# Understanding On-site Food Waste Reduction Technologies: Commercial Dehydrators and Liquefiers




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Joe Rasmussen, Ed.D.
LEED AP BD+C
Environmental Scientist
CalRecycle

# Overview

- Food Waste Dehydrators and Liquefiers
  - Technology Descriptions
  - Technology Examples
  - Case Studies
  - Claims Made by Vendors
  - Places Within the Food Cycle
- Food Recovery Hierarchy
- Conclusions and Implications


**Above: Non-hazardous waste management hierarchy, U.S. EPA: http://www.epa.gov/waste/nonhaz/municipal/hierarchy.htm**

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# Food Waste Dehydrators

## Technology Description

- Water removed from heat and turning; “dry system”
- Volume & mass reduced 70-90%; batch system[10]
- Can be coupled with pulping or dewatering prior to dehydration[4]
- Residual Materials = Dehydrated Food Waste and Condensate Water
- Dehydrated Food Waste is NOT compost[1]

LOS ANGELES MISSION COLLEGE

**Left: Los Angeles Mission College, 2010.**

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# Food Waste Dehydrators

## Technology Description

Above: Dehydrated Food Waste from Loyola Marymount University, 2010.

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# Food Waste Dehydrators

## Technology Example

### Somat eCorect® DH-100w

- Capacity = 220 lbs. daily/18-hour cycle[9]
- Electricity Usage = Daily estimate - 3 kW[4]
- Temperature = Up to 180° F[9]
- Unit Cost = Approximately $32,000[4]

Right: Costco in Irvine, CA, 2008.

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# Food Waste Dehydrators

## Claims made by vendors:

- *"The end product is a material ideal for use as soil amendment."*
- *"Decomposes compostable waste without using microorganisms, enzymes or additives."*
- Condensate water is *"sterile water for landscaping or other recoverable use."*
- *"Reduces carbon footprint."*
- *"Zero environmental impact."*

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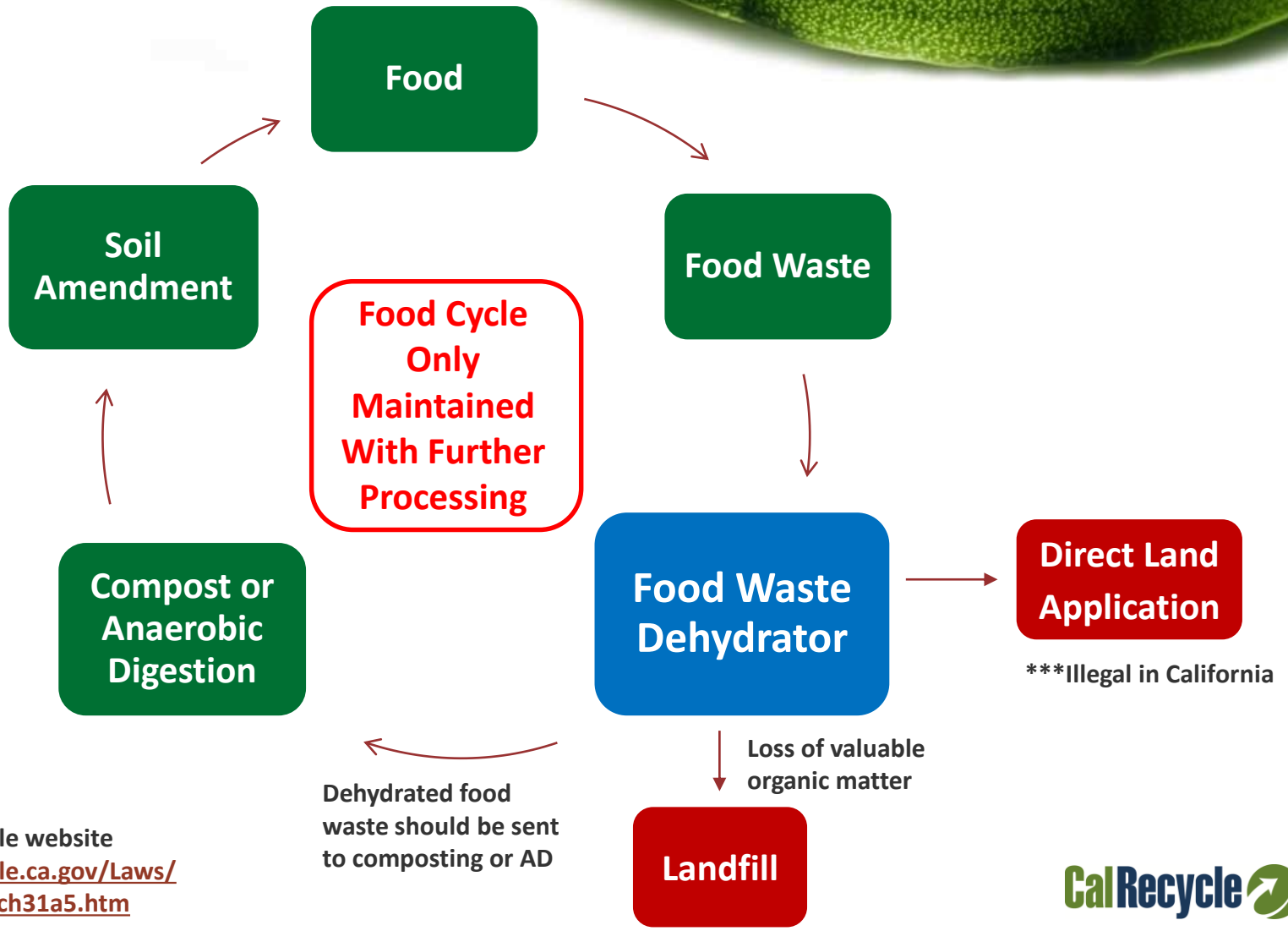
# Food Waste Dehydrators

