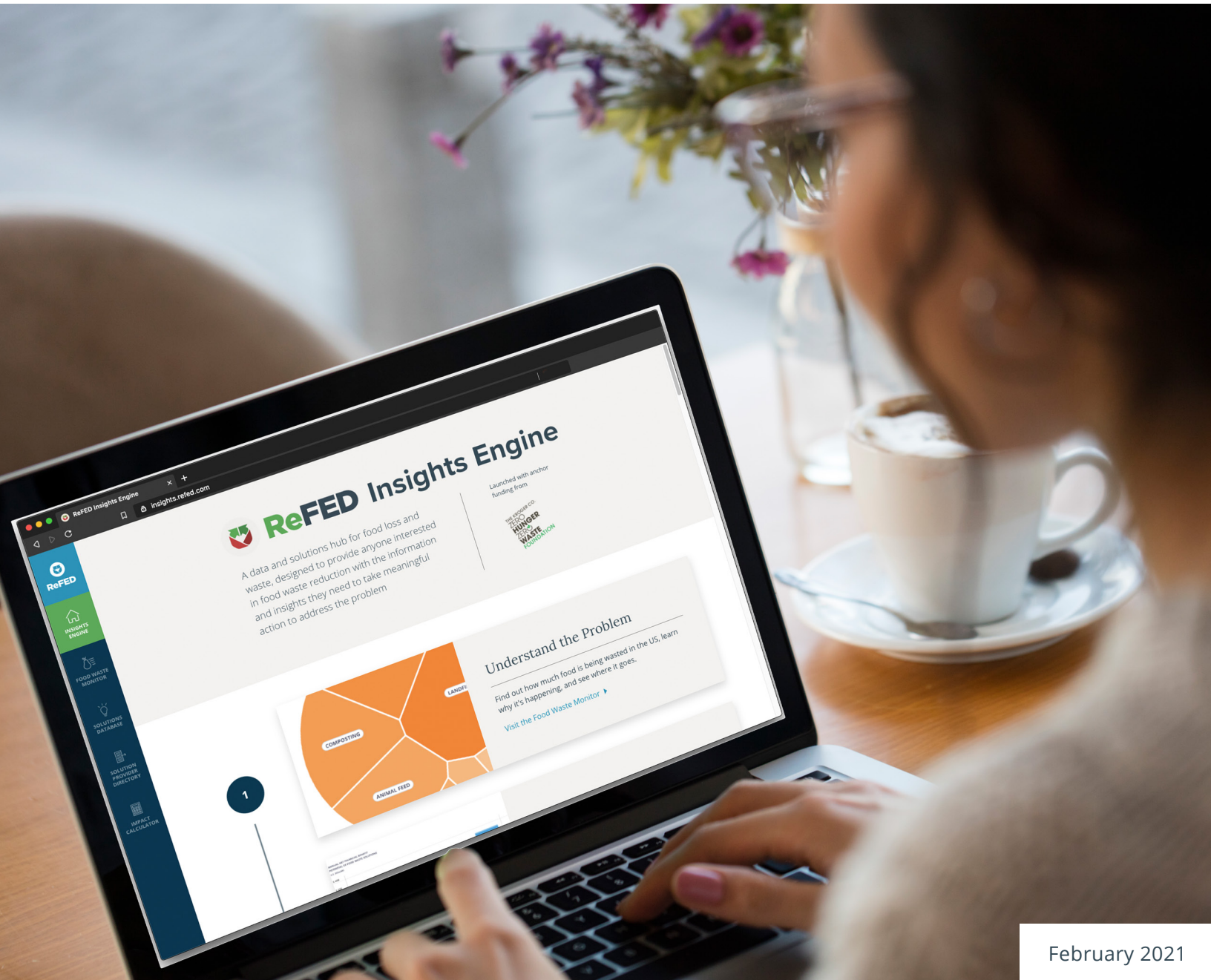




# *Roadmap to 2030: Reducing U.S. Food Waste by 50% and the ReFED Insights Engine*

## At-A-Glance



# Acknowledgements

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## Contributors

ReFED's *Roadmap to 2030* and Insights Engine analysis draws from the input of dozens of experts and practitioners from the food industry, professional trades, solution providers, academia, and more. We have enormous appreciation for the time, expertise, and data that they contributed. Please [click here](#) for a full list of all the contributors who have helped to make these resources possible.

