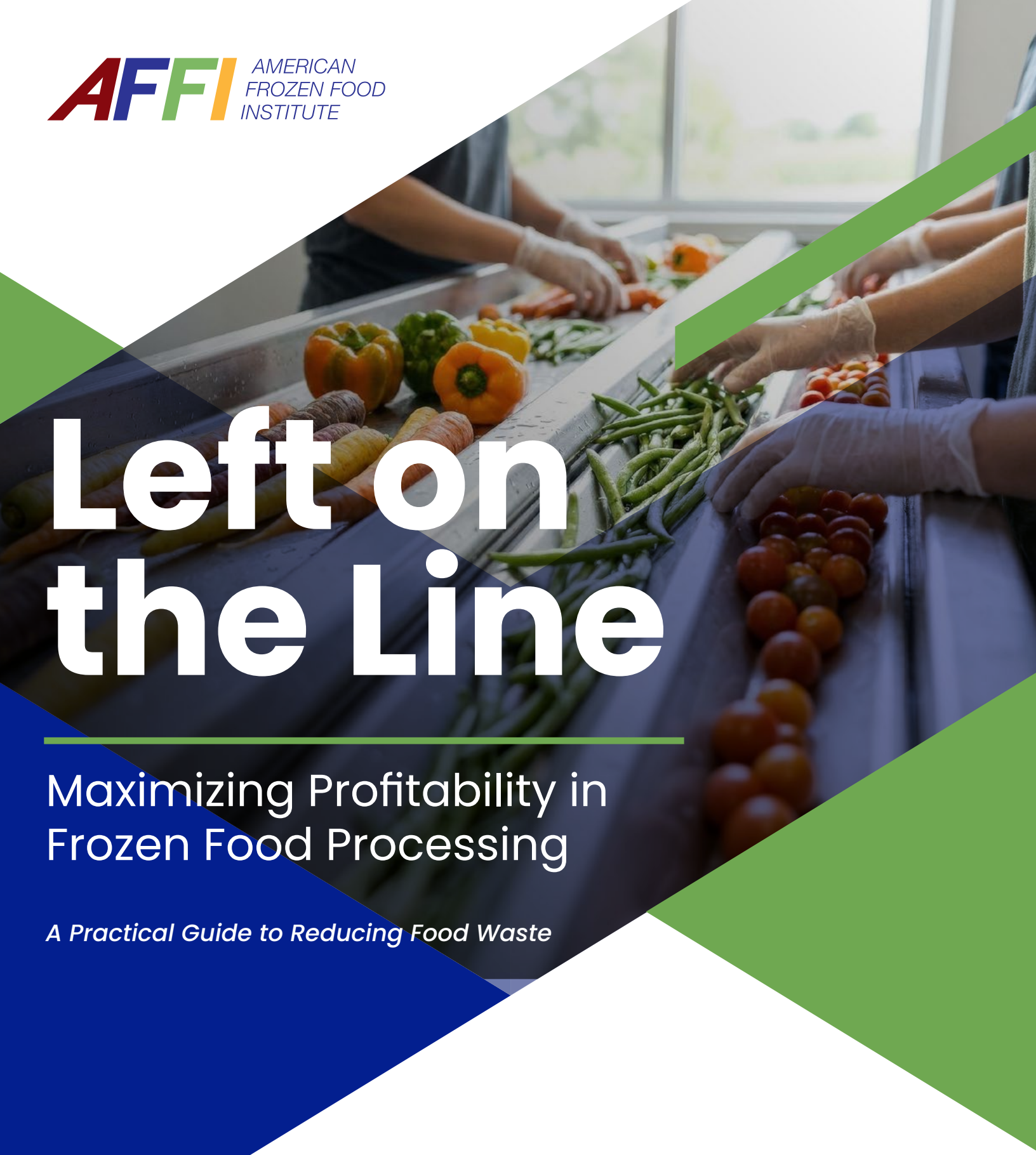
AFFI AMERICAN FROZEN FOOD INSTITUTE



Left on the Line

Maximizing Profitability in Frozen Food Processing

A Practical Guide to Reducing Food Waste

Made Possible By:

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Contents

Executive Summary 2

About This Guide 4

Why Make the Most of Food? 6

- Defining Food Waste 6
- The Value Gained by Reducing Wasted Food 6
- The Common Global Definition of Food Waste 7

Why Is Food Discarded in Frozen Operations? What Action Is Being Taken? 9

- Specifications and Other Design Decisions 10
- Limitations in Operational Processes 11
- Frozen Products Deemed Not Suitable for Commerce 12
- Case Study: Partnering on the Logistics for Product Donation 15

How to Understand Wasted Food Streams and Uncover Opportunities? 16

- A Common Strategic Approach 16
- Getting Started 16
- Gaining Internal Buy-In 17
- Quantifying the Opportunity to Maximize Throughput 18

Summary of Options for Food Waste Definition & Setting a Reduction Target 21

- Selecting a Definition for Food Waste 21
- Setting a Target 25

Appendix 26

- Sampling of Action Using the Wasted Food Scale 26
- Definition of Waste and Surplus Destinations 27
- Definition of Destinations 28
- Other Relevant Resources 28
- References 30

Executive Summary

U.S. food manufacturers generated 13.1 million tons of wasted food in 2024, representing nearly one-fifth of all food wasted nationally. This guide from the American Frozen Food Institute (AFFI) helps frozen food companies treat that waste as an untapped asset rather than an unavoidable cost.

Waste in processing operations shows up as raw materials or products that are given away, overpacked, or discarded. It typically arises from three sources: narrow quality specifications that grade out edible product, operational inefficiencies in processing and temperature control, and products written off due to labeling errors or forecasting mismatches. Addressing these drivers delivers measurable financial returns alongside environmental and community benefits, including food donation opportunities.

The guide recommends a “Target, Measure, Act” strategic approach, which includes securing cross-functional buy-in, quantifying the volume of food and side streams discarded (through facility audits or waste hauler data), and prioritizing high-value interventions.

AFFI members across the value chain are already seeing results by rethinking specifications, improving line efficiency, and upcycling by-product streams. Companies of all sizes can embed food waste prevention into everyday operations as a core business priority, not a standalone initiative. Now is the time for companies to use this guide as a practical roadmap to reduce waste, unlock value, and lead with measurable impact.





13.1 MILLION TONS

of surplus food generated by U.S. food manufacturers in 2024

Prevent Waste. Unlock Value. **Lead with Impact.**



About This Guide

This guide helps frozen food businesses better understand why and how to prevent food from being discarded in their operations to unlock financial value as well as gain environmental and community benefits. Wasted food represents both a significant challenge and a major opportunity for frozen food manufacturers and their supply chain partners.

Individuals and teams who directly or indirectly influence how food moves through a frozen food facility and the broader supply chain will benefit from reading this guide across operations, quality, food safety engineering, supply chain, and sustainability functions. It covers:

- How reducing wasted food can improve profitability, matters to customers, and can deliver environmental and community advantages.
- Where discards most commonly occur in frozen operations.
- Actions currently being taken by frozen food operators and with supply chain partners to maximize throughput and minimize waste.
- Practical ways to uncover value through waste prevention and recovery.

Reducing food waste begins with understanding what "food waste" is and recognizing the operational, environmental, and financial benefits of minimizing it. Waste in frozen food operations commonly arises from choices made during product design, limitations or inefficiencies in storage, production and handling processes, and inaccurate forecasting, mishandling or accidents, which may result in expired stock, product write-offs, or material that ultimately does not meet saleable standards. Each of these drivers presents opportunities for targeted, value-adding, or corrective interventions. This guide lays out the benefit of a waste prevention-first mindset and helps teams focused on product design, production, quality, logistics, and waste management find opportunities for improvement and innovation.

To support action, this guide outlines a practical strategic approach that helps companies assess their current state, gather initial data, and prioritize waste-avoidance strategies. It equips readers with tips such as simple measurement techniques, strengthening cross-functional collaboration, and using a food-use hierarchy to guide decisions that preserve the highest product value possible. Case studies demonstrate and the recommended resources lay out how companies across the frozen food sector are already capturing savings and operational improvements by addressing food waste more intentionally.

Overall, this guide equips frozen food businesses with the rationale, tools, and framework needed to reduce food waste, improve profitability and efficiency, and contribute to a more resilient and sustainable frozen food system.

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IMPORTANT NOTICE

This guidance and information herein are intended to be a user-friendly resource to assist the broader frozen food industry. It is anticipated that feedback from this guide may result in further amendments and improvements to this first edition document. Readers, practitioners, and companies are cautioned that this guidance does not provide fail-safe solutions for the processing, storage, distribution, and other logistics related to frozen foods, the supply chain, and the broader food industry. While the guidance endeavors to consider current industry practices, it is not intended to be a substitute for careful review or analysis of operational food loss and waste practices as it relates to each company's own products and operations; nor does adherence to this guidance ensure compliance with applicable statutory and regulatory requirements. **THIS DOCUMENT PROVIDES GENERAL INFORMATION AND GUIDANCE BUT IS NEITHER INTENDED AS NOR DOES IT CONSTITUTE LEGAL ADVICE.**

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Why Make the Most of Food?

How food is or is not used in your operations has wide-ranging implications. It can affect:



Cost of goods | Energy and waste hauling expenses | Carbon footprint | Corporate reputation | Marketing opportunities | Employee engagement | Community relations

Defining Food Waste

Food waste is, at its most basic, anything of eating quality that was intended upstream for someone to eat. It shows up as raw materials or products that are given away, overpacked, or discarded.

