FOOD WASTE: AN INTRODUCTION & OVERVIEW

Danyi Qi & Brian Roe
SURVEY BEFORE THE CLASS

In the past 12 months, have you ever read, seen or heard anything about the amount of food that is wasted or about ways to reduce the amount of food that is wasted?
INTERESTS IN FOOD WASTE

Search Interests in Food Waste (Worldwide)

Data Source: Google Trend
INTERESTS IN FOOD WASTE

Search Interests in Food Waste (United States)

Data Source: Google Trend
FOOD WASTE

1:38-5:55 Last Week Tonight on July 19, 2015
WHY FOCUS ON FOOD LOSS AND WASTE?

1. The amounts are staggering
WHY FOCUS ON FOOD LOSS AND WASTE?

1. The amounts are staggering

- The FAO estimates that globally, approximately one-third or 1.3 billion tons of food is wasted annually (Gustavsson et al., 2011)

- USDA estimates that in the United States, food loss and waste at the retail and consumer levels was 31% of the food supply in 2010 (Buzby & Hyman, 2012)
  
  • 133 billion pounds of food
  • 162 billion dollars
HOW MUCH FOOD WASTE IN THE U.S.?

- Enough to fill the Rose Bowl (90,000-seat) every day (vs. Ohio Stadium: 104,944-seat)
- 1,249 calories per person per day at the retail and consumer levels
  - Equivalent to the calories in a Big Mac, large fries and a medium Coke
- $1,350 to $2,275 worth per year for an average family of 4
WHY FOCUS ON FOOD LOSS AND WASTE?

1. The amounts are staggering

A great waste of the resource used to produce those food

- **Water**: 70% of global freshwater withdrawals are used for irrigation (Postel et al., 1996).

- **Land use**: 37% of the earth’s land surface is occupied by agricultural lands, and 70% of the grassland, 50% of savanna, 45% of the temperate deciduous forest, and 27% of the tropical forest biome is cleared or converted by agricultural (Pretty, 2008).

- **Labor, agricultural investment,**...
WHY FOCUS ON FOOD LOSS AND WASTE?

2. People need the wasted food - now
WHY FOCUS ON FOOD LOSS AND WASTE?

2. People need the wasted food - now

- Wholesome food that is wasted could help feed people in need

Source: The American Academy of Pediatrics (AAP) and the Food Research & Action Center (FRAC)
WHY FOCUS ON FOOD LOSS AND WASTE?

2. People need the wasted food - now

- Wholesome food that is wasted could help feed people in need

Source: The American Academy of Pediatrics (AAP) and the Food Research & Action Center (FRAC)

Source: United Nation World Food Programme, Hunger Map 2014
WHY FOCUS ON FOOD LOSS AND WASTE?

2. People need the wasted food - now

- Feeding America, a hunger-relief charity, estimates that there are billions of pounds of potentially usable food loss in the U.S. food supply chain
  - 48 billion pounds pre-distribution
  - 22 billion pounds in local markets
WHY FOCUS ON FOOD LOSS AND WASTE?

3. Environmental Cost
WHY FOCUS ON FOOD LOSS AND WASTE?

3. Environmental Cost

Source: World Resources Institute
WHY FOCUS ON FOOD LOSS AND WASTE?

3. Environmental Cost

- Food is the single **largest component of municipal solid waste going to landfills (~21%)** and the U.S is running out of landfill space
- Landfills generate **20% of the nation’s emission of greenhouse gas**
- Bacteria breaks down food waste into more harmful components **that pollute water and soil**

GOAL: CUT FOOD LOSS AND WASTE IN HALF

- U.N. Sustainable Development Goal #12 (Lipinski, O’Connor, and Hanson 2016)
- In September 2015, USDA joined with EPA to announce the United States' first-ever national food waste reduction goal, calling for a 50-percent reduction by 2030
GOAL: CUT FOOD LOSS AND WASTE IN HALF

- USDA estimates that in the United States, 21 percent of the food supply is wasted at the consumer level – this represents nearly 2/3 of all wasted food.

Consumers and communities are key

Source: Godfray et al (2010)
DEVELOPED COUNTRIES – CAUSES OF FOOD WASTE

Cost of food waste

- **Consumer**: The replacement cost of uneaten food; Environment cost; Social cost

Benefits of food waste

- **Consumer**: The expected avoided damages, including avoided pain, suffering, time loss and all other health and financial costs from eating aging food; reduced time cost; reduced cost of having insufficient food.
MARGINAL BENEFITS AND COSTS OF FOOD WASTE

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

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

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

Source: Qi and Roe (2015)
HOUSEHOLD FOOD WASTE: AWARENESS AND ATTITUDES AMONG U.S. CONSUMERS

- Feel guilty when throwing away food: 77%
- Throwing away food if the package date has passed reduces chance of foodborne illness: 70%
- Some food waste is necessary to make sure meals taste fresh and good: 59%
- Throwing away food is bad for the environment: 58%
- Waste more food when bought in large packages or large quantities during sales: 53%
- It would be difficult to reduce household food waste further: 51%
- Throwing away food is a major source of wasted money: 42%
- Don't have enough time to worry about the amount of food wasted: 24%
- Your household wastes more food than other households of your size: 14%

Source: Qi and Roe (2016)
INTRODUCTION TO FOOD WASTE

HOUSEHOLD FOOD WASTE: DATE LABELS CONFUSION
Do you agree with the following statement?

