

Food Waste Management: Best Practices



Presented by:

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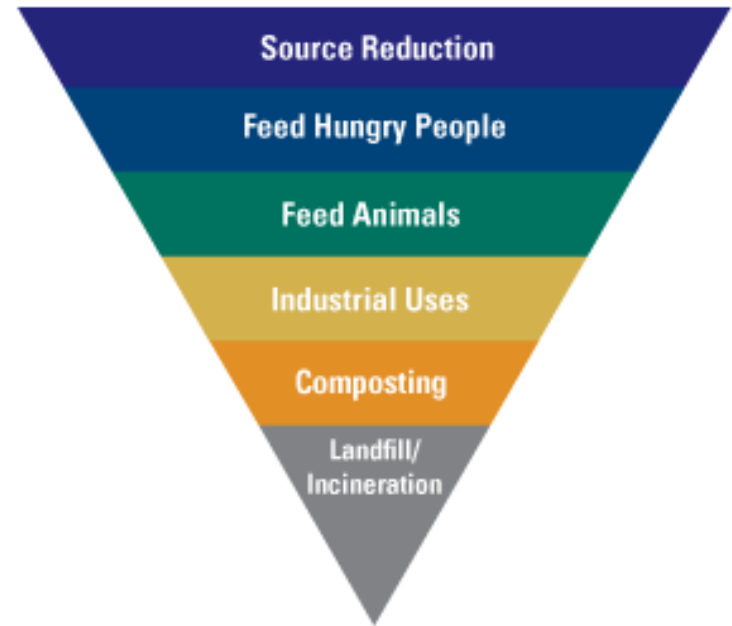
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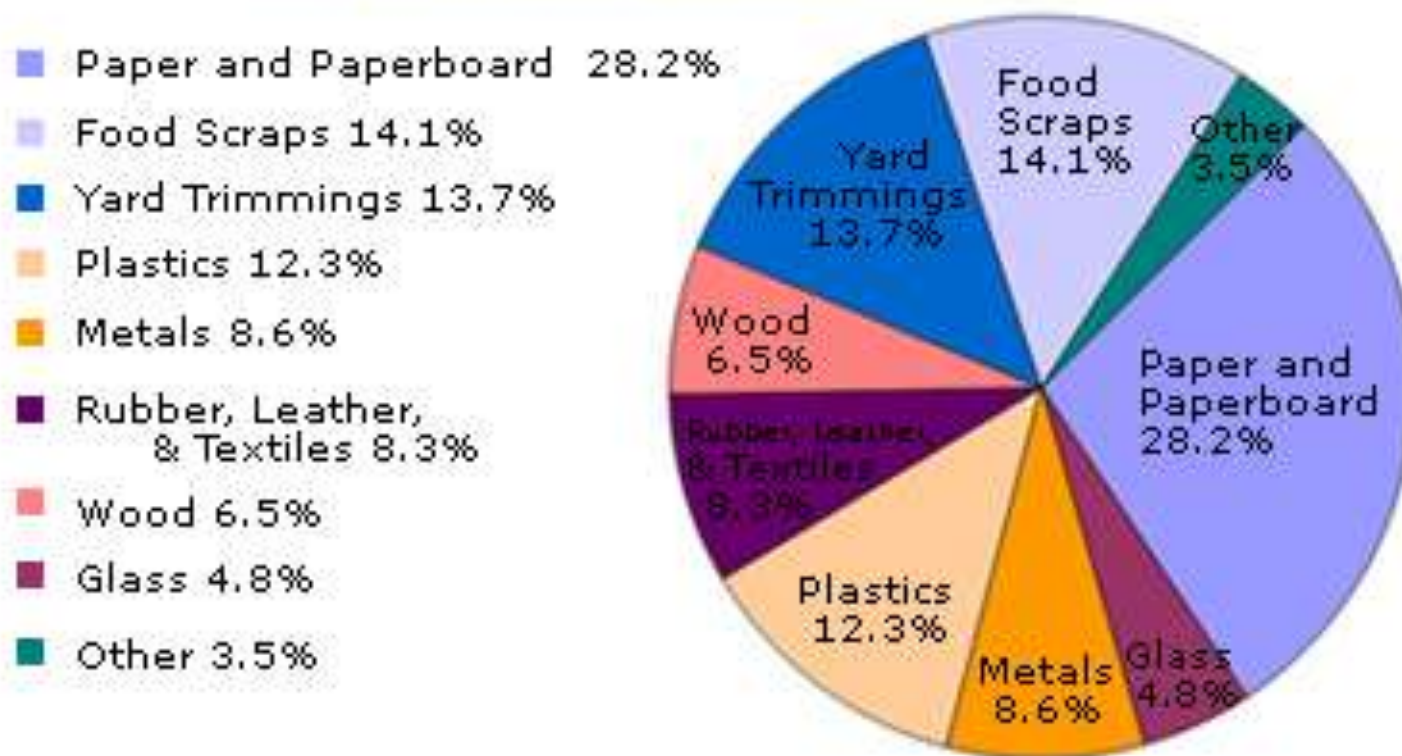
Topics

- I. Key Concepts/Stats
- II. EPA Food Waste Management Hierarchy
- III. Food Waste Prevention – Why It Ranks First
- IV. Food Waste Prevention Methods

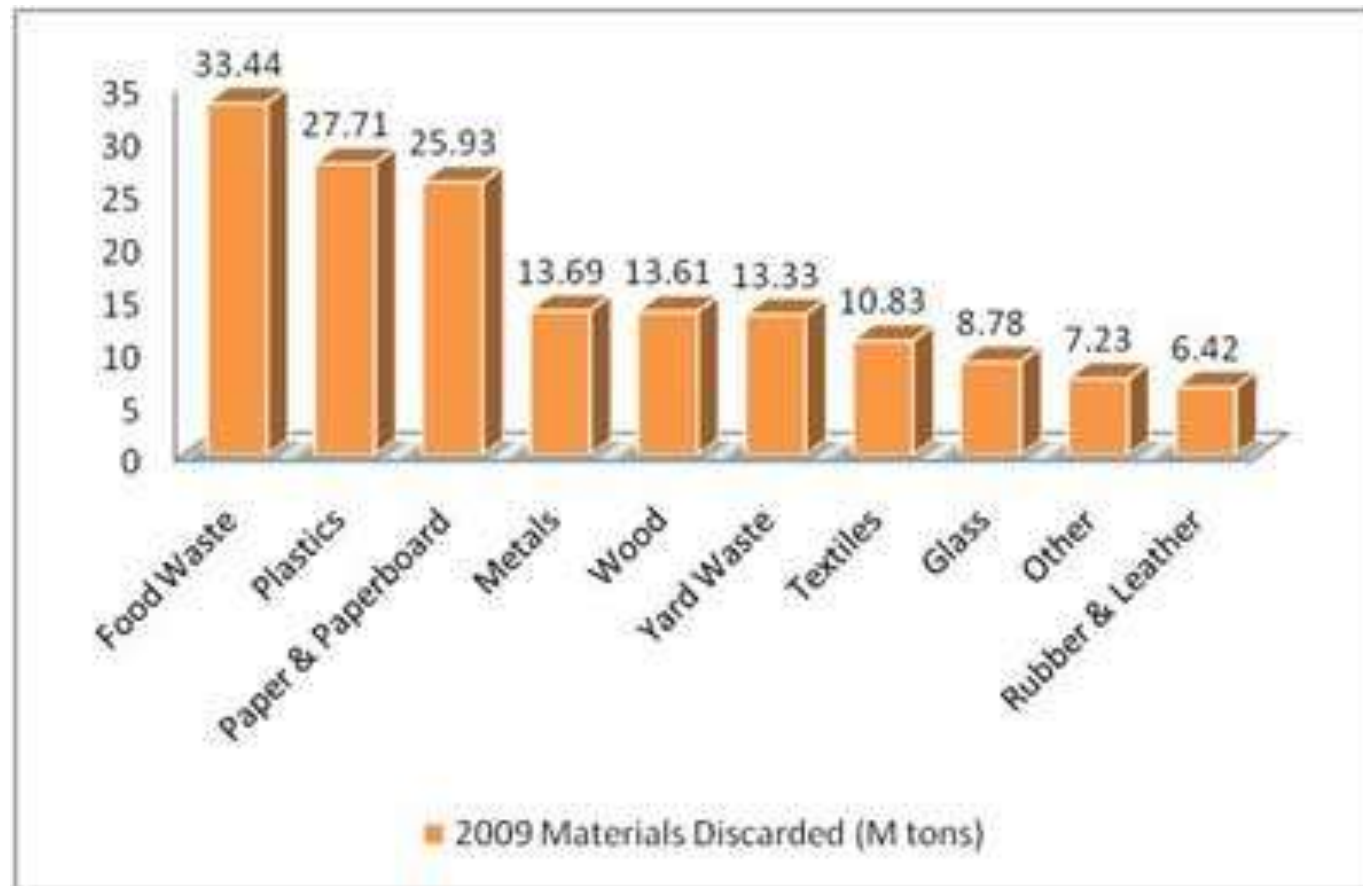


Food Waste – 14.1% of MSW

Total MSW Generation (by Material), 2009
243 Million Tons (Before Recycling)



Food Waste in Landfills



“Food waste now represents the single largest component of MSW reaching landfills and incinerators.” – U.S. EPA

Two Types of Food Waste



Pre-Consumer
Food Waste
(aka “Kitchen Waste”)



Post-Consumer
Food Waste
(aka “Plate Waste”)

Pre v. Post Dynamics

Characteristics	Pre-Consumer	Post-Consumer
Drivers	Overproduction, spoilage, expiration, trim waste, communication, adherence to forecasts/recipes	Guest awareness and behavior, portion sizes, self-service
Natural state?	Source-segregated	Commingled
Reduction leads to lower costs?	\$\$\$\$\$	\$\$
Behavior change by:	Kitchen staff	Guests

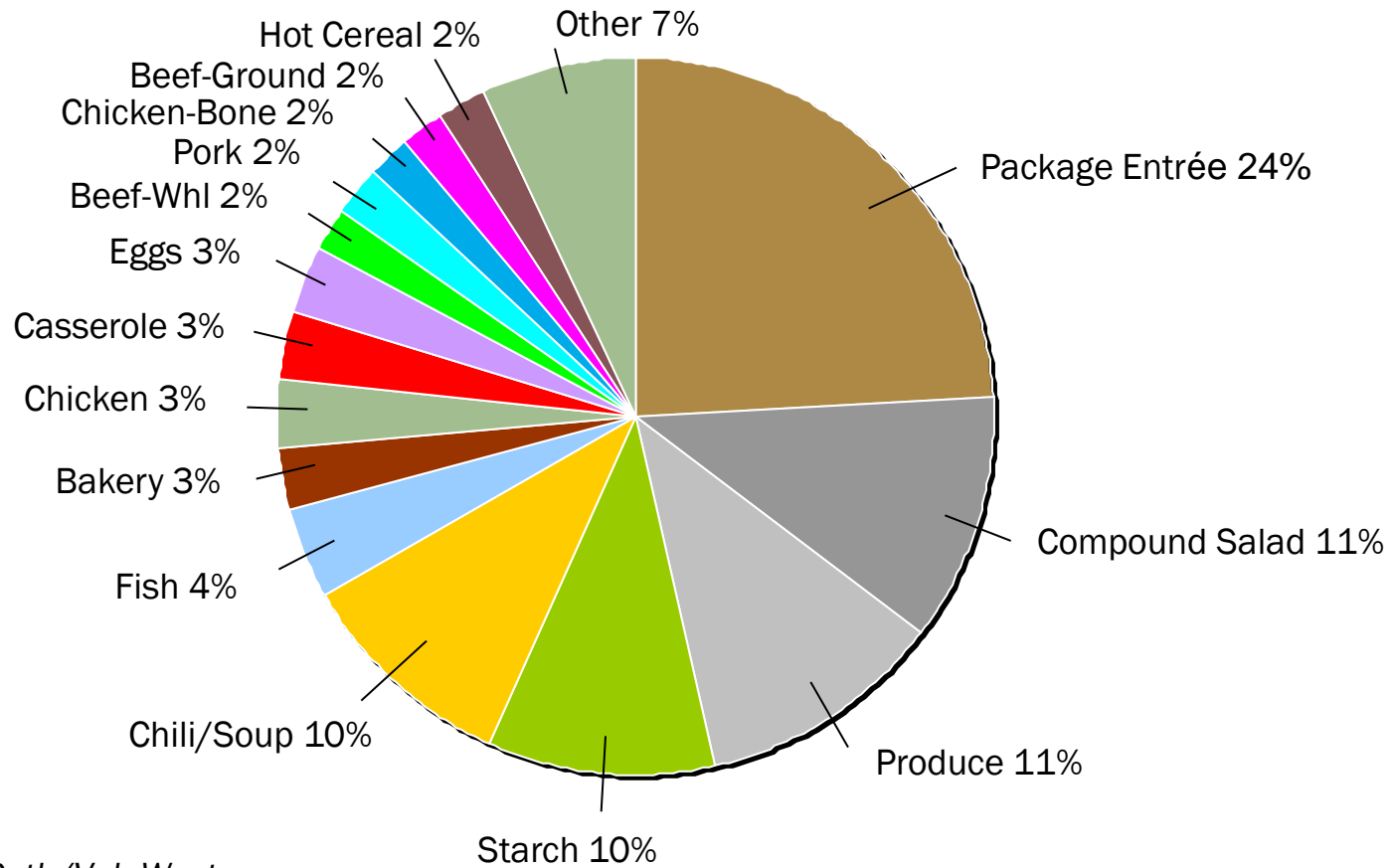
Pre-Consumer Food Waste

Name		% of FC	% without Trim
SMALL GROUP AVERAGE		10.4%	8.7%
MEDIUM GROUP AVERAGE		6.2%	5.0%
LARGE GROUP AVERAGE		4.4%	3.5%
VERY LARGE GROUP AVERAGE		3.7%	3.0%