Not surprisingly, what might be considered food of "eating quality" is subjective and therefore interpretation of the term "food waste" can vary. For food processors, what is intended for sale and human consumption is often linked to customer specifications, preferences, or other requirements in a particular supply chain. However, there may be side streams or parts of food a company discards when producing the standard "for sale" product which could nonetheless still be edible under the right circumstances.

Using potatoes as an example, the skin may be considered an inedible part if peeled based on a customer's specification and discarded as a residual byproduct. But for another customer, the peel is considered edible food and intended for sale as a skin-on potato product.[1]*

The Value Gained by Reducing Wasted Food

The term "wasted food" is used throughout this guide to reflect that industry, the public, and others may have different ways of defining food waste. Subsequent sections provide additional context about the variations and a more detailed explanation is in the section titled: "Summary of Options for Food Waste Definition & Setting a Reduction Target."

A significant amount of food grown, produced, or prepared is never sold or eaten. By weight, wasted food from farm to fork represented 29% of total U.S. food production in 2024, which equals 70 million tons of surplus food. The entire U.S. food manufacturing/processing sector accounted for nearly 19% of this total in 2024, generating about 13.1 million tons.[2] This is the equivalent of approximately 24 billion meals, which could hypothetically feed the 14 million children that faced hunger in the U.S in 2023 for an entire year. [3, 4, †]

There are three strong incentives for addressing this inefficiency and reducing the amount of wasted food in the manufacturing sector.

1 Financial Benefits.

- ✓ Save money by cutting input costs and operating expenses
- ✓ Improve sell-through rates and margins by selling food headed for the waste stream
- ✓ Increase operational efficiency and reduce supply chain risk

* The FLW Standard notes that what is considered food versus inedible parts "varies among users (e.g., chicken feet are consumed in some food supply chains but not others), changes over time, and is influenced by a range of variables including culture, socio-economic factors, availability, price, technological advances, international trade, and geography."[1]

† A meal provided by Feeding America is generally estimated to weigh around 1.2 pounds;[3] Nearly 14 million children faced hunger in 2023.[4]

THE COMMON GLOBAL DEFINITION OF FOOD WASTE

To consistently and transparently describe what is considered food waste, the global *Food Loss and Waste Accounting and Reporting Standard* (FLW Standard) is used by many companies. They typically choose the following to be in scope when collecting data about the amount of waste and tracking progress on reducing it.

Material Types. All ***food*** that is not sold and disposed is in scope as well food that was not intended for sale (e.g., sorted out due to supply chain specifications). Companies usually also include in their definition the ***parts of food*** considered ***inedible***, which are not typically intended for human consumption and discarded (e.g., residual byproducts like seeds or peel).* A broader scope gives businesses visibility into all organic material streams in order to identify alternative profitable opportunities.

Food Waste Destinations. This describes where food and any associated inedible parts go after leaving the human supply chain. Many companies follow global best practice or European Union (EU) legislation[20] and count in their definition of "food waste" the material sent to be ***anaerobically digested, composted, spread on land, flushed down a drain, sent to a landfill or incinerated***. They **do not** include as food waste — for the purpose of tracking a reduction target — food or the associated inedible parts used for animal feed or to make industrial products (e.g., by rendering). The Appendix provides additional information about these different destinations.

Boundary. Companies include in scope their ***direct operations***, which typically includes all food products handled in processing facilities and related warehouses.

While surplus food redistributed or donated to people in need (e.g., through a food bank) generates less financial value, since it stays in the human food chain, this is not considered food waste. It is, however, often tracked separately by companies to understand the quantity and value donated. Moreover, there is universal agreement that providing surplus food to communities is a top priority among the various ways for managing excess.

For additional detail on these definitions and corporate choices, refer to the section: "Summary of Options for Food Waste Definition & Setting a Reduction Target."

Each pound of waste generated represents at least a pound of raw material that was produced or purchased with the intent of creating a product that would generate revenue. Reducing waste therefore means companies get more out of what they have grown (or paid for) and have more products to sell. In a recent study about unlocking the hidden value of food waste, the former CEO for Unilever, Paul Polman, highlights that addressing it is "…one of the greatest innovation and growth opportunities of our time."[5]

Numerous examples show a significant return on investment. In Australia, Simplot Company identified 30 food waste related productivity projects in 2024, amounting to over AUS$5 million in annualized savings.[6] For Nature's Touch Frozen Foods, Inc., something as simple as welding a metal plate over a gap between two sections of a processing line to prevent fruit from falling saved the company $28,695 a year and only cost $1,500 to install.[7]

Increasing operational efficiencies and reducing cost is possible through process and material optimization as is avoiding financial losses associated with overproduction and waste management related fees. In Canada, a project involving 20 food manufacturing facilities found on average savings at each facility of $205,800 per year with payback periods of 12 months or less in large part by retaining food that was previously being lost or wasted.[8] A global study showed that on average for every dollar invested in food waste reduction, businesses can see a return of approximately $14. This is due to various factors, including reduced costs, increased sales, and improved efficiency.[9] In addition, for consumer-facing brands, a focus on food waste prevention and transforming what remains to new value can enhance brand equity.

When companies only measure the value of preventing waste based on the disposal cost to remove products, they vastly underestimate the true cost of wasted food.

* The FLW Standard notes that what is considered food versus inedible parts "varies among users (e.g., chicken feet are consumed in some food supply chains but not others), changes over time, and is influenced by a range of variables including culture, socio-economic factors, availability, price, technological advances, international trade, and geography."[1]

The products discarded have also already incurred a range of other costs from upstream activities related to labor, energy, storage, and other inputs.

To fully see the financial savings from preventing waste, food waste must be calculated as the cost of disposal *plus* the total value (e.g., overhead costs) that was added to a product before disposal. Companies may build the financial loss associated with unsold food into the cost of goods sold, although this practice masks the opportunity to generate additional revenue.

A recent study, *Exploring the True Cost of Unsold Food in Retail*, calculated that for retailers the cost of dealing with unsold food can be as much as 1.8% of sales revenue but is not visible since it is often buried within their profit and loss statements as staff time, markdowns, redistribution and disposal. Further it estimates that if retailers cut these costs in half, most could grow their profits by more than 20%.[10, 11]

2 Environmental Benefits.

- ✓ **Reduce reliance on limited landfill space**
- ✓ **Reduce greenhouse gas emissions and the company's environmental footprint**

When food is wasted, all the inputs used in producing that food are wasted too. That includes all the land, water, fertilizer, fuel and other resources utilized to produce, process, store, and transport food, which was meant to be consumed by people but instead was thrown away.

In addition, when food decomposes in landfills, it creates methane, which is a powerful greenhouse gas and harmful pollutant. In the United States, food waste is about 24% of municipal solid waste in landfills. But due to its quick decay rate, food waste accounts for an estimated 58% of the methane emissions released to the atmosphere from municipal solid waste landfills. This amount of wasted food is contributing to more methane emissions than any other landfilled materials.[12]

Cutting waste at every stage, particularly in manufacturing, demonstrates to customers (and consumers) a company's commitment to using resources more efficiently, leading to greater profitability while also minimizing its environmental footprint.

3 Community Benefits.

- ✓ **Help people in need by redistributing surplus edible food through food banks, food rescue agencies and other charities**

Every unit of food wasted represents not only lost revenue but also lost nutrition. Saving food from being needlessly discarded helps the millions of people who struggle to get enough to eat. In addition, in the United States, companies can not only receive tax benefits from donating food to people in need but also are also protected from legal liability by the Bill Emerson Good Samaritan Food Donation Act.[13]

Given the clear business case, hundreds of companies as well as countries are taking both voluntary and mandatory action to help reach the United Nations' Sustainable Development Goal (SDG) of halving food waste by 2030 (i.e., SDG Target 12.3).[14] This includes many of the largest food retailers and brands having committed to a 50% reduction by 2030 based on a common definition of food waste.[15] In the U.S. some AFFI members and their customers have signed up to voluntary programs such as the U.S. Food Waste Pact and USDA's Food Loss and Waste 2030 Champions, while others are involved in global programs including The Consumer Goods Forum's Food Waste Coalition of Action, 10x20x30 initiative , or other country-level Food Waste Pacts.[16, 17, 18, 19] Moreover, in the EU, Parliament and Council have agreed on a binding food waste reduction target of 10% in food processing and manufacturing by 2030.[20]*

Equally, AFFI has been supporting actions to raise awareness about the role of frozen foods in reducing waste among customers including retailers, food service operators, and individual consumers. AFFI is also collaborating with influential organizations such as ReFED, the national nonprofit dedicated to actions that stop the waste of food. This includes collaborating with ReFED on awareness and knowledge campaigns, webinars, participation in annual events, and targeted advocacy. These efforts combined with member actions outlined in this guide will further industry progress on reducing wasted food across the frozen food ecosystem.

* The reduction is to be compared to the annual average generated between 2021 and 2023. For retail, catering, food services and households, the target is 30 percent per capita. Details at: Reducing Food Waste in the EU.[20]

Why Is Food Discarded in Frozen Operations? What Action Is Being Taken?

There are a range of reasons why food may be rejected, graded out, and eventually discarded during food processing (whether a freezing, blending, or repacking operation), distribution, and storage.

For processors, this may include strict quality standards, forecasting gaps, production planning and scheduling challenges, poor inventory tracking or inadequate temperature monitoring along with competing business priorities that lead to yield losses and inefficiencies. In addition, narrow specifications increase waste by rejecting usable products, while limited infrastructure and incentives slow the adoption of upcycling or better waste management solutions.