## The Food Cycle




*** Source: CalRecycle website
http://www.calrecycle.ca.gov/Laws/Regulations/Title14/ch31a5.htm

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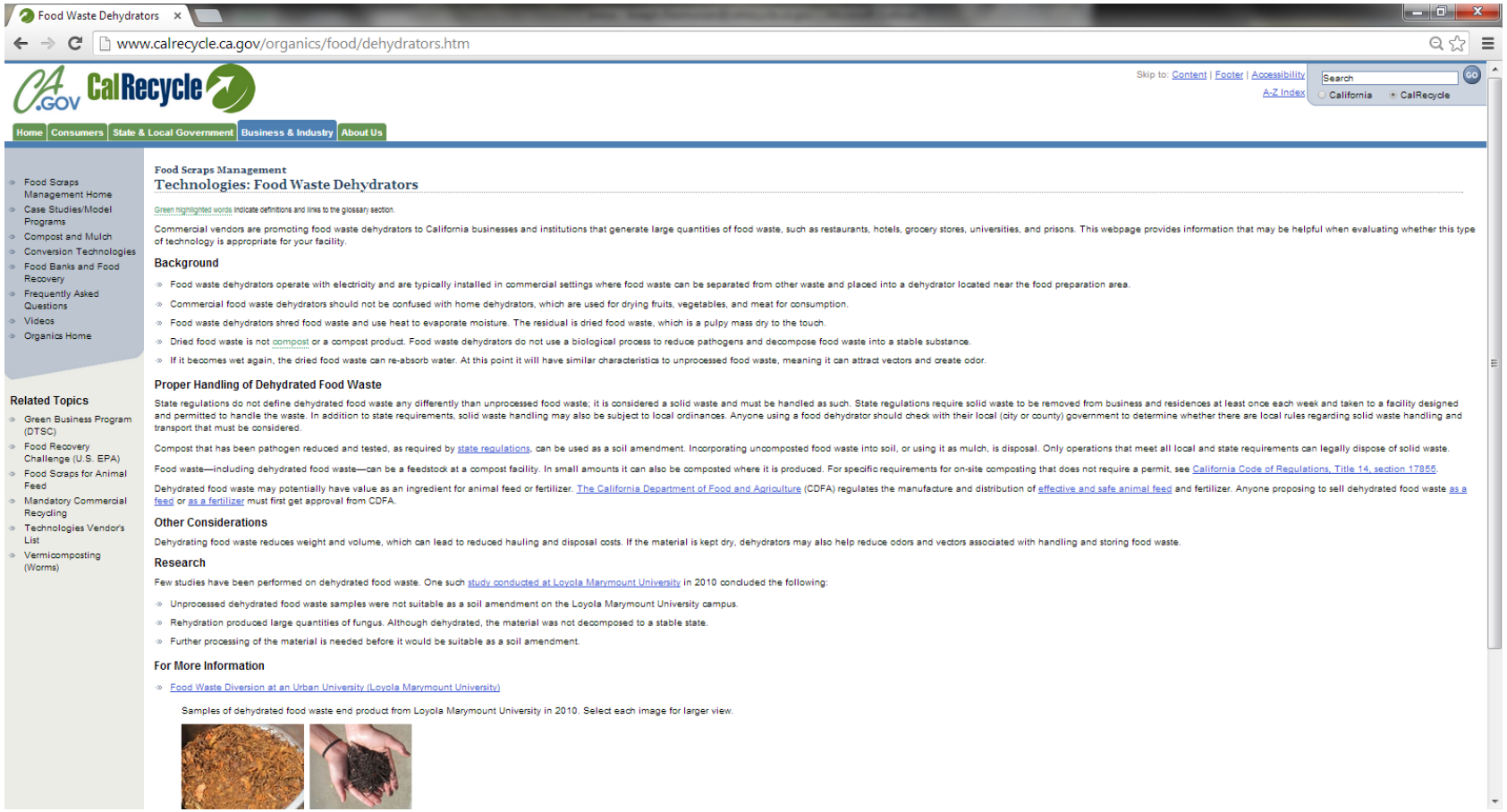
# Food Waste Dehydrators

## New CalRecycle Webpage




http://www.calrecycle.ca.gov/organics/food/dehydrators.htm

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# Food Waste Dehydrators

## California State Regulation

- Dehydrated food waste is food waste.

- Land application of food waste is disposal.

**Title 14, Section 17852 (a)(15)(C)**

http://www.calrecycle.ca.gov/Laws/Regulations/Title14/ch31.htm

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# Food Waste Dehydrators

Case Study:

**California State Teachers Retirement System (CalSTRS)**

**West Sacramento, CA**

- 13-story building, completed in 2009
- 490,000 sq. ft. of office space
- 2 LEED certifications:
  - Gold - LEED BD+C: New Construction v2.1 (2009)
  - Platinum - LEED O+M: Existing Buildings v2009 (2011)
- Request for LEED Innovation in Design credit for dehydrator was reportedly denied by USGBC

**Above: CalSTRS Building, West Sacramento, CA, 2014.**

CALSTRS

U.S. GREEN BUILDING COUNCIL

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# Food Waste Dehydrators

## Case Study:
## **CalSTRS Building**
## **West Sacramento, CA**

- Somat eCorect® food waste dehydrator
- Leased from WM, Inc. (2009 – 2014)
- Feedstock: **Pre-consumer** food waste
  - **Post-consumer** food waste also diverted, but not put through dehydrator
- Did not attempt to use dehydrated food waste as a soil amendment

**Above: Food Waste Dehydrator at CalSTRS building in West Sacramento, CA.**

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# Food Waste Dehydrators

Case Study:

**CalSTRS Building**

**West Sacramento, CA**

Monthly food waste generation:

- 45 cy = post-consumer (sent directly to composting)
- 2 cy = pre-consumer (dehydrated, then composted)
- Both sent to Northern Recycling Compost - Zamora