Trim equals 15-20% of total pre-consumer waste volume

Source: *LeanPath/ValuWaste*

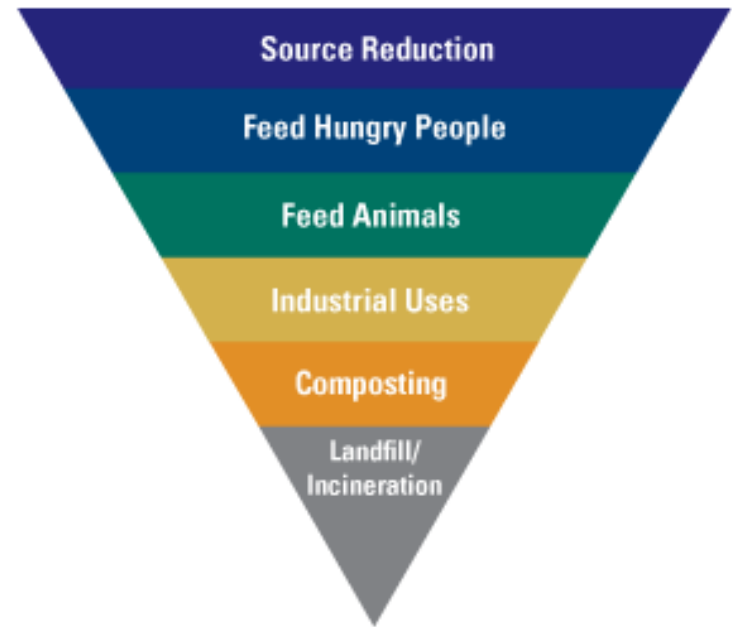
Retail Detail



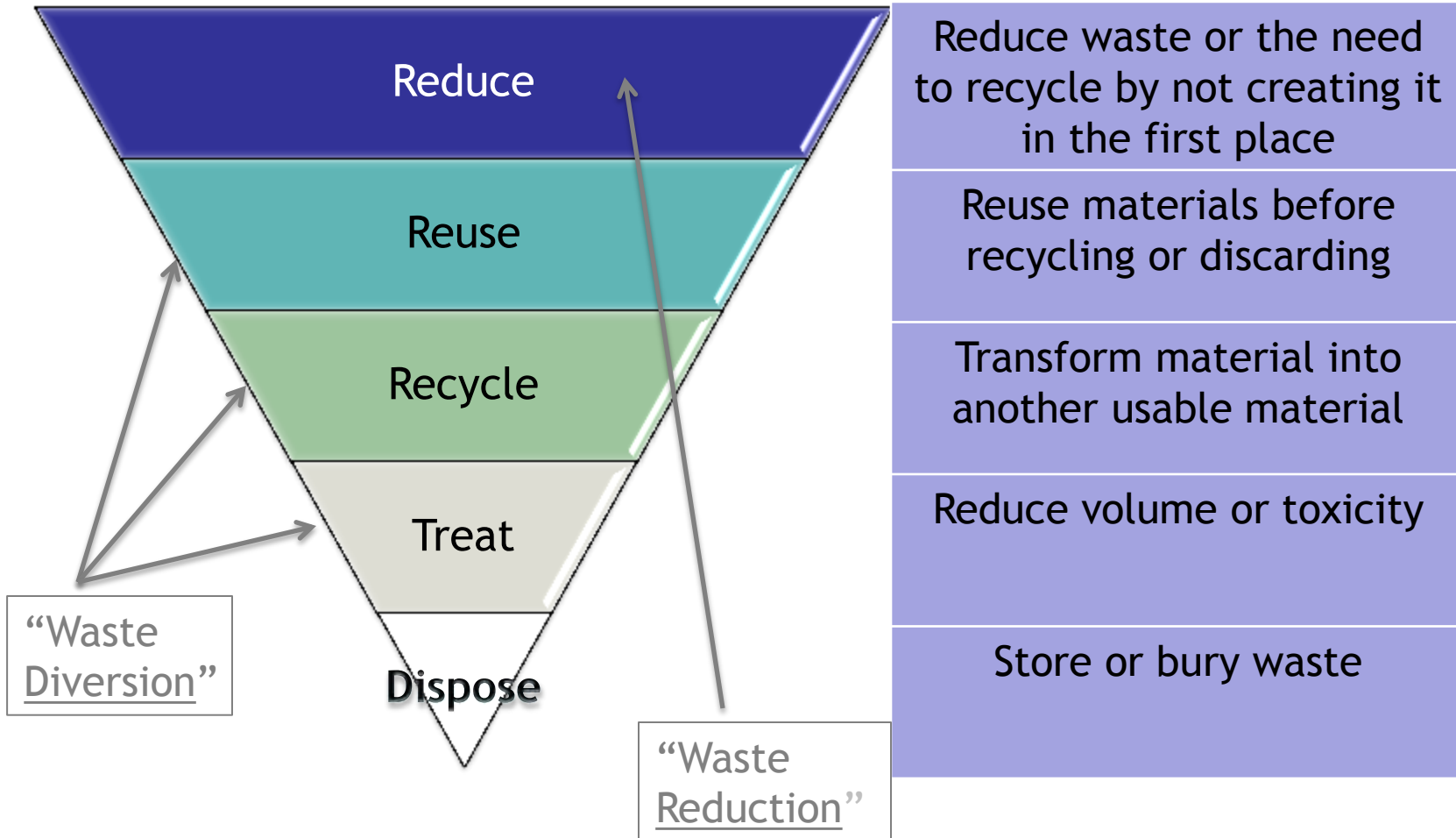
Source: LeanPath/ValuWaste

Topics

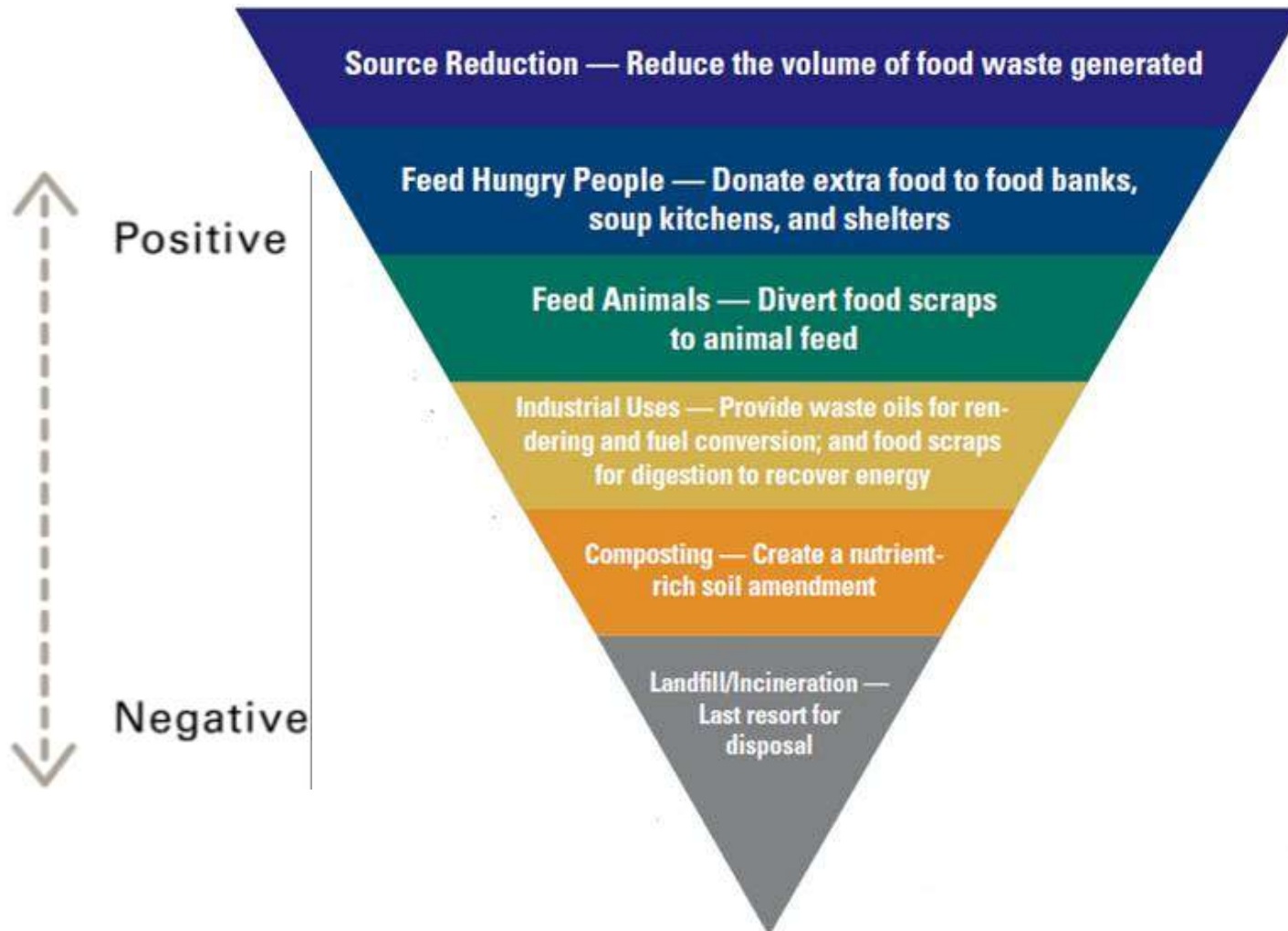
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Reduction v. Diversion



EPA Food Waste Recovery Hierarchy



Handling Hierarchy



Ultimate Goal

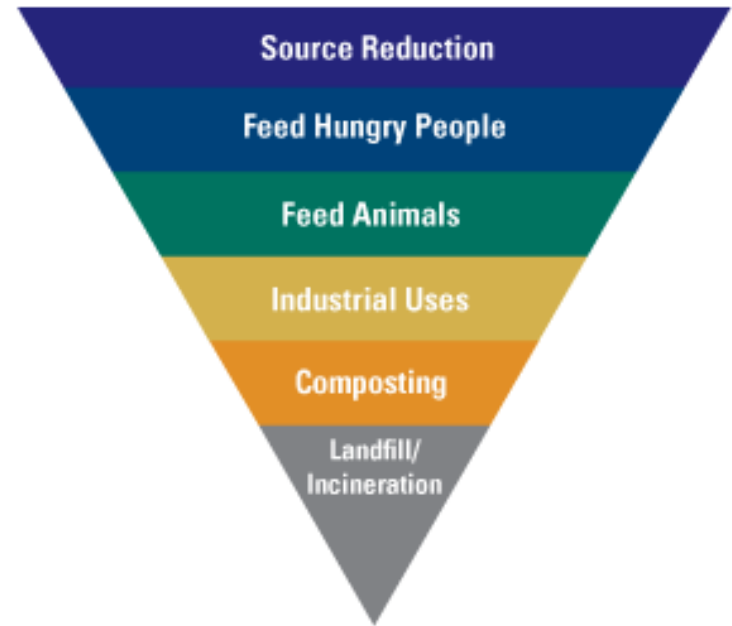
Zero Waste

What is Zero Waste?