## About ReFED

ReFED is a national nonprofit working to end food loss and waste across the food system by advancing data-driven solutions to the problem. We leverage data and insights to highlight supply chain inefficiencies and economic opportunities; mobilize and connect supporters to take targeted action; and catalyze capital to spur innovation and scale high-impact initiatives. Our goal is a sustainable, resilient, and inclusive food system that optimizes environmental resources, minimizes climate impacts, and makes the best use of the food we grow. To learn more about our solutions to reduce food waste, please visit [www.refed.com](http://www.refed.com).

*All data in this document comes from the ReFED Insights Engine, unless otherwise noted. To download our methodologies and other related resources, please [click here](#).*

# In the United States, 35% of all food goes unsold or uneaten – and most of that ends up in the trash.

In 2019, the U.S. let a huge 35% of the 229 million tons of food available go unsold or uneaten. We call this “surplus food,” and while a very small portion of it is donated to those in need and more is recycled, the vast majority becomes “food waste,” going straight to landfill, incineration, or down the drain, or is simply left in the fields to rot. Overall, ReFED estimates that 24% of food in the U.S. – 54 million tons – goes to these waste destinations.

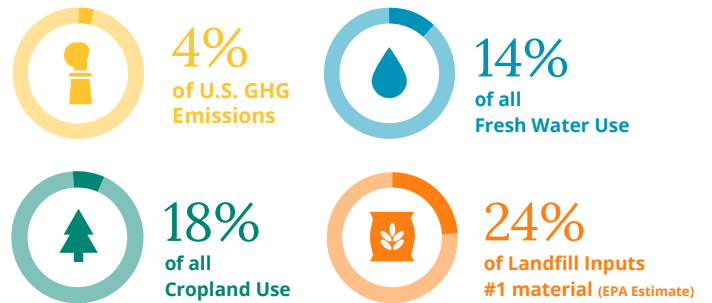
That’s almost 130 billion meals’ worth of food that we’re letting go unsold or uneaten each year, worth almost 2% of U.S. GDP. And the impacts of surplus food and food waste on our climate and environment are enormous, since food that is never eaten still requires resources to grow, harvest, transport, cool, cook, or otherwise prepare – even when it ends up being disposed of. Around the world, food waste has been recognized as an urgent issue requiring immediate action – the United Nations, U.S. Government, European Parliament, global business coalitions such as the Consumer Goods Forum, and more have all set goals to cut food waste in half by 2025 or 2030.



## What is the Impact of Uneaten Food?

### Climate and Resources ▸

When food goes uneaten, the resources used to produce it go to waste as well. If all of our country’s surplus food was grown in one place, this “mega-farm” would cover roughly 80 million acres, over three-quarters of the state of California. In the United States alone, surplus food is responsible for:

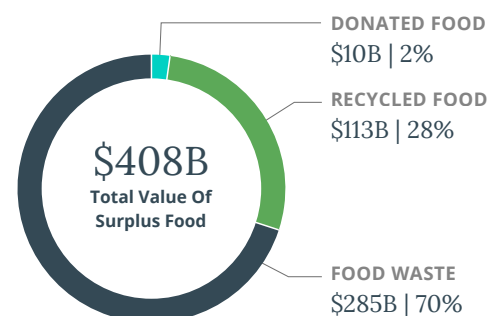


### ◀ Food Security

Because of the impact of COVID-19, the number of people struggling with food insecurity grew in 2020 to more than 50 million, according to Feeding America. A significant portion of wasted food is perfectly edible and could go to help those in need.

