Audit found that 33.9% of waste in the Old Main building was organic (Cleveland, 2008). There is strong potential for a campus-wide composting program at TRU, and significant opportunities for partnerships with the campus food services, horticulture and culinary arts programs—provided that financial issues, campus expansion, and labour requirements are taken into consideration when developing the composting system.

There are three main types of composting: windrow composting, vermicomposting, and in-vessel composting. Windrow composting is used by the City of Kamloops through the yard waste management program located at Cinnamon Ridge near the Kamloops airport. This is a slow decomposition process that requires a large land area and high labour supply, though the capital costs are somewhat low. This option would likely be difficult for TRU to undertake due to the substantial land use.

Vermicomposting utilizes worms to speed up the decomposition process and enables easy composting for areas with limited space and no outdoor access, for example apartments or dormitories. A few Canadian universities have adopted vermicomposting for their dorms and offices with success. It is a low cost system when small in scale, but does require substantial oversight to ensure that the worms are healthy, the compost system is odour free, etc. It is ideal for small-scale composting in offices or rooms where there are volunteers willing to take on the responsibility associated with maintaining the system.

In-vessel composting is the most common type of composting utilized by Canadian universities. It is carried out in closed system vessels where aerobic conditions are maintained through mechanical turning of the vessels. They can either be manually turned or mechanized, depending on the system used. Compostable organic matter is supplied to the vessels and electrical energy is used to build up temperature, causing organic matter to decompose overtime. It is a convenient way to compost that doesn't require a large labour supply or time, and as a result has been picked up by many Canadian universities.

Below is a summary of the composting systems in place at British Columbia universities.

Composting at BC Universities

Institution	Type	Capacity	Labour Intensity		Capital Intensity	
BCIT	Vermicomposting	2,180 litres annually	High	Volunteers receive bin and manage their own system	Low	Cost of bins/worms funded by BCIT and Student Association
UBC Okanagan	2 Earth Tubs	100 lbs/day each unit	Medium	About 1 hr/day by 1 person. Manual turn system	Medium	Over \$10,000/tub and additional campus bins required.
UBC Vancouver	WEMI Composter large scale	5 tonnes/day	Medium	Less than 1 hr/day. Mechanized turn system	High	1.3M Capital costs and \$180,000 annual operating cost
UNBC	Outdoor composters (backyard style)	Unknown	High	Completely manual, outdoor exposed system	Low	2 Staff members/materials funded through UNBC Green Fund
UVic	Office program Outsourced to local company (ReFuse)	10L bin/office	Low	Taken care of by company	High	Managed/funded by Facilities Management.
SFU	Outsource to local company (Fraser-Richmond soils)	22 deposit sites on campus	Low	Taken care of by company	High	Managed/funded by Facilities Management.

Canada-wide Summary

Institution	Vermi-Composting	Small-scale	Large-Scale	Source
BCIT	#			Link
UBC Okan.			#	Link
UBC Van.			#	Link
UNBC			#	Link
Uvic		#		Link
U. Winnipeg			#	Link
Queen's	#	#	#	Link
Guelph		#	#	Link
Ottawa	#		#	Link
York		#		Link
Concordia	#		#	Link
McGill			#	Link
Sherbrooke			#	Link

Table 1. Summary of composting programs at 13 Canadian post-secondary institutions.

Financial Analysis

In-vessel composting systems carry significant capital and annual operating costs. Below are a few examples of the financials of installing and operating a campus-wide composting system.

Small model WEMI (University of Toronto)

Vessel (0.9 tonnes/day)	323,000
Infrastructure	150,000
Housing facility	194,000
"Other"	3,000
Total capital costs	<u>670,000</u>
Annual Operating	
& Maintenance Costs	<u>132,610</u>

***Labour costs are almost 65% of total annual expenses. (Rasanu, 2008).

Large model WEMI (UBC Vancouver)

WEMI Vessel (5 tonnes/day)	700,000
Civil Infrastructure	180,000
Site Preparation and Utility Servicing	260,000
Project design, Management, and Permits	130,000
Collection Carts	30,000
Total Capital Costs	<u>1,300,000</u>
Annual Operating Costs	<u>180,000</u>

(Batty & Bonfield, 2009).

Concordia University: Brome Composter

Brome Vessel	35,000
Infrastructure Costs	35,000
Total Capital Costs	<u>70,000</u>
Annual Operating Costs	<u>15,000</u>

(Batty & Bonfield, 2009).

Pricing - Composting Vessels

Vessel	Price	Processing Capacity	Processing Time	Footprint	Operating Cost Estimate	Material Accepted
Earth Tub	\$9,975	100 lb/day	3-4 weeks	12' x 12'	\$10,000 /year	Limited meat/dairy
Small WEMI	323,000	0.9 tonnes/day	1-2 weeks	6' x 8'	\$140,000 /year (U of T)	All types
Large WEMI	765,000	5 tonnes/day	1-2 weeks	8' x 10'	\$300,000 /year (UBC)	All types
Brome 8100	\$34,375 (smallest)	100 kg-455 kg/day	5 weeks	6' x 14'	\$15,000/year	All types
Big Hanna	\$30,000-100,000	50 or 272 kg/day	8-10 weeks	16' x 7'	Unknown	All types

Table 6. Composting vessels.