Topics

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Why focus on prevention?

The Case For Waste Prevention

Reduce
Environmental
Impacts

Reclaim
Financial
Resources

Engage Staff

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Environmental Impact



A Wasted Sandwich



Upstream Impact – Food Waste



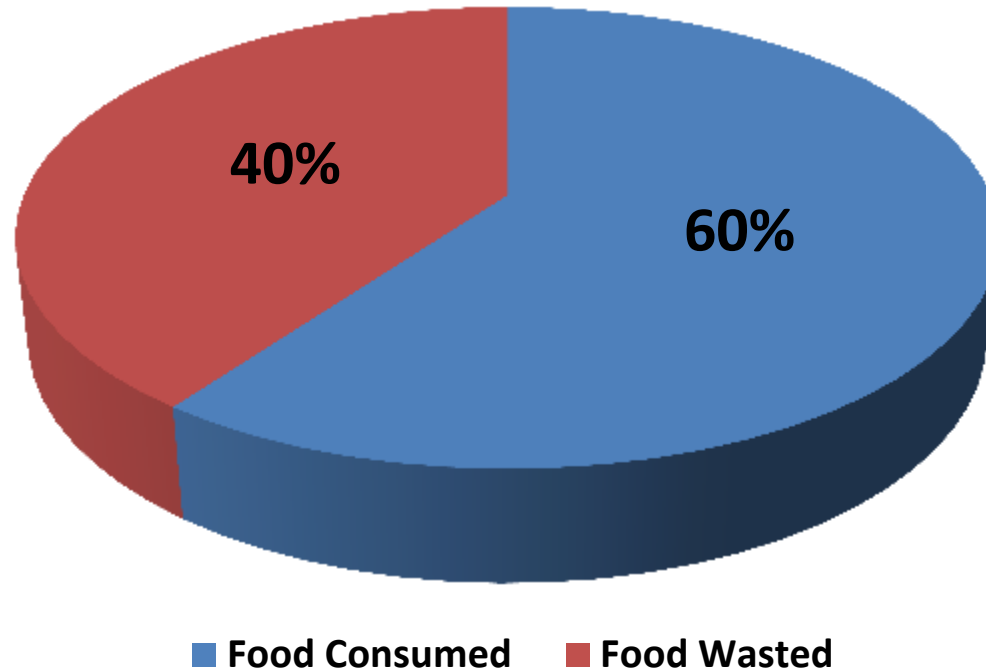
Every item we throw away includes a large amount of invisible embedded energy and other resources

Environmental Impact of Food & Agriculture Sector...

- One quarter of the world's arable land is dedicated to food production.
- Food production accounts for 34% of water use in the North America and about 40% globally.
- Food production accounts for more than 10% of energy use in the North America and 10-15% globally.
- It is estimated to take 10 calories of fossil-fuel energy to produce a single calorie of food for consumption.
- Food and agriculture are responsible for 1/3 of all global greenhouse gas emissions

40% Food Waste

Total U.S. Food Production



Source: National Institutes of Health

Waste and Energy

“The energy embedded in wasted food represents approximately 2% of annual energy consumption in the United States, which is substantial when compared to other energy conservation and production proposals.”

Environ. Sci. Technol. 2010, 44, 6464-6469

Wasted Food, Wasted Energy: The Embedded Energy in Food Waste in the United States

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This work estimates the energy embedded in wasted food annually in the United States. We calculated the energy intensity of food production from agriculture, transportation, processing, food sales, storage, and preparation for 2007 as 8880 ± 790 million BTU. In 1950 approximately 27% of edible food was wasted. Synthesizing these food loss figures with our estimate of energy consumption for different food categories and food production steps, while normalizing for different production volumes, shows that 2002 is 193 million BTU of energy were embedded in wasted food in 2007. The energy embedded in wasted food represents approximately 2% of annual energy consumption in the United States, which is substantial when compared to other energy conservation and production proposals. To improve this analysis, nationwide estimates of food waste and an updated estimate for the energy required to produce a food for U.S. consumption would be valuable.

Introduction

Recent food shortages, blamed in part on the growth of the hydrocarbon industry (1, 2), have created a new awareness of the relationship between food and energy. Food is not only a form of energy but also a consumer of fossil energy in its production, transportation, and preparation. Historically this has been a positive relationship: the last 50 years have seen increased agricultural productivity thanks to the adoption of new technologies and inputs (3), which are largely based on fossil fuels. The increase in the energy intensity of agriculture has brought with it unprecedented yields with minimal human labor. Productivity improvements have been achieved through a variety of means, including mechanization of the agriculture sector, improved fertilizers, more resilient crops, and the development of pesticides (4), all of which rely on fossil fuels.

Prior estimates for the amount of energy consumed by the United States (U.S.) to produce food range from 10.5% (5) to 14.5% (6) of annual energy consumption. The newest estimate, released in March of 2010, estimates that 15.7% of energy consumption in 2007 was used to produce food (7). Despite the significance of the food system as an energy consumer, few estimates for the energy intensity of the

system are available, and, despite the enormous energy investment we make in food production, the USDA reports that about 27% of available food was wasted in 1995 (8). This estimate does not include food wasted on the farm, in fiberries, and during processing and relies on outdated food consumption and waste data, some of which is from the 1970s. Because of economic and population growth, the total amount of food production and consumption has grown since the latest food loss study for 1995 (9), and the portion of income Americans spend on food has dropped (10, 11). Consequently we expect the current amount of food wasted to be higher both relatively and absolutely as compared to the USDA's 1995 estimates. Since food production requires about one-tenth of the energy consumed annually in the U.S., the energy embedded in wasted food might also correspond to a significant portion of energy consumption in the U.S. and represents an opportunity for avoided energy consumption.

Because of the desire to reduce greenhouse gas emissions, concerns about fossil fuel availability, and the expected increase in population (12), the reliance of food on fossil energy sources has become more scrutinized. In order to better understand the relationship between food and energy, a current estimate for the energy embedded in food production is needed as well as a calculation of the energy that is lost in wasted food. No such study using current data has been identified in the literature. Consequently this work seeks to fill that knowledge void and provide important data that will quantify both the energy required to produce food in the U.S. in 2007 and the energy embedded in wasted food.

This work will calculate the amount of energy used to produce food from agriculture, through transportation, processing, retailing, and finally for preparation and consumption. These data will then be combined with food loss factors from the USDA (8) to calculate the energy lost in wasted food. Because the data available on food production and food waste are from different years, all data will be considered as a percentage of annual energy production for that year and extrapolated to obtain an estimated 2007 energy value.

Energy for Domestically Consumed Food. First, we calculated the energy required to produce food. Despite various literature sources that estimate the energy required for U.S. food production (5, 7, 13, 14), we recalculated the value for 2007 to generate an estimate organized in a way that is compatible with the available food waste data. For our estimate of the energy required to produce food consumed in the U.S. we compiled data from various sources including government reports and scientific literature. Data for the energy consumed in food production is mostly from the year 2002, whereas the available data on food loss is from 1995 and food quantities are given for 2004. In order to minimize error, the energy values for food production were determined for 2002 and then scaled to estimate 2007 values. A summary of the results is shown in Table 1, along with the year of the data source and citation. The Supporting Information (SI) contains details of our methodology.

While we expect that all values listed in Table 1 have significant uncertainty, none of the published data include error estimates. A range of error is not given in Table 1 unless we have multiple estimates for a single value in Table 1 in which case we use the standard deviations of the multiple estimates to approximate the error. For other listings, in Table 1 when we have a single estimate that is for all categories except transportation and nitrogenous fertilizers included in agricultural chemicals, fuel, and

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Source: *Env. Science Technology*, 2010, 44, 6464-6469 – “Wasted Food, Wasted Energy: The Embedded Energy in Food Waste in the United States”

Downstream Impact – Food Waste

- The decomposition of food and other organic matter in landfills produces methane, a green-house gas 21 times more potent than Carbon Dioxide.
- Landfills are the largest human-related source of methane in the US, accounting for over 20% of all methane emissions.



Why focus on prevention?

