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Food Residual - Source Reduction Activities and Case Studies

Food can be wasted for a large variety of reasons, which makes the food was issue difficult to solve with one single solution.[1] This document outlines a variety of source reduction activities and relevant case studies which can be utilized by businesses, institutions, schools and the general public.

Source reduction is the most encouraged method of food recovery. Source reduction activities prevent waste from being generated. There are various food residual source reduction activities individuals, communities and businesses can implement to prevent food scraps.

With **consumers** responsible for approximately 60% of food scraps, any source reduction activities implemented will have a significant impact on the amount of food scraps generated. Some of these actions include:

- Pre-planning weekly meals;
- Optimizing storage space in closets, cabinets, and refrigerators;
- Preparing the more perishable foods first; and
- Being mindful of leftovers and ingredients.

Businesses and institutions can work to minimize surplus food generation and prevent avoidable food loss and waste[2] by developing foundational initiatives that can include:

- *Reducing Portion Sizes* to reduce plate waste and address over-serving, plate composition and tray use.
- *Increasing Marketability of Produce* to increase use of second-grade produce, adjust government and/or grading requirements, raise merchandising standards, and reduce shipments rejected.
- *Standardizing Date Labels* to reduce wasted food caused by confusion related to date labels through standardization and education of key players across the food supply chain.
- *Implementing Packaging Adjustments* to manage portion size and reduce damage during transport and increase shelf life.
- *Improving Cold-Chain Managemen*t to avoid rejection of shipments due to spoilage and cold chain deficiencies related to infrastructure and management.
- *Expanding Value-Added Processing* to cultivate secondary markets for damaged or surplus food and byproducts

Learn more about waste reduction strategies by visiting the EPA's Sustainable Management of Food webpage Tools for Preventing and Diverting Wasted Food.

- Toolkit for Reducing Wasted Food and Packaging
  - Food and Packaging Waste Prevention Tool
  - Reducing Wasted Food & Packaging: A Guide for Food Services and Restaurants
- Food: Too Good To Waste toolkit, which has 5 key waste prevention strategies:
  - *Get Smart:* see how much food (and money) you are throwing away

[1] https://www.researchgate.net/publication/283453035_Supermarket_food_waste_-_Prevention_and_management_with_the_focus_on_reduced_waste_for_reduced_carbon_footprint
[2] CEC. 2017. Case Studies on Food Loss and Waste in North America. Montreal, Canada: Commission for Environmental Cooperation. 51 pp.

- *Smart Shopping*: buy what you need
- *Smart Storage*: keep fruits and vegetables fresh
- *Smart Prep*: prep now, eat later
- *Smart Saving*: eat what you buy

Food residuals, per COMAR 26.04.13 are defined as materials derived from the processing or discarding of food, including pre-and post-consumer vegetables, fruits, grains, dairy products, and meats. According to a 2019 report prepared by Oregon Department of Environmental Quality[3], wasted food, however, refers to only a subset of food waste – the **edible parts of unconsumed food**. Of the food waste we throw away, 30% was never edible such as banana peels and eggshells.

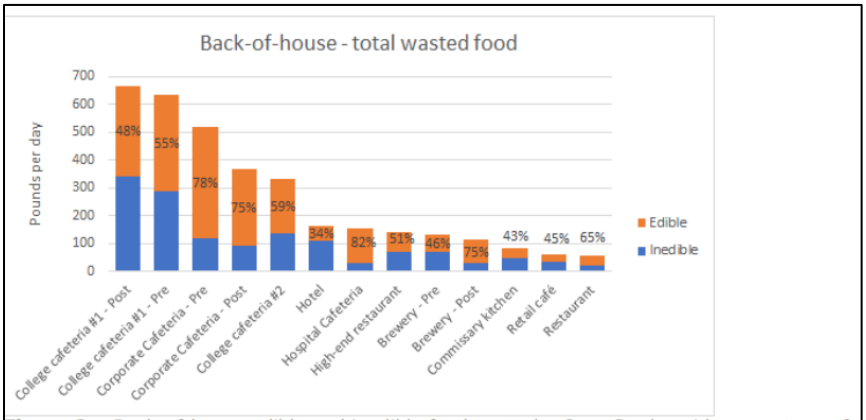


Figure 3: Back-of-house edible and inedible food waste by Case Study, with percentage of edible wasted food