Table 6 Notes

***All prices do NOT include taxes, shipping, installation, infrastructure and housing facility.

Other costs to consider (unique to each campus)

Capital Costs

- Vessel delivery
- Vessel installation
- Vessel infrastructure and housing facility
- Collection containers

Operational Costs

- Collection
- Transportation
- Processing bulking agents
- Energy and electricity
- Promotion and education campaigns – constant turnover of students requires continuous education
- Staff training

Considerations for Future Composting Programs

- **Amount of organic waste** produced per year, and any projected future changes
 - What is the goal diversion rate (% of waste stream)?
- Compostable **materials** included – meat, dairy, paper towels?
- Possibility of **funding** – available grants, partnerships, etc.
- **Training** staff, particularly at food service locations
- Gathering, emptying, and cleaning the collection containers
- Future inertia and **long-term plan** for the composting program
 - Who is responsible going forward?
 - Established and integrated policies and procedures
- **Rodents** – depends on vessel and closure
- **Smell** – depends on vessel and size of items in composter
- What are the next best alternatives to a large-scale composter?

Options for Thompson Rivers University

Opportunities

Campus Master Plan

The ongoing campus master planning project is an ideal avenue to push a campus wide composting program through. This will ensure that TRU maintains its commitment to sustainable development and takes into consideration the expected university growth when purchasing a composting system.

TRU Culinary Arts Program

A composting program would be an educational opportunity for the chef-training program. The Culinary Arts program would potentially provide a number of student volunteers to maintain the system during the academic year and in turn the program compost system would be used by Culinary Arts students.

TRU Horticulture

Composting is integral part of any horticulture program and an on-campus composting program would enable students to gain hands-on experience with operating a medium to large-scale commercial composter or vermicomposting system, which would be valuable for student employment prospects.

Funding Opportunities

The Sustainability Grant Fund would be a source of funding for capital required for a composting program on campus. Other federal grant programs such as ecoInvent may provide some funding for capital costs.

Partnerships

A large-scale composting system will likely come with a net loss rather than gain, as the reduced tipping fees paid to the City of Kamloops will not be greater than the operational and capital costs associated with the composting system. Unless significant funding is available, it is unadvisable to go with this option. Though TRU does not have the volume to warrant large scale composting systems, partnerships with other organizations in Kamloops – BCLC or local restaurants such as Tim Hortons, may make the system viable and help share the costs. Previous discussions between BCLC and Tim Hortons have proven that these two organizations are interested in a partnership.

Challenges

Operating Costs

Any composting program will require oversight, management and on-the-ground labour – either paid or volunteer. If volunteer, there is concern that constant turnover of students would cause inconsistencies and be difficult to continually manage. Summer is a much slower time on campus, while for composting summer is the ideal season to compost. The question of whether enough volunteers will be found is always an issue. The Sustainability Grant fund cannot be used to fund ongoing operational costs, as a result a paid position cannot be funded through that source, and would need to be funded through some other means. Regular maintenance and potential operation of any heavy equipment associated with the composting program will also add to operational costs.

Awareness & Education

One of the most common issues for composting programs is contamination of materials by mixing organic and non-organic waste together. Awareness of how to correctly use the compost bins would be an ongoing challenge, particularly due to the nature of the university, with students constantly turning over and a large number of sessional and temporary staff and faculty. Ongoing education programs and materials would need to be available to both staff and students to ensure the program is as effective as possible. Significant staff time and funds (presumably from the Sustainability Office or Facilities) would need to be dedicated to awareness and education.

Conclusion

Although composting has very positive environmental benefits including reducing landfill waste, reducing GHG emissions, and naturally fertilizing green spaces, there exist a variety of barriers to composting programs which emerge repeatedly in the literature, this report has focused on two of most relevance to Thompson Rivers University (Batty & Bonfield, 2009; Gray-Donald, 2010, McEachren et al, 2004; Rasanu, 2008).

Financial

A large-scale composting program is relatively costly, in both capital and ongoing operating costs. According to several financial feasibility studies at other universities, there will be a cost/ net loss associated with a university composting program (Batty & Bonfield, 2009; McEachren et al, 2004; Rasanu, 2008). The cost savings from reduced landfill tipping fees, as well as less manure and fertilizer purchases, do not offset the operating costs.

Awareness

A successful composting program requires an extensive degree of awareness and education by all the stakeholders (students, faculty, staff, and visitors) in order to encourage participation and minimize contamination. Contamination of the composting material with non-compostable waste is a major challenge to any composting program, especially in a large institution with a multitude of people (Batty & Bonfield, 2009). In addition, the nature of a university is a continuous turnover of students therefore it will require continuous education and awareness (McEachren et al, 2004). Awareness must include the *how* and *why* of a program in order to stimulate environmental awareness and participation (Dahle & Neumayer, 2001).

Next Steps

The next logical decision would be to determine the amount of funding that Thompson Rivers University would devote to a campus composting system. This figure will determine which system to research further and provide a framework to work with that would enable further discussions with potential partners.

Links

Compost Council of Canada
www.compost.org

The Greater Victoria Compost Education Centre
<http://www.compost.bc.ca/>

Wright Environmental Management Inc. (eg. UBC Vancouver)

http://www.wrightenvironmental.com/index_nonflash.html

Earth Tub – Green Mountain Technologies (eg. UBC Okanagan)
<http://www.compostingtechnology.com/invesselsystems/earthtub/>

Brome Composting Equipment (eg. Concordia)
<http://www.bromeequip.com/brome-composting-machine/>

Big Hanna Composter (eg. McGill)
<http://www.susteco.se/>
http://gorilla.mcgill.ca/docs/Vertal_reference_03_all_39234.pdf

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