Integrating Vermicomposting into AMS SUB Operations - Phase 3 - Compiled presentations

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University of British Columbia

GRS 497B

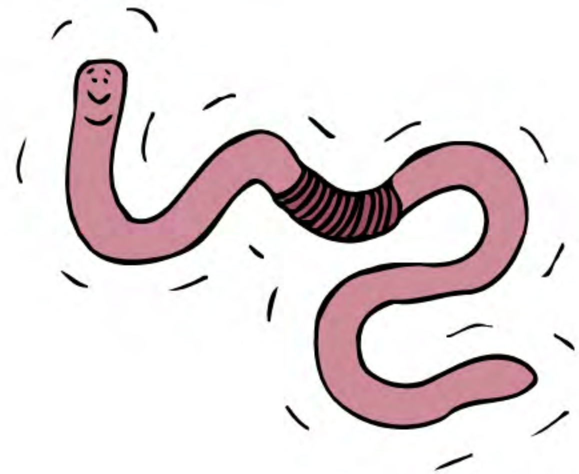
November 04, 2014

Integrating Vermicomposting into AMS SUB Operations ~ Phase II ~

A SEEDS Project
By: Emme Lee
January 25, 2012

OVERVIEW

- Objective
- Background
- Review
- Methodology
- Findings
- Recommendations
- Conclusion



OBJECTIVE

To explore the feasibility of incorporating vermicomposting (VC) in the new SUB by expanding the VC project in the current SUB.

~ ~ ~ ~ ~

- Identify values provided to SUB operations
- Identify challenges created
- Further understand operational logistics of creating a local food loop in an institutional environment

BACKGROUND

- 1997: UBC first focused on climate action
- 2001: ECOTrek (energy & water retro-fit)
- 2008: AMS Sustainability (Lighter Footprint)
- 2009: Waste Audit of SUB
- 2009-10: Climate Action Plan at UBC
- 2010: AMS Identifies VC for waste mgmt
- 2011 January - April: Phase I
  - Explore integration of small-scale VC into AMS
  - New SUB (2014) to include designated VC space
- 2011 May - December: Phase II
  - Scale-up Phase I → mid-scale VC in operations

REVIEW – REQUIREMENTS

- Red wiggler worms
- Aeration (no odours)
- Temp of 15–20°C
- Moisture (60–90%)
- Acidity (pH 6.8–7.5)
- Low vibrations
- Carbon: Nitrogen (20–30:1)
- Avoid: meat, dairy, oil, salt, flour, bread, pasta, rice
- Pest prevention

METHODOLOGY

- Execution: Mid-Scale
  - Set-up
  - Observation
  - Data collection
  - Assessment
  - Training Manual
- Research and Review
  - Phase I, Context
  - Literature, Interviews
- Analysis
  - Waste, Cost

EXECUTION – TIMELINE

April/May – review project, literature, familiarize with SUB, VC, staff, goals

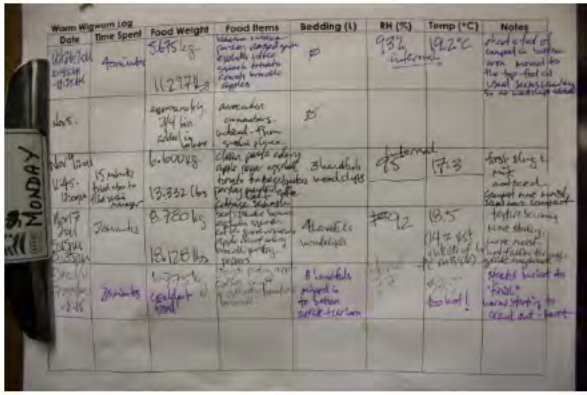
May/June – explore carbon options, arrange purchase of VC

June/July – project meetings, estimate labour/time, carbon sourced

July – compare carbon sources, delivery and set up of unit, light bulb, labour discussion, data collection charts

August/Sept – organize food collection (staff), carbon collection, engage staff

Oct-Dec – maintenance, data, research



FINDINGS – EXECUTION

Preparation

- Anticipate delays (summer)

Set-up

- 3 hours, 2-3 people
- Materials
  - Pallet
  - Bedding (newspaper, cardboard, paper, wood shavings etc.)
  - Worms and Bin
  - Light bulb stand

☼ have materials ready in advance

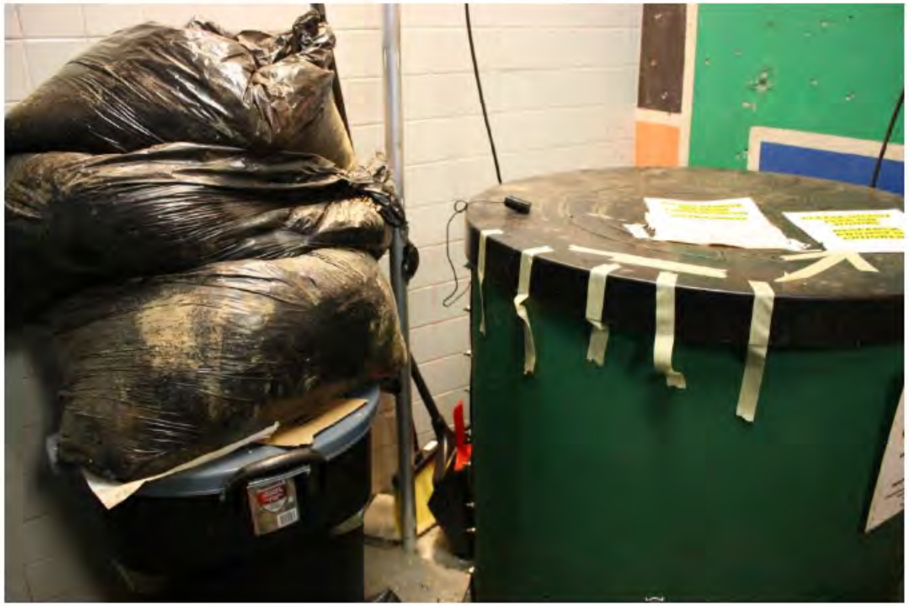
FINDINGS – EXECUTION

Maintenance

- 1 hour/week
- Dustpan (no broom)
- Stabilization (2-3 months)
- Carbon source
- Storage bins (carbon & food)
- Storage space in fridge
- Storage space for carbon

☼ have materials ready in advance, 1" newspaper

☼ storage space in fridge



FINDINGS – EXECUTION

Staff Engagement

- Support vs Resistance
- Pest Prevention
- Social Acceptance

☼ prep staff to sort food waste into separate bins

☼ hire student to feed worms weekly

☼ signage and training to prevent contamination

☼ fridge space, wheels

RECOMMENDATIONS – STAFF

STAFF QUALITIES

- Cares about the project
- Cares about sustainability
- Understanding of ecology
- Observant, Pro-active
- Fast, but tidy, can chart
- Deals well with labour, muck, worms

STAFF NEEDS

- Storage locker, protective wear (gloves, coat/apron)

ANALYSIS – WASTE STREAM

Where does waste produced by SUB operations end up??

(Based on AMS Waste Audit and Waste Management Plan, 2009)

49% goes to the Landfill
(88 000 kg/year)

25% is recycled

26% is composted at South Campus (in-vessel unit)

ANALYSIS – WASTE STREAM

- Metro Vancouver
  - Businesses must reduce waste by 70% by 2015
  - Home waste – 44% can be diverted to compost
- SUB Waste Audit (2009)
  - Goal: divert waste from landfill -> reduce footprint

SUB Landfill Waste (88 000 kg)

17% of landfill waste can be processed by worms (VC)

ANALYSIS – WASTE STREAM

ALL food waste COULD be composted at UBC

17% landfill

26% landfill

Pre-consumer via VC/worms (on site @ SUB)

Post-consumer via in-vessel (on campus, UBC)

Pre-consumer waste can be diverted from in-vessel by increasing VC

FINDINGS – COMPARE TIP FEES

IN-VESSEL	LANDFILL
46 750 kg/year	14 728 kg/year
899 kg/week	203 kg/week
TIPPING FEE: $340/week	TIPPING FEE: $107/tonne
COST: $0.378/kg	**COST: $0.107/kg**

FINDINGS – ADDITIONAL COSTS

IN-VESSEL	LANDFILL
Installation • Unit & replacement Operational • Transport, labour, time, fuel, electricity, service/repair Environmental • Some GHGs	Installation • None (except trucks) Operational • Transport, labour, time, fuel, service/repair Environmental • UBC GHGs • Metro Van • Landfill gas

FINDINGS – COST COMPARISON

WIGWAM (WORMS)

Landfill waste:
→ 8 wigwams
In-vessel waste:
→ 23 wigwams

Inst: $32 984
Op: $ 7 176
C/Yr: $10 474.40
[10 year lifespan]

$0.170/kg

IN-VESSEL

$0.378/kg

LANDFILL

$0.107/kg

FINDINGS – COMPARE

	WORM WIGWAM	IN-VESSEL	LANDFILL
Environmental Impacts	Plastic Potential for mismanaging	Materials Some GHGs	A lot of GHGs
Additional Costs	Building space	Transp. Fuel Labour Time Land space Electricity	Transp. Fuel Labour Time Land space Metro Van energy
Benefits	On site Less GHGs, energy, fertilizer Compost	On campus Fewer GHGs, Less fertilizer Compost	Cheap Not our backyard

FINDINGS – WIGWAM SAVES $$

DIVERT TO WORMS FROM IN-VESSEL

WIGWAM COSTS: $350.88/yr
(2064 kg/yr X $0.170/kg)

IN-VESSEL COSTS: $780.19/yr
(2064 kg/yr X $0.378/kg)

DIVERTING FROM IN-VESSEL SAVES: $429.31/year/bin
PAYOFF: 2.48 years

23 BINS SAVES: $9 874.13
(in tipping fees only, no extras)

- **divert pre-consumer waste (where possible) to wigwams**
- **consider larger worm bin**

FINDINGS – INST'TL SIZE BIN

DIVERT TO WORMS ALL PRE-CONSUMER

TOTAL WASTE: 61 478 kg

INDSTL. WORM BIN: 181.4 kg/day

$15021 + $1600 + $7176 X 10
TOTAL COST $8 838.1/yr

COST: $0.143/kg/yr

DIVERTING ALL PRE-CONSUMER SAVES: $7 304.25/year/bin
PAYOFF: 2.28 years

SPACE CONSIDERATION

8 X Wigwams
Need 5' each → 40' X 5'
TOTAL: 200 square feet
1 INDSTL Bin
Need 8' X 32'
TOTAL: 256 square feet

RECOMMENDATIONS – SUMMARY

- prep staff to sort food waste into separate bins
- hire student to feed worms weekly
- signage and training to prevent contamination
- fridge space, wheels
- when scaling up, determine materials necessary and have ready in advance, storage space
- divert pre-consumer waste (where possible) to wigwams
- consider larger worm bin (institutional size)

