Lessons Learned in Estimating Food Loss in the United States

Jean C. Buzby, Jeanine T. Bentley, and Linda Kantor
Economic Research Service, U.S. Department of Agriculture

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Outline

- ERS definition of food loss
- Background on the LAFA data
- Introduction
  - Loss-Adjusted Food Availability (LAFA) food loss estimates
- Measurement issues and lessons learned
- Closing thoughts

ERS Definition of Food Loss

<u>Food loss</u>: Edible amount of food, **postharvest**, that is available for human consumption but is not consumed for any reason.

ERS Food Loss Definition *Includes*…..

- **Spoilage**: Loss from mold, pests, spillage, and inadequate storage (e.g., climate control)
- **Inefficiencies**: Over-ordering product handling errors, overproduction of ready-to-eat items, theft

- **Cooking loss:** natural shrinkage (e.g., moisture loss)

- **Food waste:**
  - edible food left on plate
  - edible food discarded for cosmetic reasons (out-grading)
  - food safety concerns

ERS Food Loss Definition Excludes……

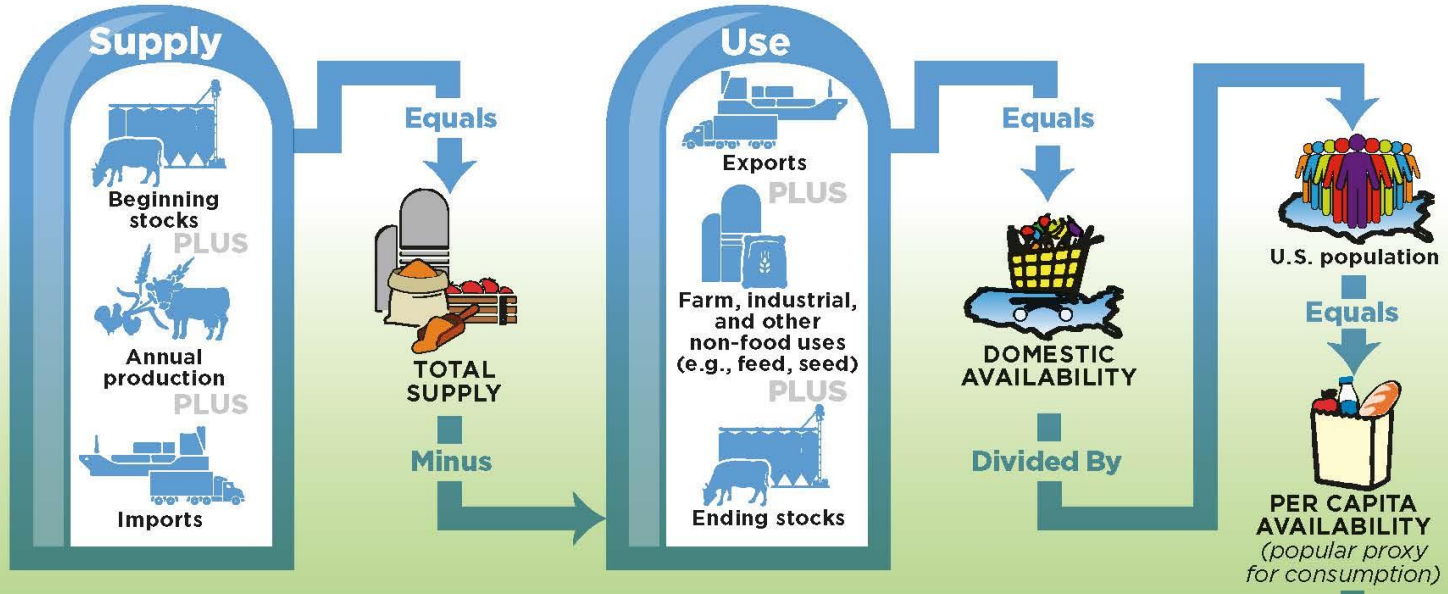
- **Pre-harvest** culling--selective harvesting of crops due to labor shortages, low market prices, oversupply, overplanting

- **Non-edible parts--**pits, rinds, cores, and bones

Loss-Adjusted Food Availability Data: Background

USDA Economic Research Service's

Food Availability Data System (FADS)