**Left: Compost windrow at Northern Recycling Compost – Zamora.**

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# Food Waste Dehydrators

Example:
**CalSTRS Building**
**West Sacramento, CA**

- Dehydrator needed frequent mechanical repairs
- CalSTRS ended dehydrator lease in 2014
- All food waste diverted now hauled to the Clean World Sacramento Anaerobic Digester

CleanWorld
*Alive with possibilities*

**Left: Clean World Sacramento Digester, West Sacramento, CA, 2014.**

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# Food Waste Liquefiers

## Technology Description

- Converts food waste into wastewater effluent; "wet system"[4]
- Mechanical turning; continuous feed system
- Potable water continually added; hundreds of gallons/day
- Plastic chips sometimes used; microbe habitat and to aid turning
- Proprietary microbes and/or enzymes may need to be added
- Wastewater effluent byproduct sent to sewer system[3]

FUJITSU

**Left: Power Knot LFC-70 liquefier at the Fujitsu campus in Sunnyvale, CA. Photo credit: BioCycle, 2014.**

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# Food Waste Liquefiers

## Technology Example

### ORCA Green™ Machine Model OG600

- Capacity: 600 lbs. (every 1 – 2 days)
- Electricity Usage: 0.37 kw[4]
- Unit cost: Rental only - $1,000 - $2,000/month[4]
- Food waste processed in 24 – 48 hours
- Water Usage
  - Uses approx. 175 gallons/day[7]
  - Generates approx. 300 gallons/day[7]


Above: ORCA Totally Green unit.
http://www.totallygreen.com/

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# Food Waste Liquefiers

## Case Study:
## **Loyola Marymount University, Los Angeles, CA**

- ORCA Totally Green liquefier installed at LMU in 2011
- Used primarily for food waste from catered events
- Effluent sent to Hyperion Wastewater Treatment Plant
- ORCA liquefier was utilized for approximately 2 years
- The unit was removed in 2013 after a mechanical failure
- Replaced the ORCA with a Somat food waste dehydrator

**Left: Loyola Marymount University, Los Angeles, 2012.**

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# Food Waste Liquefiers

## Case Study: **Loyola Marymount University, Los Angeles, CA**

- LMU partnered with CSU, Northridge to study the liquefier
- CSUN Master's Thesis studied ORCA - Ms. Maryam DeHaghin
- Results: ORCA effluent much "stronger" than raw sewage
- High levels of fecal indicator bacteria (pathogen indicator)
- High levels of BOD, FOG, TSS, Nitrates and Phosphates(3)

California State University Northridge

LMU|LA Loyola Marymount University

**Left: Faculty and students in the environmental science laboratory at Loyola Marymount University, Los Angeles, 2012.**

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# Food Waste Liquefiers

## Claims made by vendors:

- *"Effluent can be re-used for irrigation and agricultural applications."*
- *"There are no by-products, this water can go down the drain or gets recycled for gardening."*
- *"The liquid compost is channeled through the sewer system or can be returned to the soil as nourishment."*


