

# Enhancing Global Sustainability by Reducing Food Waste:

## Articulating and Assessing the Economic Challenges

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25th Annual World Symposium

International Food and Agribusiness Management Association (IFAMA)

Minneapolis-Saint Paul 2015



# Introduction

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- One-third of all edible food is wasted annually (Gustavsson et al., 2011)
  - In the United States the estimated total value of food loss in 2008 is \$165.6 billion. (Buzby & Hyman, 2012)
  - In the United Kingdom, almost 50% of the total amount of food, 7 million tons of food and drinks, is thrown away by households. (WRAP)
- Previous reviews summarize the food waste in supply chains from a global perspective. (Parfitt et al., 2010)
- We focus on the incentives of food waste from different agents, food waste prevention, food waste management, and the rebound effects of food waste.

# Definition

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- **Define food waste by position in the supply chain**
  - Postharvest loss (Lucia & Assennato, 1994)
  - Food loss (Bloom, 2010): lost at production & processing.
  - Food waste (Parfitt et al., 2010): wasted by retailers and consumers
- **Define food waste by the purpose of the food**
  - Edible for human consumption (FAO, 1981)
  - Edible for animal consumption (Stuart, 2009)
  - Over-Nutrition (Smil, 2004a)
- **Our Definition**

# Developing Countries – Causes of Food Waste

- **Infrastructure and technological conditions**
  - >40% of food is lost post-harvest or during processing because of poor infrastructure and technological conditions (FAO, 2011).
  - In India, 35-40% of fresh food is lost due to the lack of cold storage
  - Need better integration of producers, suppliers, processors & consumers.
- **Liquidity constrained farmers lacking short-term credit**
  - May harvest food prematurely to generate cash
  - May avoid price-enhancing storage to sell immediately at harvest

# Developed Countries – Causes of Food Waste

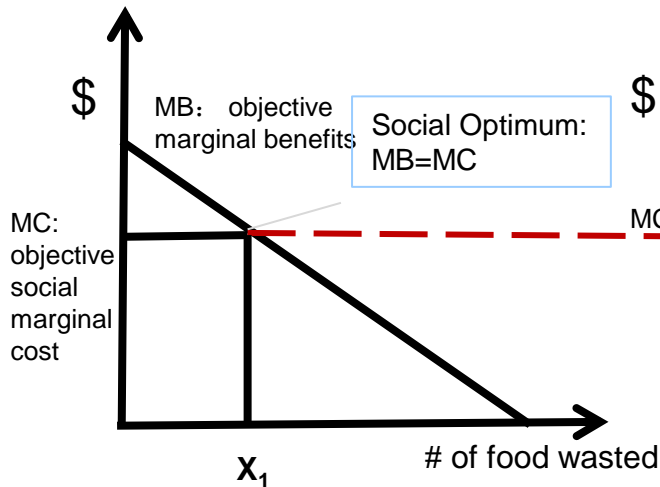
## ● Benefits of food waste

- Retailer: Allowing food waste may lower risks to reputation from selling aging food, lower expected recall costs and associated legal risks
- Consumer: The expected avoided damages, including avoided pain, suffering, time loss and all other health and financial costs from eating aging food.
- Note: both retailers and consumers may over-estimate risks

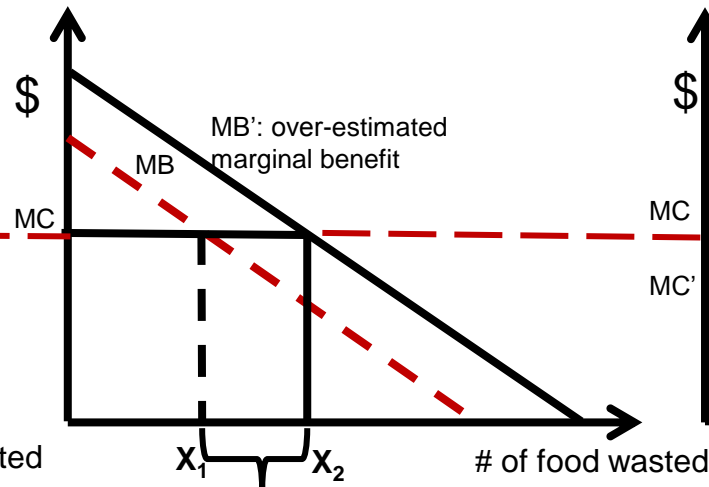
## ● Cost of food waste

- Retailer: The forgone revenue if food is disposed and disposal fee
- Consumer: The replacement cost of uneaten food
- Note: both retailer and consumer may under-estimate opportunity costs

