Innovations to Mitigate Food Loss and Waste: From the Farmer to the Consumer

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Food Loss and Waste (FLW)


- This amount is in the range of 39-79 million metric tons (Muth et al. 2019, and multiple sources).

- Product specifications leads to $277 mill of diverted produce (ReFED 2016).

- FLW occurs along the entire supply chain.
Johnson, et al. 2018
<table>
<thead>
<tr>
<th>Crop</th>
<th>Walk-By Field Losses (% of Planted Area)</th>
<th>Full-season Loss for Harvested Fields (% of marketed yield)</th>
<th>Total Crop Losses Including Walk-by and Harvested Fields (% of marketed yield)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artichokes, annual</td>
<td>0.0</td>
<td>8.5</td>
<td>8.5</td>
</tr>
<tr>
<td>Artichokes, perennial</td>
<td>0.0</td>
<td>4.7</td>
<td>4.7</td>
</tr>
<tr>
<td>Broccoli</td>
<td>3.0</td>
<td>15.9</td>
<td>18.9</td>
</tr>
<tr>
<td>Brussels sprouts</td>
<td>0.0</td>
<td>13.2</td>
<td>13.2</td>
</tr>
<tr>
<td>Bunch spinach</td>
<td>2.6</td>
<td>20.9</td>
<td>23.5</td>
</tr>
<tr>
<td>Cabbage</td>
<td>4.0</td>
<td>51.6</td>
<td>55.6</td>
</tr>
<tr>
<td>Cantaloupe, LSL</td>
<td>1.0</td>
<td>9.7</td>
<td>10.7</td>
</tr>
<tr>
<td>Cantaloupe, WS</td>
<td>0.0</td>
<td>14.2</td>
<td>14.2</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>2.0</td>
<td>34.1</td>
<td>36.1</td>
</tr>
<tr>
<td>Celery</td>
<td>1.8</td>
<td>30.3</td>
<td>32.1</td>
</tr>
<tr>
<td>Green beans</td>
<td>12.5</td>
<td>21.4</td>
<td>33.9</td>
</tr>
<tr>
<td>Green leaf lettuce</td>
<td>3.5</td>
<td>43.3</td>
<td>46.8</td>
</tr>
<tr>
<td>Iceberg lettuce</td>
<td>2.0</td>
<td>22.6</td>
<td>24.6</td>
</tr>
<tr>
<td>Kale</td>
<td>0.0</td>
<td>38.6</td>
<td>38.6</td>
</tr>
<tr>
<td>Napa cabbage</td>
<td>3.3</td>
<td>42.0</td>
<td>45.3</td>
</tr>
<tr>
<td>Romaine hearts</td>
<td>2.9</td>
<td>113.6</td>
<td>116.5</td>
</tr>
<tr>
<td>Romaine lettuce</td>
<td>3.1</td>
<td>39.5</td>
<td>42.6</td>
</tr>
<tr>
<td>Roma tomatoes</td>
<td>1.3</td>
<td>8.2</td>
<td>9.5</td>
</tr>
<tr>
<td>Round tomatoes</td>
<td>1.3</td>
<td>6.4</td>
<td>7.7</td>
</tr>
<tr>
<td>Strawberries</td>
<td>0.0</td>
<td>43.8</td>
<td>43.8</td>
</tr>
<tr>
<td>Sweet corn</td>
<td>4.0</td>
<td>4.5</td>
<td>8.5</td>
</tr>
<tr>
<td>Watermelon</td>
<td>1.0</td>
<td>56.7</td>
<td>57.7</td>
</tr>
<tr>
<td>Surveyed crops</td>
<td>2.4</td>
<td>31.3</td>
<td>33.7</td>
</tr>
</tbody>
</table>

*a Loss as a percentage of marketed yield was calculated by dividing the average kg/ha remaining by the reported marketed yields per hectare from county crop reports (except for green beans for which grower estimates were used). To calculate the mean crop losses (walk-by, full-season, and total), the mean loss percents for the two variety types for artichokes and cantaloupes were used.*
FIGURE S-1 Conceptual model of a food supply chain. Elements or actors in this supply chain in one area (e.g., region or country) also have interactions (e.g., international trade) with actors in other areas.
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IOM (Institute of Medicine) and NRC (National Research Council) (2015)
GUIDELINES FOR SCORING UNDEVELOPED (DAMAGE) OR BADLY DEFORMED (SERIOUS DAMAGE) FOR STRAWBERRIES

The U.S. standards defines “Undeveloped” as damage when a Berry has not attained a normal shape and serious damage when a berry is “Badly deformed.”