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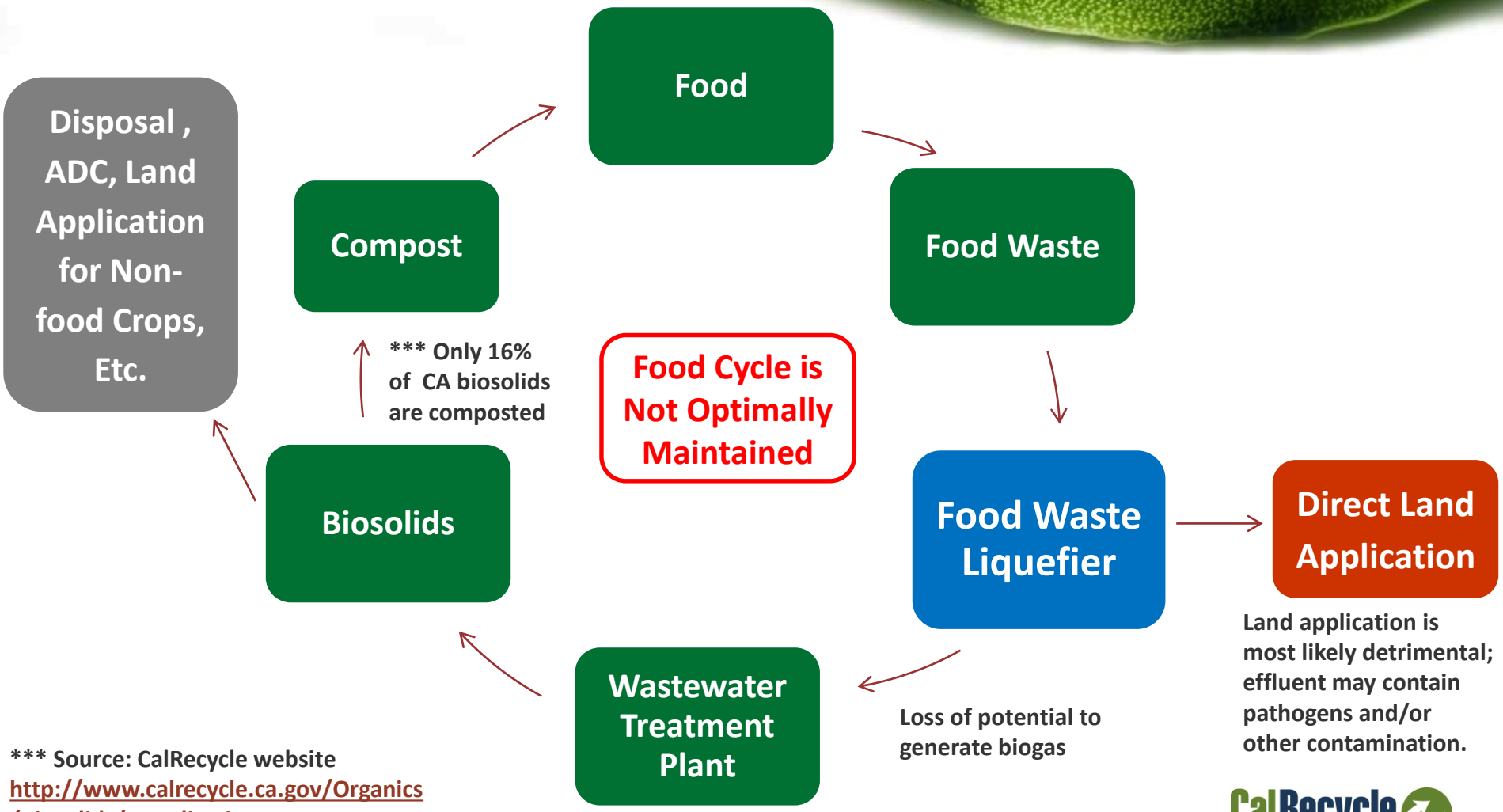
# Food Waste Liquefiers