The Case For Waste Management

Reduce
Environmental
Impacts

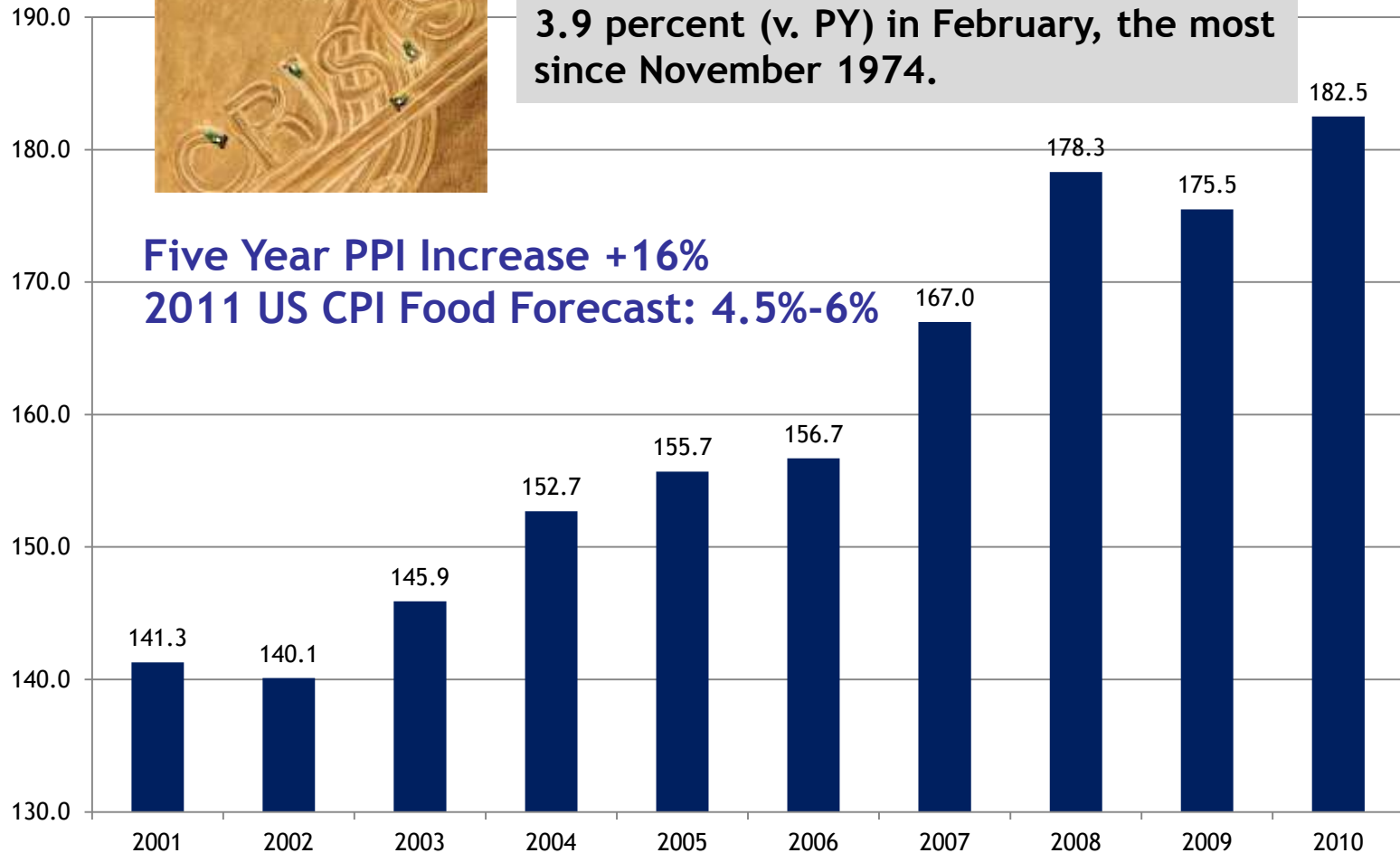
Reclaim
Financial
Resources

Engage Staff

Pressure: Food Cost Inflation

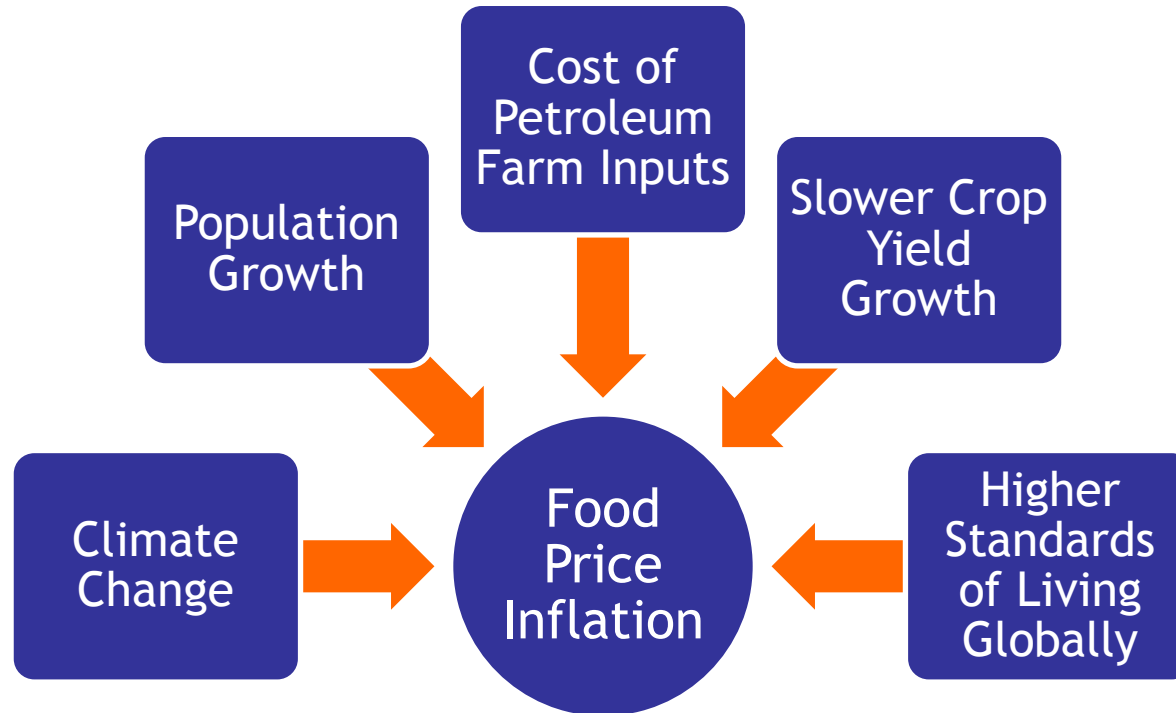


BLS 3/16/11: Wholesale food prices rose 3.9 percent (v. PY) in February, the most since November 1974.



Source: Bureau of Labor Standards, Producer Price Index for Finished Consumer Foods

Not Getting Better Soon



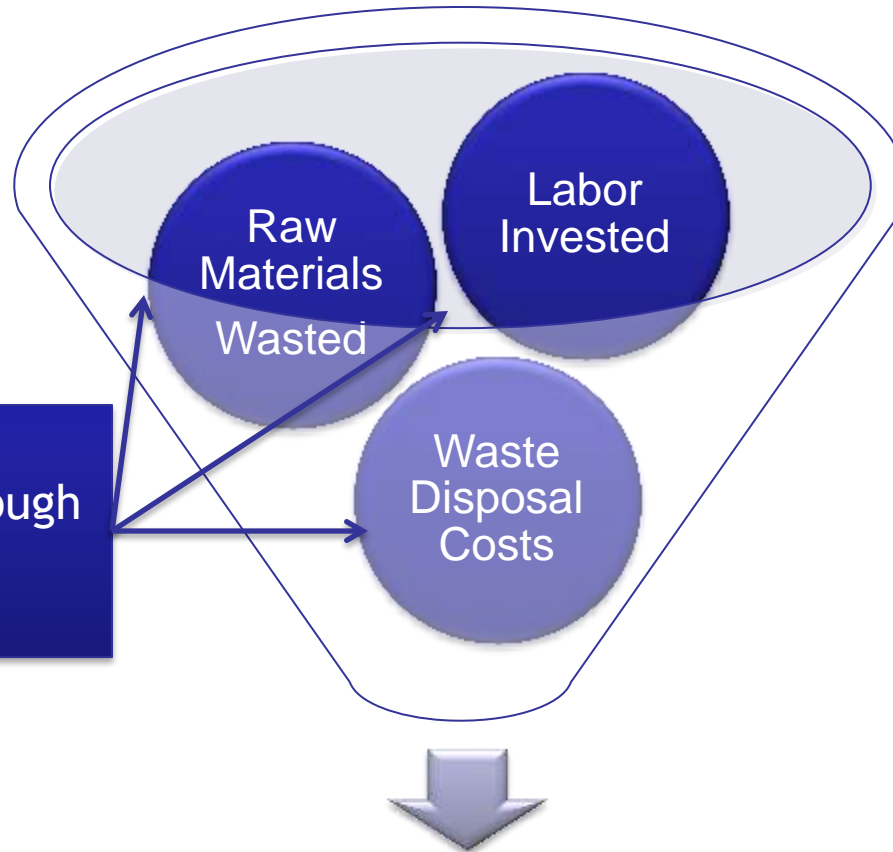
“Global food prices probably will rise in the first half of this century because of an expanding population and higher incomes, slower crop-yield growth and the effect of climate change”

- Ross Garnaut, the Australian government’s climate-change adviser, as quoted in BusinessWeek. March 3, 2011.

How to react to this pressure?

- Reduce quality?
- Reduce variety?
- Negotiate with supply chain partners?
- Reduce portions?
- Accept lower profitability?

Or Prevent Food Waste?

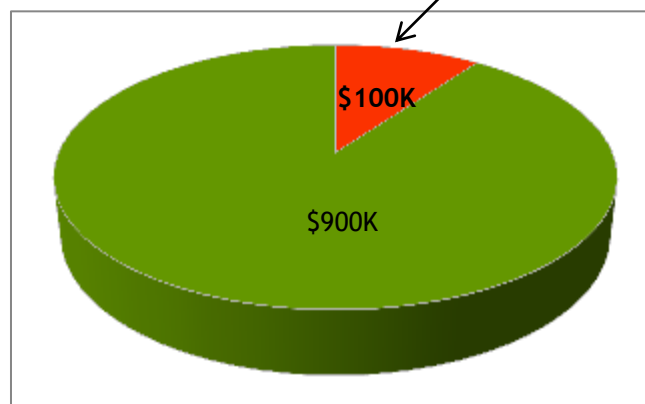


“Real Cost of Waste”

Opportunity to Increase Efficiency

Actionable pre-consumer food waste represents 4-10% of the food purchased in volume foodservice

Up to \$100K in Food Waste!



Example: \$1.0M Food Purchases

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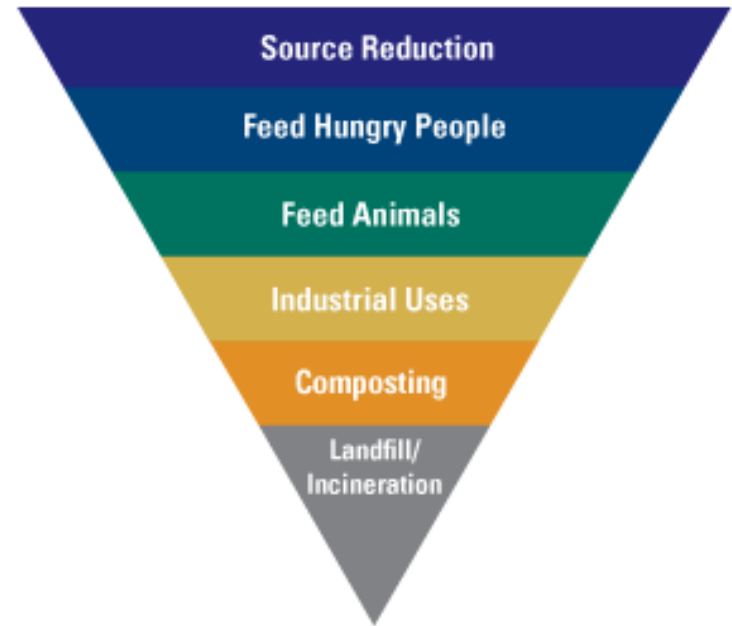
Engage Staff