Series 1:
Food Availability Data
(230 foods)

Provides estimates of:

- Quantities/year

Series 2:
Loss-Adjusted
Food Availability Data
(215 foods)
(preliminary series)

Provides estimates of:

- Loss-adjusted quantities/year
- Loss-adjusted calories/day
- Loss-adjusted servings/day
- Amount of food loss at the retail and customer levels

Series 3:
Nutrient Availability Data
(From USDA's Center for Nutrition Policy and Promotion)

Provides estimates of:

- Nutrients and other components of the U.S. food supply (calories, protein, fats, 10 vitamins, 9 minerals)
- Nutrients from major food groups

Source: USDA, Economic Research Service
http://www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system.aspx

ERS Food Loss-Adjusted Food Availability (LAFA) Data Series

- Primary purpose: Provide per capita ***food availability*** estimates of:
  - Amount (e.g., grams, ounces, pounds),
  - Calories
  - Food pattern equivalents (i.e., "servings")

- Secondary purpose: Provide ***food loss*** estimates in the United States
  - Amount
  - Calories
  - Value

LAFA Structure

LAFA adjusts the core Food Availability (FA) data for loss at three levels:

Primary: Farm gate to retail (e.g., during transport, processing, and wholesaling)	**Retail:** Supermarket losses (e.g., dented cans, unpurchased foods, spoilage, and the culling of blemished or misshaped foods)	**Consumer:** Losses of food consumed at home and away from home (e.g., in restaurants, schools). Includes cooking loss, uneaten food, and nonedible share (for selected commodities)

Chicken example of the different types of loss adjustments in the ERS LAFA data

Year	Primary weight[2]	Loss from primary to retail weight[3]	Retail weight[3]	Loss from retail/ institutional to consumer level	Consumer weight	Loss at consumer level		Total loss, all levels	Per capita availability adjusted for loss			Calories per ounce equivalent (oz-eq)[4]	Ounce equivalent[4]	Calories available daily[5]	Food pattern equivalents[6]
						Nonedible share	Other (cooking loss and uneaten								
	-- Lbs/year --	-- Percent --	-- Lbs/year --	-- Percent --	-- Lbs/year --	-- Percent --	-- Percent --	-- Percent --	-- Lbs/year --	-- Oz/day --	-- G/day --	-- Number --	-- Ounces --	-- Number --	-- Ounces --
1970	40.1	31.7	27.4	4.0	26.3	0.0	15.0	44.3	22.4	1.0	27.8	66.0	1.0	64.7	1.0
1971	40.1	31.8	27.4	4.0	26.3	0.0	15.0	44.3	22.3	1.0	27.8	66.0	1.0	64.6	1.0
1972	41.5	31.8	28.3	4.0	27.1	0.0	15.0	44.3	23.1	1.0	28.7	66.0	1.0	66.8	1.0
1973	39.8	31.9	27.1	4.0	26.1	0.0	15.0	44.4	22.1	1.0	27.5	66.0	1.0	64.1	1.0
1974	39.7	31.9	27.0	4.0	26.0	0.0	15.0	44.4	22.1	1.0	27.4	66.0	1.0	63.8	1.0
1975	38.7	32.0	26.3	4.0	25.3	0.0	15.0	44.5	21.5	0.9	26.7	66.0	1.0	62.1	0.9
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2005	100.5	39.8	60.5	4.0	58.1	0.0	15.0	50.9	49.4	2.2	61.4	66.0	1.0	142.9	2.2
2006	101.1	39.8	60.9	4.0	58.5	0.0	15.0	50.9	49.7	2.2	61.7	66.0	1.0	143.8	2.2
2007	99.5	39.8	59.9	4.0	57.5	0.0	15.0	50.9	48.9	2.1	60.8	66.0	1.0	141.5	2.1
2008	97.6	39.8	58.7	4.0	56.4	0.0	15.0	50.9	47.9	2.1	59.6	66.0	1.0	138.7	2.1
2009	93.1	39.8	56.1	4.0	53.8	0.0	15.0	50.9	45.8	2.0	56.9	66.0	1.0	132.4	2.0
2010	96.4	39.8	58.0	4.0	55.7	0.0	15.0	50.9	47.4	2.1	58.9	66.0	1.0	137.0	2.1
2011	97.0	39.8	58.4	4.0	56.1	0.0	15.0	50.9	47.7	2.1	59.2	66.0	1.0	137.9	2.1
2012	94.1	39.8	56.6	4.0	54.4	0.0	15.0	50.9	46.2	2.0	57.5	66.0	1.0	133.8	2.0