In distribution and storage, waste often results from inconsistent quality checks, poor inventory practices that cause goods to expire, unexpected temperature deviation, and outdated infrastructure with cold chain gaps leading to spoilage.

Wasted food is often the unintended consequence of interconnected decisions that start with planning and raw material sourcing and extend through processing and packaging to inventory and storage decisions. The temperature state of frozen foods uniquely impacts temperature control and supply chain expectations with potential food waste implications. Each entity in the value chain faces distinctive responsibilities and abilities to maintain integrity of the cold chain. Notwithstanding the need for critical control, the following are three summary causes of wasted food particularly relevant for processors:

Specifications or other product design decisions
Result in raw material and semi-finished product rejected or graded out

Limitations or inefficiencies in operational processes
Generate product spills or spoiling during processing or handling

Frozen product considered unsuitable for commerce
Leads to finished goods unsold due to labeling, packaging, or product dating concerns

The following includes additional details about the underlying reasons for each, along with examples from companies in the frozen food supply chain highlighting how they are being addressed.



Specifications and Other Design Decisions

CONTEXT

At the start, products are developed with specifications, which may result in surplus (food and/or residual organic material) that is subsequently discarded.

Design decisions are typically made before a product enters the processing line and intended to meet perceived consumer needs or expectations, concerns about food safety, quality, or other factors. As food flows into and through a facility, these decisions and specifications dictate how it is graded, sorted, or rejected.

Common product specifications are quality parameters such as trimming for aesthetics or consistency and acceptance limits based on customer requirements about certain attributes. Primary attributes may be physical (such as color, size, shape, and uniformity of product), chemical/nutritional (including Brix, pH, peroxide value, water activity, sodium, additives, fat, and moisture content), sensory, and microbiological.

How to Address

Ways to address specifications and design decisions to avoid wasted food include:

- Collaborating with customers and others downstream to increase the range and share of products that are accepted and could be sold. This may involve specific and transparent discussions about current consumer norms and expectations.
- Connecting with actors across the food supply chain to expand value-added processing of side streams or residual byproducts. This could increase the proportion of product able to be consumed – either by people, or further up the "Wasted Food Scale" (Figure 1) such as to animal feed.[21] As one example, a side stream like vegetable trimmings still contains nutrients and can be turned into bases for sauces or powders for seasoning blends. For further details about this scale, see the Appendix: Sampling of Action Using the Wasted Food Scale.

Figure 1. ***United States Environmental Protection Agency (EPA) Wasted Food Scale*** [21]



AFFI MEMBER AND INDUSTRY EXAMPLES

Product innovations in the frozen food sector resulting from rethinking specifications to maximize the use of raw material inputs and avoid processing waste include:

Skin-on potatoes: Potatoes are often peeled before processing and freezing. The residual skin may therefore be considered a design loss among processors. Since skin can be eaten, some companies are taking advantage of opportunities to sell more skin-on products. For example, in Lamb Weston's European facilities, Mariska van Dalen, Manager 'Sustainability by Design' reported the company is more actively selling 'skin-on' frozen potato products. As noted by Van Dalen, "This way, the product retains more flavor and dietary fiber. And we use less energy in our process because the skin does not need to be removed, which takes place in a steam boiler. Moreover, you are left with fewer steam peels, which now go into cattle feed. Our innovation policy is that every new product(concept) should contain at least one skin-on product."[22]

***Crumbly fruit*:** For various reasons, when berries are picked the fruit may fall apart or 'crumble.' In 2023, Simplot Company developed a new line (Simple Goodness™ Fruit Raspberry Crumbles) that prevents this off-spec fruit from going to waste. It offers multiple benefits to commercial kitchen customers such as being easy to portion, thawing quickly, leeching less color and, given their small size, offering more even distribution in recipes.[23]

AFFI MEMBER AND INDUSTRY EXAMPLES

Broccoli stems: To address the significant food waste that comes from discarding broccoli stems, ArdoVLM has created a new broccoli mix featuring both tender florets and nutritious stems. By including all edible parts of the broccoli, they've reduced food waste by up to 33% compared to traditional floret-only mixes. Not only does this mean less waste, but also fewer CO2 emissions and less water usage per kilogram.[24]

Avocado oil: A major frozen avocado exporter in Peru, Viru Group, diverts avocados that were sorted out during raw material reception at the plant (due to quality, size, or other parameters) to an oil processing line instead. There they are ground into an avocado paste, including the pit, peel, and pulp. The pulp undergoes a series of thermal mixing and spinning processes to separate the crude avocado oil from the residual water. Annually, Viru diverts about 19 million pounds of raw material to produce avocado oil, avoiding the landfill and generating an additional revenue stream for the plant. All residual organic matter is directed to the onsite composting facility, and all residual water goes to the onsite water treatment facility.[25]



Limitations in Operational Processes

CONTEXT

Routine and one-time situations occur that may prevent the use of all raw materials purchased or result in the discard of frozen products.

Situations that result in wasted food may be chronic and ongoing and include raw material storage conditions, inefficient or poorly designed processing equipment, or procedures that cause losses during manufacturing. This may result in food not being fully utilized due to spillage, degradation before or during processing, temperature fluctuations during storage or transport, introduction of foreign material, production line changes, contamination, or overproduction.

Moreover, inconsistent implementation of sanitation processes, environmental monitoring practices and other verification procedures may result in potential test and hold losses, rework, or product withdrawals and recalls. In addition to creating compliance risk, these types of food safety breakdowns result in avoidable waste, thus generating lost throughput and higher operating costs.

Acute one-time events may also result in wasted food such as products damaged during storage or transportation, temperature abuse from a loss of power, or spillage of incoming raw materials. The biggest opportunities for ongoing waste reduction, however, are typically when chronic losses can be identified and targeted.

How to Address

Opportunities to improve limitations or inefficiencies in processes include:

- Cultivating a continuous improvement culture, which prioritizes eliminating waste as well as improving quality. This is reinforced by offering training to employees about the value of preventing waste, regular review and revision of procedures, and an incentive system that empowers employees to identify and suggest areas for improvement.[26]
- Optimizing or re-engineering processing lines and production processes to increase yields and reduce inefficiencies during production. When adjusting processes, a deeper dive may also be needed to identify the underlying root causes, which may be structural, technical, managerial, or behavioral in nature.[27]
- Following robust food safety practices and complying with the U.S. Food and Drug Administration's (FDA) Food Safety Modernization Act (FSMA) requirements.[28] Given the dynamic regulatory system that exists, this includes staying abreast of changing compliance requirements to ensure products meet relevant standards. By embedding strong preventive controls on the production floor, facilities protect product integrity, maintain efficiency, and keep more food in commerce instead of in the waste stream.
- Improving raw material storage conditions as well as cold-chain management and infrastructure to prevent spoilage or degradation during storage and transport.
- Managing spillage through dry pick up and removal rather than flushing it down the drain. This allows for the material to possibly be diverted to animal feed, which is a more preferred option on the Wasted Food Scale.

AFFI MEMBER AND INDUSTRY EXAMPLES

Process modifications relevant to the cold chain that increase food throughput include:

Closing gaps: Nature's Touch Frozen Foods, Inc. implemented 13 recommendations that improved the amount of throughput across various stages of processing, saving the company over $800,000/year. These included avoiding losses in conveyor transfers, installing guarding and sanitary catches under various machines or transfers, reducing gaps in the processing line, and many other machine-related improvements. Something as simple as welding a metal plate over a gap between two sections of the processing line saved $28,695 a year, 8,838 kg of blueberries a year, and only cost $1,500 to install.[7]

Spatulas for scraping: Land O'Lakes asked employees for solutions to reduce food waste at one of its Kozy Shack pudding facilities. The low-cost solution was a silicone rubber spatula to scrape remnant condensed milk out of pails and into the ingredient mixing batch for flan production. With a waste audit to test the effectiveness of this solution, Kozy Shack's Turlock plant realized a 74% material yield savings that translated into a nearly $60 cost savings per production run, which saves almost $3,500 annually.[29]

Regular employee training: McCain Foods found that following a comparison of two plants, one was generating higher than average food waste. Further investigation found this disparity was due to differing approaches to aesthetic food quality requirements, resulting in one plant discarding usable food. Employee training on food waste is being provided, and its impact will be assessed.[30]

Improved temperature monitoring protocol: AFFI and the Global Cold Chain Alliance (GCCA) have developed a protocol with standardized methods for recording temperature fluctuations throughout the frozen food journey.* By adopting this protocol and gaining visibility into real-world temperature variations across products and operators, frozen food operators will be able to reduce waste as they detect and address deviations that could impact product quality or safety. In addition, better temperature monitoring supports energy optimization and greenhouse gas reduction goals and builds a foundation for future improvements in shelf-life, food quality, and reduced environmental impacts.[31]



Frozen Products Deemed Not Suitable for Commerce

CONTEXT

Food may be discarded due to demand fluctuations or when frozen products do not meet processor or customer specifications for quality or food safety.