Opportunity for Staff Engagement

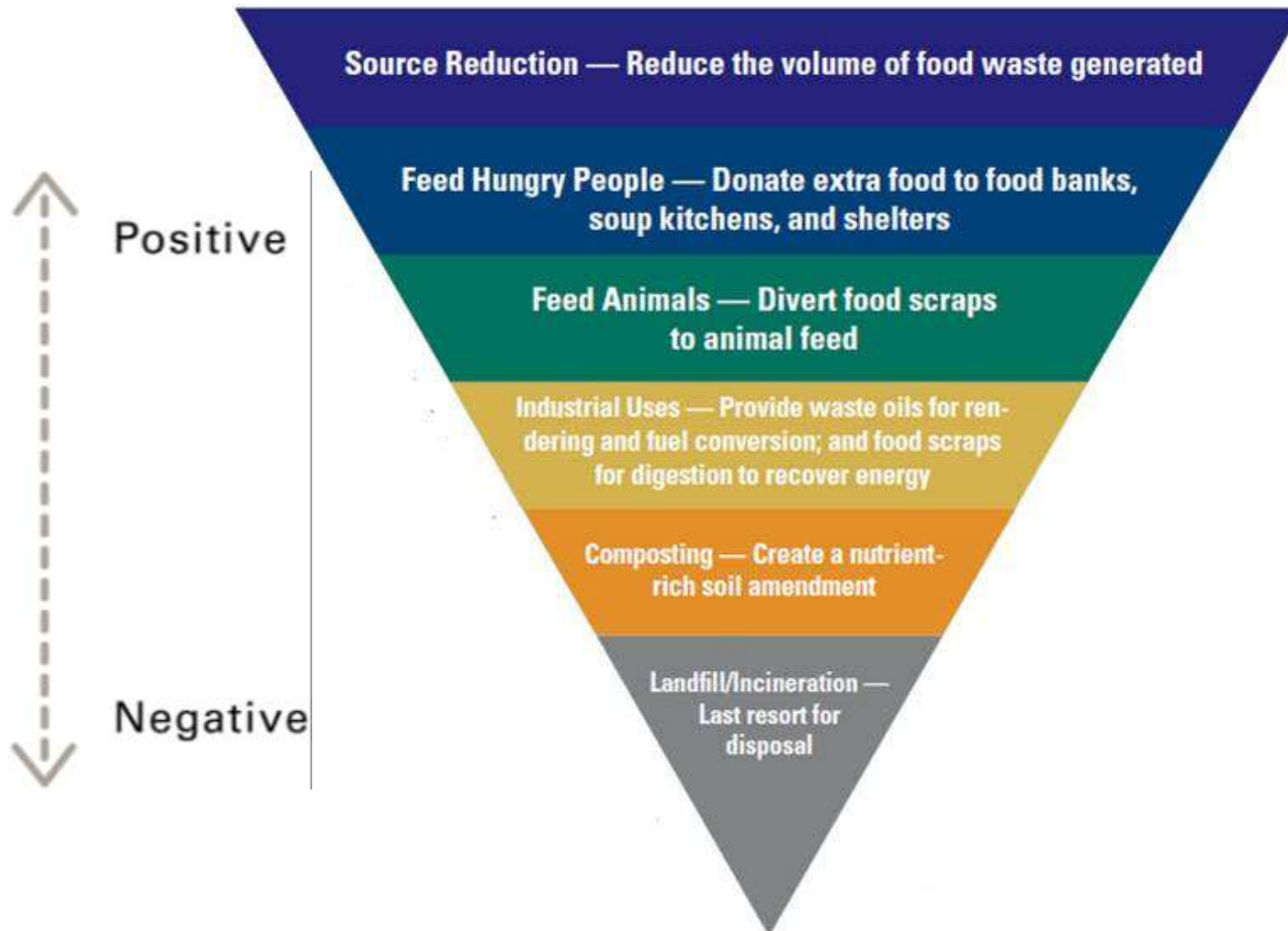


Topics

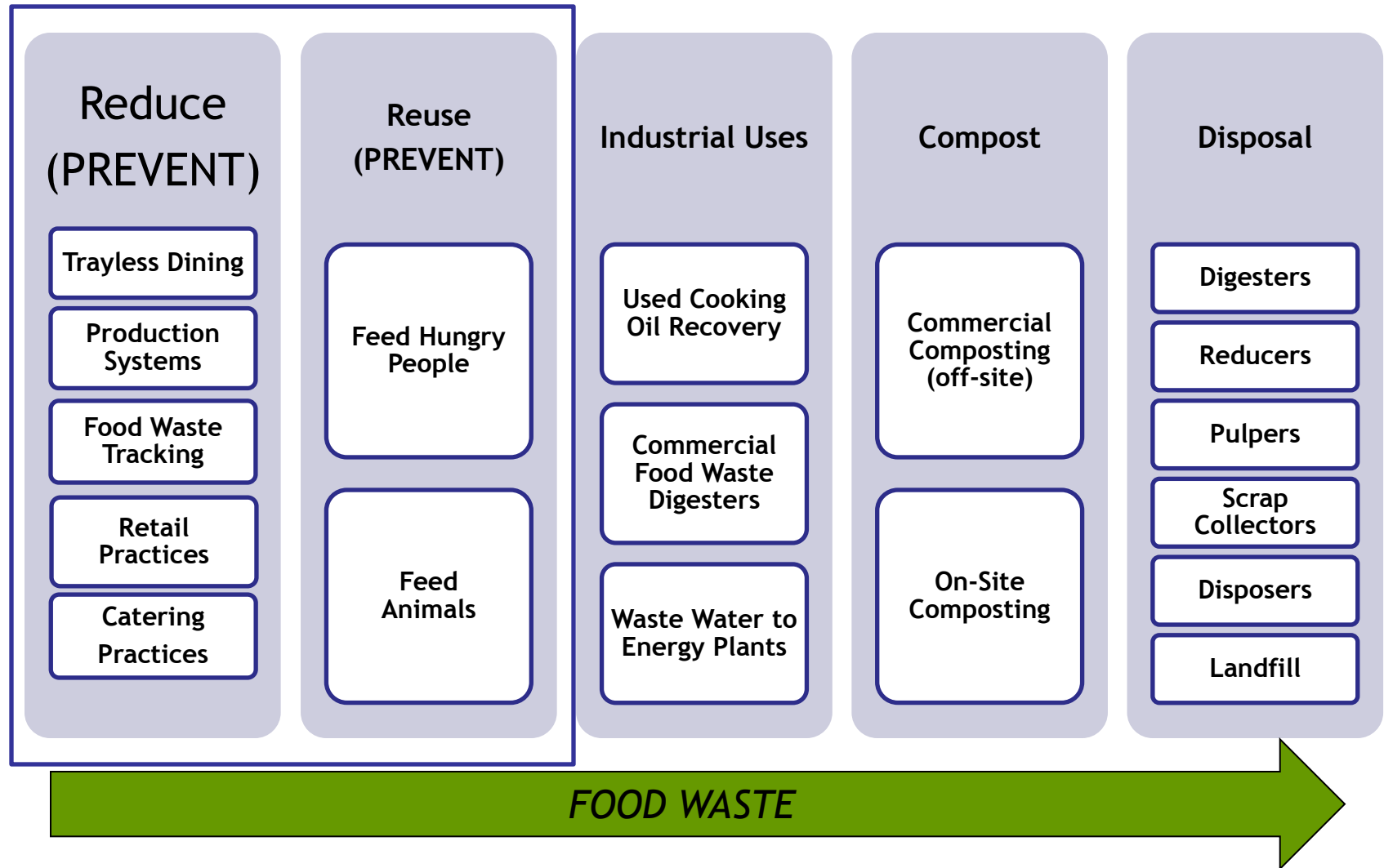
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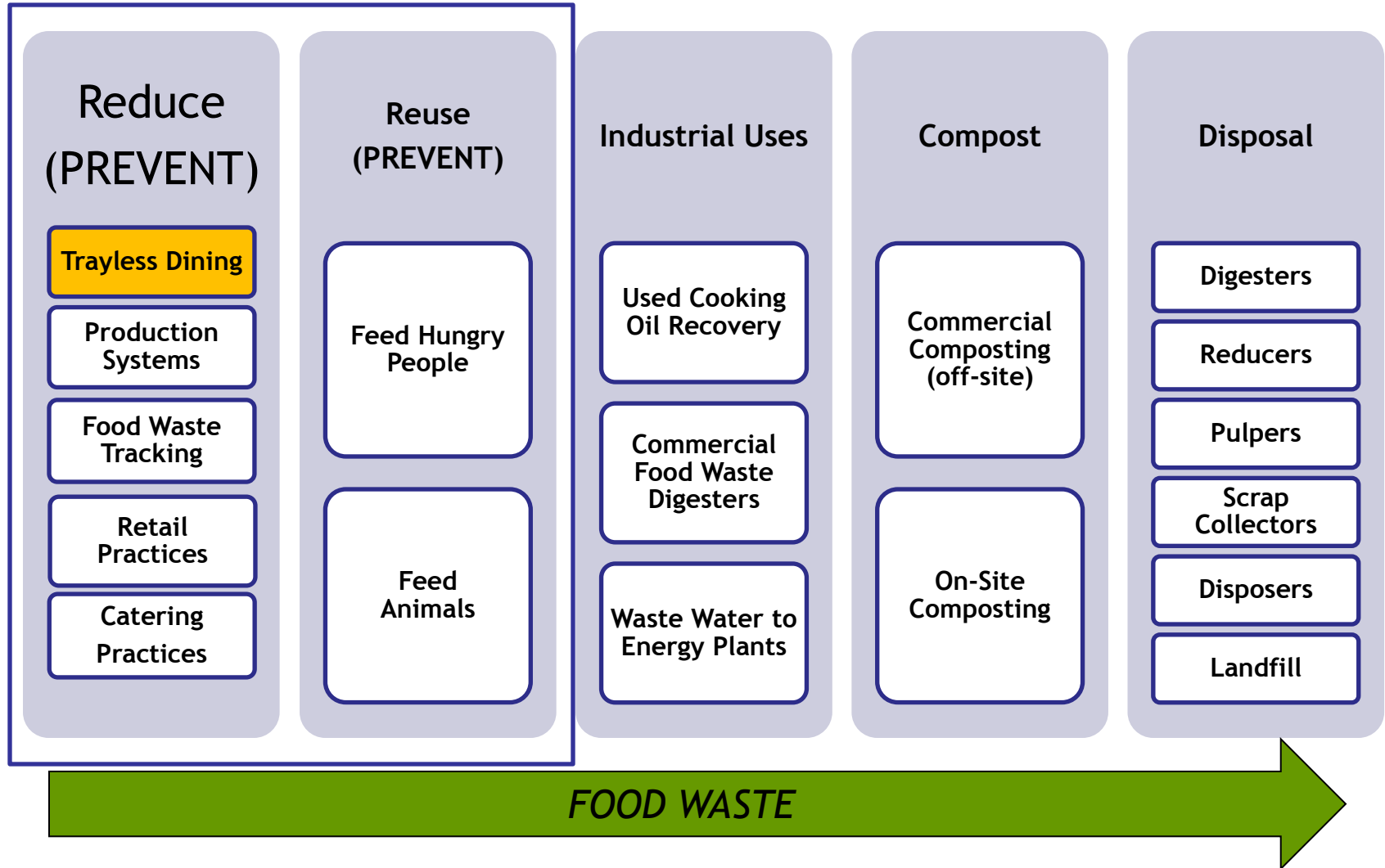
EPA Food Waste Recovery Hierarchy



BMP's: Food Waste



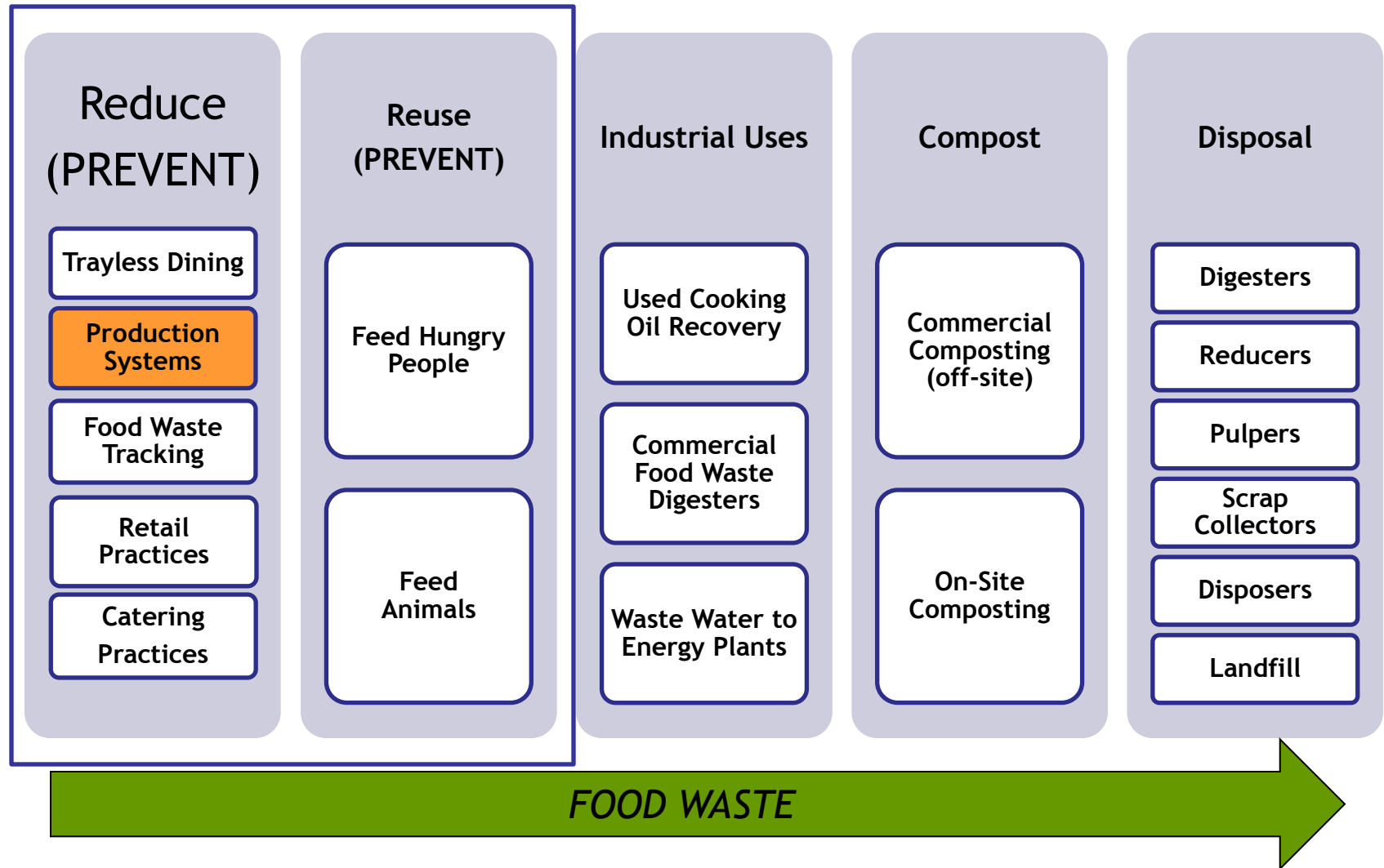
BMP's: Food Waste



Trayless Dining

- Extensively deployed at this point
- Targets post-consumer food waste
- Reduces waste volume ~30%
- Also impacts food cost
- Essentially a portion-control technique