Notes: Loss estimates at the consumer level have been updated. See http://www.ers.usda.gov/Publications/TB1927/. Also, loss estimates from retail/institutional to consumer level for fresh fruit, vegetable, meat, poultry, and seafood have been updated. See http://www.ers.usda.gov/publications/eib-economic-information-bulletin/eib44.aspx.

[1]This table uses aggregate food availability data, adjusts for losses, and converts the remaining supply into daily per capita calories and food pattern equivalents. [2]The basic availability estimate is made at a primary distribution level, which is dictated for each commodity by the structure of the marketing system and data availability. [3]Boneless-equivalent or edible weight. [4]Calories per ounce-equivalent and ounce-equivalent were obtained from USDA's Nutrient Database for Standard Reference Release, http://ndb.nal.usda.gov/ndb/search/list. [5]Food pattern equivalents multiplied by calories per ounce-equivalent. [6]Ounces per day divided by ounce-equivalent.

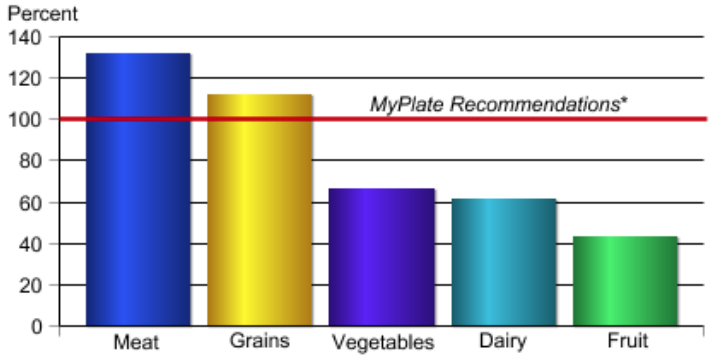
Source: Calculated by ERS/USDA based on data from various sources (see http://www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system/loss-adjusted-food-availability-documentation.aspx). Data last updated Feb. 1, 2014. Note: The loss factors presented here are preliminary estimates and are intended to serve as a starting point for additional research and discussion. We welcome suggestions to expand on and improve our loss estimates. Contact Jean Buzby at jbuzby@ers.usda.gov or Jeanine Bentley at jbentley@ers.usda.gov for more information.

Background on LAFA

- Per capita estimates are provided for individual commodities and food groups and where appropriate, in total.
- Like the FA estimates, the LAFA Estimates serve as popular proxies for actual consumption for over 200 commodities (e.g., fresh spinach, frozen apples, beef, and eggs) in the United States.
- Estimates are useful for studying food consumption trends.
- Series is considered to be ***preliminary*** or work in progress.

American diets are out of balance with dietary recommendations

In 2014, Americans consumed more than the recommended share of meat and grains in their diets but less than the recommended share of fruit, dairy, and vegetables



*Data based on a 2,000-calorie-per-day diet.

Note: Rice and durum flour data were discontinued and thus are not included in the grains group. Food availability data serve as proxies for food consumption.

Source: Calculated by ERS, USDA, based on data from various sources (see Loss-Adjusted Food Availability Documentation).

Data as of February 2016.