# Marginal Benefits and Costs of Food Waste

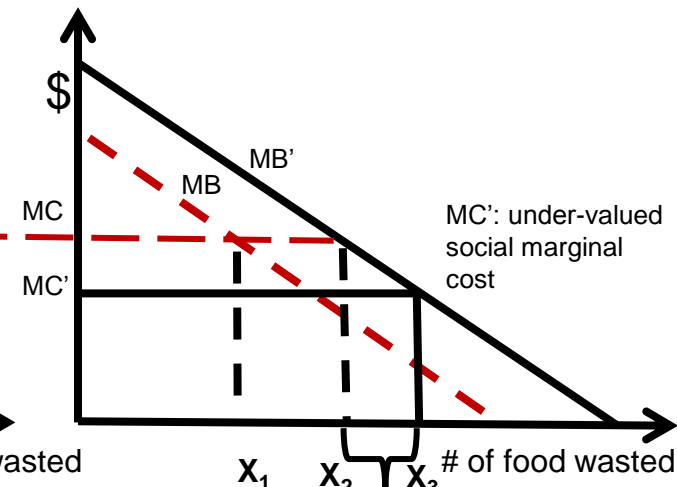


**Figure 1.1** Food waste under objective social marginal costs and marginal benefits



**Food waste due to over-estimated marginal benefit**

**Figure 1.2** Food waste when marginal benefits of waste are over-estimated



**Food waste due to under-valued social marginal cost**

**Figure 1.3** Food waste when marginal benefits are over-estimated and social costs don't internalize the externalities by food waste

# Developed Countries: Causes of Food Waste

## ● **Over-Nutrition**

- The amount of over-eaten food could supply another 350 million people with the meaty and fatty diet that prevails in affluent countries, or twice as many people with Asian diet which consists of primarily vegetarian calories (Smil, 2004a).
- 65.7% of adults in the US were either overweight or obese (Hedley et al., 2004).

## ● **Large Packages**

- Multi-packs: 30% of consumers believe that large packages are one potential reason for food waste (Williams et al., 2012; Fredriksen et al., 2010).
- Over-nutrition due to over-consumption.

## ● **Large Portion Size**

- Larger portion sizes are likely to induce people to intake more food and energy (Van Ittersum & Wansink, 2011; Diliberti et al., 2004).

# Policies and Practices to Reduce Food Waste

<p><b>Health Concerns</b></p>	<p>The United Kingdom removed ‘sell-by’ date on food packages to reduce food waste (Guardian, 2011)</p>
<p><b>Inexpensive Food/Waste</b></p>	<p>Korean government initiated its <i>Comprehensive Plan for Food Waste Reduction</i> and began charging residents and businesses for food waste based on weight(WasteMET Asia).</p>
<p><b>Package/ Portion Size</b></p>	<p>An experiment in hotel restaurants in U.S reduced around 20% of food waste, simply by reducing plate size (Kallbekken &amp; Sælen, 2013).</p>
<p><b>Over-Nutrition</b></p>	<p>Posting calorie levels in chain restaurants, firm-level health promotion policies</p>

