BA504: B-Model Project UBC Farm Compost Financial Feasibility Executive Summary

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Overview

UBC Farm and the UBC Centre for Interactive Research on Sustainability are seeking to determine the financial viability of a composting facility at UBC Farm. The concept was brought forward due to the increasing quantity of food waste being generated on the UBC campus as a result of the Zero Waste Action Plan. The campus is expected to generate 1000 tonnes of food waste over the 2014-2015 academic year and 1300 tonnes the following year. If this growth continues as expected, UBC's in house composting facility will reach its capacity limit in the next few years and additional food waste will have be shipped to external facilities to be processed. There is an opportunity for some of this food waste to be diverted to UBC farm to be composted and used on the farm. This fits well with UBC's zero waste initiative and it would create a unique closed loop food cycle.

The farm currently has a 12'x24' concrete pad where limited composting takes place on a small scale. A technical feasibility study determined that this space would be suitable for a larger scale composting facility and could process up to 500 tonnes of organic material per year. This would produce between 344 and 772 yards of compost. The farm uses 70 cubic yards internally so the excess compost could be sold at farmer's markets where UBC Farm already sells produce.

The previous study used a model with three feedstocks: food waste, yard waste, and animal bedding. Due to public perception of risks associated with using animal bedding from scientific labs in food production, UBC Risk Management has recommended not using animal bedding in the composting process. Disposing of animal bedding was an important source of revenue in the model due to the high price UBC labs pays for disposal of this material. This potential cost saving would have offset much of the operational budget, however, the risk of tainting public perception of food products originating at UBC Farm outweighs the possible financial gain.
Based on information from the technical feasibility study, the capital cost of a 500 tonne/yr composting facility would be approximately $344,100. With a full time compost technician on staff, the operating cost of the facility would be approximately $65,700 per year and the revenue would be in the range of $43,170 to $55,557 depending on the yield of the facility. This would require an initial investment of $344,100 and an annual investment of $10,143-$22,530 to keep the facility operating. We do not recommend proceeding with the facility as outlined in the technical feasibility study because the cash flows are negative and there are risks and uncertainties in the quantity and quality of the compost generated.

Alternatives

Financial feasibility alternatives are limited for large-scale composting at UBC Farm. The first-cost effective alternative is to operate the composting facility by engaging a part-time compost technician, as opposed to hiring a full-time employee, and/or by utilizing existing UBC Farm employees and volunteers to run the operation.

The second alternative would be to pilot the project on a small scale to produce only what the farm requires. This would require 79 tonnes of food waste and 23 tonnes of yard waste, resulting in 70-157 cu. yds. of compost being produced. This would cover UBC Farm's needs for

the season and allow the project to be implemented on a trial basis to help determine the feasibility of higher production. Operating costs would need to stay below $9,267 in order to stay revenue neutral. In this case we would recommend using resources available on the farm and renting specialized equipment as needed.

The third alternative is to scale the facility up to generate more revenue from compost sales. This would provide additional revenue to cover the operating cost of the facility, but would require additional space and capital investment to increase the size and throughput of the facility. This alternative would expose the farm to significant risk. There are uncertainties in the market for compost as well as uncertainty in the quality of the output.

Recommendation

We recommend piloting the project on a small scale. A small scale production would not require a full time compost technician and would allow the farm to keep the costs low while the quality of the output, the demand for compost, and the logistics of the operation are tested. If the pilot project is successful, it can be used to justify spending additional money to increase the capacity of the project.

Short-term Implementation

- Pilot the composting project and produce a volume of 102 tonnes (sufficient to yield the UBC Farm's 2013 purchased compost volume) for 4 months
    - Following the pilot period, a decision to scale the project will need to be taken. All partners should be involved in the decision-making process.
- Validate all costs, referenced against UBC spend and budgeting. Validate value proposition of the UBC Farm Compost Project. (2 Months)
- Gain consensus among all involved UBC departments and formulate contract agreements. (2 months)
- Identify funding opportunities (grants, donations, in-kind support) to offset infrastructure, operating and labour costs. Approach key supporters of urban food production and municipal sustainability. (3 Months)
- Procure. Construct. Commence operation. Ensure change management practices are communicated in advance of operation. (3 months)
- Active awareness and engagement programs with UBC campus community. Ongoing
- Pursue continuous improvement of the UBC Farm compost operation. Ensure all sustainability elements of the model align to UBC Farm's mission, and adjust