BMP's: Food Waste

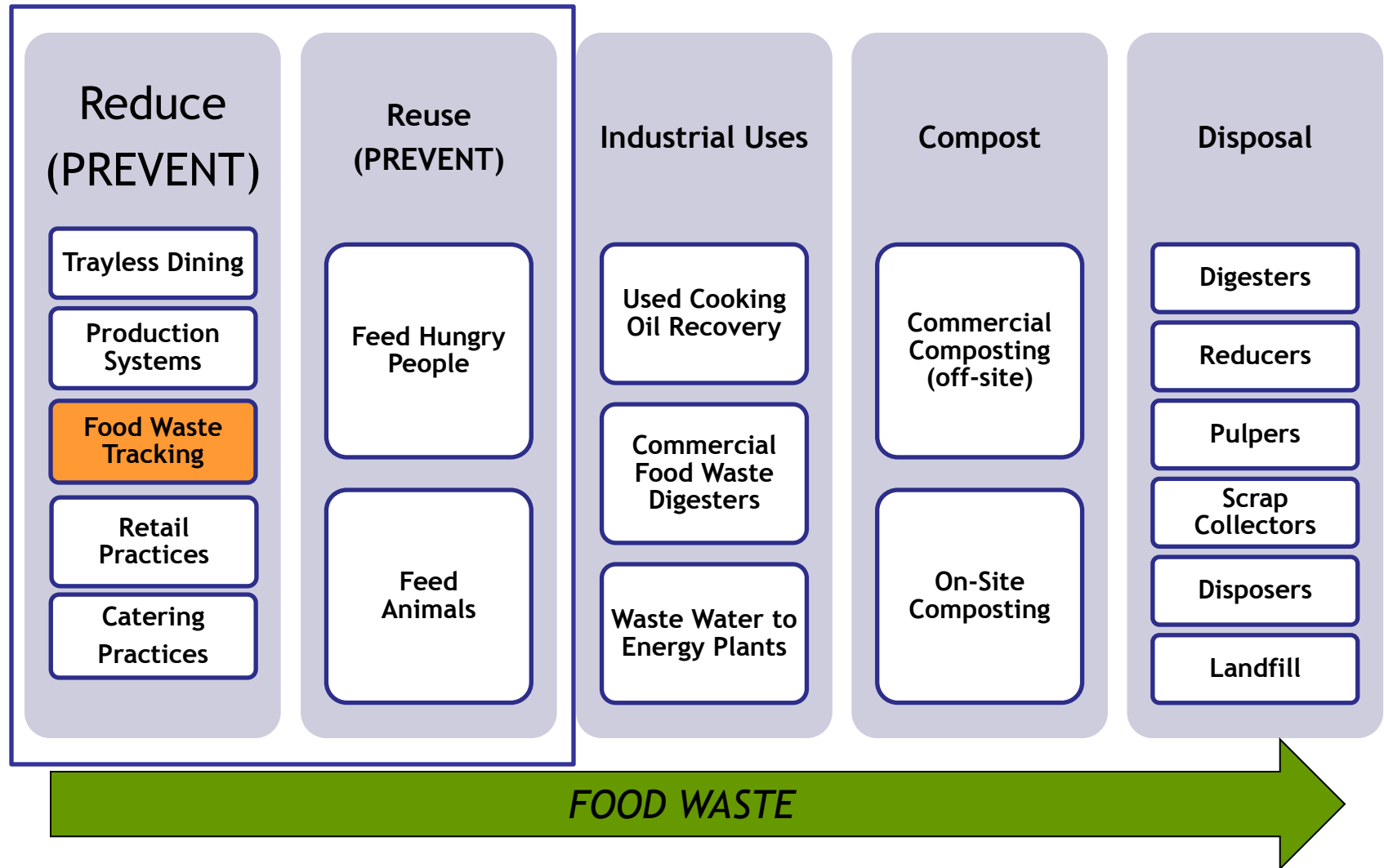


Source Reduction: Production Systems

- Production systems are **critical** to successful forecasting, purchasing, inventory management, recipes, menus and production.
- They focus on production management data rather than the culture of the operation, so do not replace the need for food waste tracking.



BMP's: Food Waste

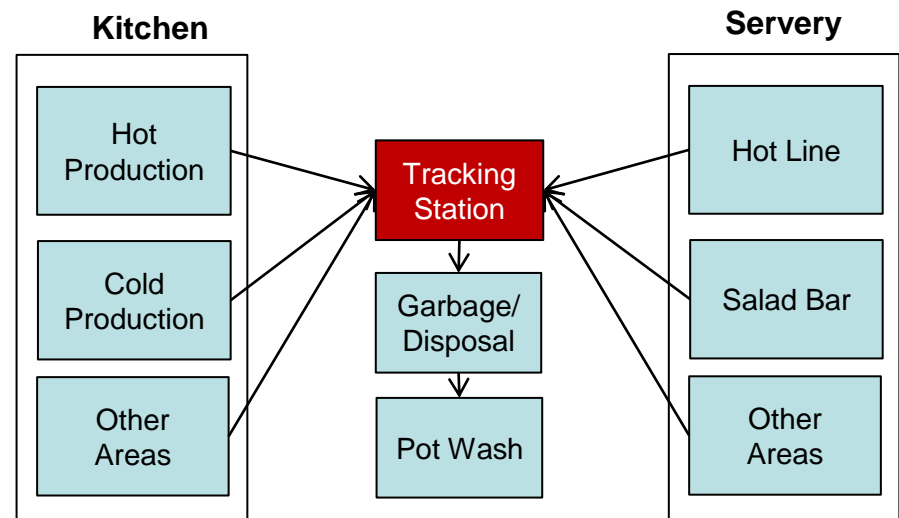


Reduction: Food Waste Tracking



What happens when we receive our electric or gas bill at home?

- Food waste tracking is a key step toward food waste reduction
- Establish baselines, benchmark and monitor progress



Fully Automated Tracking



When to Track Food Waste

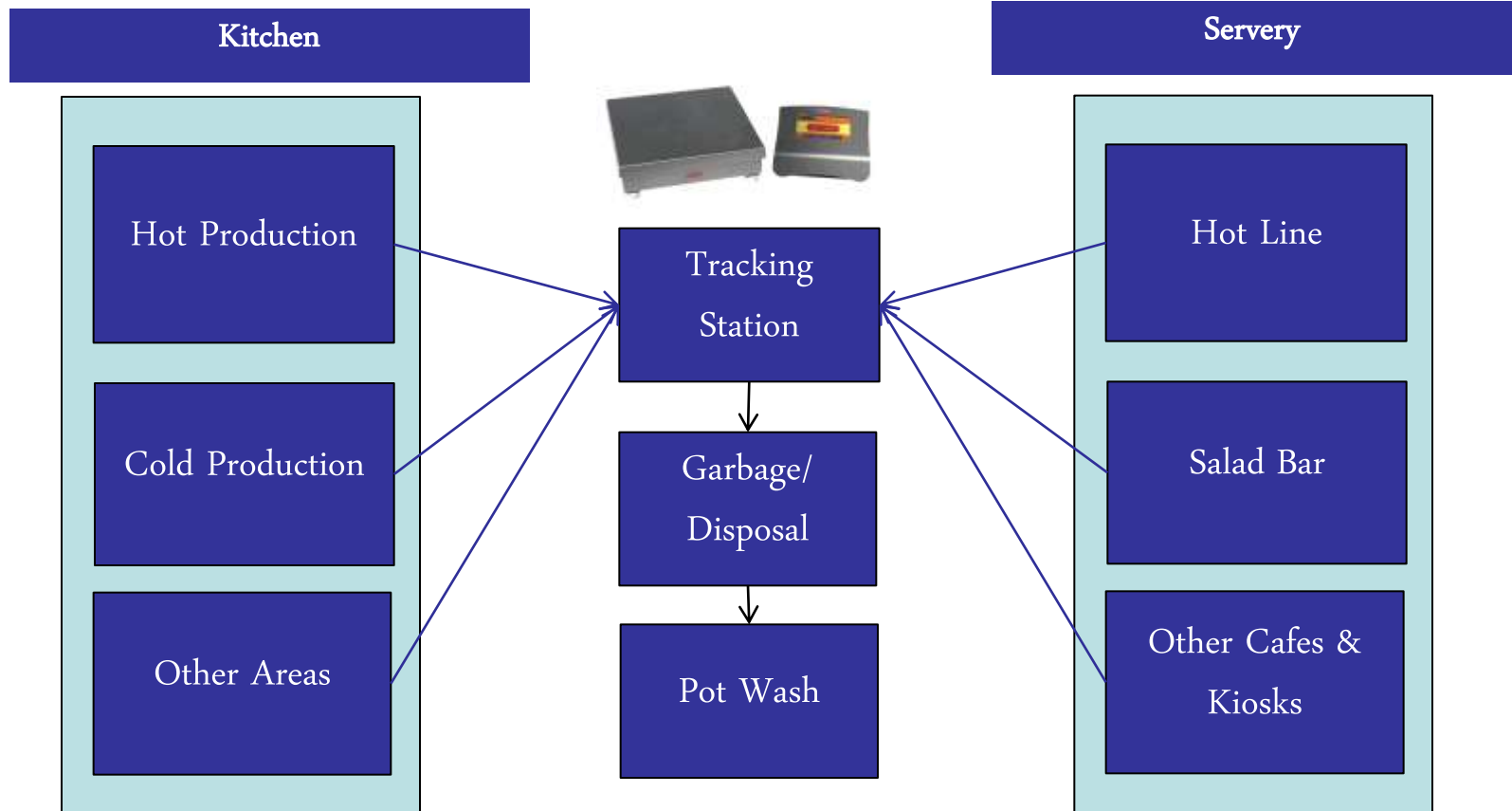
- All pre-consumer food waste should be tracked daily
- Post-consumer food waste should be tracked periodically, in aggregate.
 - Monthly or quarterly assessments work well in most operations.

What Was Tracked: Kitchen Waste

- Overproduction
- Spoilage
- Expired/Dated Items
- Trim Waste
 - (i.e. fresh fruit rinds)
- Contamination
- Burned/Dropped Items



Tracking Flow



Tracking Process



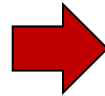
Overproduction



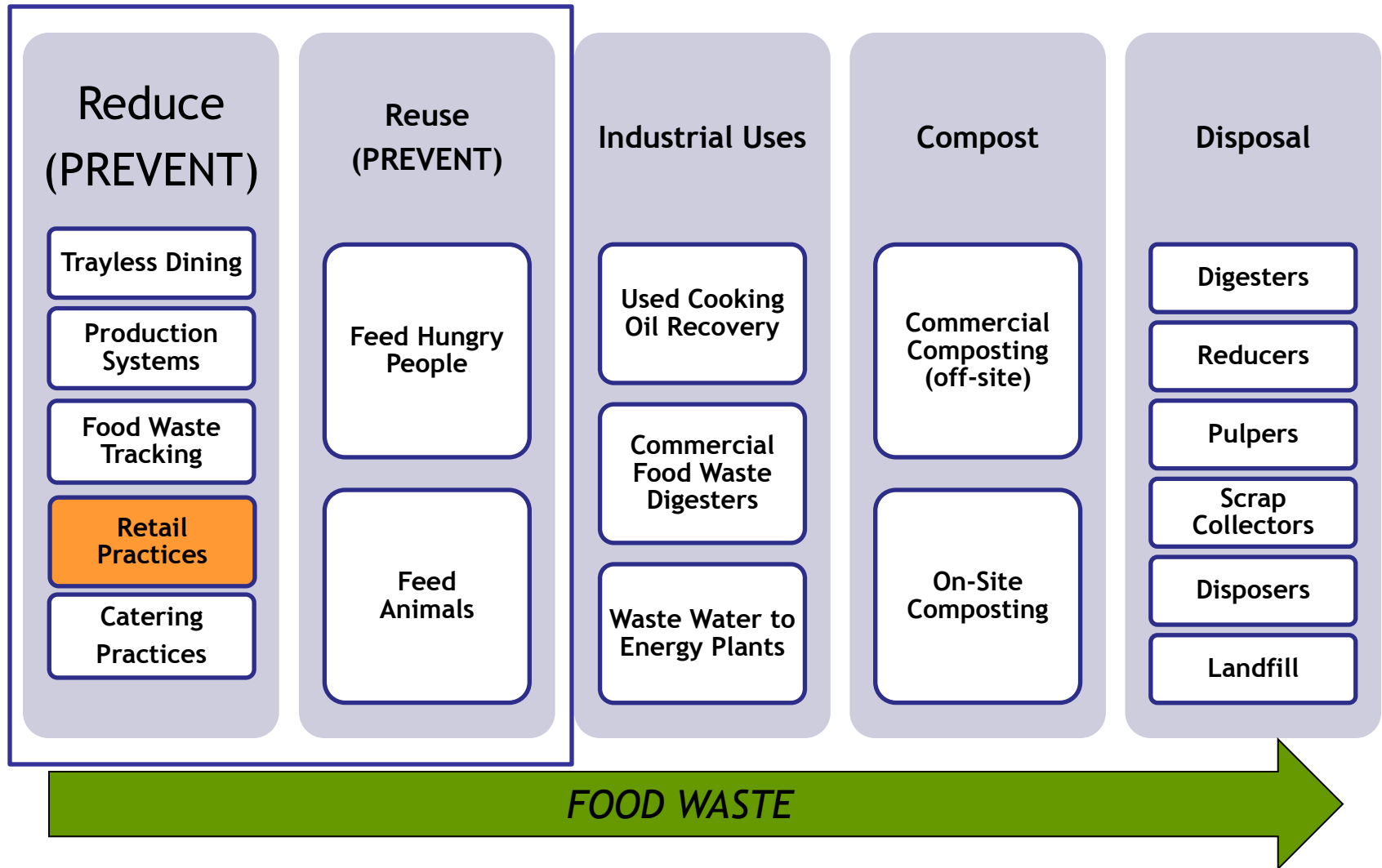
Trim



Dated/Spoiled



BMP's: Food Waste



Source Reduction: Retail

- Common challenges
 - Soup
 - Salad bars
 - Breakfast
 - Desserts
 - Starches
- Planning and execution gaps are a significant problem