U.S. No. 1

U.S. No. 1

Lower Limit U.S. No. 1

Lower Limit U.S. No. 1

Damage (U.S. No. 2)

Damage (U.S. No. 2)

Damage (U.S. No. 2)

Damage (U.S. No. 2)

Serious Damage

Serious Damage

Serious Damage

"Berries shall be scored as serious damage if there is a hole readily apparent.

USDA Agricultural Marketing Service (2017)
Strawberry Case Study

- Strawberries are grown throughout the U.S.
- California produced >91% of total production in U.S.
- Upon maturity, growers make repeated decisions to harvest based on
  - Fruit maturity,
  - Quality,
  - Price, and
  - Labor availability (Hsu-Flanders, Gallagher, and Wilson, Forthcoming)
Monthly Prices Received by Growers of Fresh Strawberries for Selected Years

Hsu-Flanders, Gallagher, and Wilson (Forthcoming) and California Strawberry Commission, n.d.
Improved Varieties

- Hardier varieties
- Facilitate shipping
- Better timing (Ellison et al. Forthcoming)
Controlled Environments

- Examples
  - Low and high tunnels
  - Hydroponics and vertical farming.

- Can manage growing conditions and pests (Ellison et al. Forthcoming).

Gleaning

- Gleaning is “an ancient tradition, a key part of the agricultural poor laws of the Bible” (Vitello et al 2015).
- The National Gleaning Project lists 282 groups in 45 states.
- Society of St. Andrew recovered 28.5 million lb. from 916 produce providers (St. St. Andrew Impact Report 2017).
Food waste in the sharing economy

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\textbf{Abstract}

Wasting food is one of the rare problems that affects our ability to achieve economic goals in terms of food security, environmental sustainability, and farm-financial security. Most of the ideas proposed to this point involve either behavioral nudges or administrative regulations that are either too paternalistic or piecemeal to represent viable solutions. In this study, we investigate the potential for commercial peer-to-peer mutualization systems (CPMSs), or sharing-economy firms, to emerge as market platforms for the exchange of surplus food. If a system of CPMSs is able to develop in a self-sustaining way, then the market prices they create will generate sufficient incentives for all actors to manage surplus food more efficiently. We develop an empirical model of a
The Murky Ethics of the Ugly-Produce Business

America’s wonkiest fruits and vegetables have ignited a food war.

AMANDA MULL  JAN 25, 2019

The middle strawberry is probably just as sweet. (JENNIFER A. SMITH / GETTY)

Do you know what baby carrots actually are?

For me, the baby-carrot jig was up a couple years ago. I’m not sure what I’d
FIGURE S-1 Conceptual model of a food supply chain. Elements or actors in this supply chain in one area (e.g., region or country) also have interactions (e.g., international trade) with actors in other areas.

IOM (Institute of Medicine) and NRC (National Research Council) (2015)
Cold Chain and Tech

• Failures can lead to shorter shelf-life, lower quality, and food safety issues (Ellis et al. 2019, references (Aung and Chang 2014; Badia-Melis et al. 2018; Chonhenchob, Singh and Singh, 2017; Mercier et al. 2017; Ndrahha et al. 2018))

• 12% of food waste is from poor refrigeration (Ellis et al. 2019 reference (Gunders 2012;)

• In strawberries, temperature fluctuations and delayed cooling can affect fruit color.
Cold Chains and Sensor Technology

• In strawberries, growers use cooling mechanisms liked forced air tunnels and cold walls. (Talbot and Chau 1998).

• Clam shells and their arrangement on pallets can help support cold chains (Ferrua and Singh 2009).

• Management strategies like first-expired-first-out vs. first-in-first-out can mitigate waste (Hsu-Flanders, Gallagher, and Wilson, Forthcoming).