Throwing away food if the package date has passed reduces the chance someone will get sick from eating the food

1. Agree
2. Disagree
3. Not sure
### HOUSEHOLD FOOD WASTE: DATE LABELS CONFUSION

<table>
<thead>
<tr>
<th>Statement</th>
<th>Percent</th>
<th>Agree Strongly</th>
<th>Agree Somewhat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feel guilty when throwing away food</td>
<td>77%</td>
<td></td>
<td></td>
</tr>
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<td></td>
</tr>
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<td></td>
<td></td>
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<td>24%</td>
<td></td>
<td></td>
</tr>
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<td>Your household wastes more food than other households of your size</td>
<td>14%</td>
<td></td>
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Source: Qi and Roe (2016)
HOUSEHOLD FOOD WASTE: DATE LABELS CONFUSION

Consumer Perceptions of Date Labels: National Survey

Authors: Emily Broad Leib, Christina Rice, Roni Neff, Marie Spiker, Ali Schklair, Sally Greenberg
HOUSEHOLD FOOD WASTE: DATE LABELS CONFUSION

0:00-3:11  ADAM RUINS EVERYTHING: WHAT THE DATE LABELS ON FOOD ACTUALLY MEAN
…, but in fact for most foods the date is a manufacturer’s **BEST GUESS** as to how long the product will be at its **PEAK QUALITY**.
A U.K. study found that 20% of consumer waste occurs because of date label confusion.

Source: Leib et al (2016)
HOW DATE LABELS INFLUENCE DISCARDING BEHAVIOR

INTRODUCTION TO FOOD WASTE

HOUSEHOLD FOOD WASTE: ENVIRONMENT COST
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Source: Qi and Roe (2016)
FOOD WASTE VS ENVIRONMENT

Food Waste in Landfill

- Food waste is the No.1 material sent to landfills and the **U.S is running out of landfill space**
- Landfills generate **20%** of the nation’s emissions of **Greenhouse Gas**
- Bacteria breaks down food waste into more harmful components that pollute water and soil

Source: World Resource Institute

Source: Qi and Roe (2017)

HOW FW MESSAGES INFLUENCE PLATE WASTE BEHAVIOR

Average Grams of Solid Waste Discarded

<table>
<thead>
<tr>
<th></th>
<th>Base: FLxLandfill</th>
<th>Comp: FLxComp</th>
<th>FW: FWxLandfill</th>
<th>Both: FWxComp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>41</td>
<td>38</td>
<td>9</td>
<td>29</td>
</tr>
</tbody>
</table>

Source: Qi and Roe (2017)
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Source: Qi and Roe (2017)
HOW FW MESSAGES INFLUENCE PLATE WASTE BEHAVIOR

Average Percentage of Selected Food Being Consumed

<table>
<thead>
<tr>
<th></th>
<th>Base: FLxLandfill</th>
<th>Comp: FLxComp</th>
<th>FW: FWxLandfill</th>
<th>FWxComp</th>
</tr>
</thead>
<tbody>
<tr>
<td>89%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>97%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>92%</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Average Percentage of Subjects Cleaning Plates

<table>
<thead>
<tr>
<th></th>
<th>Base: FLxLandfill</th>
<th>Comp: FLxComp</th>
<th>FW: FWxLandfill</th>
<th>FWxComp</th>
</tr>
</thead>
<tbody>
<tr>
<td>21%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33%</td>
<td></td>
<td></td>
<td></td>
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</tr>
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Source: Qi and Roe (2017)
INTRODUCTION TO FOOD WASTE

HOUSEHOLD FOOD WASTE: ECONOMIC COST
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Source: Qi and Roe (2016)
HOUSEHOLD FOOD WASTE: ECONOMIC COST

Percent of per capita disposable income spent on food in the United States, 1960-2014

South Korea cuts food waste with 'pay as you trash'

South Korean housewife Cho Sung Ja using an RFID food waste disposal system that is able to weigh how much trash each household generates and bill it accordingly. She lives in a three-bedroom apartment with her husband and son in Mapo, a mid-sized district in Seoul.