There are a range of potential situations that result in excess bulk or finished products (unshipped or shipped), which in many cases are still fit for consumption but deemed unsuitable for commerce, including:

- **Products rejected because of contractual deviations.** This could be an erroneous order, issues related to the product (such as physical, chemical, or microbiological contaminant; visual or textural defects; potential temperature-abuse impact) or issues related to the packaging (such as, damaged cases, mislabeled cases, unsealed cartons, or interior seal issues).
- **Short-dated products.** This would be, for example, items in a distribution center that are too close to the product date window to be sold by retailers and are not linked to a food recovery process or sale to secondary markets.
- **Discontinued products or surplus with expired coupons or promotions.**
- **Surplus products resulting from changes in demand.** This may be due to errors in forecasting the supply chain or other changes such as unanticipated shifts among consumers, cancelled orders from buyers, rejection of frozen products by buyers after delivery, or supply chain disruptions. It is important to also keep in mind that the impact of shifts in demand may extend throughout the frozen food supply chain, resulting not only in unsold frozen products but also rippling into unsold surplus among agricultural suppliers.
- **Products "withheld" due to strict hazard-based interpretations of regulatory policies and supply chain requirements.** This may include unnecessarily rigid standards or testing specifications as well as unclear guidance about policies, which unintentionally cause safe and wholesome products to be discarded.

* See: Baseline Monitoring of Key Storage and Distribution Data in the Frozen Food Supply Chain.[31] The protocol also includes practical guidance on identifying critical monitoring points; best practices for data collection, management, and analysis; and how to establish baseline measurements to support future innovation.

- **Discards or rejections by the customer if the cold chain is broken.** If items are not stored at the correct temperature, this may compromise food safety. In the most extreme is a product recall because food safety risk is evident.

Discarding frozen food is a major financial loss because processors have already fully absorbed the costs of raw materials, packaging, labor, and operations. Once fully assembled and packaged, separating food (organic material) from packaging for recycling becomes incredibly difficult. As a result, these items usually end up in landfills or incinerators, causing severe environmental damage.

How to Address

Reducing the volume of products deemed not suitable for commerce can be accomplished by implementing dynamic forecasting, good inventory control and quality systems, training, as well as monitoring the impact of food safety and quality standards.

In addition, collaboration with customers, logistics providers and other partners allows for food to be put to the best use. Where food is still safe, edible, and nutritious, surplus products may be sold through alternative channels or donated to meet the needs of food insecure individuals and communities. This may require adjustments to any mandatory destruction requirements within vendor agreements. GCCA has produced a food rescue toolkit with links to relevant resources and policies.[32] If food cannot be rescued for human use, identifying suppliers that can separate packaging from frozen products is critical in allowing for organic food material to be sent to a destination more preferred than landfill (such as animal feed).

Proactively managing the storage of excess products is also important to allow sufficient time for finding alternative diversion solutions. Companies should avoid holding expired stock or other products in storage until space becomes the constraining factor as this often leads to an urgent push for quick removal, which favors sending food to the least desirable outlets such as landfills.

AFFI MEMBER AND INDUSTRY EXAMPLES

Solutions that help avoid the waste of frozen products include:

Join with cold chain partners to rescue edible food: Lineage, a global leader in temperature-controlled supply chain logistics, helps customers donate product through a program created by the Lineage Foundation for Good. The Foundation's Customer Product Donation Program encourages and facilitates donations of safe-to-eat products that are nearing expiration or have minor imperfections, such as labeling errors or packaging issues. The program provides an alternative to "dump and destroy" by allowing the Foundation to take title of donated products and tap into its logistics expertise and temperature-controlled transportation network to redirect food to food banks, charities, and community organizations worldwide.

As a result, the Lineage Foundation for Good has donated more than 50 million pounds of food over the past five years on behalf of its customers. One notable example involved a discontinued, one-million-pound inventory of frozen kiwis from a producer that was at risk of being discarded. Working with Feeding America, the Foundation coordinated the rescue and redistribution of the customer's product through 14 truckloads, which were then repackaged into healthy frozen smoothie kits for families experiencing food insecurity. [33, 34, 35] For another example, see the case study on page 15.

Another cold storage provider, Congebec Logistics, Inc., works in partnership with Food Banks of Quebec to implement a three-step strategy - providing free storage space, encouraging industry partners to participate, and helping to optimize the logistics for effective redistribution. Since starting its program, Congebec has donated storage space for 500,000 kg of food a month, including at their new freezer in Mascouche, Montreal.

The key to this partnership's success was Congebec also helping the food bank integrate their data into its warehouse management system, which significantly sped up and professionalized the donation process. In addition, since Congebec does not own the food it stores and moves, it takes a proactive approach and encourages its customers to donate products that are deemed safe for consumption. Congebec's understanding of the rules that allow for legal protection from liability when donating safe food helps customers have the assurance they need to allow the donation.[36, 37]

AFFI MEMBER AND INDUSTRY EXAMPLES

Manage distressed inventory: Finished products often end up discarded when the remaining shelf life is too short based on buyer's requirements. Platforms like Spoiler Alert can provide processors with the tools to better manage and sell surplus frozen packaged products to secondary market outlets (such as discount retailers and foodservice).[38]

Optimize product dating: Since 2011, Ajinomoto Co., Inc. has been collaborating with the Japanese government and all manufacturing, distribution, and sales sectors to study changing best-before date labels to a month-year format, extending best-before dates, and optimizing delivery dates.[39]

Redirect to secondary markets: Gorton's Seafood strives to reduce all waste, but operational and engineering constraints make it impossible to generate zero waste. In response, the company has implemented extensive recovery and diversion programs for fish products, batter, breadcrumbs, and fish scraps that are deemed unsuitable for sale to their main retail customers. As one example, slightly misshapen yet still high-quality fish is redirected to secondary markets, which includes providing meals for local correctional facilities.[40]

Donate to food banks: Amy's Kitchen, Inc. donates both finished goods and raw materials directly to food banks near its production plants and warehouse locations to benefit local communities. In 2025, the company redirected approximately half a million pounds of food, made up of 425,000 meals and 115,000 pounds of organic ingredients, in addition to donating 360,000 pounds of cardboard cases and trays to help local food banks safely pack and serve food.[41]

Beyond the confines of the frozen food supply chain, the sector can also participate in helping others in the food value chain make the most of their food purchases. Downstream, this could include collaborating with ***retailers*** on targeted messaging that highlights the ways in which buying frozen food helps shoppers reduce waste at home. For ***shoppers***, frozen food processors can offer innovative packaging solutions, a diversity of portion sizes, provide tips for cooking and storing frozen food as well as how to interpret on-package dates.

Upstream with ***logistics partners, suppliers, or growers***, processors could collaborate to coordinate supply chain logistics, identify innovative new product offerings to sell surplus crops and promote circularity in waste management by encouraging options that have a positive impact on the environment. (See Appendix for details related to the U.S. EPA's Wasted Food Scale.)

As one example, Good Bowls creates healthy frozen meals by upcycling surplus odd-shaped vegetables that do not meet retailer's specifications. Not only does this reduce food waste and provide local farmers with an alternate source of income, but these meals also meet various medically tailored guidelines (for example, carbohydrate-controlled, kidney-friendly, and heart-healthy).[42]

Another example where a cold storage provider partnered with a frozen food processor to coordinate logistics and rescue safe and nutritious food is highlighted on the next page.



CASE STUDY:

Partnering on the Logistics for Product Donation

Providing an Opportunity to Give

As a leader in the food supply chain, Lineage takes a proactive approach to addressing food insecurity. The Customer Product Donation program, developed through the Lineage Foundation for Good, is a unique initiative designed to empower customers and Lineage team members to work together to rescue safe, quality food from going to waste and redirecting it to those in need.

The program is designed from the ground up to empower Lineage customers in their 450+ temperature-controlled warehouses worldwide. It creates the infrastructure and proactive support needed to identify safe-to-eat food products nearing expiration or with minor imperfections and divert them towards donation. Rather than allow these nutritious products to end up in landfills, where they can contribute to climate change, they are redirected to a global network of food banks, charities and community centers.

A Significant and Nutritious Donation

One recent donation came out of a Lineage facility in Illinois. A customer at the Illinois cold storage facility identified a surplus of high-quality, nutritious food items they had in storage. Lineage worked with the customer to prevent this safe food from going to the landfill and provided a solution to donate the food through Lineage's Customer Product Donation program.

The donation itself was substantial and nutritious. It consisted of 546 pallets, totaling 326,533 pounds of high-quality food. These products included cauliflower-based pizza crusts, frozen pizzas, pasta dishes and plant-based chicken products. All-in-all, it was enough to provide 261,226 meals to food-insecure families.[34]

Coordinating the Logistics

One of the strengths of the Customer Product Donation program is the ability to coordinate large-scale donations of food with a food storage and logistics expert. Lineage makes donations like this possible by tapping into an expansive and cutting-edge logistics network, streamlining the entire process. In this case, the donated products were already stored in a Lineage facility, simplifying that first step. Once the customer decided to donate, the Lineage Foundation for Good team and site management took over.

When food is still safe for consumption, Lineage makes the donation process even easier by tapping into a large network of food banks, food rescues and community centers. This growing network allows Lineage to connect these donated food products with the communities who need them the most. In the end, the donated food was distributed to several organizations, including Midwest Food Bank, Hands of Hope, Milford Food Bank, and Cultivate Food Rescue.

How to Understand Wasted Food Streams and Uncover Opportunities?

As seen above, understanding the ways in which food waste can present itself within the operational environment and its impact can lead to uncovering profitable solutions. This section provides industry approaches and tools that can help a business find opportunities in the facility and supply chain, motivate support for action, and dedicate resources to implement practical steps.