## Food Cycle




*** Source: CalRecycle website
http://www.calrecycle.ca.gov/Organics/Biosolids/#Application

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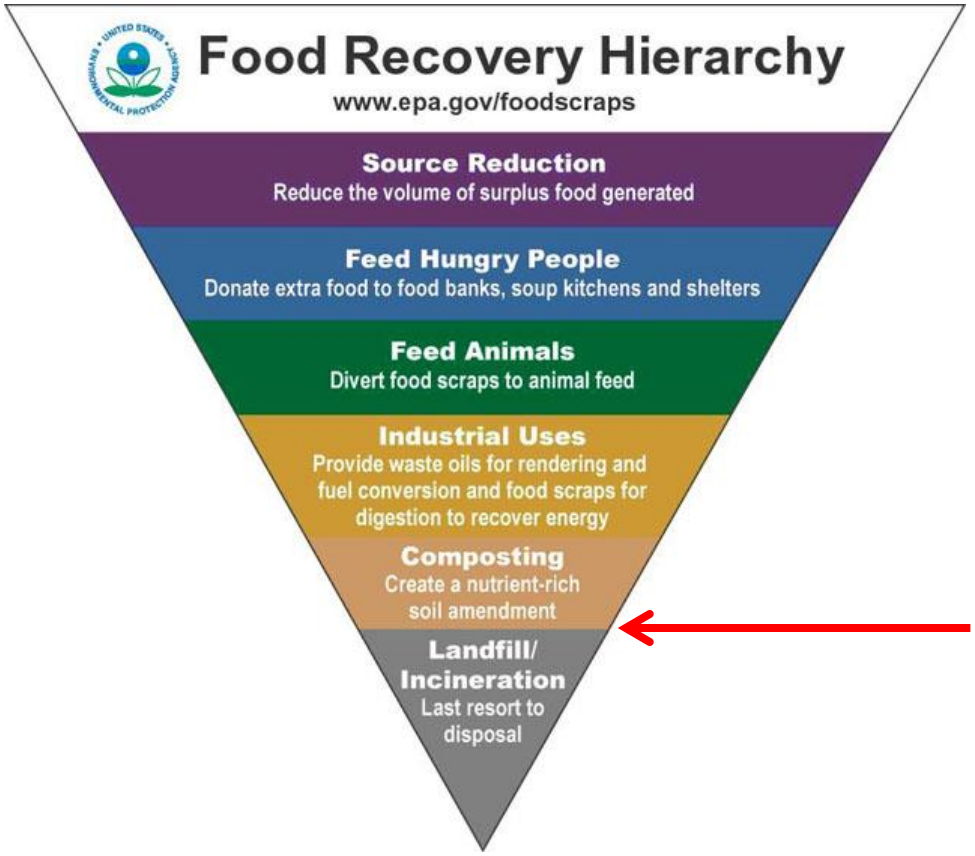
# Food Recovery Hierarchy

## Food Waste Dehydrators and Liquefiers




- Dehydrated food waste must be disposed or sent to composting and/or AD
- Liquefied food waste is sent to the sewer with little to no beneficial use
- **Without further processing, dehydration and liquefaction are low on the hierarchy**

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# Conclusions and Implications

## Understanding Food Waste Dehydrators and Liquefiers

- Not stand-alone solutions; can be a link in a chain
  - **Dehydrators:** Can be coupled with composting and/or anaerobic digestion for full beneficial use
  - **Liquefiers:** Contact local wastewater treatment authority to understand sewer discharge implications
- Conduct a cost-benefit analysis to determine suitability
- Contact known users of the technologies for testimonials
- Do your homework; read literature to keep up to date

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# References


1) Bergstrom and Rasmussen (2011) *Food Waste Diversion at Urban University*. BioCycle. Vol. 52, No. 12, p. 34.
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3) Dorsey and Rasmussen (2012) *Evaluating Food Digestion Effluent For Landscape Use*. BioCycle. Vol. 53, No. 9, p. 26.
4) Griffith-Onnen, Patten & Wong (2013) *On-Site Systems for Processing Food Waste: A Report to the Massachusetts Department of Environmental Protection*. Northeastern University, Boston, MA.
5) Neale (2013) *Analysis of Biodigesters and Dehydrators to Manage Organics On-site*. BioCycle. Vol. 54, No. 10, p. 20.
6) Neale (2014) *Biodigesters and Dehydrators – Operational Experiences*. BioCycle Vol. 55, No. 1, p. 52.
7) ORCA Totally Green sales presentation: (http://www.swrl.com/images/orca_green_machine/ORCA-Sales-Presentation.pdf)
8) ORCA Totally Green website: (http://www.totallygreen.com/)
9) Somat Company website: (http://www.somatcompany.com/uploadedFiles/Content/Products/100w_rev2-11.pdf)
10) Spencer (2008) A New Generation Of Commercial Disposers. BioCycle. Vol. 49, No. 7, p. 27


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