Long-term Implementation

- Scale commercialization, based on successful operation. Create a marketing campaign that promotes high quality compost, generated from a closed-loop urban sustainability model. 2 months set-up
    - Sell 10L bagged compost at UBC Farmer's Markets. Potentially pursue an opportunity to sell at Save-On-Foods on campus.
    - Engage UBC farm and community volunteers to participate in bag filling and market selling.
- Negotiate with UBC Risk Management to make use of animal bedding. (2 Months)

ASSUMPTIONS

As per November 12th meeting with Bud Fraser, animal bedding will most likely not be approved for use in compost by UBC Risk Management. This eliminates an estimated 110 tons of feedstock with a potential revenue of $800 per ton.
In-vessel facility will not be able to handle the estimated 1300 tons of food waste projected for 2015 and any excess would be shipped to Harvest Power at a cost of $60/ton
A consistent quantity of yard waste and food waste will be available for UBC Farm composter

Compost production model holds true and 250-350 tons of usable compost can be produced yearly (assume that operational feasibility is valid)

The existing tipping fees charged by Harvest Power remain at this level or higher, but do not decrease
Capital and operating costs from Erik's report and supplementary research are valid
Maximum 40% expected increase in construction costs on UBC campus
Pad size remains constant at 12mx24m
All excess compost not used by UBC Farm will be sold to the public
Compost sales price is based on high quality compost output
Model assumes there is a regulatory fee charged by OMRR. An estimate of $2000 was used.
Model assumes there are no variable or fixed costs associated with selling compost to the public

HOW TO USE THIS FINANCIAL MODEL

This workbook is built upon linked worksheets that serve the following purposes:

1. Financial Calculations Captures interest and growth rates, payback period and capital costs. Enter these values in blue cells B4 to B7. Compost selling price and volume in cells B8 and B9 can be chosen use the slider buttons. These inputs are integrated into the 4 financial scenarios, each calculated at low and high yields based on the compost mixing model. A breakeven analysis is automatically calculated for all scenarios. Figures in red cells denote a loss and green cells

2. Revenues Captures potential revenues generated from operation of the UBC Farm compost facility. Numbers are to be inputted in blue cells B8 to B10, B18 and C18, and B27 and B28.

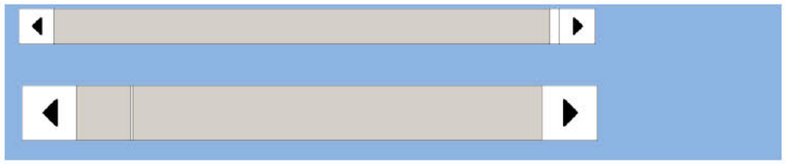
3. Capital & Operating Costs Captures known capital and operating costs. Numbers are to be inputted in blue cells D7, D10 to D14, D23, D26, D29 and D30, D33 and D36.

4. Selling Price & Volume DO NOT EDIT A self-calculating table that shows breakeven points based on compost price and compost volume, based on inputted values from the Financial Calculations worksheet. Red cells denote a loss and green cells denote a surplus.

FINANCIAL CALCULATIONS

Numbers in blue cells can be modified

Imput Calculations			Unit
Interest Rate		2.00%	%/per year
Compost Price Growth Rate		0.05%	%/per year
for a period of		20	years
Structure Cost	$	200,000	
Compost Selling Price	$	70.00	per tonne
for volume of		172	tonnes



	Year 1 Cashflow
Capital Cost	
Offset UBC Farm compost purchase	$ 2,650.00
Disposal fees from UBC Food Waste	$ 9,104.89
Disposal fees from UBC Yard Waste	$ 2,095.75

Year 0 Cashflow
$ (316,100.00)

	Low Yield	High Yield
Revenue from compost sales	$ 3,394.88	$ 13,680.54
UBC Farm Compost Operating Costs	$ (65,700.00)	
Total		