A Common Strategic Approach

A global framework many companies use to guide their action is referred to as "Target, Measure, Act." More specifically this suggests:

1. **Target:** Make a time-bound commitment to reduce food waste. Typically, companies align with the United Nations' Sustainable Development Goal (SDG) Target 12.3 to cut food waste by 50% by 2030.[14]
2. **Measure:** Monitor and track within your business operations the amount of food waste and associated cost. The best practice is to also report publicly.
3. **Act:** Identify interventions and take action to prevent and reduce food waste – within your operations and through customer and supply chain collaboration.

These three elements (Target, Measure, Act) can be followed in whatever order best suits a company's culture. For example, some companies prefer to measure first and gather initial baseline data (at the enterprise or facility-level) and subsequently set a target based on an understanding of their key waste drivers. Figure 2 is a visual summary of this approach as recommended by the World Resources Institute, a global organization leading efforts to measure and prevent food waste.[27, 43]

Simplot Australia has built on this Target, Measure, Act framework to organize their approach to food waste as seen in Figure 3.[6]

Getting Started

Like implementing any new process, it makes sense to begin with simple steps when addressing food waste and then to integrate broader and steady company-wide changes aligning reduction tactics with business strategy. Pilot projects can show the benefits gained by preventing wasted food and stimulate internal engagement. In addition, where quick wins in operational or inventory efficiency are feasible, savings from early actions can also help fund future waste reduction action and innovation.

The learnings from companies that are successfully preventing and reducing food waste are described in various publications (see Appendix: Other Relevant Resources). This includes tips from U.S. manufacturers and retailers in *Messy but Worth It: Lessons from Fighting Food Waste*.[44] Recommendations from these businesses for getting started and building food waste into a company's internal culture include:

- Galvanize a champion within the organization
- Capture some initial data
- Create and invigorate cross-functional teams
- Make your standard operating procedures (SOPs) stick through consistent repeated training
- Align incentives within the organization

Drawing from these recommendations, the following are additional suggestions for gaining internal buy-in and several approaches for collecting data on the volume of food that is currently underutilized.

Gaining Internal Buy-In

Because preventing food waste is not typically centralized in any one person's job description, it is important to identify and support an individual (or small team) to be accountable for leading these efforts. This may include employees and managers involved with procurement, production and packaging, operations and maintenance, quality and food safety compliance, product development, marketing, distribution and retail, finance, and senior management.

Ideally a shared "waste prevention culture" would be embedded in the daily decisions associates make across the diverse parts of an organization, since how food is used (or not) has implications on the cost of goods sold, energy and waste hauling expenses, corporate/brand reputation, and employee engagement.

Some of the ways to gain internal buy-in and connect across the diverse functions involve:

- **Tailoring the business benefits** from addressing food waste for team members to highlight the value that will resonate based on how success is measured in their role.[45]* For example, the motivation for operational functions would be to more efficiently manage product, while for human resource functions, a more relevant motivator may be improvements in employee engagement.
- **Ensuring language is accessible** for front-line employees or others that will be implementing processes to reduce food waste.
- **Developing clear Standard Operating Procedures (SOPs)**. Quality and write-off SOP should include specific requirements to manage "disposal" of the food waste material with full and clear accountability plus ownership of the waste until its end destination. This should be managed by the team "generating" the food waste (such as manufacturing, quality, or write-offs) and not left to the waste operator to manage via disposal. The SOP should specify actions and requirements to actively identify ways to divert waste away from landfill to other higher-level options such as donations, animal feed, biomaterial processing, or other higher valorization or treatment options such as anaerobic digestion with *biogas* recovery or composting. This helps ensure landfill is the last resort and not the first quickest option.
- **Communicating consistently and continuously**, which includes follow-up training to ensure new and existing staff understand any new SOPs and regular reminders about the connection between food waste reduction and its related benefits (from a business, community, and/or environmental perspective).
- **Reviewing related incentives** keeping in mind that the individuals/roles/functions which can have a big impact on addressing food waste often are not the ones who see the cost savings or other benefits of food waste reduction. As one example, to encourage food donation by facilities, ensure the related tax benefits are recognized in the bottom line of the participating facility or the business unit versus only benefiting the corporate entity.

FIGURE 2. ***Target, Measure, Act Approach***



Source: World Resources Institute

* Examples of ways to describe the benefits in terms that may resonate with different types of audiences are included on page 5 of Overcoming Resistance to the Measurement of Food Loss and Waste.[45]

Figure 3. ***Simplot Australia's Approach to Food Waste***



Quantifying the Opportunity to Maximize Throughput

Utilizing easily available data is a good place to start and see where an operation or enterprise may have opportunities to increase throughput of its raw materials and frozen product. This is because calculating a company's *total* volume of wasted food can be challenging given that the flow of wasted raw materials and residual byproducts, plus bulk and packaged products, often cuts across the responsibilities of various departments and functions. Having granular data to develop tailored insights is valuable but can be complex if it requires pulling and coordinating data stored in different software across the company.

There are a range of ways to get started with some initial data and have a "good enough" sense of food quantities and side streams that are underutilized. These initial estimates can be used to initiate conversations and organize next steps.

Among the approaches for collecting preliminary data and insights are:

1. **Observe and record the points at which any food, side streams, or parts considered inedible are sorted out.** A quick-start option would be to simply walk the processing line (or follow the harvest) to spot points where, for example, there are product spills; customary diversion, disposal, or rejection of product or parts thereof; or where totes are being filled with unutilized product. If possible, take photos for a high-level analysis of:
   - *All points in the process where the primary product or its parts get diverted* - meaning they are no longer in the revenue stream. This could be where product is deliberately sorted out and rejected or has unintentionally fallen to the ground.
   - *What is in the containers that collect diverted material.* A photo begins to give insights about the type of material collected, why it was removed from the line, the approximate volume, and, if the containers were color-coded, where this material would end up.
2. **Arrange a food-waste prevention audit** at one or more locations in the facility. This is a visible way to quite literally see the opportunity. It involves sorting material currently discarded and collected in containers to identify what proportion falls into different quality categories. It ideally also includes placing a container or tarp on the floor to catch current spills that hit the ground and sorting these

volumes. An audit can be run over a few shifts or for a longer period of time (for example, a week) in order to observe the triggers and gain a more granular sense of the potential volume and its consistency.

Quality categorizations that are used for farm-stage losses but also relevant for facilities could include sorting based on what is:

- "Marketable" (what would have met specifications but was on the ground or got discarded by mistake);
- "Edible/not marketable" (what could hypothetically be eaten by people but the company doesn't have a buyer and it may require further processing); and
- "Spoiled" (what is not fit for human consumption - though the material could have value in non-food applications or as a source of energy).

As an example, raw potatoes received at the plant might not be suitable for processing due to poor quality. If these potatoes are graded out and disposed, they may be categorized as "spoiled" if there is product deterioration (such as potentially due to improper storage conditions), or "edible/not marketable" if they were sorted out for not meeting a certain specification such as size.

3. **Review records from waste haulers or material flow analyses.** Existing records can provide information about:
   - *Volumes that are sent to waste haulers or other outlets.* This sums up the aggregated volume of wasted food and side streams classifying where it goes. Knowing what is picked up for traditional landfill or incinerator management versus what is sold as animal feed could be used to discuss options for moving material up the food-use scale for improvements in financial and environmental value. These volumes typically do not, however, provide understandings about where within an operation the waste was generated and why.
   - *Volume of inputs, outputs, and material flows.* This data may already be collected for other reasons such as quality or food safety. Mapping and tracking material flows can provide insights into what is causing food to be wasted. Assessing at which points food is not fully utilized should include a review of where in the flow of activities:
     - Materials or products do not meet specifications and are "graded out"
     - Spills or damage are occurring in the processing stream
     - By-products or side streams are generated at a definite rate as part of the process
     - Excess food is generated. This may include product development and design efforts (such as from testing a new product), during product line changeovers, due to packaging mistakes, or crop surplus if farming is part of the operation

   The accuracy of existing data records could be confirmed with a real-time review conducted while the facility is in operation or during downtime when any food-associated materials are being removed from the production environment.

4. **Speak with your managers and employees** at food processing facilities and logistics experts at warehouses and distribution centers. Associates working in the facilities have a good firsthand understanding of where, and why, food is rejected and waste occurs.
   - An understanding of processes and equipment used may shed light on what are known hotspots, the root causes and potential reduction opportunities. This includes systems related to storage and packaging, distribution, and delivery arrangements, as well as related labeling, preparation, or handling steps.

     Gaining input from front-line employees can also be structured around the principles of a "Gemba Walk," which is a continuous improvement strategy to observe, understand, and improve how work is performed on the ground. A publicly available toolkit on using this approach and how build a register of food waste reduction ideas was created for businesses through the U.S Food Waste Pact. [46]*

* Click on the "Continuous Improvement Resources" that's part of the Food Waste Pact Employee Engagement Toolkit[46]

SAMPLE QUESTIONS TO ASK FRONTLINE EMPLOYEES

The following questions could be used to gain the perspective of front-line employees and others about what types of opportunities might exist to reduce the amount of operational food waste.

- **What would it take to increase our product utilization rate?**
- **Is there anything better we could do with the material that ends up in the totes, falls onto the facility floor, or is scraped into collection bins?**
- **How much of what is in the totes or on the ground could be eaten (if it could be captured and there is not a food safety concern)? Think beyond current quality specifications and more broadly about what people could use as food (for example, crumbly or unripe berries).**
- **What might be alternative channels for this food (or side stream) that bring the business more value? Could we redirect some of the volume to be sold or manage it in a way that is further up the "Wasted Food Scale" (such as applying the priority of providing food for people, then using it for other more circular options)?**

5. **Review what is known about customer requirements along with any statutory or regulatory requirements.** External expectations can play a significant role in generating surplus food or other side streams that end up discarded. An important consideration for frozen foods specifically is limits on common practices such as allowable percent of ice glazing and deviations from standard set points (temperature control) used in the industry.