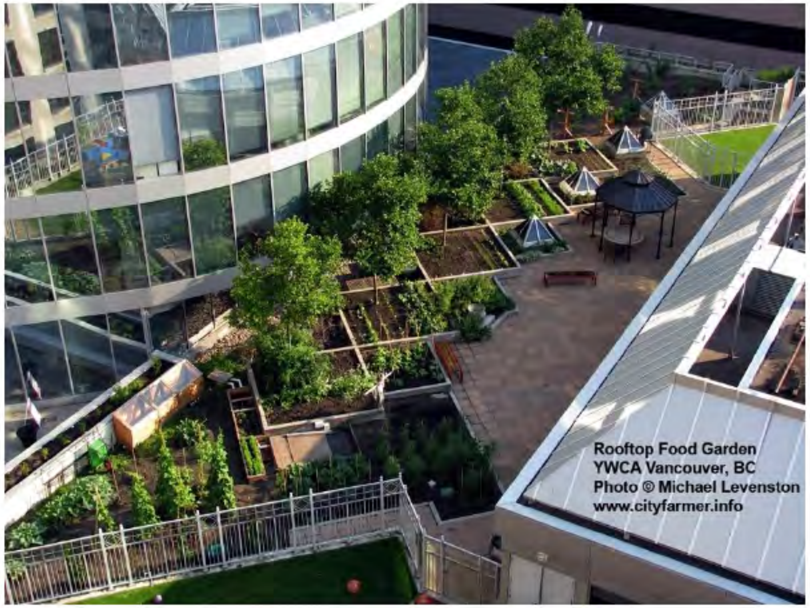
CONCLUSION

Vermicomposting can:

- Reduce costs
- Reduce transp., energy, GHGs
- Help meet sustainability targets
- Reduces ecological footprint
- Establish AMS as leader
- Produces closed loop system
- Helps Metro Van achieve targets

Vermicomposting needs:

- Planning and organization
- Staff engagement (training etc.
- Larger (institutional) bin



SPECIAL THANKS TO:

DS Supervisor, Professor Emeritus, Art Bomke
SEEDS Coordinator, Liska Richer
AMS Sustainability, Justin Ritchie
AMS Catering staff, Bryan Goodman
Undergraduate (Phase I), Hillary Topps
Earthworks Composting, Robert Crofton-Sleigh
UBC Building Ops. Sindi Sohi, Darren Duff
AMS Facilities Management, Jeffrey Smith
AMS Food and Beverage, Tom Coleman
UBC Wood Science, Vincent Leung

QUESTIONS ?

On-Site Composting in the NEW SUB

EMME LEE
AMS COMPOST COORDINATOR

OCTOBER 30, 2013

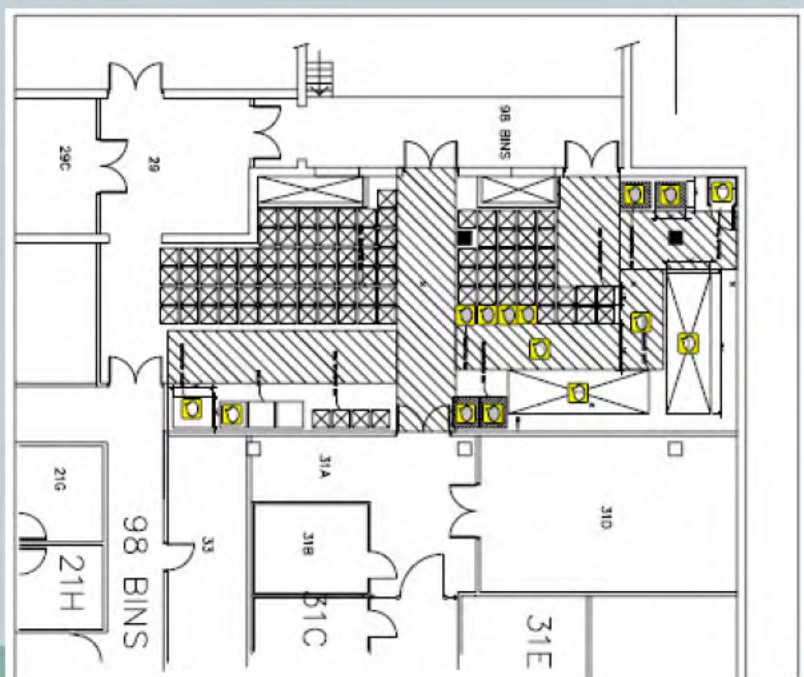
Drivers for On-Site

- Less GHGs
- Connects to Local Food
- Educational Value
- Engagement Opportunities
- Diversity of Systems
- Quality Control
- Re-sale Value
- Green Economy/Jobs
- Shift in Culture

Blakeway, 2013

Last time…

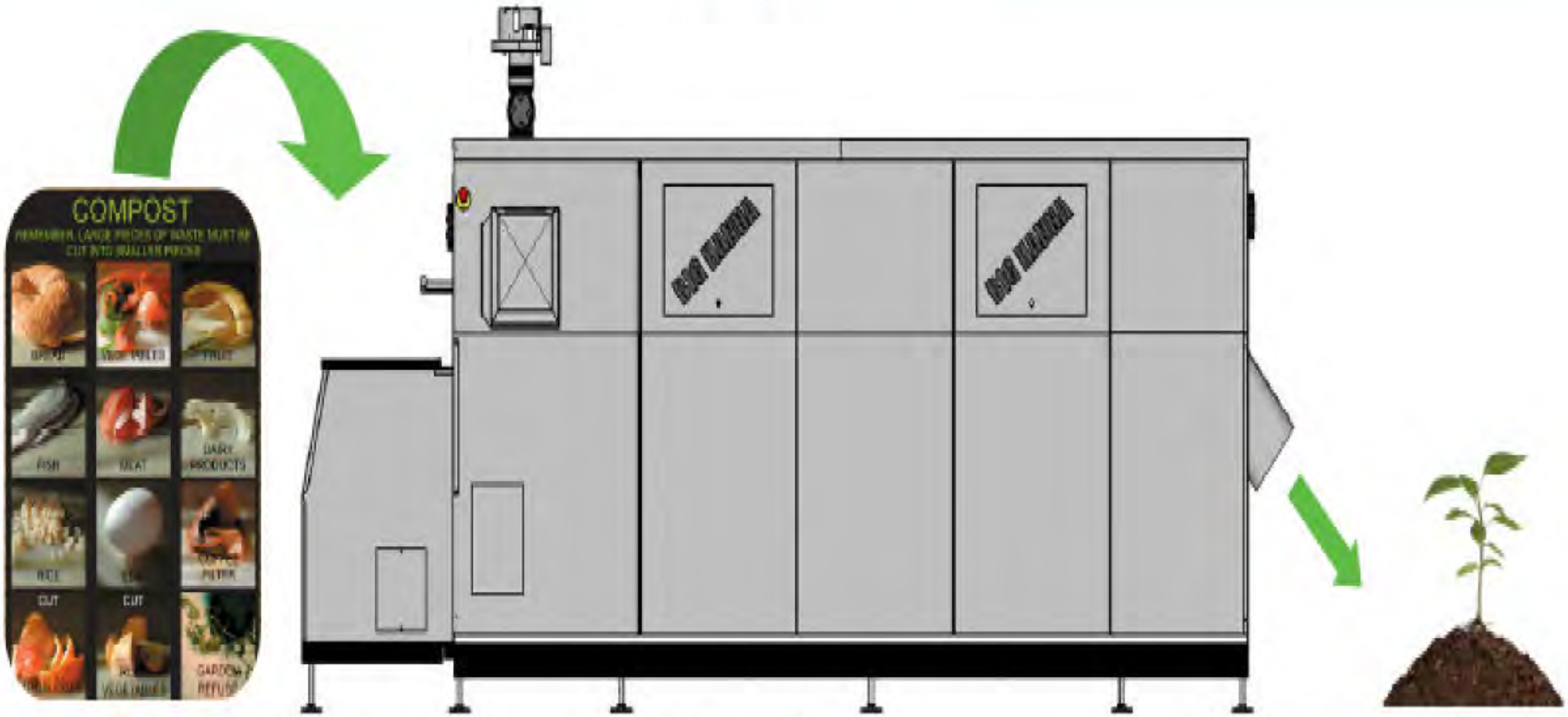
- Space
- 3-phase Electric
- Tech Review



Big Hanna

"Big Hanna" composter models
"BIG HANNA" MODEL T40
"BIG HANNA" MODEL T75
ODOR DESTROYER
BIOFILTER "BIG HANNA"

How does it work?



100 lbs food waste + sawdust
The solid food waste is fed into the composter together with 10-20 weight-% of sawdust.

Big Hanna composter
The biological process in the Big Hanna composter reduces the food waste itself by up to 90%.

10 lbs compost + sawdust
The result – peat free, environmentally friendly compost – 100 lbs of food waste including the sawdust generates about 20-30 lbs compost.

General Process

- Staff → Schaefer
- Schaefer → LB
- Bin Lifter → Pulverizer
- Mini-Bin → Big Hanna
- Bin Wash
- Collect Compost → Screen → Store → Use

Case Studies in Canada

- Mount Allison University (Sackville, NB)
  - Inside machine for 6-8 weeks, no windrows
  - Other machines cheaper, shorter processing
  - BUT: more mature compost, 20yr lifespan
  - Use a pulper, cutlery magnet
  - 9yr payback

- McGill (Montreal) - News Clip

Cost Estimates

T120	$49 000	T240	$79 000
Pulverizer	$7 900	Pulverizer	
Biofilter	$3 700	Biofilter	$3 700
Odour System	$3 700	Odour System	$3 700
Bin Lifter	$11 000	Bin Lifter	$11 000
Shipping		Shipping	
Installation		Installation	
Mechanical		Mechanical	
Electrical		Electrical	
TOTAL	$89 313.15	TOTAL	$114 510.15

Drivers for AMS

- Leadership
- Less GHGs
- Connects to Local Food
- Educational Value
- Engagement Opportunities
- Diversity of Systems
- Quality Control
- Re-sale Value
- Green Economy/Jobs
- Shift in Culture

Blakeway, 2013

Integrating Vermicomposting into AMS SUB Kitchen Operations

A UBC SEEDS Project

By: Emme Lee

WE <u>WANT</u> TO CHANGE THE WORLD

social equity
ecological health
economic prosperity

OVERVIEW

- ❑Objective
- ❑Vermicomposting
- ❑Methodology
- ❑Execution
- ❑Findings
- ❑Comparison
- ❑Recommendations
- ❑Conclusion

OBJECTIVE

Explore Feasibility of :