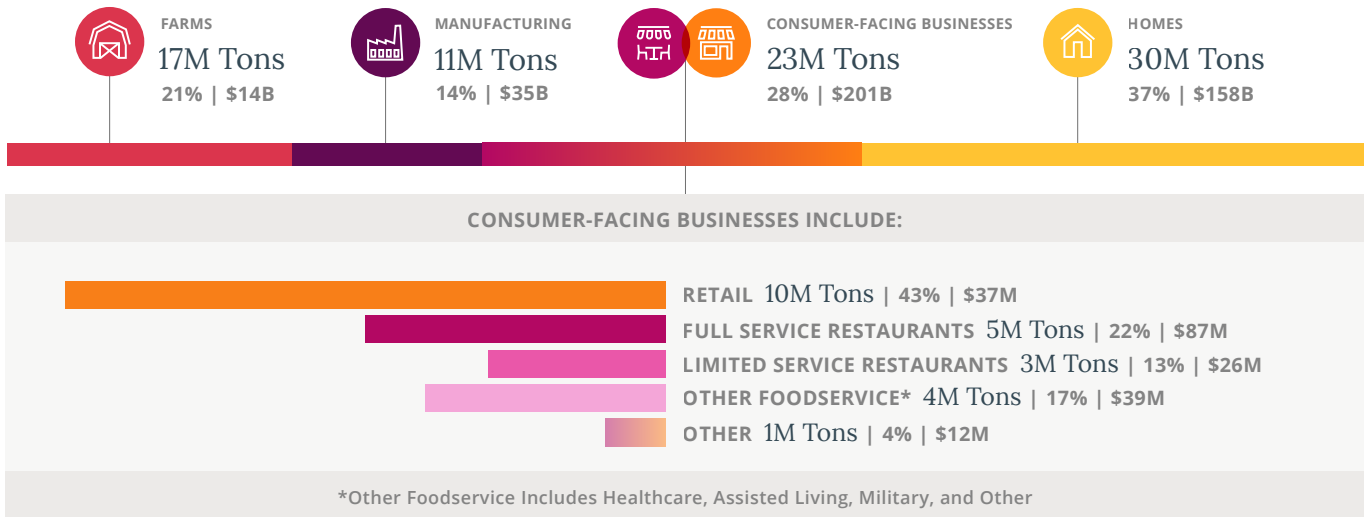
### Economic ▸

In 2019, surplus food was valued at \$408 billion. Of this, 70% – \$285 billion – was due to food waste. While the financial cost of uneaten food is greatest for consumers, the food industry lost \$250 billion, with restaurants and other foodservice businesses shouldering the greatest burden.



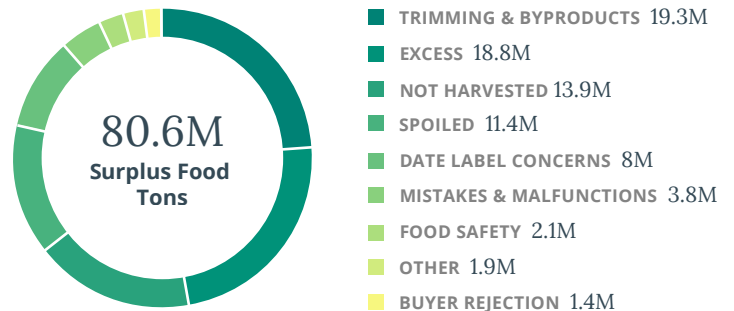
# Where Does Food Waste Occur?

Loss and waste occur at each stage of the supply chain, with the majority happening at consumer-facing businesses and in homes. Food waste is systemic in nature, and what happens at one stage is often influenced by something that happens at another stage, either upstream or downstream. Surplus food breaks out across the supply chain as follows:



# What Causes Surplus Food?

The reasons for surplus food are numerous and complex across the food supply chain. But it's important to note that the biggest causes have common-sense solutions that are ready to be implemented with the right combination of motivation, stakeholder alignment, and funding.