Scenarios	IRR	NPV	Annual Cashflow	Volume in Tonnes (holding price constant at $45)	Breakeven Analysis: Compost Sale Price (holding volume at 500T)	Breakeven Analysis: Compost Sale Price (holding volume at 700T)	Breakeven Analysis: Payback Period (Years)
Base case (low yield)	#NUM!	$ (2,800,944.99)	$ (48,454.48)	689	$ 111.09	$ 42.37	N/A
Base case (high yield)	#NUM!	$ (2,273,475.52)	$ (38,168.82)	492	$ 43.46	$ 17.29	N/A
Without technician (low yield)	#NUM!	$ (493,252.68)	$ (3,454.48)	221	$ (52.87)	$ (66.79)	N/A
Without technician (high yield)	-7%	$ 34,216.79	$ 6,831.18	158	$ (20.68)	$ (2.79)	47
Excluding Capital Costs (low yield)	#NUM!	$ (2,484,844.99)	$ (48,454.48)	689	$ 111.09	$ 42.37	N/A
Excluding Capital Costs (high yield)	#NUM!	$ (1,957,375.52)	$ (38,168.82)	492	$ 43.46	$ 17.29	N/A
Excluding Capital Costs w/o tech (low yield)	#NUM!	$ (177,152.68)	$ (3,454.48)	221	$ (52.87)	$ (66.79)	N/A
Excluding Capital Costs w/o tech (high yield)	#NUM!	$ 350,316.79	$ 6,831.18	158	$ (20.68)	$ (2.79)	N/A

REVENUES

Numbers in blue cells can be modified

REVENUE FROM DISPOSAL OF WASTE

Paramater	Value	Unit	Comment
Input Quantity	431	Tonnes	Reflects maximum volume based on exisiting concrete pad size and optimal C:N ratio
Food Waste Quantity	336	Tonnes	Reflects optimal C:N ratio based on a pad capacity of 500 tonnes
Yard Waste Quantity	95	Tonnes	Figure provided by Bud Fraser in conversation
Food Waste disposal fee	$60.00	$/Tonne	Harvest Power Inbound Rate for Grade 2 Food Waste (pre and post-consumer)
Yard Waste disposal fee	$47.00	$/Tonne	Harvest Power Inbound Rate for Green Waste R9 (grass clippings and leaves)
Transportation cost	$8.00	$/Tonne	Transportation cost to truck waste to Harvest Power (Estimated based on compost delivery price to UBC Farm)
Revenue from disposal of food waste	**$22,815.15**		Fees paid by UBC Building Operations to UBC Farm for disposal of food waste
Revenue from disposal of yard waste	**$5,251.57**		Fees paid by UBC Building Operations to UBC Farm for disposal of yard waste

REVENUE FROM COMPOST SALES

Paramater	Value		Unit	Comment
Compost Pad Capacity	431		Tonnes	Can increase to 700 tonnes with additional cost (based on Erik Toren's report)
Yield scenario	**High**	**Low**		
Compost Mass Loss Rate	30%	50%	Percentage	Based on Erik Toren's Report
Output Production	301.7	215.5	Tonnes	(Compost Pad Capacity x Production) - Compost Mass Loss
Tonnes to Cubic Yards	665	297	Cu Yd	Based on high and low conversion factor below from http://www.mulchstoremn.com/faq.htm
Compost available for sale	595	227	Cu Yd	Quantity available after UBC Farm has used the compost they need for internal use
Compost Sales Price	$70	$70	$/Cu Yd	
Revenue from Compost Sales	**$41,659.37**	**$15,885.43**		Sales price x compost available for sale

REVENUE FROM COMPOST PURCHASE OFFSET

Paramater	Value	Unit	Comment
Volume of compost purchased	70	Cu Yd	
Purchase price	$25	$/Cu Yd	
Total Cost for Compost	$1,750		
Delivery ($450 per 40 yards)	$900		
Total annual cost of compost purchased	**$2,650**		
Total cost per cu yd	$37.86	/Cu Yd	