   Gaining a view of what contributes to reduced output in turn offers business intelligence such as drivers of food waste and potential opportunities to make adjustments. The range of expectations a frozen food processor in particular faces can be linked to:

   - Sensory qualities (such as, appearance, flavor, color, aroma, texture, and cooking performance)
   - Tolerances for foreign and extraneous materials (such as the inclusion of glass, metal, wood, or plastic; the presence of stems or stalks)
   - Packaging (such as unit and piece count or portion size, seal integrity, oxygen and moisture barrier properties)
   - Label requirements (such as weight, product name, allergens, nutrition facts panel, brand, shelf life)
   - Regulatory aspects (such as food safety compliance)
   - Production systems (such as certain processing conditions, food safety efforts such as environmental monitoring programs)

   After taking initial steps to establish the business benefits for assessing where and why food is not fully utilized, a company can establish a more structured program. Having higher quality granular data enables more targeted site- and process-specific insights and interventions. Such a robust program to manage food waste would include the following elements and could follow steps in the related *ISO 20001 Standard*[47] to:

   - Confirm and quantify the amount of wasted food in a structured way, which likely includes reviewing and challenging previously accepted quantities of food waste
   - Identify and prioritize hotspots
   - Conduct root cause analysis
   - Identify and select potential reduction actions and the associated business benefit (recognizing that a combination of coordinated actions among functions or trading partners may be required for a particular hot spot)
   - Establish monitoring and correction procedures and confirm integration into responsibilities and procedures

Summary of Options for Food Waste Definition & Setting a Reduction Target

AFFI members and others in the frozen food sector are clearly already taking action to prevent food from being wasted and working to reduce the environmental impact of discarded organic material.

This guide also offers the structured Target, Measure, Act approach as one way that companies are embedding in their operations food waste reduction actions as a business priority. Adopting this approach collectively presents the frozen food industry with an opportunity to elevate existing efforts at improving efficiency and making the most of food.

To apply this more strategic approach, companies would need to define food waste so that they can track progress in meeting any reduction goals.

Selecting a Definition for Food Waste

There are two decisions to be made when defining what is considered food waste. The choices made should be clearly documented. This is particularly important when comparing data across facilities (or, if reporting externally, benchmarking against other companies).

Selecting what is in scope includes (1) the material types and (2) the destinations (where the material goes when leaving the operation):

1. **Material Types** *(food-related flows including residual organic material considered "inedible parts")*

The decision about what material types to include as food waste will differ based on the type of products a company sells along with its ability to track various food flows. Figure 4 visually shows how organic material streams generated in the typical food processing operation could be categorized and tracked. The illustrative example used assumes whole peppers as the starting raw material input for producing Individually Quick Frozen (IQF) pepper pieces in a facility. Other production activities would be relevant for different businesses. For example, companies that assemble meals may also generate food waste during production as a result of batching irregularities or planned surplus production.



FIGURE 4. *Illustrative Example Showing How Food Flows During Processing Activities and Where It Leaves the Food Chain (IQF Sliced Peppers)*

Potential Food Waste in Frozen Food Processing

CATEGORY & EXAMPLE OPPORTUNITIES	Raw Materials Receiving	Preprocessing *(Washing, Cutting & Sorting)*	Processing *(Freeze & Repack)*	Post-Freezing	Packaged Product
Food (Intended for Sale) *Meets supply chain specs but falls out of production chain* **ASSESS OPERATIONS:** • Check equipment • Fix gaps • Catch spills • Adjust employee training	DROPPED ON FLOOR	DROPPED ON FLOOR	DROPPED ON FLOOR	DROPPED ON FLOOR	MISLABELED (SUCH AS DICED VS. SLICED)
Food (Not Intended for Sale) *Food that does not meet supply chain specs but could be edible* **BALANCE SUPPLY CHAIN EXPECTATIONS:** • Discuss spec adjustments • Collaborate with QA	BROWN PEPPERS OR DAMAGED	SORTED OUT (SUCH AS FOR WRONG COLOR OR SIZE)	SORTED OUT (SUCH AS FOR WRONG COLOR OR SIZE)		
Residual Organic Material Considered Inedible *Parts of incoming raw materials removed at the facility* **IDENTIFY VALUE/MARKETS:** • Innovate and develop new products • Move up the Wasted Food Scale (such as to animal feed or compost)	LEAVES & PLANT MATERIAL	SEEDS & STEMS			

WASTED FOOD AND ORGANIC MATERIAL

The illustrative example in Figure 4 shows the potential sources of food waste as:

- **Food (originally intended for sale)**, which may be incoming raw materials or IQF products. Using peppers as an illustrative example:
  - ***Incoming raw materials.*** This would refer to peppers that met raw material specifications at the time of entry into the facility for further processing. If peppers accidentally fall off the line and onto the floor as they move to preprocessing, this would be represent "food originally intended for sale. During subsequent steps, additional sorting of raw materials may occur on the line resulting in what's described below as "food (not intended for sale)."

    Peppers that remain on the line continue through a variety of pre-processing steps (including washing/cutting/sorting) and inefficiencies may result in the loss of raw materials. Unintentional losses from spill points may also occur (for example, product falling off the conveyor belt). Together, these raw materials that were "food (originally intended for sale)" become no longer suitable for further processing and may be discarded.
  - ***Frozen/packaged frozen products.*** After freezing, frozen peppers may also be further sorted before packaging and therefore be considered "food (not intended for sale)" – see below.

    Unintentional loss of frozen products intended for sale may also occur (e.g., from operational challenges, falling off the conveyor belt, labeling issues, faulty packaging, excess unsold inventory).
- **Food (not intended for sale)**, which may be raw materials or IQF products. This is typically due to specification limits that consider them unsuitable for sale. These are side streams that are often edible but currently lack an existing market.

  For raw peppers, a specification may be in place for color and ripeness required by IQF pepper customers. Discarded following sorting and grading activities, this would include peppers that did not meet raw material specifications upon entry into the facility, during pre-processing stages (such as sorting during washing), or IQF peppers sorted out prior to packaging.
- **Residual organic material typically considered "inedible parts"** of a food. These may be referred to as byproducts, or trimmings which are parts of incoming raw materials often separated in a facility but that may still contain functional value, flavor, or nutrition. Through drying, milling, or fermentation steps, these materials may potentially be sold as sources of fiber, protein, or bioactive compounds. For raw peppers, seeds, stems, calyx, and leaves are typically considered inedible parts for an IQF pepper customer.

The more ambitious and comprehensive definition of food waste would focus on reducing all three types of organic material streams generated by the facility. This ensures processors gain full utilization from the products that enter for processing or further distribution. While there is much subjectivity about what is considered edible or inedible, evidence from numerous food innovations (such as sausages, baby carrots, and whey) points to the possible benefit that can be gained by taking full advantage of all organic material brought into a facility and maximizing food-grade value.

At a minimum, it would be logical for a company to focus food waste prevention on maximizing the sell-through of food that was originally intended for sale. This is a narrow focus and less ambitious since it ignores what the company may currently consider side streams of edible products (such as unripe peppers) or residual byproducts (such as seeds). Even if this option is chosen and some material streams are excluded for the purpose of a specific reduction target, there is nonetheless value in tracking the amount of side streams and byproducts as they could be repurposed as a source of potential untapped revenue.

TYPICAL INDUSTRY APPROACH

It is most common for food processors in other sectors to define food waste as all three material streams and use this for the purpose of defining food waste in their reduction target. Companies should clearly document and report what is included in the scope of their food waste inventory.

2 Destinations *(where food is sent when it exits the human supply chain)*

The options for defining waste based on its destinations would be, *from most to least*, ambitious:

OPTION A Count as waste **all the possible destinations**, meaning where food goes when it leaves the human food chain. This reflects a company's philosophy that the best use for all raw materials grown or purchased is to keep it in the human cycle, even over industrial uses like animal feed or outputs generated by "biochemical processing."

OPTION B **Exclude** from the definition of food waste **any material sent to animal feed and used as biomaterials/biochemical processing**. This aligns with the globally accepted definition of food waste used by global food waste reporting programs. See Figure 5.