The report further identifies that:

> *Source reduction is the highest priority as the majority of economic and environmental burdens of wasted food happen before consumption, in the food's production, processing, transportation, storage and preparation. For businesses the* ***most potent cost and labor savings are associated with avoiding the purchasing and preparation of food****, rather than pursuing rescue or recovery efforts.*

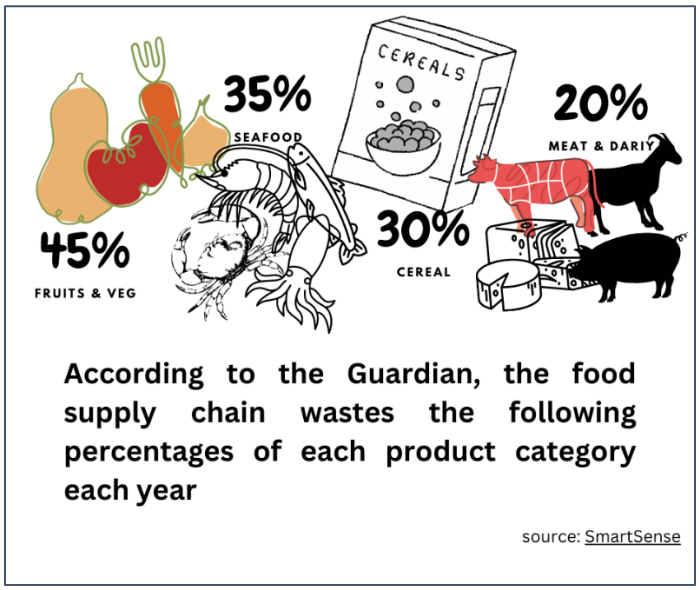
The information provided below is a compilation of case studies, white papers and articles that highlight tool kits, programs and plans for source reduction of food residuals. While these are categorized by industry type, much of the information shared can be utilized by any school, business or institution.

Supermarket, Mini-Mart, Bodega, Grocery Store

Grocery retails are at the center of the supply chain. According to ReFED, (grocery) retailers generate 10.5M tons of surplus food each year[4]. ReFED provides a list of recommendations to this sector on how to reduce their surplus tonnage. Methods for prevention include:

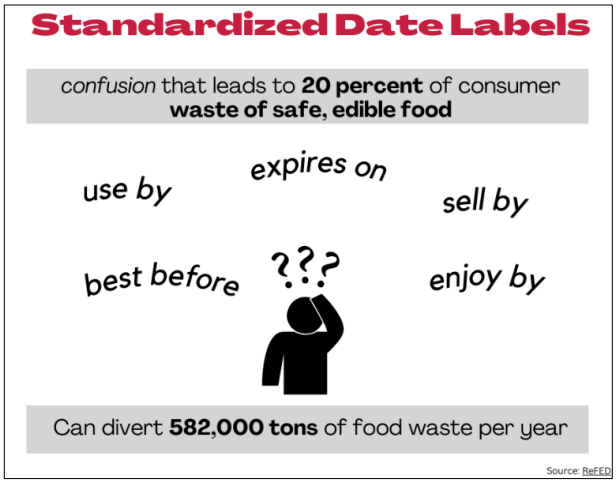
- Optimize the Harvest
- Enhance Product Distribution
- Refine Product Management
- Maximize Product Utilization
- Reshape Consumer Environments

[3] Community Environmental Services, 2018 submitted 2019 revised, Oregon Wasted Food Study: Institutional and Commercial Sector Case Studies
[4] https://refed.org/stakeholders/retailers/



The Biological Diversity program identifies **supermarkets** as "*gatekeepers to the US food system, influencing what makes it from farms to shelves, what happens to unsold food, and what types of food shoppers buy.*[5]" Most studies conducted share the back and forth for profit, promotion and competition of products. While mini-marts and bodega's have the ability to limit their materials by the square footage of retail space available in the facility all facilities require forecasting to ensure product moves and is captured prior to the wasted classification. Waste is a lack of profit and while sales offset the total amount wasted, it is still net profit of waste.