Source: The Straits Times
FOOD WASTE TAXES AND FEES

FOOD FOR THOUGHT
Tossing Out Food In The Trash? In Seattle, You'll Be Fined For That

January 26, 2015 - 2:54 PM ET

AMY RADIL

CNN politics

In Seattle, compost your food scraps -- or else

Sean Kennedy, CNN

Updated 10:20 AM ET, Fri October 3, 2014

Source: NPR
FOOD WASTE TAXES AND FEES

Social-Optimal Household Food Waste: Taxes and Government Incentives

Bhagyashree Katare, Dmytro Serebrennikov, H. Holly Wang, and Michael Wetzstein

Source: Katare et al (2017)
FOOD WASTE TAXES AND FEES

Tossing Out Food In The Trash? In Seattle, You’ll Be Fined For That

Source: NPR

Judge: Seattle trash-check ordinance ‘unconstitutional’

Rodney Watkins, a lead driver for Recology CleanScapes, pulls out food waste that should have been thrown into the food/yard-waste bin instead of the garbage bin in December 2014. A judge on Wednesday ruled that trash collectors in Seattle can’t examine garbage for food scraps. (Steve Ringman/The Seattle Times)

Source: The Seattle Times
**GROUP DISCUSSION: FOOD WASTE TAXES AND FEES**

*Discussion*: Should we have food waste tax/fee to achieve food waste reduction?

*Source: The Straits Times*

*Judge: Seattle trash-check ordinance ‘unconstitutional’*

*Originaly published April 27, 2016 at 4:48 pm | Updated April 28, 2016 at 12:34 pm*

*Source: The Seattle Times*
INTRODUCTION TO FOOD WASTE

HOUSEHOLD FOOD WASTE: MEASUREMENT OF FOOD WASTE
Do you agree with the following statement?

*Your household wastes more food than other households of your size*

1. Agree
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Source: Qi and Roe (2016)
HOUSEHOLD FOOD WASTE: MEASUREMENT OF FOOD WASTE

- Household Food Waste diaries

Volume (litre, pint, oz)  Weight (g, oz)
# Household Food Waste: Measurement of Food Waste

## Example of completed entries

<table>
<thead>
<tr>
<th>If no food or drink waste, please say why:</th>
<th>All food consumed</th>
<th>Meal not eaten at home</th>
<th>Other (write in)</th>
</tr>
</thead>
</table>

### Evening Meal

<table>
<thead>
<tr>
<th>What?</th>
<th>Type?</th>
<th>Pack</th>
<th>Size?</th>
<th>How much was...</th>
<th>Why?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas Beef pork sausages</td>
<td>Pack of 10</td>
<td>2 sausages</td>
<td>These were too burnt to eat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birds Eye quarter pounder beef burgers with mint</td>
<td>Pack of 2</td>
<td>2 burgers</td>
<td>Not cooked on BBQ, didn’t want to risk refreezing it</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mashed potatoes made with 3 large potatoes</td>
<td>1/2 pint</td>
<td>About 2 tablespoons</td>
<td>Husband bought frozen on way home for the kids and they didn’t get eaten</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coca Cola and Smirnoff vodka made up as a glass</td>
<td>As above</td>
<td>All</td>
<td>Didn’t all get eaten – don’t fancy savaging it for another meal or it didn’t taste that great</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salad pack (for the mash above)</td>
<td>As above</td>
<td>As above</td>
<td>Want that before it was finished</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Source: WRAP 2012
HOUSEHOLD FOOD WASTE: MEASUREMENT OF FOOD WASTE

- Household Food Waste diaries
- Household Waste Stream Composition Analysis
FOODIMAGE APP

Automated EMA prompts

Daily report of EMA responses images

If needed, staff contact the participant

EMA responses & images of food from patients

Eat - After Photo

User-dq

Dinner

Take After Photo
(1 photos)

Served Too Much

Tossing details?

Add Receipt Photo

View Receipt Text
Food intake 97%

Food Selected (average per item): 169.96g

Plate Waste (average per item): 5.63g

FOODIMAGE APP – LEARNING AT HOME

Plate Waste Rate

Reducing Wasted Food At Home

Most people don’t realize how much food they throw away every day — from uneaten leftovers to spoiled produce. About 55 percent of the food we throw away ends up in landfills or combustion facilities. In 2014, we disposed of more than 38 million tons of food waste. By managing food sustainably and reducing waste, we can help businesses and consumers save money, provide a bridge in our communities for those who do not have enough to eat, and conserve resources for future generations.

On this page:

- Benefits of Reducing Wasted Food
- Ways to Reduce Wasted Food
  - Planning Tips
  - Storage Tips
  - Prep Tips
- Thriftiness Tips
- Toolkit for Your Home and Your Community
- If You Can’t Reduce Wasted Food, Divert It From Landfills

https://www.epa.gov/recycle/reducing-wasted-food-home
HOW CAN WE REDUCE FOOD WASTE?

1. buy it with thought
2. cook it with care
3. serve just enough
4. save what will keep
5. eat what would spoil
6. home-grown is best

*don’t waste it*
Food Flows Mapping