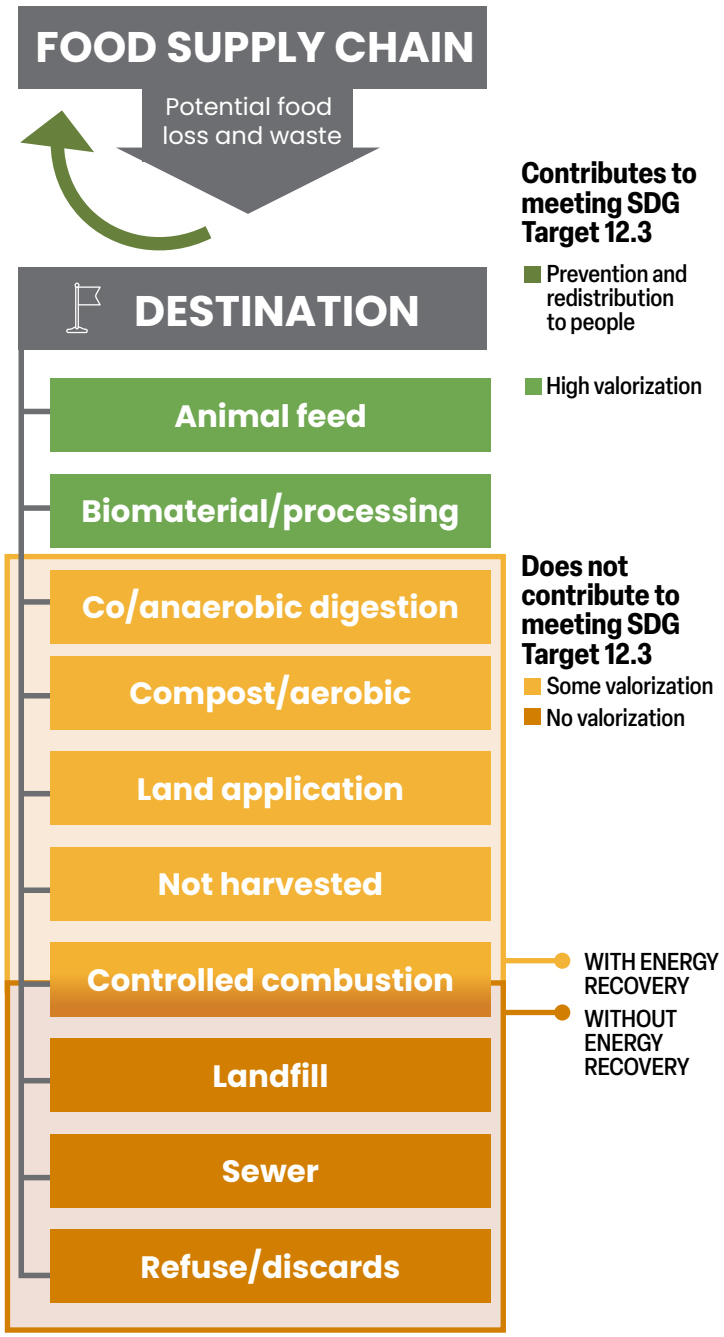
OPTION C Count as waste only what goes to the **"least preferred" destinations** (landfill, incineration, or down the drain).

TYPICAL INDUSTRY APPROACH

For the purpose of meeting a target, Option B is what most companies consider as their standard definition of food waste, meaning material going to any destinations except what is sent to animal feed or as biomaterials/biochemical processing.

For additional context, see the definition of each destination in the Appendix. Companies should clearly document and report which destinations are included in the scope of their food waste inventory.

Figure 5. ***Destinations That Count as Food Waste Based on the Interpretation of SDG Target 12.3***[15]



Setting a Target

For setting a goal to reduce food waste, companies should keep in the mind the basic principles of establishing a credible target and at a minimum:

- Include a percentage reduction, which could include a goal of "zero" waste
- Include a base year and target year
- Indicate whether the target is 'absolute' or 'intensity'-based. For example: reduce total food waste by a set amount (absolute) or reduce food waste by x% per ton produced (intensity-based). If using an intensity metric, clearly indicate the equation used and, if interested in benchmarking, align with what is used by other companies.*

The three most common options companies refer to for their "percentage reduction" are as follows from most to least comprehensive:

OPTION A Set a **50% reduction target** (in line with the SDG Target 12.3 and voluntary global food waste reporting programs like the U.S. Food Waste Pact and 10x20x30).

OPTION B Set a **10% reduction target** (mirroring the mandatory reduction for processors in the EU Waste Directive).

OPTION C Set a **zero waste to landfill target** (this could include zero waste to landfill [ZWTL] certification; for actions to prioritize, see Figure 1).

TYPICAL INDUSTRY APPROACH

Option A (a 50% reduction target) is what most companies have agreed upon. The target year based on SDG Target 12.3 is 2030; however, another timeframe could be selected given companies may not yet have a baseline to use for such a near-term target. In addition to the 50 percent reduction target, some companies (such as McCain Foods) also have a zero waste to landfill goal.



* When using an intensity-based target, it is important to be clear on what equation is used. The more simplistic option is to divide the total weight of food waste (which typically excludes the amounts sent to animal feed and biomaterial processing) by the total weight of finished production placed on the market. For a more complex but robust option used by the voluntary food waste reporting programs, divide the total weight of food waste by the total weight of all food handled. Food handled includes all finished production placed on the market plus the weight of unsold product (i.e., the sum of food waste and any food donated or sent to non-food waste destinations).

Appendix

In this Appendix as additional guidance are:

1. Details about the priorities of the Wasted Food Scale with examples of action by the frozen food sector
2. Definitions of waste and surplus destinations
3. A sampling of other relevant resources
4. Endnotes that provide a detailed bibliography of references in this guide

Sampling of Action Using the Wasted Food Scale

Several countries and other organizations have developed food use and waste hierarchies to guide action on making the best use of food. The most current version in the United States was developed by the EPA and is referred to as the "Wasted Food Scale" (Figure 6).[21]

The Wasted Food Scale shows prioritization of actions that prevent and divert wasted food from disposal. The tiers of the scale highlight different pathways for preventing or managing wasted food arranged in order from most preferred on the top left to least preferred on the top right. Within a given tier, pathways are ranked equally.

The most preferred pathways (prevent wasted food, donate, and upcycle food) offer the most benefits to the environment and to a circular economy. These "top" pathways prioritize using food for its intended purpose: to nourish people. The least preferred pathways (landfilling, incineration, and sending food down the drain) have the largest environmental impacts and have limited potential for circularity. In the middle of the scale are options like feeding animals with wasted food and food crops that remain unharvested in the field.*

Figure 7 shows examples of how companies in the frozen food value chain are taking action to prioritize the most preferred pathways, and finding financial benefit from preventing waste and also finding opportunities for better use of food-related flows by donating safe products to people in need or innovating to create new products (for example, moving what currently may be sent to animal feed or composted to instead be upcycled into new revenue streams). Additional details about these corporate examples are included in earlier sections of this guide.

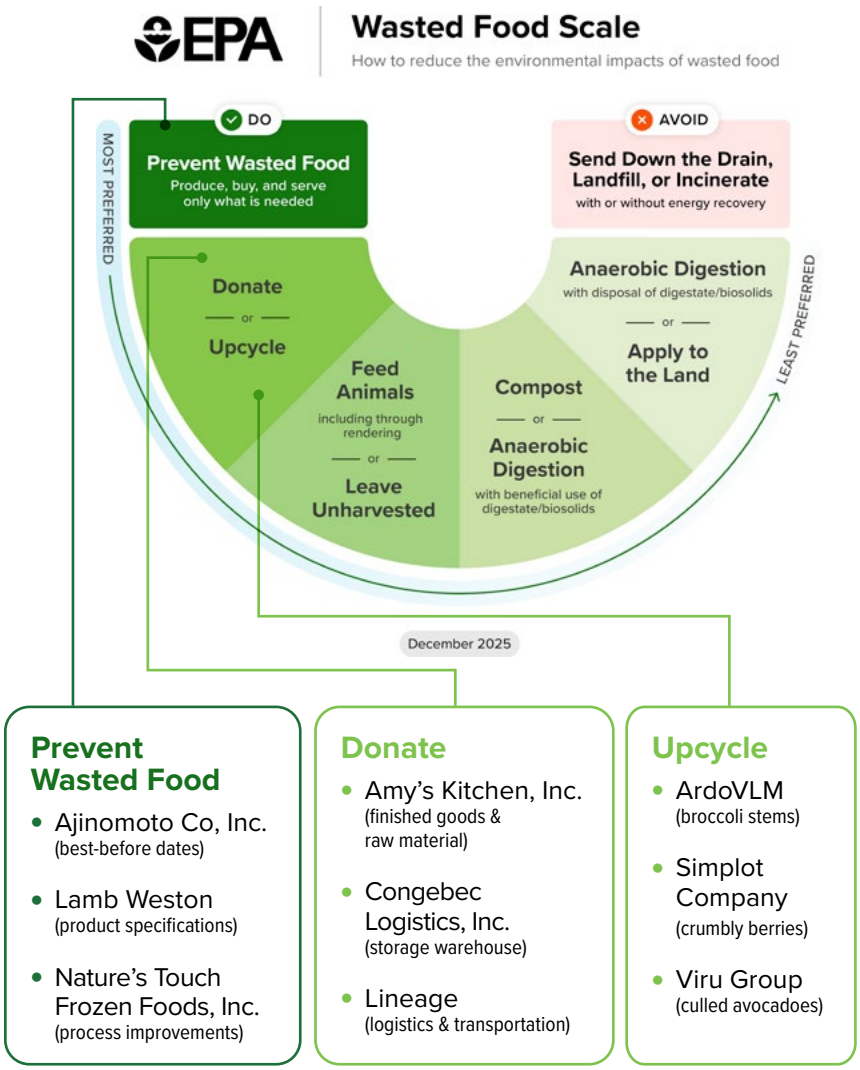
Where waste cannot be avoided, companies are also finding ways to move material up the hierarchy from the least preferred material management options to the middle of the scale. For instance, instead of sending material down the drain or to a landfill, they are redirecting it to be anaerobically digested with beneficial use of the biogas and digestate created. As one example, McCain Foods in Australia have built a cogeneration biodigester on site, which creates an energy-rich gas using material that was previously land-spread.[48]

* Crops that do not meet primary market specifications can be sold or processed in alternative and secondary markets. Gleaning organizations can also harvest surplus crops for donation. However, if crops will not be consumed even if harvested, leaving them in the field avoids the impacts of picking, processing, packaging, and distributing food that is ultimately wasted. Unharvested crops may be grazed by animals or plowed into the soil. The plant nutrients and carbon in unharvested crops enhance soil health and support the growth of future crops.