One of the biggest culprits of food waste is expiry dates. According to LS Retail article[6], "87% of food waste from **grocery** stores is because of them having to dispose of food that goes past its expiration date." Supermarkets can play a strong role in the education of its consumers as well as work with legislation to standardize the information on packaging across all sectors to have a definitive date in which the product is created – sold by – used by.



A 2018 announcement by FMI and Nielsen identified that in the next five to seven years, 70% of consumers will be grocery shopping online. Tie in a global pandemic, and the online grocery customer base counts roughly 150 million shoppers[7], close to half the country's population, and is forecast to grow further in upcoming years.

Food waste alliance recommends rolling out just two or three amended standard operating procedures (SOP) over time, rather than integrating all the changes at once. Additionally, once establishing the SOP, be consistent, repeat the training and translate materials into languages that are accessible to your front-line employees[8].

A case study, supported by the Food Loss + Waste Protocol[9], identified a variety of changes implemented by grocers that have supported source reduction activities, such as daily fresh product deliveries which result in more accurate ordering and improvement in quality.

From a 2017 article in Canadian Grocer, it identifies *5 ways grocers can reduce food waste,* calling out that while *some grocers might assume that consumers are more likely to buy off a full shelf. However,*

[5] https://www.biologicaldiversity.org/programs/population_and_sustainability/grocery_waste/
[6] https://www.lsretail.com/resources/six-ways-supermarkets-can-reduce-food-waste
[7] https://www.statista.com/statistics/1032362/online-grocery-purchasers-united-states/
[8] https://foodwastealliance.org/wp-content/uploads/2020/04/FoodWaste_Final_small.pdf
[9] https://www.flwprotocol.org/case-studies/delhaize-americas-operations-united-states-food-waste-stores-distribution-centers/

putting an abundance of produce on display can result in perishable items going bad before they're sold and consumed.[10]

Supercenters

The Consumer Goods Forum identifies large scale food centers (**supercenters**) case study actions such as strict internal procedures, including accurate forecasting of trade volume of food items and marking down prices of food items that are approaching the best before or expiry date improve source reduction. Citing engaging customers and staff strengthened our forecasting and ordering tools to improve inventory flow, adjusted store fixtures to increase product turnover, enhanced distribution centers and offered discounts on food that is close to its expiration date[11]. A major key to meeting source reduction goals has been to update, track and utilize inventory management software to optimize opportunities for reduction.

Food Wholesale & Distribution

According to a 2021 white paper by Softengine, Inc., the most common type of food waste in **food distribution** waste is in inventory[12]. This occurs when distributors have too much of a particular food product and the food spoils or is never consumed. This is often due to the inability to sell items and a mismatch between supply and demand. Food waste also occurs due to improper storage methods, including during transportation from the supplier to the warehouse, to retail stores, or restaurants. Inventory waste has multiple costs to distributors, including the cost of the food products, the time and labor used to store, locate and manage items within the warehouse, storage costs, and costs of disposal.

Three ways warehouse operations can reduce waste include:

- Supply and Demand Planning
- Proper Warehouse Organization
- Implement the First-in-First-out method

Hospitality – hotels/motels

A 2019 Case Study[13] on Food at the Baltimore Convention Center, that was part of a broader study of the **hospitality industry** which culminated in the development of an industry focused toolkit[14] supporting prevention, donation and diversion of food waste. Participating hotels saw a reduction of 10-38% in just 12 weeks.