The ERS Loss Estimates

Table 1: *Estimated Total Food Loss at the Retail in the United States, 2010*

Commodity	Food Supply[a]	Retail Level Losses		Consumer Level Losses		Total Loss	
	Billion pounds	*Billion pounds*	*Percent*	*Billion pounds*	*Percent*	*Billion pounds*	*Percent*
Grain products	60.4	7.2	12	11.3	19	18.5	31
Fruit	64.3	6.0	9	12.5	19	18.4	29
Vegetables	83.9	7.0	8	18.2	22	25.2	30
Dairy products	83.0	9.3	11	16.2	20	25.4	31
Meat, poultry, and fish	58.4	2.7	5	12.7	22	15.3	26
Eggs	9.8	0.7	7	2.1	21	2.8	28
Tree nuts and peanuts	3.5	0.2	6	0.3	9	0.5	15
Added sugar and sweeteners	40.8	4.5	11	12.3	30	16.7	41
Added fats and oils	26.0	5.4	21	4.5	17	9.9	38
Total	430.0	43.0	10	89.9	21	132.9	31

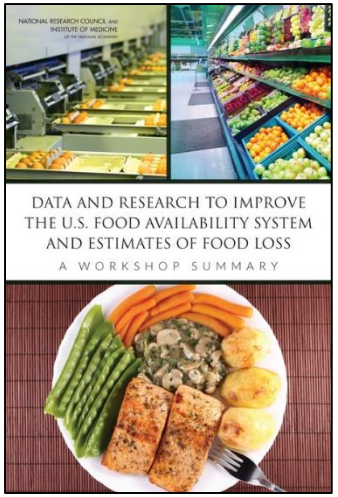
[a] Food supply at the retail level, which is the foundation for the retail- and consumer-level loss stages in the loss-adjusted data series. Totals may not add due to rounding. Source: Buzby et al. (2014).

ERS Initiatives to Improve LAFA Data

- ERS has undertaken a series of initiatives to improve the technical and measurement assumptions underlying the LAFA loss estimates.

- Lessons learned could provide valuable information for researchers interested in measuring food loss and its food waste subcomponent.

- 2014: ERS sponsored a workshop to inform data and research planning on food availability and food loss (NRC and IOM, 2015).



Measurement Issues and Lessons Learned

Lessons Learned: 2014 Workshop

- FADS relies on continuous, high-quality national, annual data at different points of the farm gate to fork chain.
- Food loss factors are not refined enough to vary over time (in most cases).
- Food donations (e.g. from retailers) are not directly measured.

- FADS import and export data do not reflect the growth of multi-ingredient foods.

Study: In 2013, ERS contracted with the National Research Council (NRC) and the Institute of Medicine (IOM) of the National Academies

Definitions of Food Loss and Waste Vary

- Various definitions of food loss and waste complicate comparisons of studies worldwide and the estimation of new loss factors.

USDA

wrap

Food and Agriculture Organization of the United Nations

WORLD RESOURCES INSTITUTE

FUSIONS

Lessons Learned: Initiatives to Update and Improve ERS Food Loss Assumptions

- ERS has completed several initiatives to update loss assumptions for many of the 200 plus commodities in the LAFA data series.

- Data from two initiatives, which measured losses at the retail (e.g., fresh fruits and vegetables) and consumer levels (all commodities), are now used directly in the LAFA data series.

- Select data from a third initiative, which measured farm-gate to retail losses, are used by ERS commodity analysts in the FADS supply and use balance sheets.

Lessons Learned: Measuring Losses at the Primary Level (farm to retail)

- Lack of data on the increased amount of some commodities (e.g., chicken) going to pet food use.

- Difficult to produce reliable national farm-to-retail conversion factors or food loss estimates for individual commodities due to:
  - size and diversity of the U.S. farm and food processing sector;
  - wide range of commodities;
  - diverse growing regions;
  - year-to-year variation in weather (e.g., drought, floods);
  - pest infestation; and
  - farm animal and plant diseases

- Concerns from farmers and processors about losing competitive advantage may limit data collection and release.

Studies: 2003 contract with the University of Minnesota's Food Industry Center (TFIC) ; 2007 Contract with Pennsylvania State University and the International Life Sciences Institute (ILSI).

Lessons Learned: Losses at the Retail Level (1)

- Estimating supermarket loss (shrink) for fresh meat, poultry, and seafood difficult due to lack of reliable supplier shipment data.

- Using UPC-coded data alone to estimate shrink for fresh meat, poultry, and seafood is not appropriate due to a lack of data on random weight items,

  which account for a significant

  share of total product sales.