TOTAL ANNUAL REVENUE FOR UBC FARM COMPOST FACILITY

Yield Scenario	High	Low
TOTAL REVENUE	**$72,376.09**	**$46,602.15**

UNIT CONVERSION DATA

Low compost density	0.454	tonnes/cu yard	http://www.mulchstoremn.com/faq.html
High compost density	0.726	tonnes/cu yard	http://www.mulchstoremn.com/faq.html
Proportion of food waste to yard trimmings	0.778		

CAPITAL & OPERATING COSTS

Numbers in blue cells can be modified

CAPITAL COSTS

Category	Details	Value	Comment
Infrastructure			
	Frame & Cover (installed)	$ 200,000	E (for 500 tonnes)
	UBC construction premium	40%	
		$ 280,000	
Equipment			
	Screener	$10,000	A
	Tub Grinder	$22,000	A
	Soil Moisture Probe	$50	A
	Soil Temperature Probe	$50	A
	Soil Oxygen Meter	$4,000	A
		$36,100	
	TOTAL CAPITAL COSTS	**$ 316,100**	

OPERATING COSTS

Category	Details	Value	Comment
Labour			
	Compost Technician	$45,000	R
		$45,000	
Regulated Monitoring			
	Annual Monitoring Fees	$4,500	R
		$4,500	
Utilities			
	Fuel	$2,600	R
	Electricity	$2,000	R
		$4,600	
Maintenance			
	Maintenance of Compost Equipment	$9,600	R
		$9,600	
Permitting			
	OMRR Regulatory Fee	$2,000	E
		2,000	
	TOTAL ANNUAL OPERATING COSTS	**$65,700**	

E Estimated
A Actual
R Erik Toren's Report

SELLING PRICE & VOLUMES

Effect of compost selling price and produced volume on annual cashflows

Compost Price	Compost Production Volume (tonnes)								
	500	525	550	575	600	625	650	675	700
$30	$ (22,255.84)	$ (20,111.14)	$ (17,966.43)	$ (15,821.72)	$ (13,677.01)	$ (11,532.30)	$ (9,387.60)	$ (7,242.89)	$ (5,098.18)
$35	$ (20,883.48)	$ (18,652.66)	$ (16,421.83)	$ (14,191.01)	$ (11,960.18)	$ (9,729.36)	$ (7,498.53)	$ (5,267.70)	$ (3,036.88)
$40	$ (19,511.13)	$ (17,194.18)	$ (14,877.24)	$ (12,560.29)	$ (10,243.35)	$ (7,926.41)	$ (5,609.46)	$ (3,292.52)	$ (975.58)
$45	$ (18,138.77)	$ (15,735.70)	$ (13,332.64)	$ (10,929.58)	$ (8,526.52)	$ (6,123.46)	$ (3,720.40)	$ (1,317.33)	$ 1,085.73
$50	$ (16,766.41)	$ (14,277.23)	$ (11,788.05)	$ (9,298.87)	$ (6,809.69)	$ (4,320.51)	$ (1,831.33)	$ 657.85	$ 3,147.03
$55	$ (15,394.05)	$ (12,818.75)	$ (10,243.45)	$ (7,668.15)	$ (5,092.86)	$ (2,517.56)	$ 57.74	$ 2,633.04	$ 5,208.33
$60	$ (14,021.69)	$ (11,360.27)	$ (8,698.86)	$ (6,037.44)	$ (3,376.03)	$ (714.61)	$ 1,946.81	$ 4,608.22	$ 7,269.64
$65	$ (12,649.33)	$ (9,901.79)	$ (7,154.26)	$ (4,406.73)	$ (1,659.19)	$ 1,088.34	$ 3,835.87	$ 6,583.41	$ 9,330.94
$70	$ (11,276.97)	$ (8,443.32)	$ (5,609.67)	$ (2,776.01)	$ 57.64	$ 2,891.29	$ 5,724.94	$ 8,558.59	$ 11,392.24
$75	$ (9,904.61)	$ (6,984.84)	$ (4,065.07)	$ (1,145.30)	$ 1,774.47	$ 4,694.24	$ 7,614.01	$ 10,533.78	$ 13,453.55
$80	$ (8,532.25)	$ (5,526.36)	$ (2,520.48)	$ 485.41	$ 3,491.30	$ 6,497.19	$ 9,503.08	$ 12,508.96	$ 15,514.85