Resorts, Conference Centers, Venues & Events

Case studies performed by the Green Sports Alliance at **professional sports complexes** resulted in a 2022 *Food Waste Diversion and Compostable Packaging Playbook*[15]. Per the handbook:

- There is often leftover food residue in concessionaire containers, on cutlery, or in cups. When these food serviceware items are made from compostable material, the entire item, serviceware and food waste, can be sent to composting facilities and diverted from landfills

[10] https://canadiangrocer.com/5-ways-grocers-can-reduce-food-waste
[11] https://www.theconsumergoodsforum.com/wp-content/uploads/2017/10/Environmental-Sustainability-Food-Waste-Booklet-2018.pdf
[12] https://softengine.com/wp-content/uploads/2021/03/food-waste-environment-web.pdf
[13] https://cdn.saffire.com/files.ashx?t=fg&rid=BaltimoreCC&f=A_Case_Study_in_Food_Waste_Reduction_at_The_Baltimore_Convention_Center_July_19_2019.pdf
[14] https://hotelkitchen.org/about-toolkit/
[15] https://greensportsalliance.org/wp-content/uploads/2022/08/2022_FINAL_GSA-Food-Diversion-Playbook.pdf

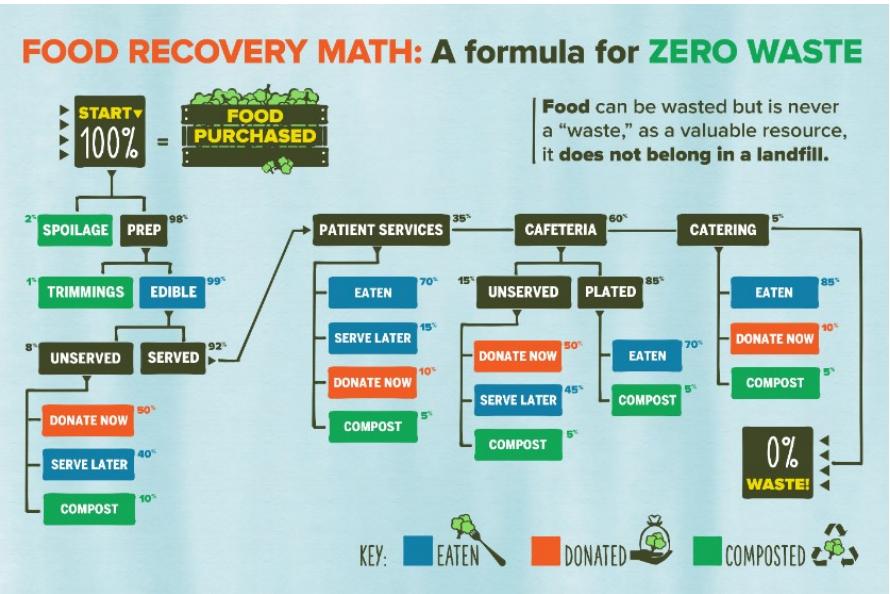
- When compostable serviceware is used across all venue applications, fans experience simplified consistent messaging on how to sort waste, leading to greater venue waste diversion rates
- In 2015, Target Field, the home of the Minnesota Twins, migrated to fully compostable food serviceware products in all concession and food service areas. By 2019, the Twins were able to achieve a 70% waste diversion.
- In 2018, US Bank Stadium became the first sports stadium to achieve a Zero Waste Super Bowl with 91% of waste diverted from landfills – more than 69 tons.

When it comes to **events**, the industry "fear of running out" has longs since been a juggle to ensure there's enough food without creating too much waste. Articles, including those written by BCD[16] and Sustainable Event Alliance[17] hone in on the need to balancing preplanning, guest expectation, and education throughout the entire process. Reevaluate by reexamine portion sizing and overset contract terms, as many contracts often include a built-in 3-percent overage that often leads to wasted food.[18]
Offset the large quantity of packaging material and potentially non-recyclable waste by incorporating reusables at events. Transparency on the use of these materials such as reusable cups and service ware, increases the overall confidence of reuse.[19] Incorporating tracking software both in food and beverages[20] aids in waste reduction and profit loss.

Hospitals

A 2017 study of food waste, focused on quantifying food purchase, consumption, waste, and energy use in the food system at **hospitals**. The study, which encompassed patients, retail, school catering and special events catering, served by a food supply network 90% Sysco Corporation and a series of smaller specialized suppliers.