Figure 6. ***U.S. Wasted Food Scale***



Figure 7. ***A Sampling of Action in the Frozen Food Value Chain***



METHODOLOGY FOR THE WASTED FOOD SCALE

The Wasted Food Scale is based on the findings of EPA's 2023 report *From Field to Bin: The Environmental Impacts of U.S. Food Waste Management Pathways*.[57] This report assessed 11 common pathways for managing wasted food in the United States based on two methodologies: Life Cycle Assessment (LCA) to assess environmental impacts and Circularity Assessment to identify potential contributions to a circular economy. Technical details including the definition and methodology related to each pathway are available in this report.

In addition to developing the Wasted Food Scale, EPA also noted in its report the following conclusions:

- Source reduction, donation, and upcycling are the most environmentally preferable pathways because they can displace additional food production. The benefits of pathways beyond source reduction, donation, and upcycling are small relative to the environmental impacts of food production; thus, they can do little to offset the environmental impacts of food production.
- Sewer/wastewater treatment and landfill stand out for their sizeable methane emissions.
- Recycling wasted food into soil amendments offers opportunities to make long-term improvements in soil structure and health and help regenerate ecosystems by recovering nitrogen and carbon and returning them to the soil.
- As the United States becomes less dependent on fossil fuels for energy, the environmental value of producing energy from wasted food will decrease.



Definition of Waste and Surplus Destinations

CONTEXT

"Destinations" refer to where food and/or the associated inedible parts go when removed from the human food supply chain. The following are definitions for the destinations published in the global *Food Loss and Waste Accounting and Reporting Standard*.

The objectives of an organization determine whether a destination is considered "waste" or not. In food use hierarchies, such as the U.S. Wasted Food Scale, they are prioritized and ranked based on criteria important to that organization, which in many cases is a destination's environmental impact.[49]

To track progress against the global SDG 12.3 target, most government regulations and voluntary reporting programs use the definition of food waste agreed to in *Guidance on Interpreting Sustainable Development Goal Target 12.3* by Champions 12.3 (a coalition of senior leaders). That definition excludes from counting as waste the two destinations of "animal feed" and "bio-based materials/biochemical processing."[15]* See Figure 5.

* This publication provides an interpretation of Sustainable Development Goal (SDG) Target 12.3—the one addressing food loss and waste—given some ambiguity about the target. It seeks to inform decision makers in government, business, and civil society about what should be considered a "best practice" understanding of SDG Target 12.3.

Definition of Destinations

DESTINATIONS	DEFINITIONS
Animal Feed	Diverting material from the food supply chain† (directly or after processing) to animals.
Bio-based Materials/ Biochemical Processing	Converting material into industrial products. Examples include creating fibers for packaging material, creating bioplastics (e.g., polylactic acid), making "traditional" materials such as leather or feathers (e.g., for pillows), and rendering fat, oil, or grease into a raw material to make products such as soaps or cosmetics. If the outputs from this destination are biofuel products (e.g., biodiesel, fuel pellets), or unknown, the material shall be included in the "Other" destination. "Biochemical processing" does not refer to anaerobic digestion or production of bioethanol through fermentation.
Co-Digestion/ Anaerobic Digestion	Breaking down material via bacteria in the absence of oxygen. This process generates biogas and nutrient-rich matter. Co-digestion refers to the simultaneous anaerobic digestion of food loss and waste and other organic material in one digester. This destination includes fermentation (converting carbohydrates such as glucose, fructose, and sucrose via microbes into alcohols in the absence of oxygen to create new products).
Controlled Combustion	Sending material to a facility that is specifically designed for combustion in a controlled manner, which may include some form of energy recovery (this may also be referred to as incineration).
Land Application	Spreading, spraying, injecting, or incorporating organic material onto or below the surface of the land to enhance soil quality.
Landfill	Sending material to an area of land or an excavated site that is specifically designed and built to receive wastes.
Not Harvested/Plowed-In	Leaving crops that were ready for harvest in the field or tilling them into the soil.
Refuse/Discards/Litter	Abandoning material on land or disposing of it in the sea. This includes open dumps (uncovered, unlined), open burn (not in a controlled facility), the portion of harvested crops eaten by pests, and fish discards (the portion of total catch that is thrown away or slipped).
Sewer/Wastewater Treatment	Sending material down the sewer (with or without prior treatment), including that which may go to a facility designed to treat wastewater.
Other	Sending material to a destination that is different from the 10 listed above, such as biodiesel or other biofuels. This destination should be described.

† Excludes crops intentionally grown for bioenergy, animal feed, seed, or industrial use

Other Relevant Resources

The following is a sampling of additional resources that provide relevant guidance to companies in the frozen food supply chain.

Employee Engagement Toolkit by U.S. Food Waste Pact

Jointly built by the Pacific Coast Food Waste Commitment and the U.S. Food Waste Pact, the toolkit is designed to inspire, educate, and empower employees to take action against food loss and waste in their workplace. Included are resources and step-by-step guides on how to implement and maximize its impact.[46]

Food Loss and Waste Accounting and Reporting Standard (FLW Standard) by the FLW Protocol

The FLW Standard provides a consistent and transparent way to describe, account, and report an inventory of food loss and waste. It was developed by the FLW Protocol, a collaboration among seven leading organizations and reviewed by stakeholders across the global food supply chain. The simplest way to start using the FLW Standard is by reading the short Executive Summary, which lays out the key definitions and requirements. The Executive Summary is available on the FLW Protocol.org website along with the full standard containing detailed guidance, case studies, FAQs and various tools and resources.[1]

Food Loss and Waste Measurement Protocol: For the Food & Drink Manufacturing Sector by Ireland's Environmental Protection Agency

Ireland established the Food Waste Charter, where businesses can pledge to measure, reduce and report on food waste. Designed for food and drink manufacturers, the Protocol provides a consistent method to measure food waste. A Guide outlines the recommended step-by-step approach and a Food Waste Measurement Workbook in Excel provides a standardized template that can be used by any business to help identify and collate the relevant data and estimate all food waste-related flows. Even though these tools are tailored to the needs of Irish businesses they provide guidance based on international best practice.[50]

Food Waste Reduction Guidance by GCCA

The information supports GCCA members in identifying organizations for donation; case studies from GCCA members with food waste reduction programs; links to US and global food waste policies and research/ reference documents.[32]

ISO 20001: Food loss and waste management system — Requirements for the minimization of food loss and waste across the food supply chain by ISO

Building on learnings by companies, countries, and others around the world, an ISO Standard has been drafted to provide a robust structured approach for managing and implementing a successful food waste management program. It is to be released in 2026 along with two complementary standards—measurement method and auditor competence—to be finalized in 2027.[47]

Messy But Worth It: Lessons Learned from Fighting Food Waste by the Food Waste Reduction Alliance

This guide is a "What I Wish I Had Known" report based on interviews with food manufacturers, grocers and food service operators.[44]

Overcoming Resistance to the Measurement of Food Loss and Waste by the FLW Protocol

For some companies, measuring food loss and waste can be a big cultural adjustment. As a result, the individuals charged with measuring the amount of food loss and waste at their company may encounter inertia against, or resistance to, measurement activities. This guidance summarizes the concerns people may raise about measuring food loss and waste, why they may have those concerns, and recommendations for how to respond in a way that inspires them to get on board with an organization's goals.[45]

A Practical Guide to Corporate Food Waste Reporting: A Roadmap for Retailers & Manufacturers by The Consumer Goods Forum (CGF)

The CGF's Food Waste Coalition of Action created this guide to help companies streamline reporting in order to accelerate action. It explains how several critical resources come together to provide a unified approach for tackling food loss and waste. It provides a roadmap for retailers and manufacturers to:

- Understand which resources define food waste
- Access comprehensive guidance on measurement, public reporting, and strategic management
- Improve the consistency of their food waste reporting with recommendations, tips and resources about the reporting scope and metric as well as quantification aspects unique to retailers and manufacturers.[51]

Root Cause Analysis **and** ***Walk the Line*** **- operational food waste hotspot assessment tools** by the New Zealand Kai Commitment

These two tools help businesses uncover operational hotspots by closely examining a business's material flow from input to output and provide a structured approach to uncover the true causes of waste.[52]

Turning Food Waste into Value: A recommended blueprint for food waste transformation by The Consumer Goods Forum (CGF) & Capgemini

This blueprint frames food waste as a strategic opportunity to drive business value, innovation, and resilience across the food system. It outlines a two-pronged approach: preventing waste through smarter production, planning, and consumption, and valorizing unavoidable waste by transforming it into new products and markets with best-practice examples from CGF members, including Kraft Heinz, Bel Group, Tesco, Loblaw, and Walmart.[53]

U.K. Convenience, Chilled and Frozen Food Case Studies by the UK Food and Drink Pact: Food Waste Reduction Roadmap. Waste and Resources Action Program (WRAP)

This series features convenience, chilled and frozen food businesses that have signed up to the U.K. Food Waste Reduction Roadmap and are taking targeted action to reduce waste in their own operations.[54]

Why and How to Measure Food Loss and Waste by Commission for Environmental Cooperation (CEC)

This practical guide walks readers through the steps for measuring food loss and waste (FLW). It can be used as a quick reference for assistance with internal links to material of interest.[55] Short sector-specific guidance is also included (see link for manufacturers).[56]



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