- Comparing shipment to point-of-sale data to estimate shrink is not appropriate for many FADS commodities (e.g. flour) that are primarily consumed as multi-ingredient foods (e.g. bread, cookies).

Study: 2007 contract with the Perishables Group, Inc.

Lessons Learned: Losses at the Retail Level (2)

Further retail-level research is needed to:

- Estimate shrink for the other commodities in LAFA;
- Determine the extent to which shrink captures an unknown amount of theft, accounting errors, and other factors;
- Determine if shrink is dependent on the assortment of products offered for sale at different value levels (e.g., lower-, average-, and higher-priced bagged spinach or salad greens) (Buzby et al., 2015)(p. 644); and
- Determine if shrink varies by store type (e.g., megastores, convenience stores, supermarkets).

Lessons Learned: Losses at the Consumer Level (1)

- Comparing food purchase data from supermarket scanners with consumption reported by individuals

  is challenging for some commodities

  typically consumed

  as multi-ingredient foods

  (e.g., wheat flour consumed as breads, and pasta).

- Sample sizes were too small for some commodities (e.g., rye flour and select fruit juices) to calculate accurate loss factors.

Lessons Learned: Losses at the Consumer Level (2)

- Methods are needed to estimate food loss for individual foods consumed away from home (i.e., in restaurants, fast-food outlets).

- Nationally representative data are not available to analyze consumer-level food loss by demographic or regional groups (e.g., education level; age).

Study: 2007 Study with RTI International

Ongoing ERS Research Initiatives on Food Loss

Measurement improvement:

- ***Consumer-Level Food Loss: An Update of Estimates for Cooking Loss and Uneaten Food at the Consumer Level***
  - Consumer-level losses for food at home for 215 LAFA commodities;
  - Updates loss factors from similar study based on 2004 data;

  Preliminary findings: September 2017 (RTI International, research grant)

- ***Expert Panel on Technical Questions and Data Gaps in the LAFA data***
  - Four-member expert panel will research and recommend workable, concrete solutions to technical questions and data gaps in the LAFA series;

  Preliminary findings: September 2017 (RTI International, research grant)

Ongoing ERS Research Initiatives on Food Loss

Theoretical framework:

- ***Optimal Food Waste: An Economic Perspective***
  - Economic arguments and evidence that a non-zero level of food waste should be expected in a well-functioning economy;
  - Economic mechanisms that lead to food loss; suitability of current definitions of food loss and waste; externalities of food waste (e.g. cost to climate, water, and land used to produce food); cost-benefits of food recovery;

Preliminary report, 2017

Closing Thoughts

Summary of ERS Initiatives

- ERS has updated and explored food loss estimates through a series of initiatives for various commodities and marketing levels

- **3 initiatives currently underway:**
  - Update of consumer level loss estimates;
  - Expert panel to answer ERS technical questions about LAFA (e.g., whether and how to integrate new supermarket loss factors into LAFA);and
  - Economic theory study of food loss and its food waste subcomponent.

- Improved accuracy and precision of loss assumptions underlying LAFA data will improve the data's usefulness to researchers and policymakers.

- Data documentation and ERS food loss reports are available on our website (www.ers.usda.gov).

As An Aside…Ideas for Future Research

- **Further retail-level research is needed to:**
  - Estimate shrink for LAFA commodities other than fresh fruits and vegetables;
  - Determine the extent to which shrink captures an unknown amount of theft, donations, accounting errors, and other factors;
  - Determine if shrink is dependent on the assortment of products offered for sale at different value levels (e.g., lower-, average-, and higher-priced bagged spinach or salad greens); and
  - Determine if shrink varies by store type (e.g., megastores, convenience stores, supermarkets).

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ERS Food Availability (Per Capita) Data System
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Loss Adjusted Food Availability Documentation
http://www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system/loss-adjusted-food-availability-documentation.aspx

JEAN C. BUZBY, PH.D.
Diet, Safety, and Health Economics Branch Chief
Economic Research Service, USDA
USDA/ Economic Research Service
1400 Independence Ave., SW, Mail Stop 1800
Washington, DC 20250-1800
Phone: (202) 694-5370
Fax: (202) 245-5115
jbuzby@ers.usda.gov