Integrating Vermicomposting into AMS SUB Kitchen Operations

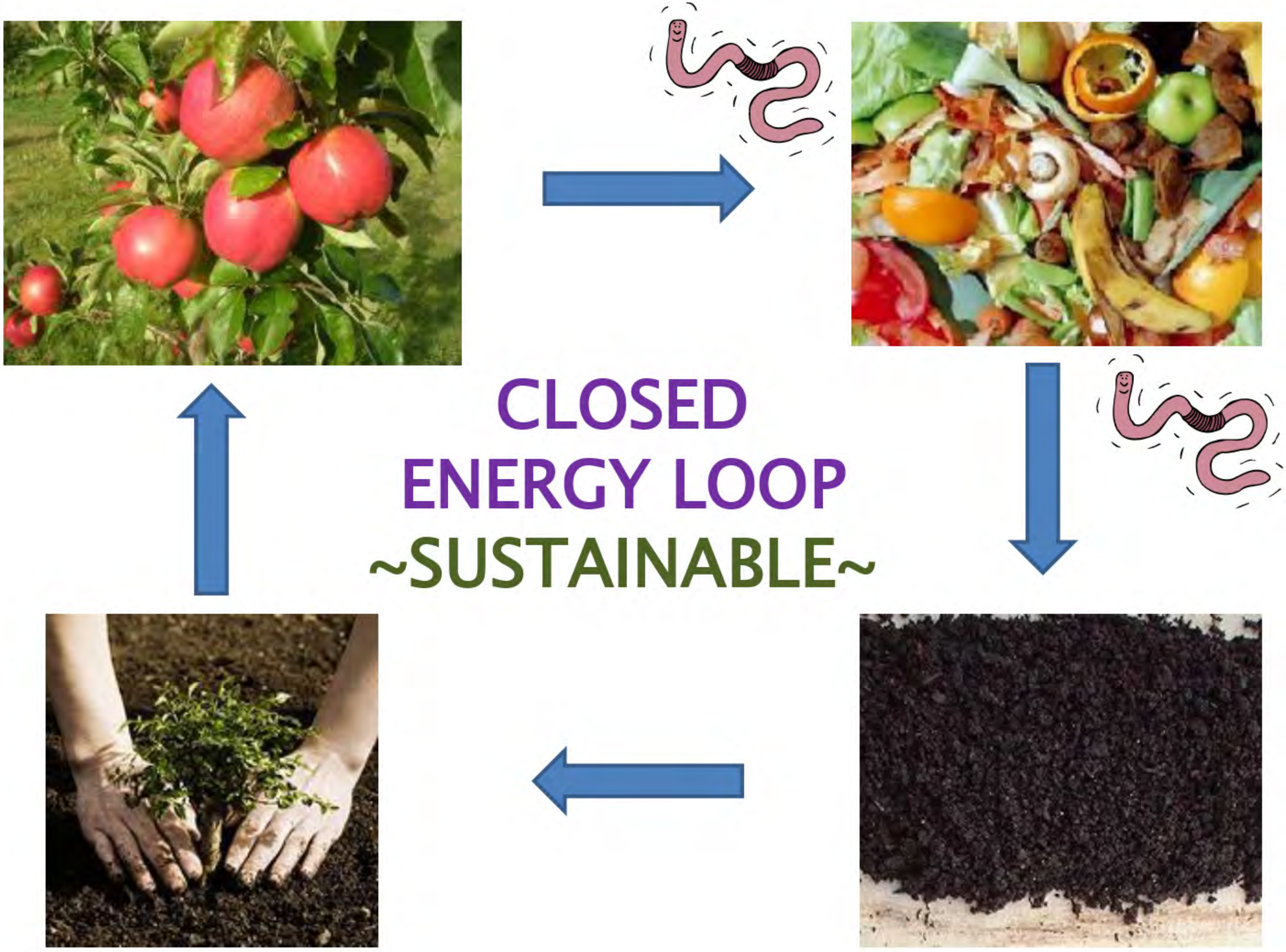
Challenges

Benefits

Logistics

Vermicomposting

Using worms to break down organic waste into recycled nutrient sources for plants


CLOSED
ENERGY LOOP
~SUSTAINABLE~

BENEFITS OF VERMICOMPOST

IMPROVES: aeration, porosity, drainage

PREVENTS: compaction, erosion, nutrient leaching

INCREASES: permeability, H_2O retention, nutrient availability, cation exchange capacity, organic material, production of humus

ACTS AS: nutrient recycler, soil conditioner

RESULTS IN: IMPROVED SOIL QUALITY → HEALTHIER PLANTS

REQUIREMENTS

- Use red wigglers
- Temp. (15–20°C)
- Acidity (pH 6.8–7.5)
- Moisture (60–90%)
- Low vibrations
- Aeration (O_2 present)
- Carbon: Nitrogen (25:1)
- <u>Avoid</u>: meat, dairy, oil, salt, dressings, sauces
- Prevent & Manage Pests
- Maintenance, Training

METHODOLOGY

Execution: Mid-Scale

- ✓Set-up
- ✓Observation
- ✓Data collection
- ✓Assessment
- ✓Training Manual

Research and Review

- ✓Phase I, Context
- ✓Literature, Interview

Analysis

- ✓Waste
- ✓Cost

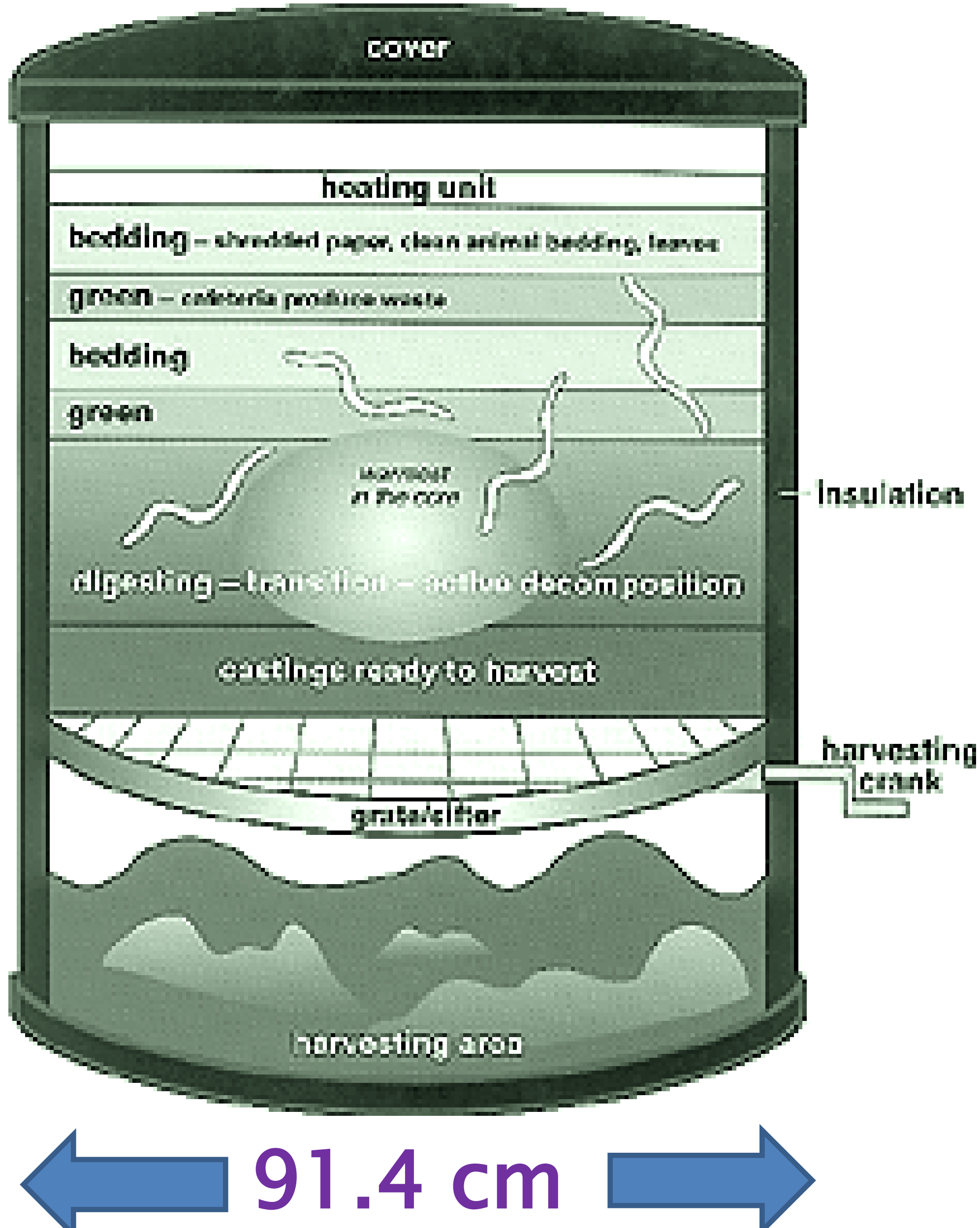
WORM WIGWAM

FRESH WASTE →

OLDER WASTE →

OLDEST WASTE →

COMPOST →



EXECUTION

Review: project, literature

Learn: SUB operations, staff, goal, vermicomposting

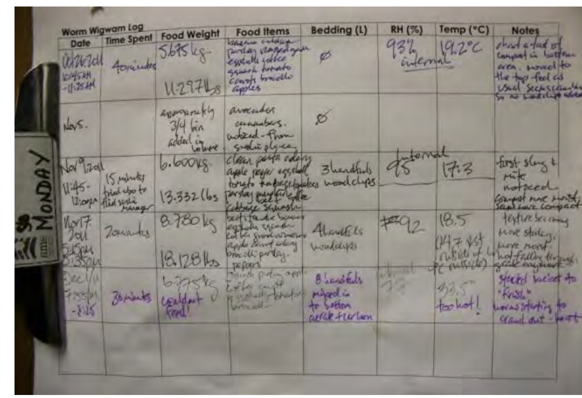
Source: carbon, tools, materials

Engage: meetings, staff

Estimate: labour requirements

Collect: data, equipment

Conduct: bin maintenance, food collection, staff participation, research, analysis



CURRENT SUB

•40+ YEARS OLD

•TOO SMALL (<45 000)

A New Student Union Building for UBC

NEW SUB

•SUSTAINABLE DESIGN

•LEED PLATINUM+ (HIGHEST RATING FOR GREEN BUILDINGS)

•LARGER (>45 000)

•VERMICOMPOSTING

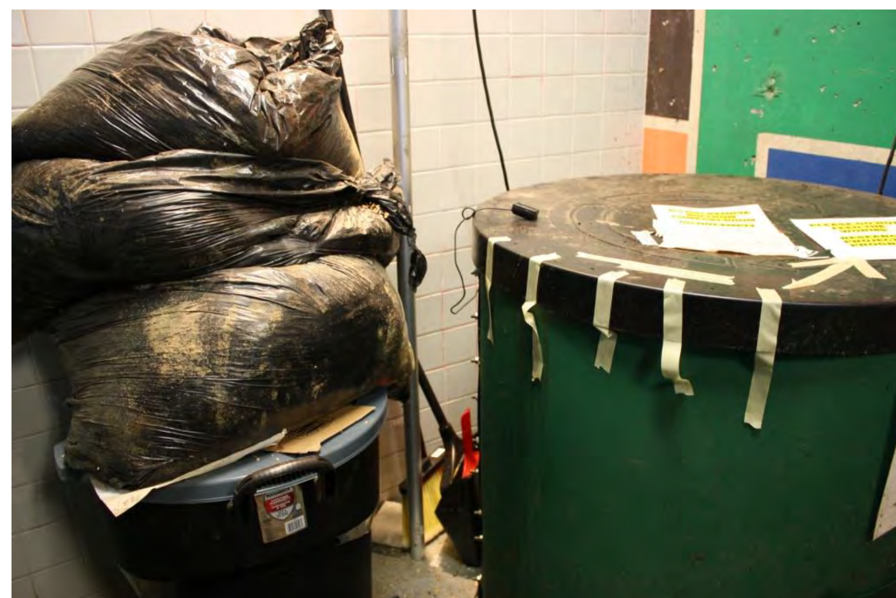
•ROOFTOP GARDEN

FINDINGS – EXECUTION

- ☼ SET-UP REQUIREMENTS
- ☼ MATERIALS LIST (ACQUIRE IN ADVANCE)

FINDINGS – EXECUTION

- POTENTIAL FOR STREAMLINING
- MINIMIZE COSTS
- STORAGE SPACE FOR FOOD WASTE, CARBON SOURCE, WORM BIN



FINDINGS – EXECUTION

- ENGAGE STAFF
- CHANGE ATTITUDES & BEHAVIOURS
- SPECIFIC FOOD WASTE BINS FOR WORMS
- TRAINING & SUPPORT
- SIGNAGE

ANALYSIS – WASTE STREAM

Where does waste produced by SUB operations end up??