Over 365 days per year, the food preparation loss is about 4.5% weight of the food purchased. Leftovers are about 30% of waste production and are most likely the patient non-consumed material as the food were prepared but not ordered in a timely fashion by patients[21].



Source: Practice Greenhealth®

[16] https://insights.bcdme.com/blog/how-to-avoid-food-waste-at-meetings-and-events
[17] https://sustainable-event-alliance.org/
[18] https://www.pcma.org/what-meeting-planners-can-do-reduce-food-waste/
[19] https://sustainable-event-alliance.org/global-reusables-at-events-hygiene-standard/
[20] https://bartrack.beer/
[21] https://www.researchgate.net/publication/321949270_A_study_of_food_waste_in_St_Francis_Hospital

An April 2019 publication[22] of a case study *Hospitals Save When They Reduce Food Waste* quoted "reducing food waste can help **hospitals** cut their food purchasing budget by up to 6%." The publication further outlines how to achieve reduction in cost including investing in the right technology, opting for made-to-order stations, and measure, measure, measure.

A similar study in a February 2022 article in The Online Journal of Issues in Nursing[23], *Hospital Food Waste: Reducing Waste and Cost to our Health Care System and Environment* further identified that *complex food planning systems utilized by hospitalizes reflect a trend toward over production of food and poor appetites of hospitalized patients. Just 28% of meals ordered were eaten completely and 29% were less than half eaten. 39% of the food served was returned to the kitchen as food waste.*

Nursing Homes / Assisted Living

In a 2019 study performed by the University of Guelph, published under the title *Food Waste at Long-Term Care Facilities, a Moral Dilemma?*[24], investigating **long-term care facilities**:

- Initial findings were straightforward, only 5.6% of all food wasted was in the kitchen
  - Minimal food waste generated in preparation and production because almost all food is frozen, pre-portioned, and often pre-prepared
  - The amount of meals needed for each service period is known ahead of time
- Forecasting is challenging, since menus are constantly changing to provide variety for residents
  - Managers make educated guesses, but also apply buffers
  - Various textures such as pureed and minced, depending on the residents feelings that day they will order what they think they can handle
  - Results in high level of food that is sent to the dining halls but never served (45.7%)
- Full portion requirements to all residence whether they want them or not
  - Determined by dietitians to ensure required levels of caloric and nutritional intake
  - Food served to residents but not eaten results in 20% food untouched

In a 2019 article by Food Management[25] titled *Senior living center's dining approach reduces waste, food cost*, describes how a Washington state **assisted living center** modified to a more customer-based dining program.

- meeting resident preferences and providing plenty of options, especially to customize individual meals
- patient daily food costs have plunged from $8.99 per day to $6.23, approximately a 30% reduction
- in a four-month study, it showed donations of 1,163 pounds of food to a recovery program run by a local organization.

A publication by the University of Stavanger in August 2020 titled *Sustainable Food Consumption in Nursing Homes: Less Food Waste with the Right Plate Color?*[26] explores the possibility of reducing food waste in **nursing homes** by replacing traditional dining white porcelain with plates of diverse color combinations. The study determined:

- 26% of food was thrown away (plate waste) when serve don white plates compared to 9% on colored plates tested

[22] https://www.hfma.org/topics/operations-management/article/hospitals-save-when-they-reduce-food-waste.html
[23] https://ojin.nursingworld.org/table-of-contents/volume-27-2022/number-2-may-2022/articles-on-previously-published-topics/hospital-food-waste/#Alshqaqeep
[24] https://ugsrp.com/2019/07/11/food-waste-at-long-term-care-facilities-a-moral-dilemma/
[25] https://www.food-management.com/healthcare/senior-living-center-s-dining-approach-reduces-waste-food-cost
[26] https://www.researchgate.net/publication/343633746_Sustainable_Food_Consumption_in_Nursing_Homes_Less_Food_Waste_with_the_Right_Plate_Color

Military Installation

In 2016, as part of the Army's Net Zero Initiative, a report was published by the US Army Corps of Engineers, *Organic Waste Diversion Guidance for U.S. Army Installations (ERDC TR-16-17)*[27], to provide installations with practical guidance on organic waste diversion practices.