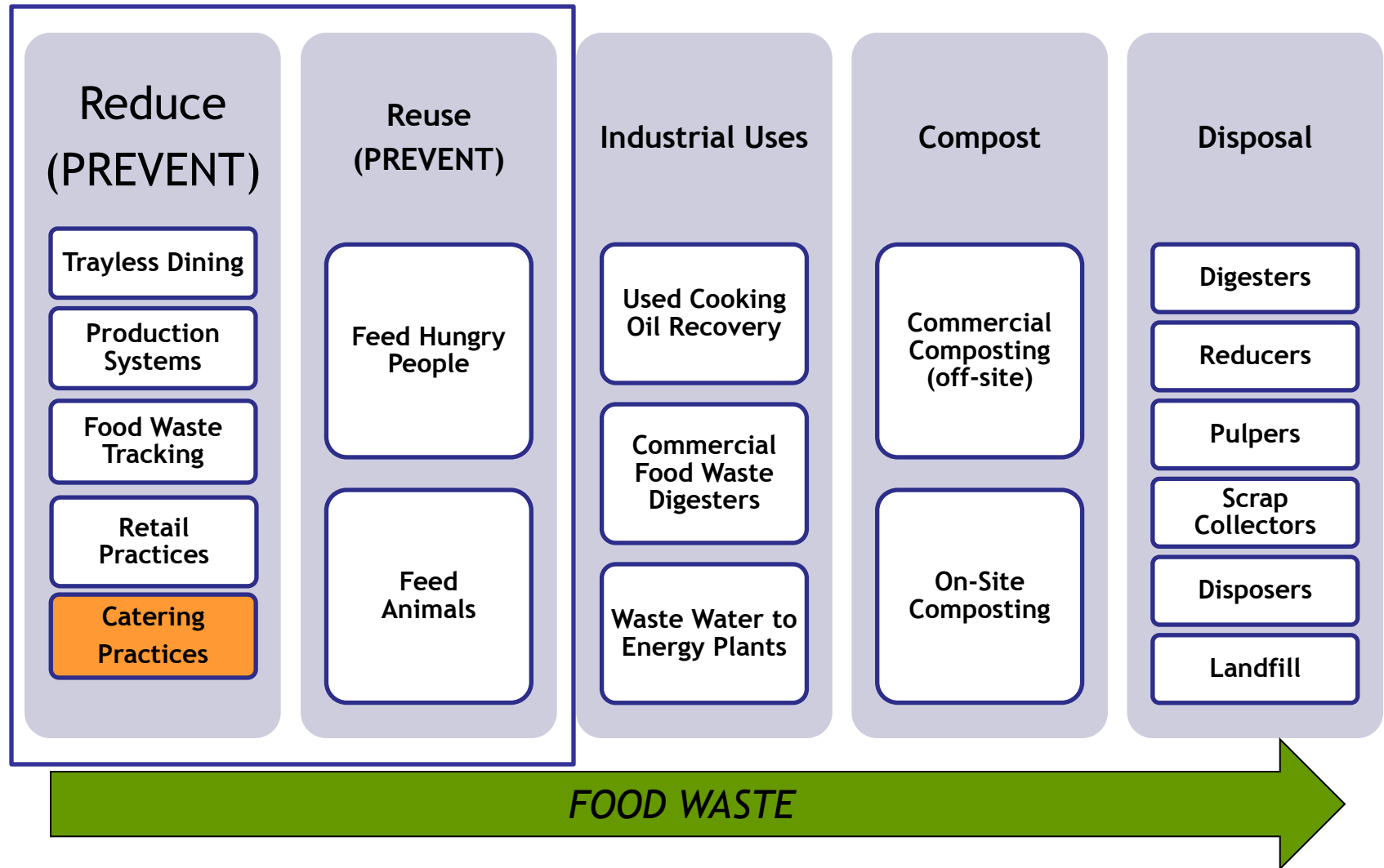


Source Reduction: Retail

- Review grab & go par levels
- Provide variety w/o excess volume



BMP's: Food Waste

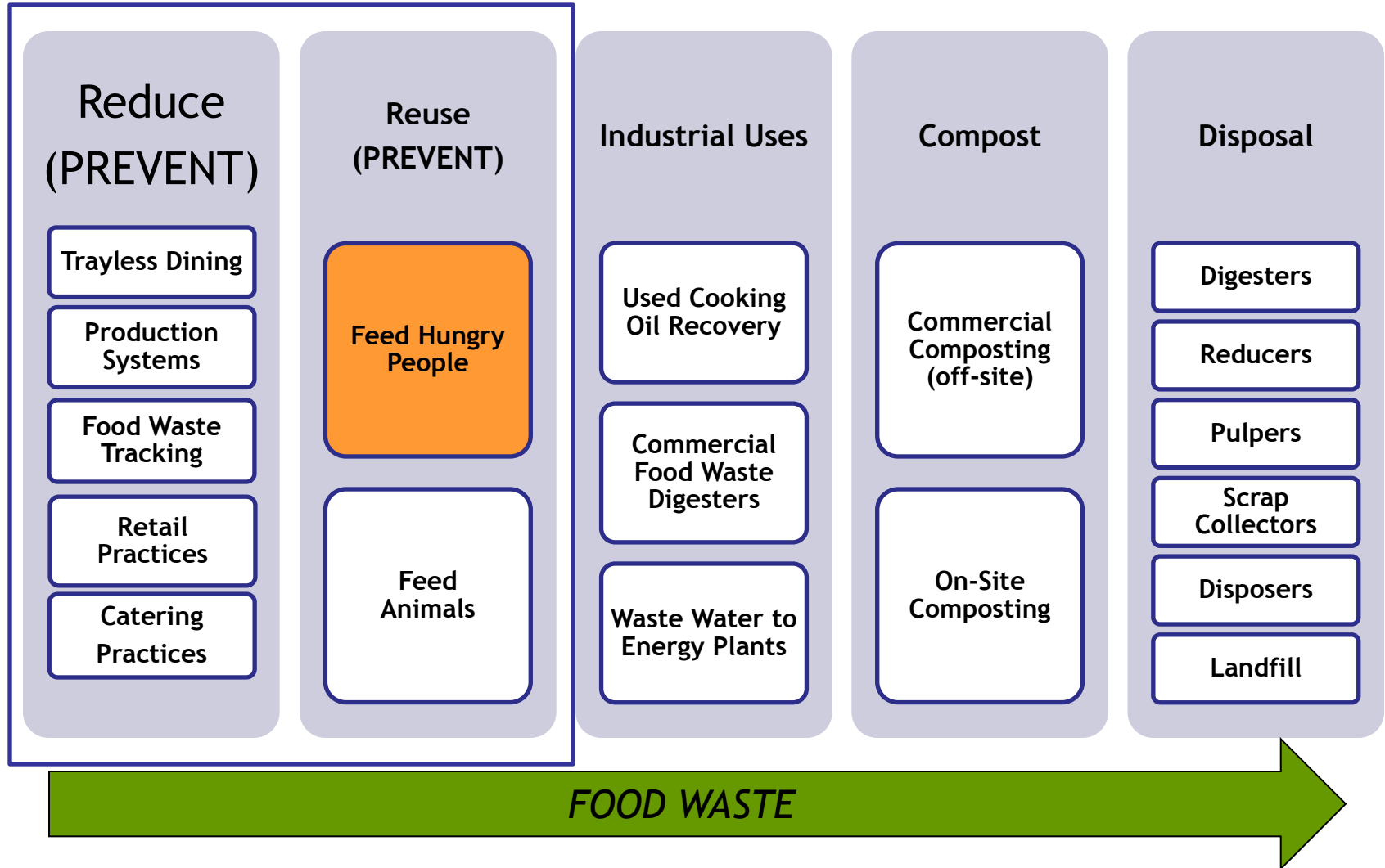


Source Reduction: Catering

- Myths:
 - “It’s been paid for”
 - “We have to produce to guarantee”
 - “It’s in the contract”
- Always room for improvement



BMP's: Food Waste

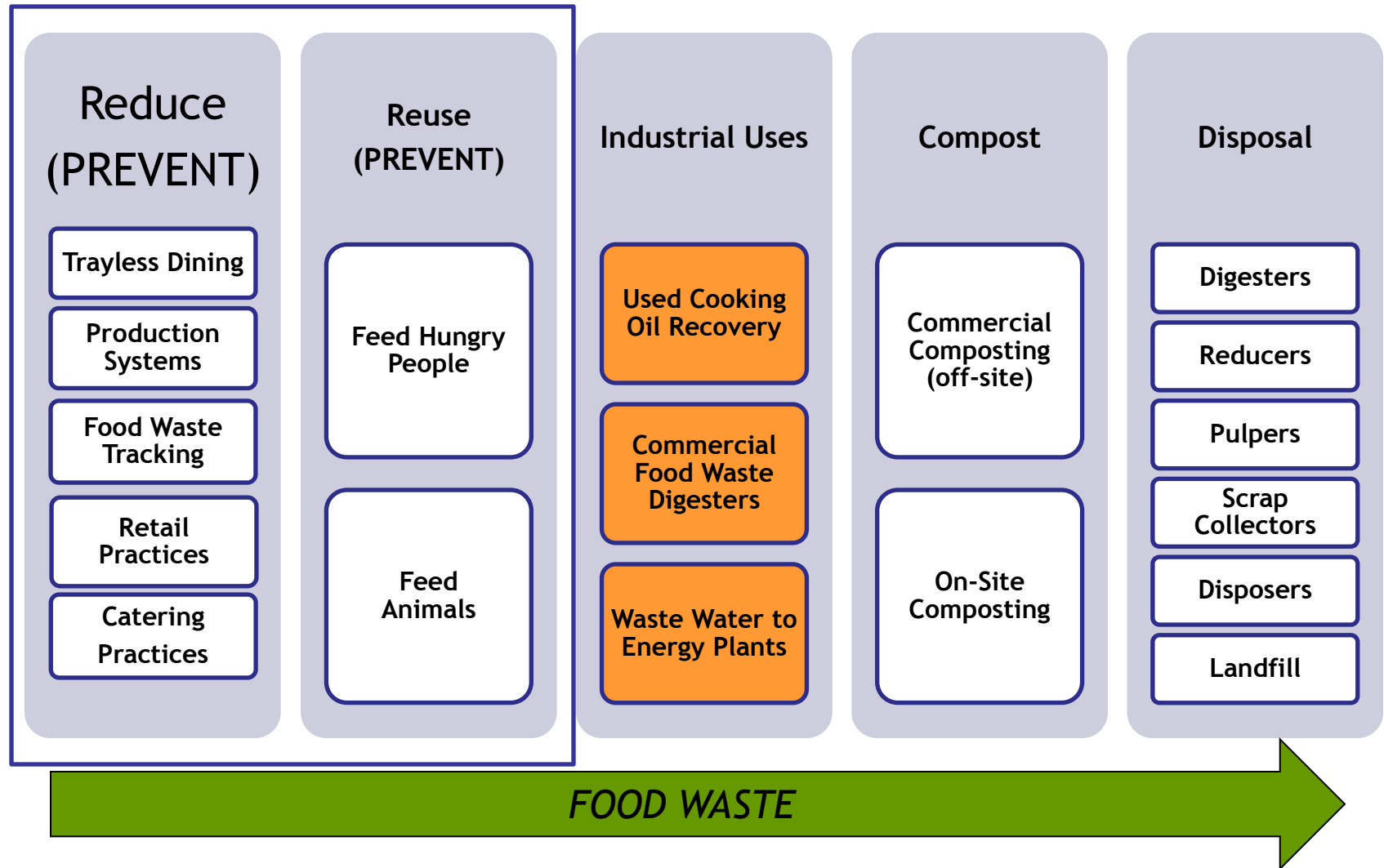


Reuse: Food Recovery

- Re-use review policy
- Emerson Good Samaritan Act
- Logistical considerations
 - Storage
 - Containers
 - Food safety
 - Matching
 - Transportation
- Food Donation Connection
 - www.foodtodonate.com