(Based on AMS Waste Audit and Waste Management Plan, 2009)

25% is recycled

49% goes to the Landfill (88 000 kg/year)

26% is composted at South Campus (in-vessel unit)


PRE–CONSUMER

POST–CONSUMER



FINDINGS – COST COMPARISON

WIGWAM (WORMS)	IN-VESSEL	LANDFILL

X 31

Start: $32 984
Oper: $ 7 176
C/Yr: $10 474.40
Based on: 10 year lifespan, student labour rate

$0.170/kg

$0.378/kg

$0.107/kg

	WIGWAM	IN-VESSEL	LANDFILL
EXTERN-ALITIES	Manufacturing of plastic (fossil fuels)	Materials Some GHGs (driving)	A lot of GHGs (driving, Landfill gas) MV's energy
MISSING COSTS	Building space (opp. cost of lost lease) Fix/repair Electricity	Tip Fee includes: fuel, energy, labour, lost land lease	UBC pays transp., fuel, labour, time, land lease
BENEFITS	On site, Less: GHGs, energy, fertilizer; closed-loop, 'green', sustainable, cost-recovery, sell compost, worms, education	On campus Fewer GHGs, Less fertilizer Usable compost	Not on-site, No mgmt required Seems cheap and simple

RECOMMENDATION

COMPOST ALL
FOOD WASTE

Vermicompost
pre–consumer
(on–site @ SUB)

In–vessel
post–consumer
(@ South Campus)

FINDINGS – COMPARE SYSTEMS

31 X WIGWAMS

COST: $10 877.28/year

$0.170/kg

FOOTPRINT: 5’ X 5’ (each)
= 775 square feet

INST’TL SIZE BIN

COST: $8 838.10/year

$0.143/kg

FOOTPRINT: 8’ X 32’
= 256 square feet

RE-CAP

Feasible IF:

- ❑ Prepare in advance (materials, storage)
- ❑ Streamline processes
- ❑ Engage, inspire staff
- ❑ Training and Support

ECOLOGICAL BENEFITS
SOCIAL BENEFITS
AFFORDABLE!

SPECIAL THANKS TO:

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WE <u>CAN</u> CHANGE THE WORLD

"Individually, we are one drop.
Together, we are an ocean."
~ Ryunosuke Satoro ~

Unless someone like you cares a whole awful lot, nothing is going to get better. It's not. ~ Dr. Seuss ~

Worm Composting in AMS SUB Kitchen Operations

A UBC SEEDS Project

By: Emme Lee

WHY WE SHOULD COMPOST WITH WORMS

- ❑ Ecological Benefits
- ❑ Costs Less
- ❑ Sustainable
  - ❑ Opportunity
  - ❑ Community
- ❑ Easy
- ❑ Feasible

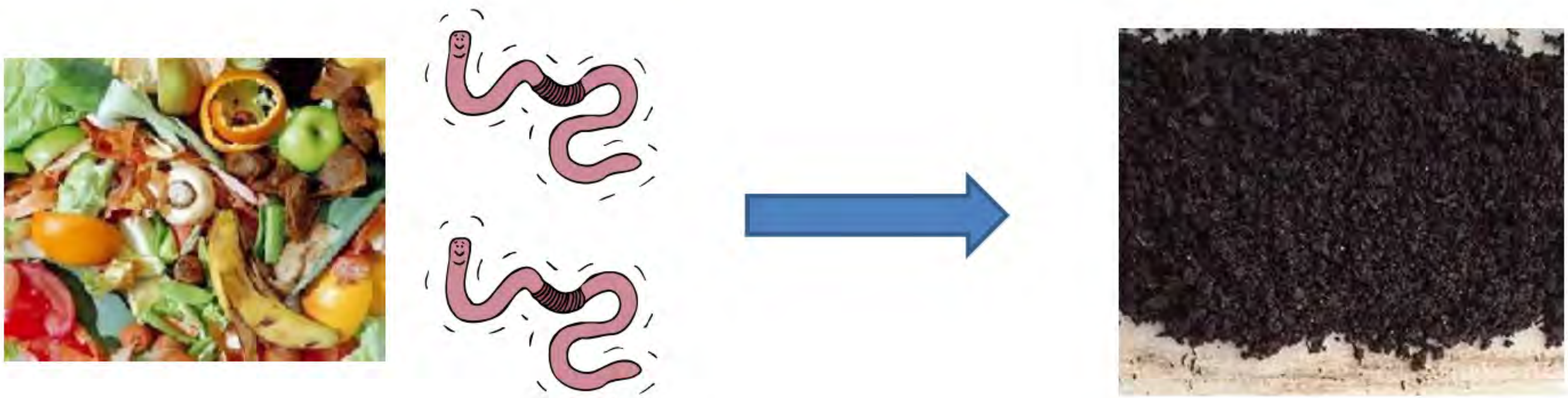
Objective:

Explore Feasibility of Worm Composting in AMS SUB Kitchens

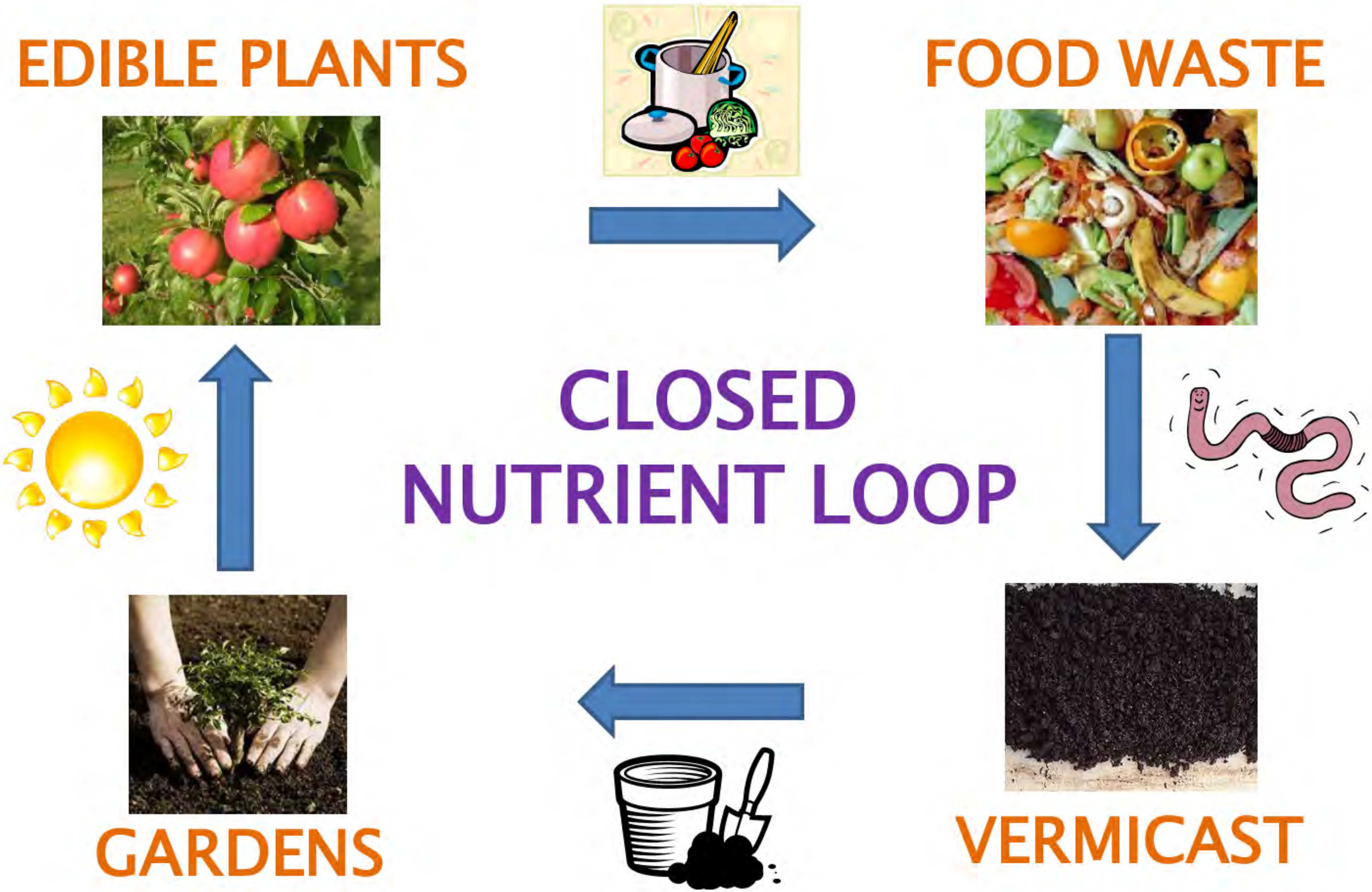
Challenges, Benefits, Logistics

Worm Composting

Using worms to break down organic waste into recycled nutrient sources for plants



CLOSED ENERGY LOOP
~SUSTAINABLE~


EDIBLE PLANTS
FOOD WASTE
CLOSED
NUTRIENT LOOP
GARDENS
VERMICAST

BENEFITS TO GROWING

IMPROVES: aeration, porosity, drainage

PREVENTS: compaction, erosion, nutrient leaching

INCREASES: permeability, H_2O retention, nutrient availability, cation exchange capacity, organic material, humus production

ACTS AS: nutrient recycler, soil conditioner

→ IMPROVED SOIL QUALITY

→ HEALTHIER PLANTS

SUB's WASTE STREAM

Where does waste produced by SUB operations end up??