In 2019, an evaluation of **military** dining facilities (DFACS) was performed in Fort Jackson[28] to support diversion of organics.

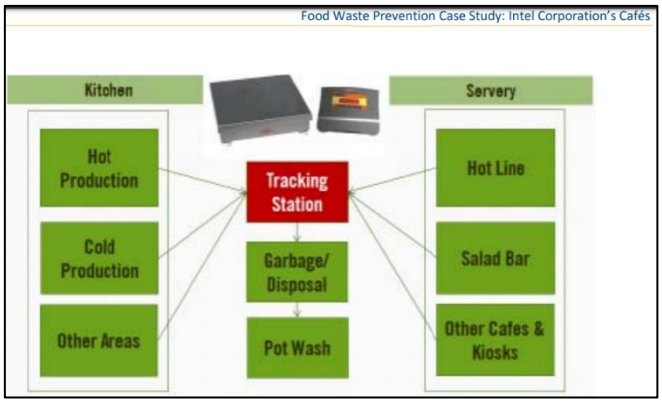
Note: Where, additional industry-type categories are located on-base (i.e., **supermarket**, **cafeterias**, **venues**, **hospitals**, etc.) refer to those sections in this document for suggestions or case studies to support additional source reduction activities.

Office Buildings and Corporate Cafeterias

Similar activities presented to restaurants and catering businesses can assist **corporate cafeterias and office building cafeterias** with source reduction.

Corporate entities that choose to roll out successful reduction programs

- Measure – using a smart scale system, an IKEA pilot program resulted in a 23-54% decrease in food waste in just 6 months[29]
- Engage staff
- Reduce overproduction
- Rethink inventory and purchasing practices
- Repurpose excess food



Correctional Facilities

A 2014 Florida waste reduction and recycling guide[30], food preparation and serving source reduction activities recommend:

- Purchase products in bulk and/or concentrated form and dispense in reusable/refillable containers (e.g., juice concentrates, beverages, frozen foods and condiments such as sugar and ketchup).
- Switch from disposable plates, cups, and eating utensils to reusable plastic products.
- Require suppliers to provide produce, meats, baked goods and dairy products in reusable crates.
- Work with suppliers to reduce or eliminate packaging where feasible.
- Practice good inventory management (first-in, first-out, limited inventory levels) to prevent spoiled and out-of-date products.
- Inspect perishable items when delivered and return spoiled and off-spec goods to the supplier.
- Track daily food production and resulting waste generation, and adjust production amounts accordingly to reduce waste.

[27] https://usace.contentdm.oclc.org/digital/collection/p266001coll1/id/3955/
[28] https://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=539177&Lab=NRMRL
[29] https://www.flwprotocol.org/case-studies/ikea-food-food-precious-food-waste-initiative/
[30] https://www.wastexchange.org/upload_publications/PrisonRecyclingGuide.pdf

- Utilizing useable food trays reduces the volume of material disposal at a **correctional facility** where plastic single serve packaging is utilized.

CalRecycle[31] shares that one of the main components of starting or expanding waste reduction and recycling programs is to bring together key players at institutions and headquarters who can contribute to the development or expansion of sustainable waste management programs:

- Wardens and assistant wardens
- Facilities and planning staff
- Maintenance and operations staff
- Kitchen managers
- Business services and contract management staff
- Hauling company representatives
- County Recycling Coordinators

Organics recycling at **correctional** programs throughout the country:

- Evergreen State College & Washington State Department of Corrections Sustainability in Prison Project
- Philadelphia Department of Prisons Composting
- Education Justice Project of the University of Illinois at Urbana-Champaign: Composting in Prison
- Virginia Department of Corrections
- California Department of Corrections and Rehabilitation

Schools – primary & secondary

Schools can implement techniques to help increase consumption and reduce food waste during lunchtime. According to a July 2019 publication by Rutgers University[32]

- Research indicates that moving lunchtime to occur after recess can help reduce food waste by as much as 30%. After recess, students tend to be hungrier and eat more, thereby wasting less.
- Studies show that increasing lunchtime by 10 minutes has the potential to reduce food waste by one-third by giving students more time to eat.