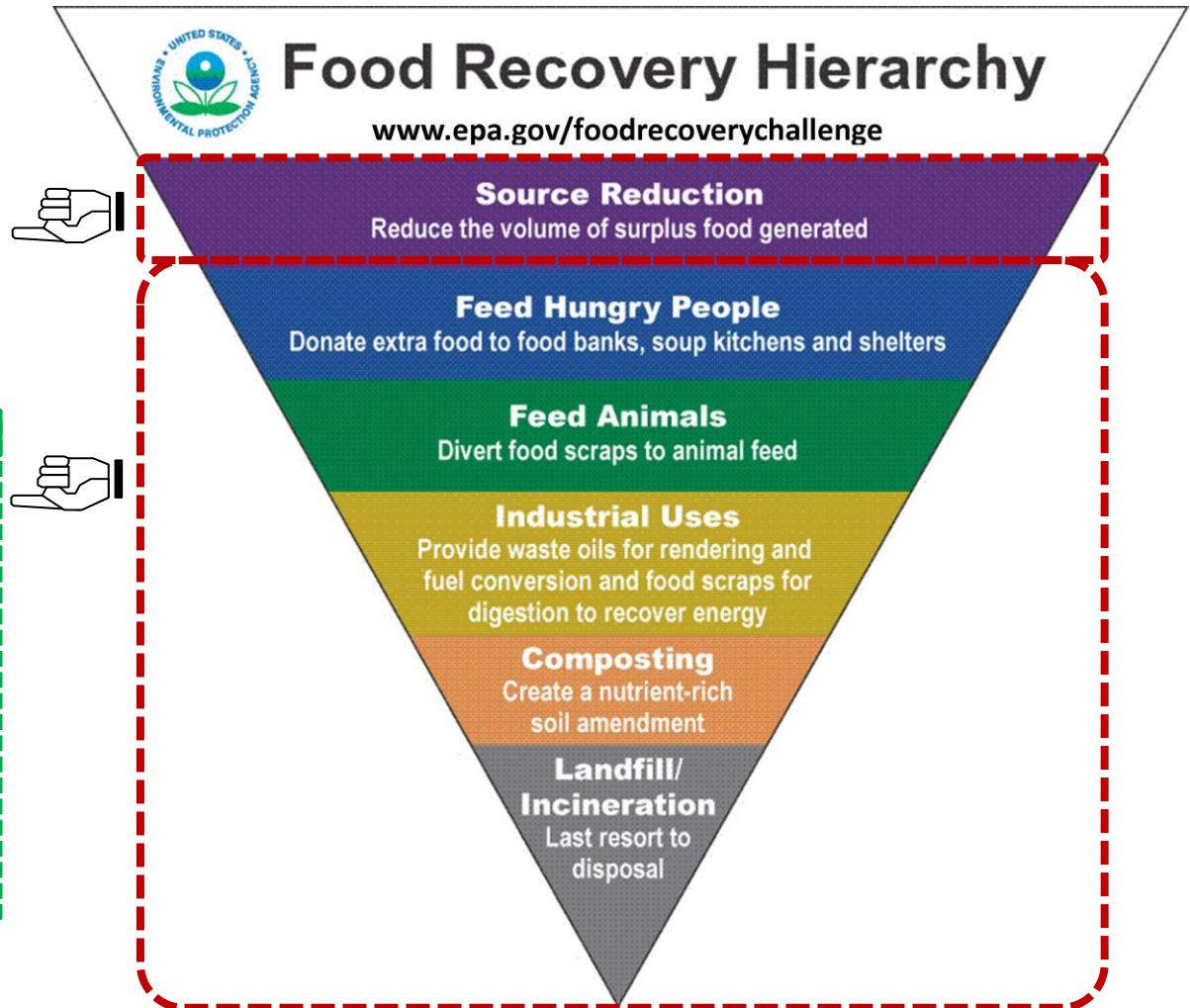


# Waste Management

## Food Waste Prevention

## Food Waste Management:

- Ugly food (Galliot, 2014), food past labeled date (NPR, 2013), food bank (Kantor et al., 1997)
- Animal feed
- Biofuel
- Composting



# Rebound Effects

- **Rebound Effect (Hanley et al. 2009)**

- Well developed concept in field of energy
- X% improvement in energy efficiency via technology leads to less than X% decrease in energy use due to general equilibrium effects
  - Technology → less energy used for current activities → lower energy efficient price → higher energy demand as lower energy price attracts more activities requiring energy

- **Rebound Effect in Food Waste**

- Food saved in early stages of chain → lower food price in latter stages
- Lower food price → more food waste due to lower opportunity costs

# Summary

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- Much of the literature has been focused on
  - Defining food waste and loss
  - Gross accounting of waste and loss levels on national scales
- Limited focus on economic incentives that determine the amount lost and wasted at each stage of production and consumption
- Focus on total amounts of waste without careful accounting for economic incentives and likely rebound effects
  - May result in misleading public expectations for the role of technology and behavioral changes in reducing food waste
- Time to shift focus to articulating economic incentives of waste

## Forthcoming

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- How do factors like health concerns, waste management and environmental concerns interact together to determine the amount of food wasted by consumers ?
- Will the impacts of these factors vary with household characteristics?
  - If they will, what's the implications for policy design?
- Will consumers' waste behaviors change when they know parts of the food they wasted will be saved by waste management?
  - If they will, will their reactions vary with household characteristics?