(Based on AMS Waste Audit and Waste Management Plan, 2009)

25% is recycled

49% goes to the Landfill
(88 000 kg/year)

26% is composted at South Campus
(in-vessel unit)

COSTS LESS MONEY

WIGWAM (WORMS)

X 31

Start: $32 984
Oper: $ 7 176
C/Yr: $10 474.40
Based on: 10 year lifespan, student labour rate

$0.170/kg

IN-VESSEL

$0.505/kg

LANDFILL

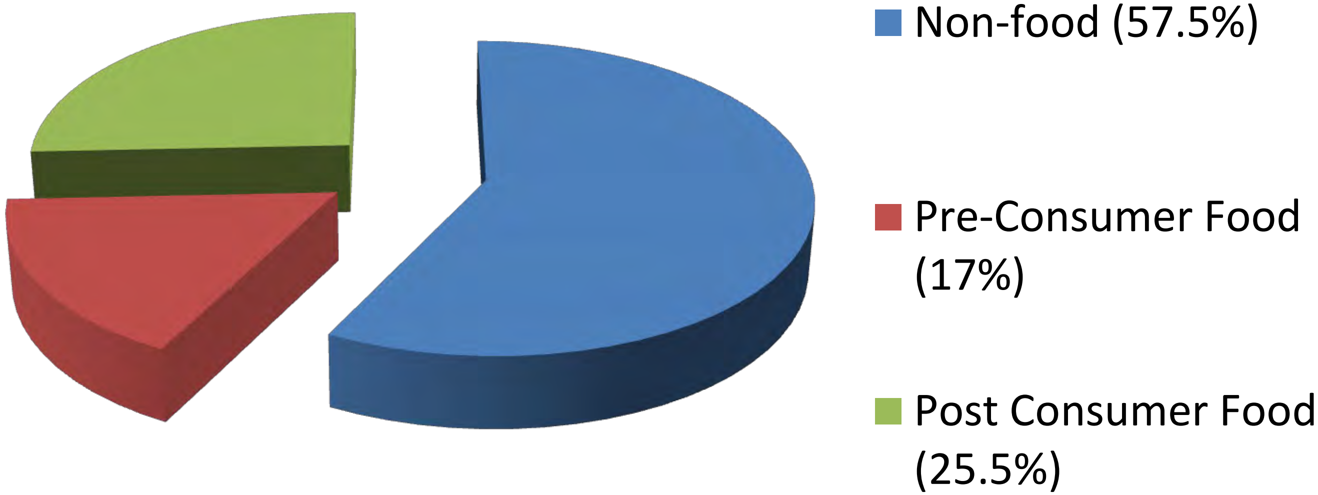
$0.205/kg

ZERO WASTE CHALLENGE

- Metro Vancouver
- Businesses reduce waste by 70% by 2015
- Tipping fee increases (50% in 3 years)

SUB Waste → Landfill

Organics
42.5%



RECOMMENDATION

COMPOST ALL
FOOD WASTE

WORM Compost
PRE-CONSUMER
(on-site @ SUB)

IN-VESSEL/ OTHER
POST-CONSUMER
(on-campus)

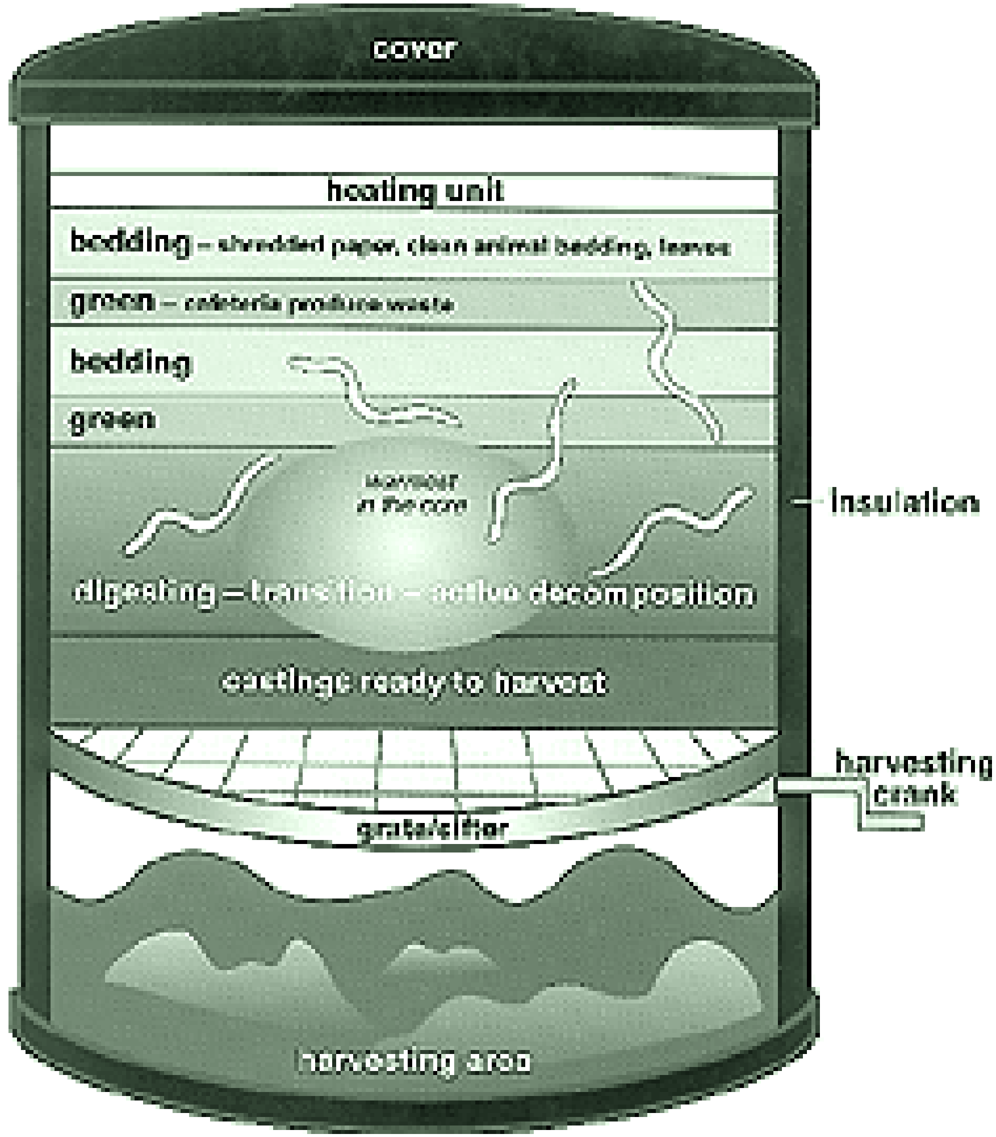
FLOW-THROUGH

FRESH WASTE →

OLDER WASTE →

OLDEST WASTE →

COMPOST →



91.4 cm

WORMS NEED…

- Use red wigglers
- Temp. (15–20°C)
- Acidity (pH 6.8–7.5)
- Moisture (60–90%)
- Salinity (<5mg/g)
- Low vibrations
- Aeration (O_2 present)
- Carbon: Nitrogen (25:1)
- Pre-consumer food waste (fruits, veggies)
- Management, training

FEASIBILITY CONSIDERATIONS

- ☼ SPACE (food waste, bins)
- ☼ MATERIALS (bedding etc.)
- ☼ STREAMLINE → LOW-COST
- ☼ WORK WITH STAFF
- ☼ TRAINING & SUPPORT
- ☼ FOLLOW THROUGH

UPSCALING

31 X WIGWAMS

COST: $10 877.28/year

$0.170/kg

FOOTPRINT: 5' X 5' (each)
= 775 square feet

INST'TL SIZE BIN

COST: $8 838.10/year

$0.143/kg

FOOTPRINT: 8' X 32'
= 256 square feet

SUSTAINABILITY POTENTIAL

- LIVING LAB
- LEARNING OPPORTUNITIES
- COMMUNITY HUB
- DEMONSTRATE
- CAMPUS-WIDE
- SUSTAINABILITY LEADER

Unless someone like you
cares a whole awful lot,
nothing is going to get better.
It's not. ~ Dr. Seuss ~

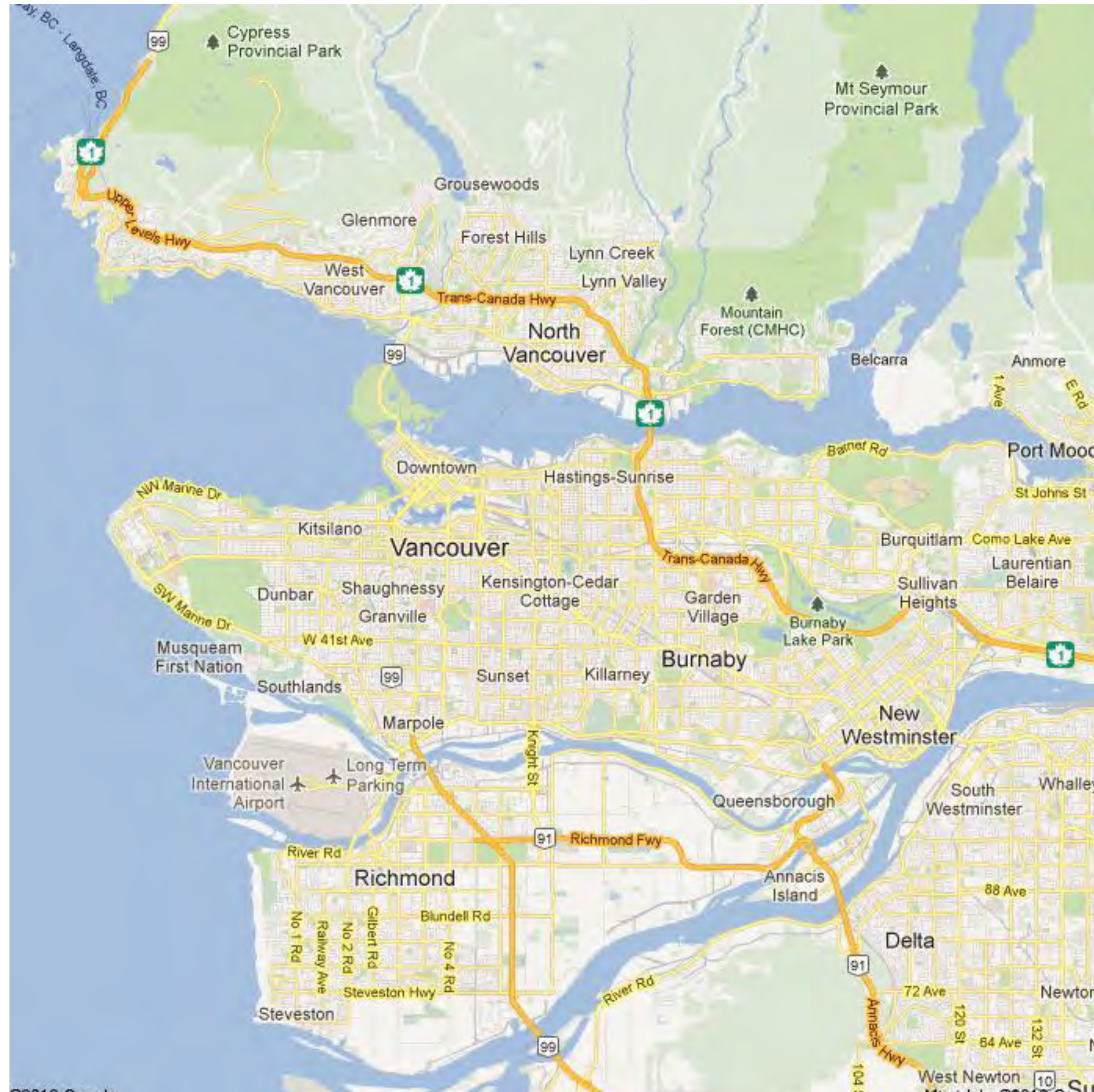
Vermicomposting in Campus Kitchen Operations