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Ugly Produce

- Hannaford in 2017 had “Misfits.”
- Kroger was to begin “Pickuliar Picks.”
- Walmart had “Spuglies” in 2016 in 400 stores in Texas and “I’m Perfect” apples in 300 Florida stores in 2016.
- Several grocers have dropped programs (Gallagher, Hsu-Flanders, and Wilson (Forthcoming) and Choi and McFetridge, 2019).
At Daily Table we believe that delicious, wholesome and affordable food should be available to all. Our mission is to help communities make great food choices by making it easy to choose tasty, healthy, convenient and truly affordable meals and groceries.

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IOM (Institute of Medicine) and NRC (National Research Council) (2015)
Packaging & Labeling
Food waste: The role of date labels, package size, and product category

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ABSTRACT
The presence of food waste, and ways to reduce it, has generated significant debate among industry stakeholders, policy makers, and consumer groups around the world. Many have argued that the variety of date labels used by food manufacturers leads to confusion about food quality and food safety among consumers. Here, we develop a between-subject, laboratory experiment with different date labels (Best by, Fresh by, Sell by, and Use by) for products (ready-to-eat cereal, salad greens, and yogurt) of different sizes and dates to evaluate how date labels influence the value of premeditated food waste of subjects, or...
Journal of Food Products Marketing

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Seeing Is Not Believing: Perceptions of Date Labels over Food and Attributes

Norbert L. W. Wilson, Ruiqing Miao & Carter Weis

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87% of Products Are Now Using Two Date Labels, Creating Needed Clarity

FOR IMMEDIATE RELEASE

Katie McBreen (844) GMA-PRESS

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87% of Products Are Now Using Two Date Labels, Creating Needed Clarity

New survey data says less confusion will help Americans waste less, save more

WASHINGTON, December 18, 2018 — The Grocery Manufacturers Association today shared the results of its date labeling initiative that narrowed the array of product labels to two options: “BEST IF Used By” and “USE By.” Since launching in 2017, 87 percent of products now carry the streamlined labels, according to the latest data from consumer packaged goods companies that was released in GMA’s new report, Best If Clearly Labeled.

“Our industry is committed to empowering consumers to make informed decisions about the products they bring into their homes, and this initiative has been a key tool in doing so,” said GMA President and CEO Asian. “We’re proud of the progress we’ve made and look forward to continuing to help reduce consumer confusion and waste.”

The survey of GMA members also found that more than 90 percent of respondents believe that consumers are better able to understand the food labels now that there is less overlap between the two terms. The initiative also received support from retailers and states that have passed laws to make the transition to “USE By” labels.

“Consumers benefit from the clarity and consistency of the new labels,” said Asian. “We’re grateful to the states that have passed laws to support this initiative and look forward to continuing to work with them to ensure that all consumers can easily understand the labels on the products they buy.”

The survey results are based on a sample of 400 consumers in the United States and were conducted in conjunction with the Policy and Behavior Analytics Group of the A. D. Ross Research Center. The results are subject to a 5 percent margin of error.

About GMA

The Grocery Manufacturers Association, the international trade association for food and beverage manufacturers, represents more than 15,000 companies across the food chain, including the industry’s leading retailers, food processors and suppliers. GMA members are committed to ensuring a safe and healthy food supply for all Americans, protecting the environment, and enhancing the quality of daily life. Visit www.gma.org for more information.
Conclusion

• Participants predicted waste of food that suggests a behavioral bias.

• Individuals who are loss averse and overweight small probabilities, wasting food avoids adverse events, at least for deli meat.

  • Their behavior reflects the myopic loss averse who excessively spend on the purchase of extended warranties for household goods (Rabin and Thaler 2001).
Assessment

• Food loss and waste
  • occur along the food supply chain and
  • is highly variable by products.

• Solutions include
  • New marketing structures,
  • Charitable institutions, and
  • Technology may help mitigate waste,
    • *but they may have unintended consequences.*
Assessment

• Solutions include
  • changing date labels, as they matter in consumer food waste,
  • *but* solutions may lead to differential effects.

• Each of these solutions has little consideration of system dynamics.
Acknowledgement

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  • Bradley Rickard, Cornell University
  • Ruiqing Miao, Auburn University
  • Adriel Flanders-Hsu, Indigo
  • Laura Gallagher, USDA
  • Carter Weis, Cornell University

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References

References