According to a Governor's Summer Internship Program (*A Greener Tomorrow: Reducing Food Waste in Maryland K-12 Schools)* Policy Paper on Food Waste[33] published in 2018, **school cafeterias** account for a significant percentage of food that is thrown out. The paper describes:

- In Montgomery County alone, schools throw out 14,000 tons of garbage every year - food scraps being a primary component. Roughly 40% of the waste from garbage (from Maryland high schools in Bethesda[34]) contained food scraps, paper trays, and uneaten/unopened food.
- Waste sorting in Frederick County[35] on some days can recover 70 pieces of salvageable fruit and another 70 unopened drinks.

[31] https://calrecycle.ca.gov/stateagency/agencytype/correctional/
[32] https://njaes.rutgers.edu/school-food-waste/food-waste-summit-toolkit.pdf
[33] https://publicservicescholars.umbc.edu/wp-content/uploads/sites/448/2018/09/GSIP-Policy-Paper-Food-Waste-Final.pdf
[34] https://www.worldwildlife.org/pages/coalition-of-maryland-students-and-schools
[35] https://www.usnews.com/news/best-states/maryland/articles/2022-03-19/schools-lunch-waste-programs-keeping-food-out-of-landfills

- A study among middle school students in Boston found that
  - 26.1% of the total food budget was thrown out by students every year
  - Students were throwing out 19 percent of entrees, 47 percent of fruits, 25 percent of milk, and 73 percent of vegetables
  - While this food was being wasted, students were **not achieving the recommended level of nutrients and were returning home hungry**, often to seek out empty calories like chips, soda, and sugary snacks.
- Smarter Lunchrooms Movement - goal of creating lunchrooms that guide healthy eating choices that are also sustainable and low-cost. [36][37]
- South Carolina Department of Health and Environmental Control[38] provides resources and addresses four benefits of source reduction:
  - Feeding people, not landfills
  - Learning opportunities and life-long lessons for students
  - Potential cost savings
  - Providing quality product from composting for your school garden.

Colleges & Universities

According to University Business article, a key to combating food waste at **universities** is incorporating trayless dining. Rutgers waste has fallen 22% since adopting this solution and Christopher Newport University cut food purchased by 20% after going trayless[39].

- Design menus to reduce food waste
  - Reducing animal protein per serving ounces
  - Choose dishes with increased familiarity (foods familiar are also less wasted)[40]
  - Reduce portion sizes for new dishes (more food is wasted when novel)
  - Menus of Change University Research Collaborative resources
- College & University Recycling Coalition webinar series
  - Flexible menu cycles (e.g., very fresh *available now* ingredients, in time cooking, longer shelf life, nutrient dense meals, work with farm partners)
  - Central production kitchen for processing (e.g., dicing or initial production)
  - Make the most out of every ingredient (e.g., trim waste for broth, cauliflower leaves for stir fry)

Additional Resources

Food Loss & Waste Protocol – Value Calculator
Food Waste Reduction Alliance - Resources
Ratio Institute – Navigating the Food Waste Regulation Landscape
US EPA Region 5 – A Guide to Recycling at Sports Venues (2011)
Stop Food Waste - Resources
Consumer Good Forum – Contractual Terms for Reducing Food Waste

[36] https://www.healthyeating.org/docs/default-source/3.0-our-cause/slm-pages/national-slm-handbook.pdf?sfvrsn=e2bd095f_2
[37] https://www.cde.ca.gov/ls/nu/he/smarterlunchrooms.asp#platewaste
[38] https://scdhec.gov/environment/recycling-waste-reduction/dont-waste-food-sc/dont-waste-food-sc-schools-colleges
[39] https://universitybusiness.com/university-food-waste-programs-food-waste-on-college-campuses/
[40] https://www.food-management.com/news-trends/viewpoint-new-multi-campus-study-reveals-two-untapped-strategies-reducing-food-waste