A UBC SEEDS Project

By: Emme Lee
BSc. Global Resource Systems '13
Faculty of Land and Food Systems

UBC, Vancouver, Canada

- •48 000 students
- •14 000 employed
- •Small city



UBC SEEDS Program

→ Campus & Community Planning

→ Campus Sustainability

→ Campus as a Living Lab

→SEEDS: Social Ecological Economic Development Studies

OVERVIEW

- FOOD WASTE CONTEXT
- VERMICOMPOSTING
- OUR PROJECT
- OUR LEARNINGS
- POTENTIAL FOR FUTURE PROJECTS

FOOD WASTE PROBLEM

- People
- Planet
- Profit

FOOD WASTE PROBLEM

Food waste
in Canada

$27 Billion/Year

FOOD WASTE PROBLEM

Food waste in Canada > Total GDP of world's 32 poorest countries

$27 Billion/Year

# of malnourished (world): 860 M

FOOD WASTE PROBLEM

Food waste in Canada > Total GDP of world's 32 poorest countries

$27 Billion/Yr (Canada)

$165.6 Billion/Yr (USA)

FOOD WASTE PROBLEM

- Consumer & Retail 70%

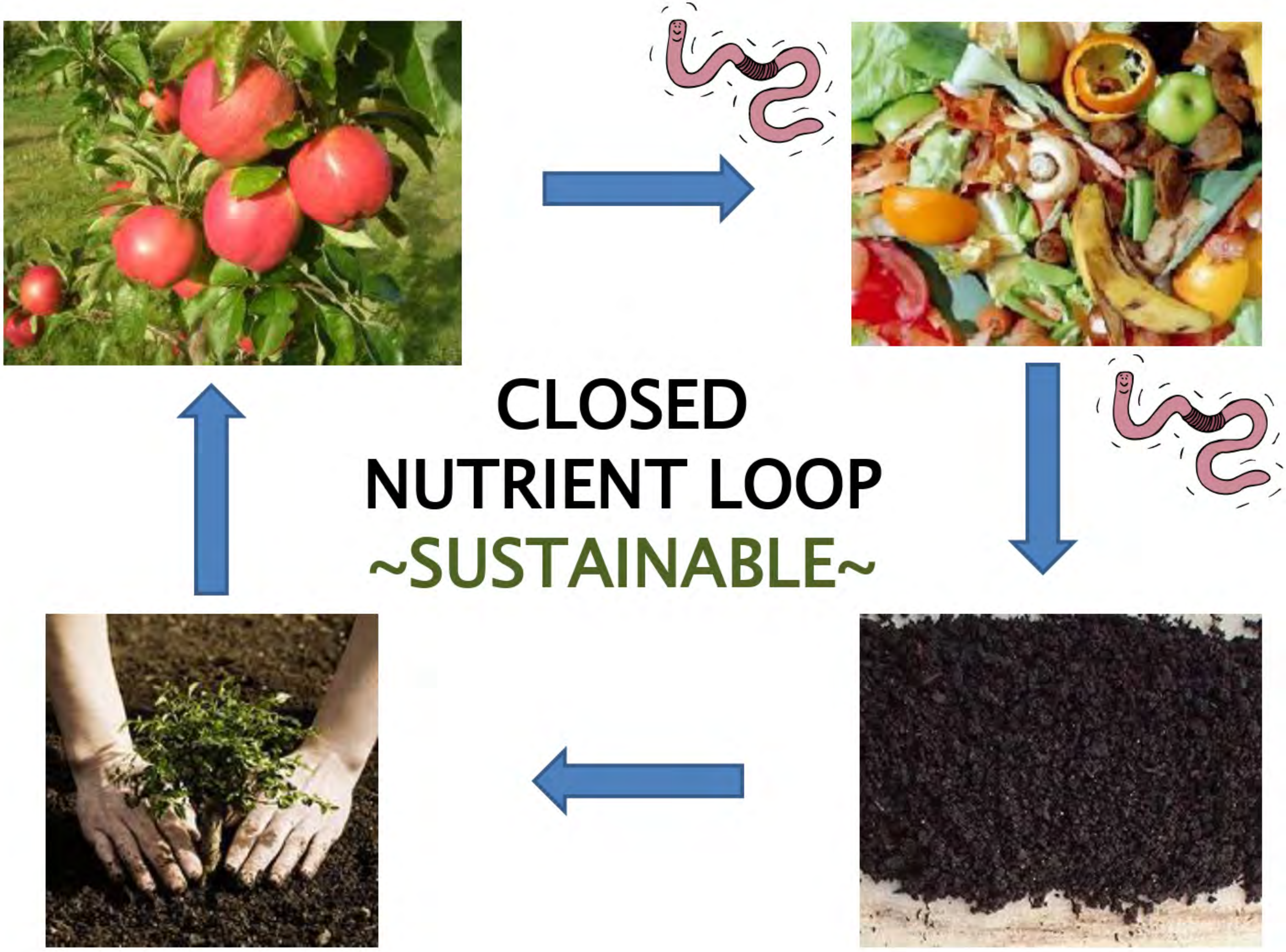
- Field 9%
- Processing 18%
- Transport 3%

$27 B/Yr (Ca)

$165 B/Yr (USA)

Vermicomposting

Using worms to break down organic waste into recycled nutrient sources for plants


CLOSED
NUTRIENT LOOP
~SUSTAINABLE~

IMPROVES SOIL & PLANT GROWTH

IMPROVES

Aeration

Porosity

Drainage

PREVENTS

Compaction

Erosion

Nutrient leaching

INCREASES

Permeability

H_2O retention

Nutrient availability

Cation exchange capacity

Organic content

Humus

ACTS AS

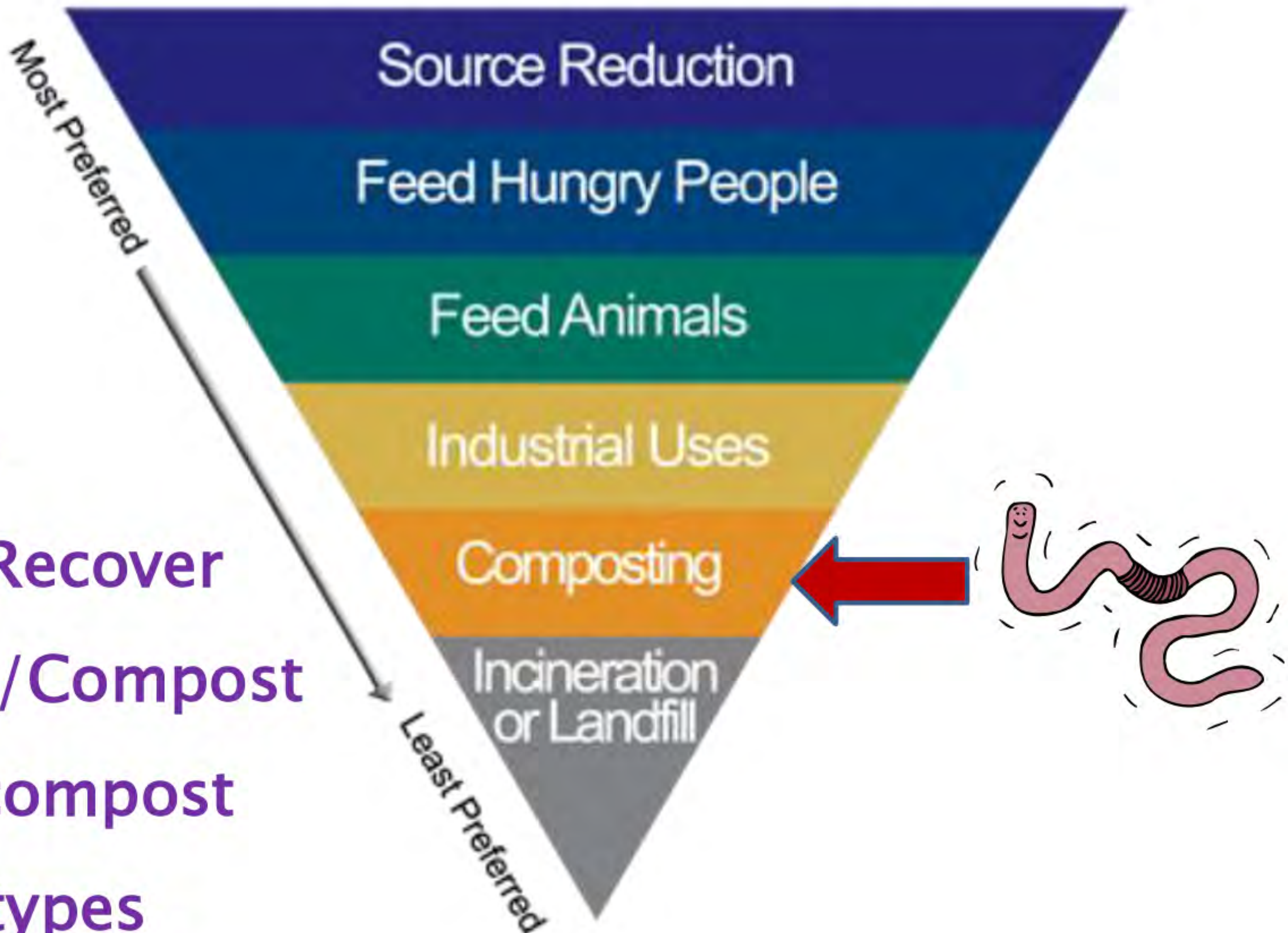
Nutrient recycler

Soil conditioner

REQUIREMENTS

- Temp. (15–20°C)
- Acidity (pH 6.8–7.5)
- Moisture (60–90%)
- Aeration (O_2 present)
- Carbon: Nitrogen (25:1)
- Avoid: meat, dairy, oil, salt, dressings, sauces

Food Recovery Hierarchy



1) Reduce

2) Reuse/Recover

3) Recycle/Compost

- Vermicompost
- Other types

START SMALL

SMALL

→

MEDIUM

→

LARGE

Student Union Building (SUB)

CURRENT SUB

- Busy, Central
- Food & beverages
- Services

NEW SUB

- Increased capacity
- More food outlets
- More food waste

AUDIT – WASTE STREAM

Where does waste produced by SUB operations end up??