BMP's: Food Waste



Industrial Uses: Used Cooking Oil

- Provide used Cooking Oil (UCO) to a biofuel refiner
- Process UCO on-site (e.g. Vegawatt)



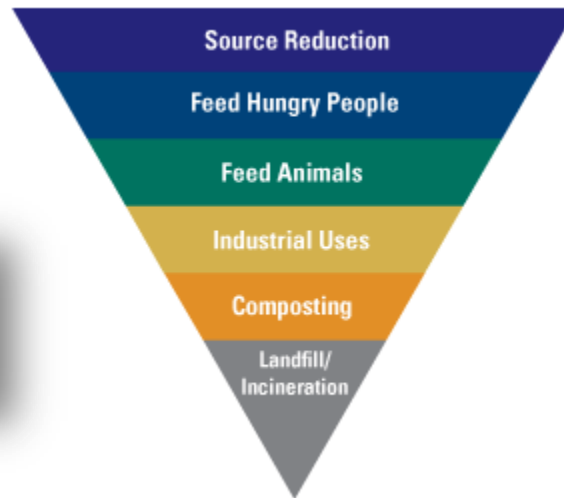
Industrial Uses: Food Waste to Energy

- Partner with a commercial biogas digester



**University of Wisconsin – Oshkosh
Groundbreaking for nation's first dry
anaerobic biodigester Sept. 15**

The renewable energy facility will be the first dry fermentation anaerobic bio-digester in the nation; the plant is designed by [BIOFerm Energy Systems](#), and the university project also is the first in North America for the German company. The project will install a 370 kWh biogas CHP (combined heat and power)

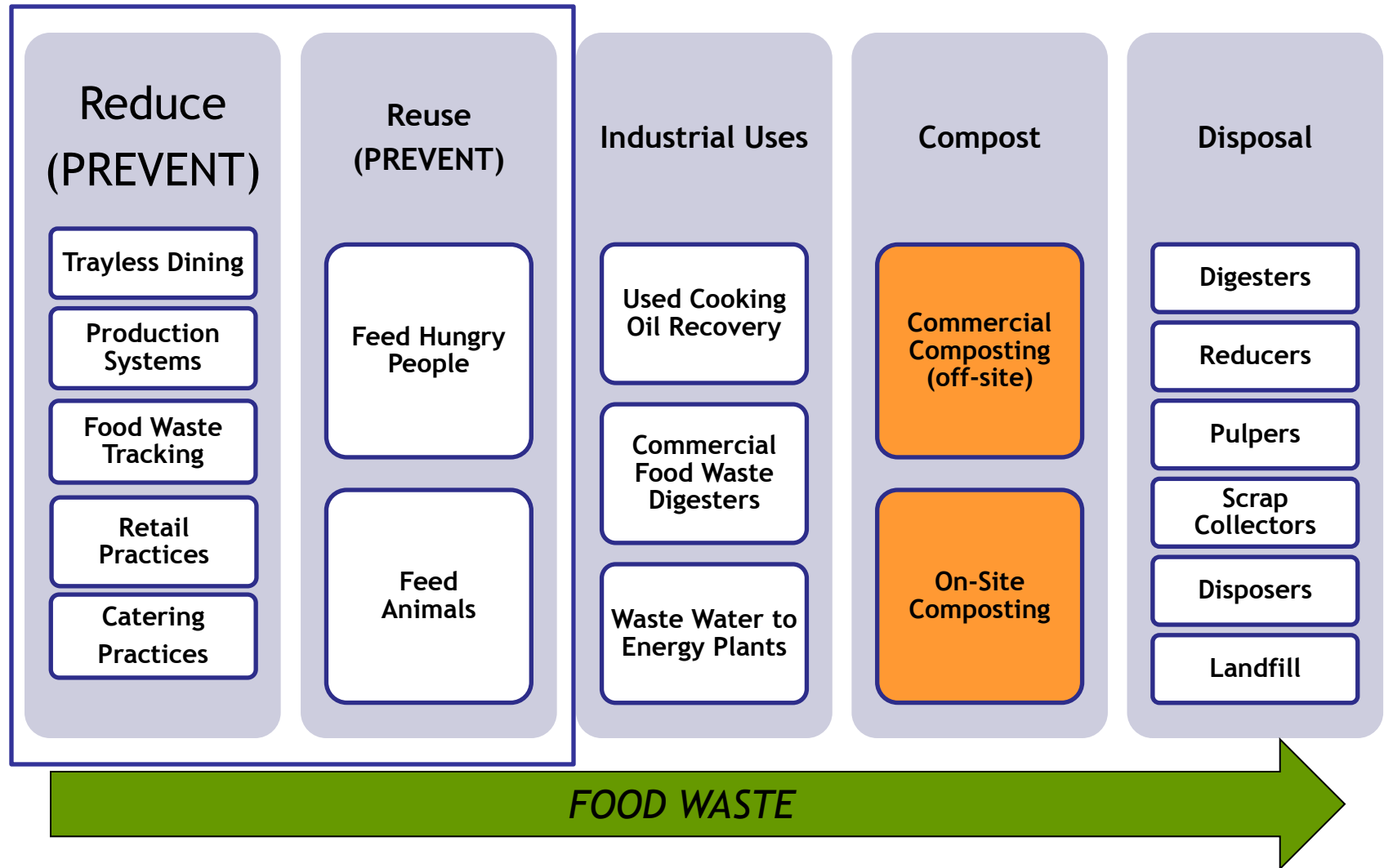


FeedStock Prep via Disposers

- Use the municipal waste water system to transport food waste
 - Food is ~70%+ water
- Avoids transportation emissions
- Acceptance varies by region
- WWTP residuals may be used as fertilizers



BMP's: Food Waste



Composting: On-Site

- Options
 - In-vessel
 - Windrow
 - Vermiculture
- Requires
 - Appropriate space
 - Consistent labor
 - Technical skill
 - Compost user(s)



Composting: Off-Site

- Commercial food waste composting offers scale, expertise, and distribution
- Not available everywhere
- Collective effort will support industry development

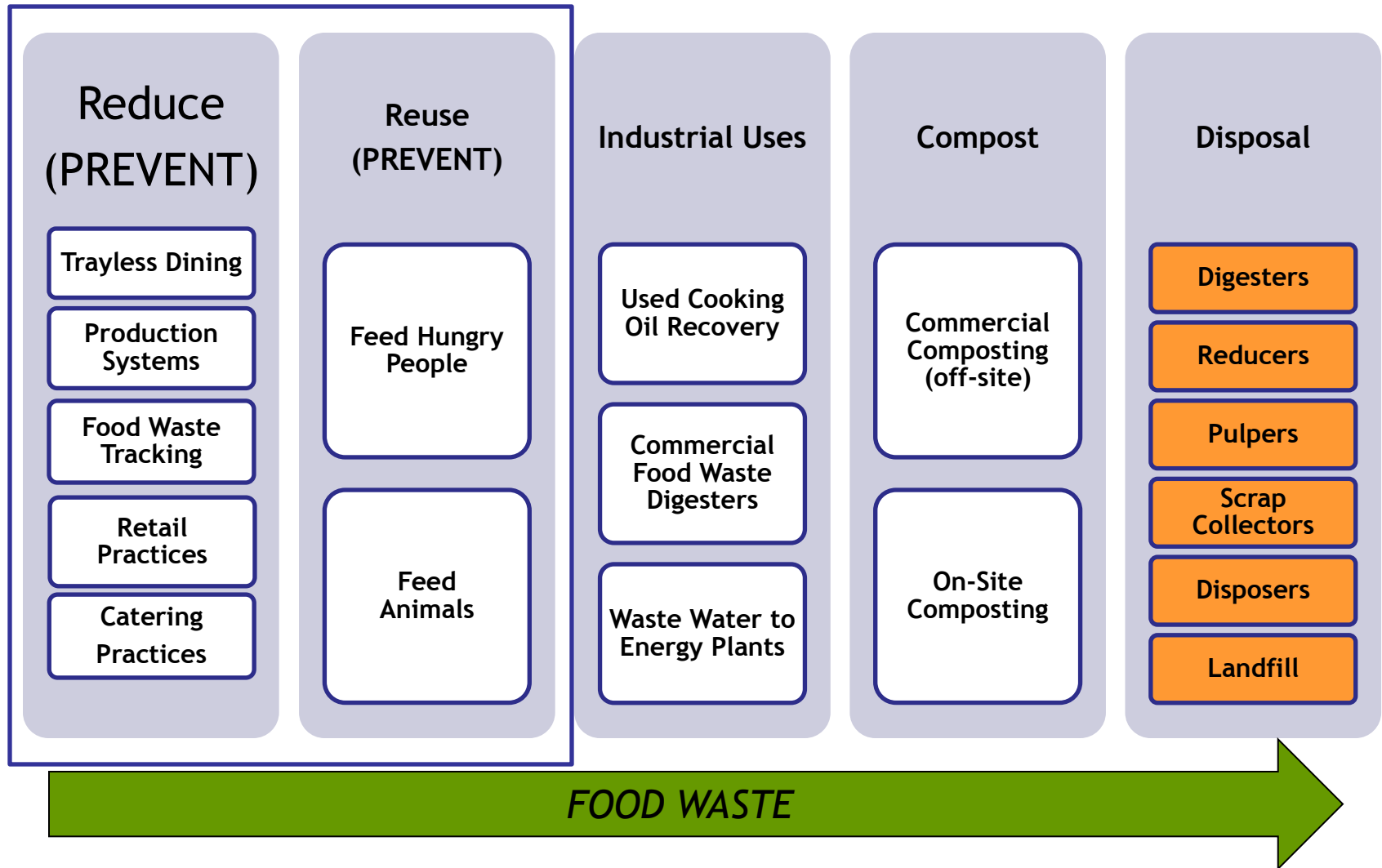


www.findacomposter.com

Commercial Composting



BMP's: Food Waste



On-Site Digesters

- On-site
- Aerobic
- No energy production



Examples: BioHitech America, OrcaGreen, Bio-EZ

On-Site Reducer

- Reduce volume
- Create a soil amendment (not compost)



Example: Somat Reducer

On-Site Pulpers, Scrap Collectors

- Pulpers
 - Macerate
 - Dewater
 - Configurable
 - Close-coupled
 - Remote
 - Scrap Collectors
 - Capture non water-solubles
- Reduce transportation Impacts
 - Reduce waste volumes by removing water
 - Lower disposal costs



Garbage Disposers

- Use the municipal waste water system to transport food waste
- Food waste is approximately 70% water
- Reduces emissions from transportation
- Acceptance varies by region
 - Amount of organic load on current plant(s)
 - Regional/local regulations on garbage disposers
- Residual bio-solids may be used as fertilizers

Landfill

- The final option
- Not a good one!
 - Environmental impact from hauling
 - Landfill methane emissions
 - Leachate
 - Lost land and utility

Resources

- <http://www.epa.gov/osw/conserves/materials/organics/food/>
- <http://www.wastedfood.com/>
- www.leanpath.com

Q&A

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