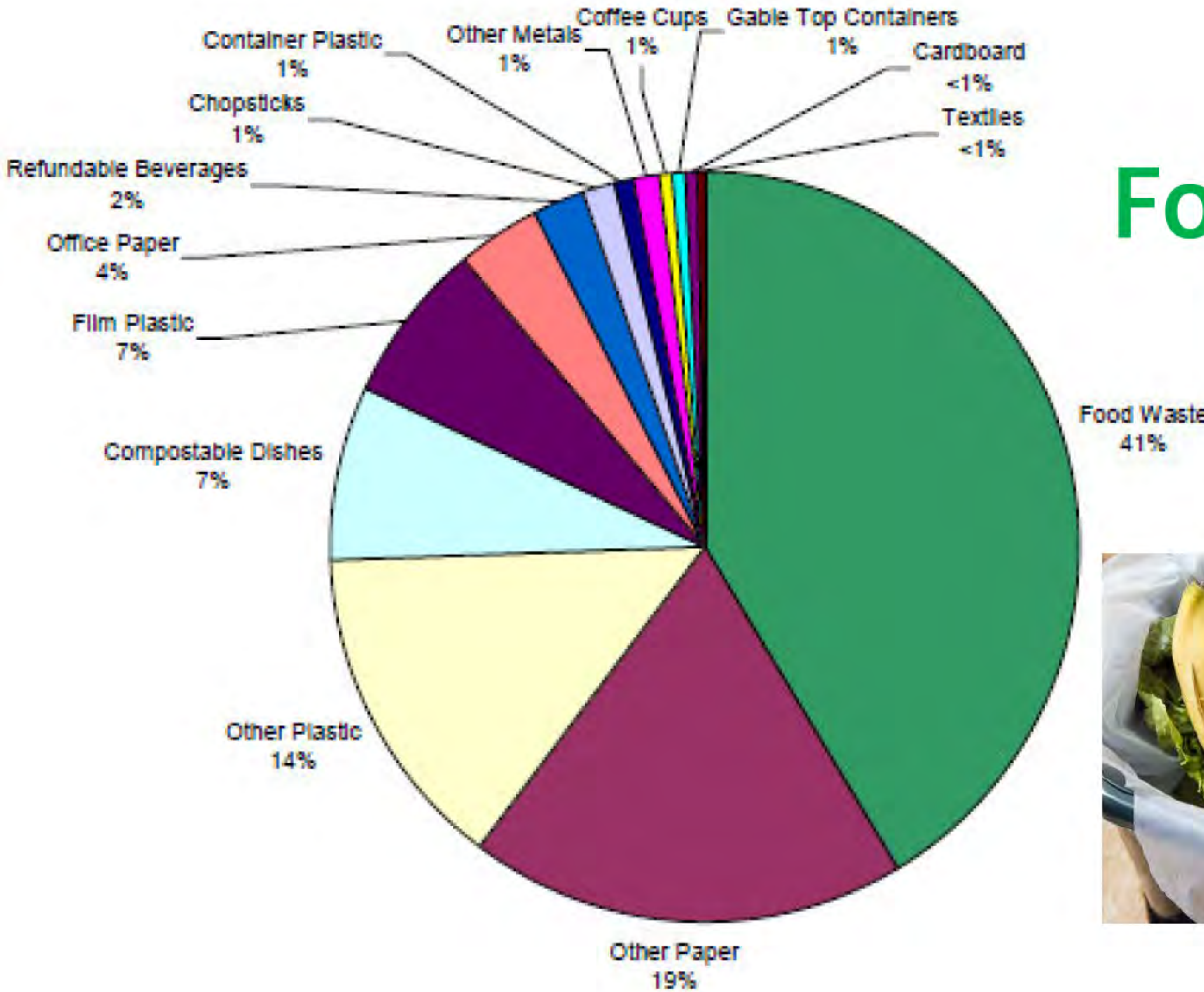
(Based on AMS Waste Audit and Waste Management Plan, 2010)

25% is recycled

26% is composted at South Campus (in-vessel unit)

49% goes to the Landfill (88 000 kg/year)

AUDIT – WASTE STREAM

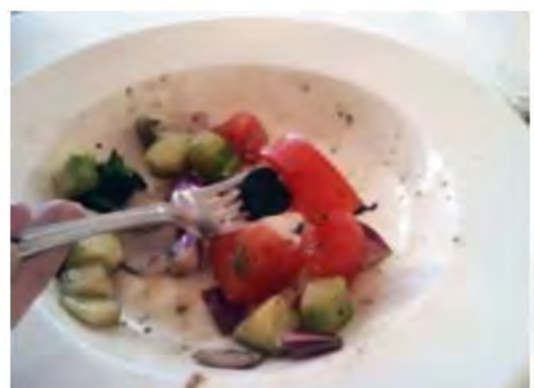


Food Waste 41%

AUDIT – WASTE STREAM

Pre–consumer

Post–consumer



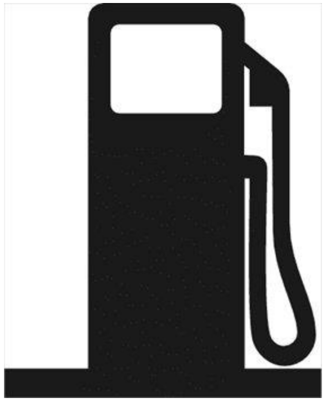
FOOD WASTE AT UBC

FIGURE 5. COMPOST BIN LOCATIONS ON CAMPUS. Source: ttp://www.batchgeo.com/map/?i=21511c87ab7bc9e1204112bab61d5eda

COST IN–VESSEL

IN-VESSEL

TIPPING FEES
$0.378/kg
Purchase + Operational
Running at cost-recovery?



COST IN–VESSEL

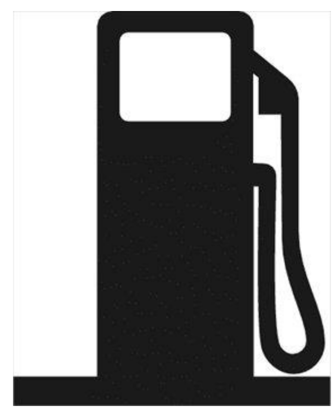
IN-VESSEL

TIPPING FEES

$0.378/kg

Purchase + Operational

Running at cost-recovery?



COST LANDFILL

LANDFILL

LANDFILL FEES

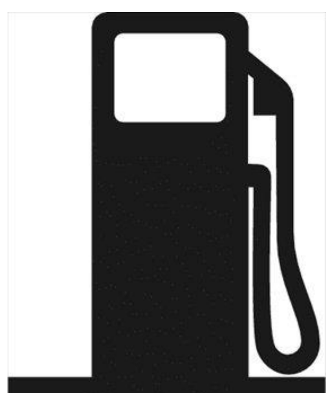
$107/T → $182/T

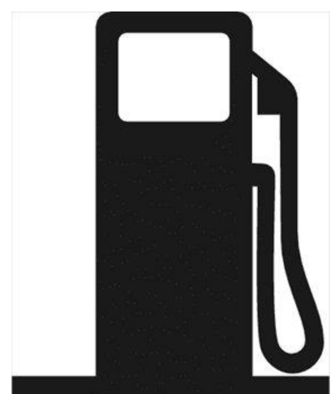
TIPPING FEES

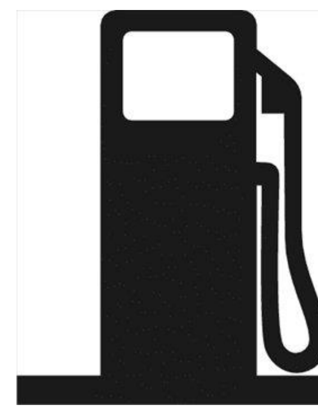
$0.107/kg

UBC must pay

Operational







COST LANDFILL

LANDFILL

Greenhouse gases from:

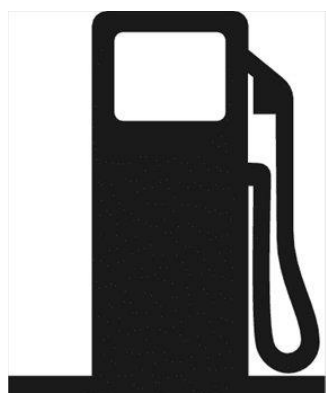
1) Vehicles
2) Landfill gas (CH_4 CO_2)

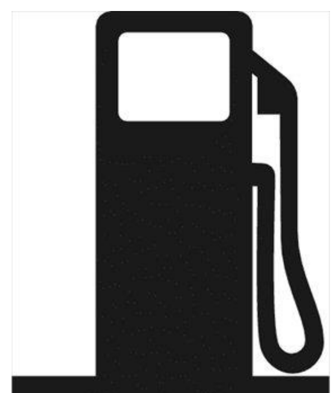
TIPPING FEES

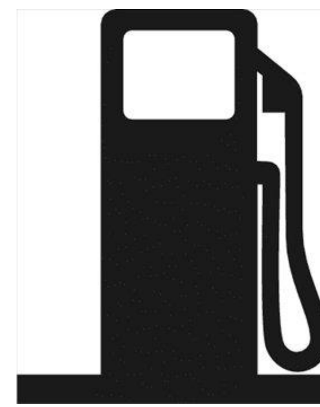
\$0.107/kg

UBC must pay

Operational







LANDFILL GAS

FOOD WASTE

LANDFILL GAS

METHANE HAS 23X MORE GLOBAL WARMING POTENTIAL

CONTRIBUTION FROM LANDFILL TO CANADA'S TOTAL METHANE: 38%

REVIEW USING 3-Ps

- ❑People
- ❑Planet
- ❑Profit

REVIEW OPTIONS

IN-VESSEL	LANDFILL	WORMS
PEOPLE:	**PEOPLE:**	**PEOPLE:**
• O/S O/M X	• O/S O/M X	• Engaging √
• Green jobs √	• Green jobs X	• Green jobs √
PLANET:	**PLANET:**	**PLANET:**
• All food, C √	• All food, C X	• Pre-C, C/paper ok
• Recycles √	• Recycles X	• Recycles √
• Compost ok	• Compost X	• Compost √
• Overall √	• Overall X	• Overall √√
PROFIT:	**PROFIT:**	**PROFIT:**
• Higher cost X	• Rising cost X	• Lower cost √
• Cost-recovery ?	• Cost-recovery ?	• Cost-recovery ?
$0.378/kg	$0.107/kg ↑	$0.143/kg

COST WORM COMPOSTING

WORM COMPOSTING

Purchase:	$16 621
Operations:	$71 760
C/Yr:	$ 8 838

Assume: 10 year lifespan, and student wage rate

$0.143/kg

LANDFILL: $0.107/kg

IN-VESSEL:$0.378/kg

MAJOR STEPS

- Small bin → Medium bin
  → Large/Institutional
- New support (staff, managers)
- Created 1 green job
- Student, staff, faculty engagement, learning

CURRENT STEPS

<u>Business plan</u>

- Financial feasibility
- Profit or cost-recovery

<u>Testing</u>

- Production/diversion
- Quality

<u>Literacy</u>

- Writers, videography

- ❑ People
- ❑ Planet
- ❑ Profit

SUMMARY

- Worm composting in kitchen operations
- Small → Medium → Large
- Environmental benefits
- Supplement in-vessel as waste mgmt option
- Minimizes landfill disposal
- Engages people
- Creates high-quality, valuable product
- Reduces costs

SPECIAL THANKS TO:

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AMS Catering staff, Bryan Goodman
UBC Chemical Engineering, Kevin Reilly
Undergraduate (Phase I), Hillary Topps
Earthworks Composting, Robert Crofton-Sleigh
UBC Building Ops. Sindi Sohi, Darren Duff
AMS Facilities Management, Jeffrey Smith
AMS Food and Beverage, Nancy Toogood
UBC Wood Science, Vincent Leung

Unless someone like you
cares a whole awful lot,
nothing is going to get better.
It's not. ~ Dr. Seuss ~

On-site Composting of Food Waste in the NEW SUB

a place of mind

THE UNIVERSITY OF BRITISH COLUMBIA

WHY WE SHOULD COMPOST

- Ecological Benefits
  - Less GHGs, landfill gas, driving
  - Better quality compost
  - Less fertilizer
- Volume Reduction
- Affordable
- Sustainable
  - Opportunities (leadership, cost-recovery)
  - Community Engagement
- Feasible
- Policy

SEEDS Project in 2011

Feasibility of Worm Composting in the AMS Prep Kitchen

Challenges, Benefits, Logistics

COSTS LESS MONEY

WORMS

$0.143/kg

IN-VESSEL

$0.505/kg

LANDFILL

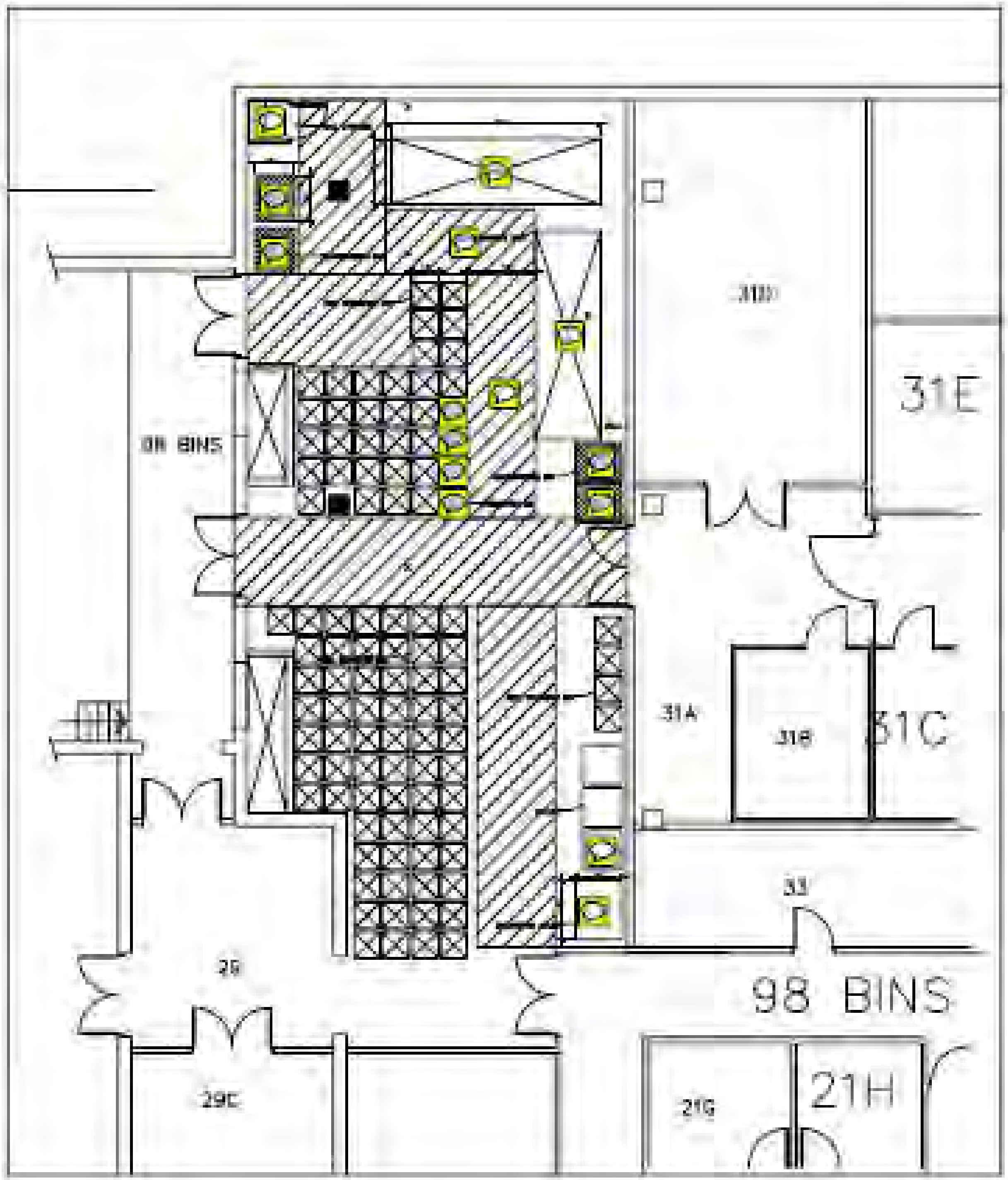
$0.205/kg

NEW SUB APPROVAL in 2012 for TWO LARGE WORM BINS

- Upfront Capital Cost: $17 000
- COST: $8 838.10/year (includes labour)

INSTITUTIONAL SIZE BIN

TWO 1.5m X 5m



Yellow = space already reserved for worm composting

RECOMMENDATION

COMPOST ALL FOOD WASTE

ON-SITE MACHINE

ALL FOOD TYPES

ON-SITE WORMS

FINISHING

WHY ON-SITE? Drivers for Small-Scale

(Blakeway, 2013)

- ❑Less GHGs
- ❑Connects to Local Food
- ❑Educational Value
- ❑Engagement Opportunities
- ❑Diversity of Systems
- ❑Quality Control
- ❑Re-sale Value
- ❑Green Economy/Jobs
- ❑Shift in Culture

HOW DOES IT WORK?

- Automated, programmable systems
- Temperature, moisture, heating
- Indoors/outdoors
- Small footprint, volume reduction
- Carbon sources vary
- Odour control (vents, biofilters)
- Require care
- All wastes accepted
- Contamination

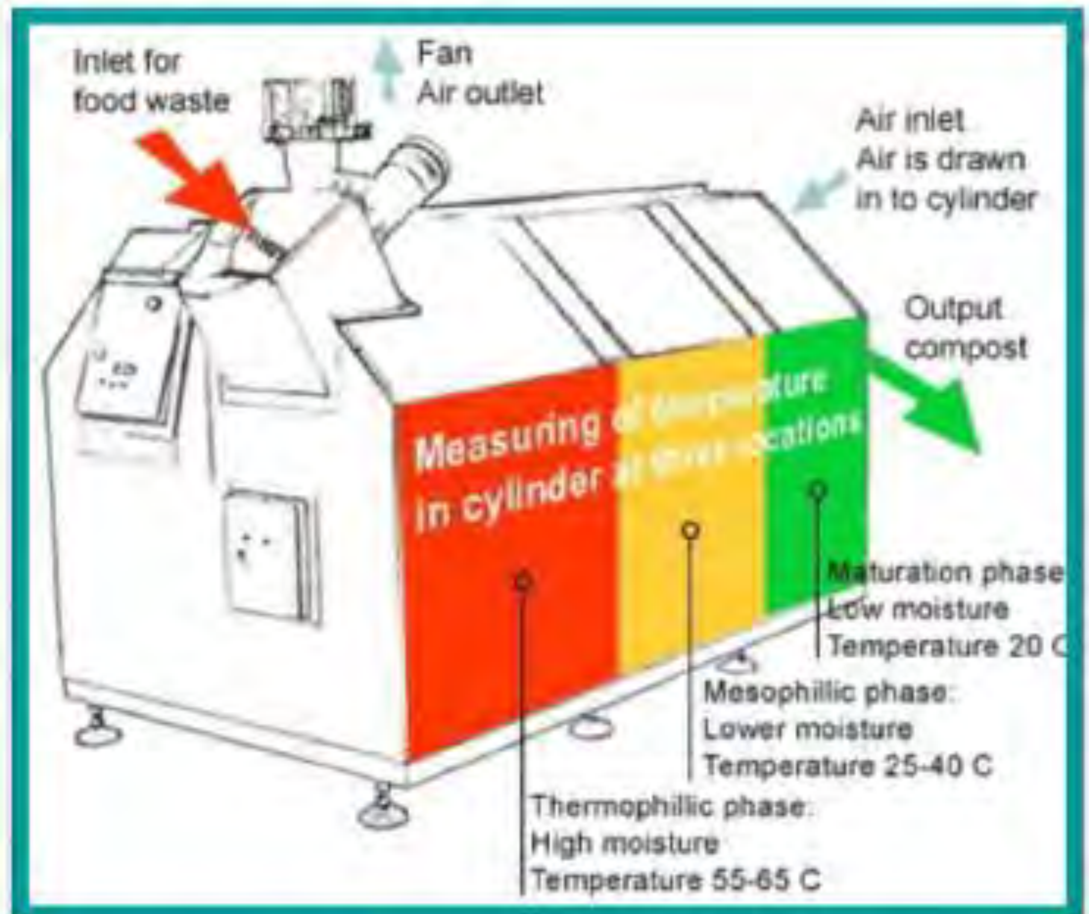


Image courtesy of http://www.vertal.ca/

Criteria for On-Site Machine

- ❑ **Environmental Effectiveness**
- ❑ **Cost-Effective**
- ❑ **Proven technology**
- ❑ **Feasible**
  - ❑ **Footprint**
  - ❑ **Hook-ups (electrical, venting)**
- ❑ **High Quality Product**

- ❑ Connects to Local Food
- ❑ Educational Value
- ❑ Engagement Opportunities
- ❑ Green Economy/Jobs
- ❑ Shift in Culture

Preliminary Tech Review

Tech Unit	Capacity	Cost	Size	Time	Energy Cost	Add'l Notes
Eco Hero 350 (UK)	55T/yr 150kg/day	$40 000	L: 2.5m W: 1.5m H: 1.8m	Mgmt: 30 minutes per week		Has shredder No paper coats/crdbrd Fertilizer pellets
Rocket A900 Dewaterer	46T/yr	$46 000 $15 000	L: 4.0m W: 1.0m H: 1.6m	Processing: 14 days Curing: 30 days	$175/yr	Data Logger Software Ventilation Finished Compost
Green Good 50 (S Korea)	40-50T/yr 110-137 kg/day	$38 000 * Lifespan 10-15 years	L: 1.87m W: 1.0m H: 1.3m	Mgmt: 30 minutes per week		Has deodorizer
Big Hanna T240 (Sweden) Biofilter Bin Lifter Dewaterer	42-122T/yr	$80 000 *Lifespan 20 years $3 400 $11 000 $20 000	L: 5.3m W: 1.4m H: 1.8m	Mgmt: 30 minutes per week Processing: 8-10 weeks Curing 2-3	$52/yr	Finished Compost
Biovator 430 (Manitoba, Canada)	116T/yr	$83 000	L: 12.65m W: 1.22m H: 1.5,	30 minutes per week		


7. 10. 2010

- Mendeley, zoterro (firefox), pages, evernote