# COVID-19's Impact on Food Waste

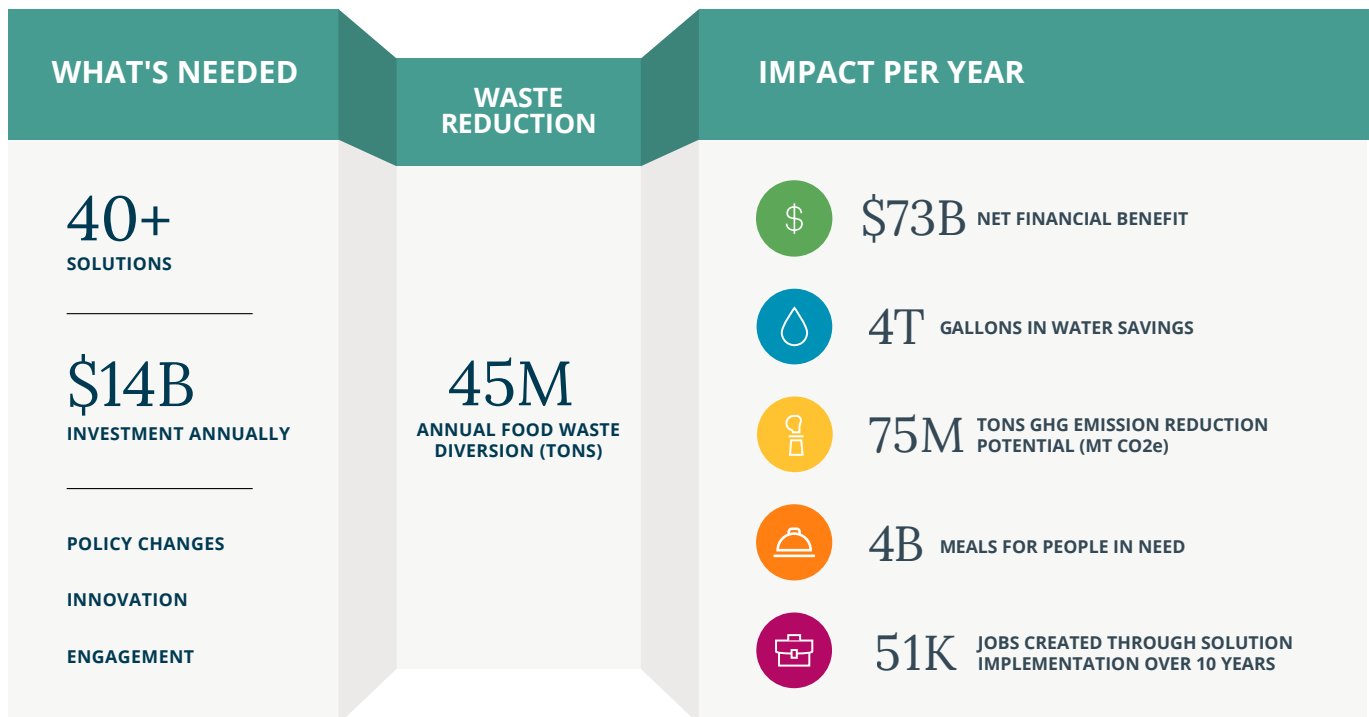
COVID-19 has upended our food system, and its effects have been felt across the entire supply chain. While there are no firm numbers yet, initial estimates – along with anecdotal evidence – suggest an increase in food waste in 2020. The forced closures of foodservice businesses and a surge in consumer demand at the retail level in the early days of the pandemic caused barriers and bottlenecks in the normal flow of products. Suddenly, there were huge quantities of produce and other perishable goods with nowhere to go, as products meant for wholesale foodservice distribution could not easily be repurposed to grocery.

The meatpacking and food processing sectors were hit especially hard with COVID-19 outbreaks and have had continuously high disruption levels since. Rapidly changing customer patterns made it difficult for retailers to accurately order the correct amounts of stock. Foodservice businesses remain among the hardest hit, as mandated lockdowns and ongoing customer apprehension over safety have led to huge decreases in business, meaning no outlet for the many products, such as gourmet seafood, that tend to be used more by restaurants than in homes.

[Learn More](#)

# Food waste is a solvable problem - here's how to do it.

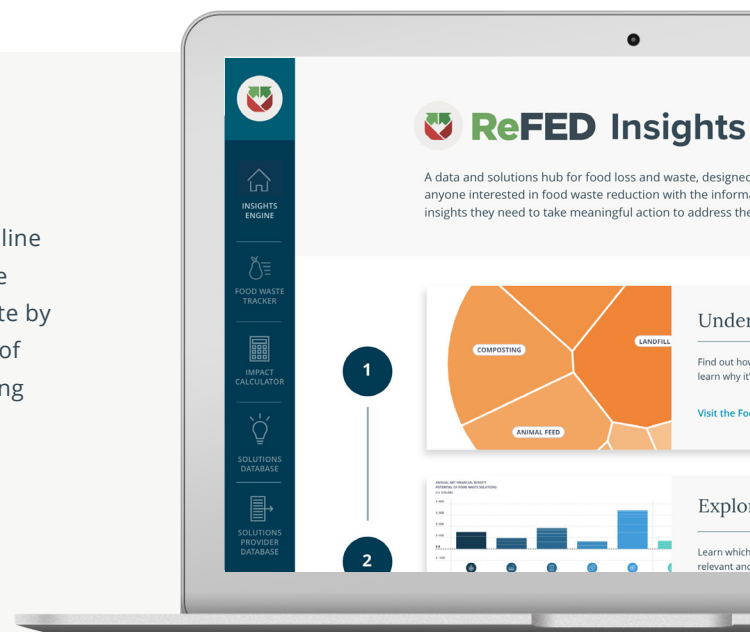
In line with the "Target-Measure-Act" framework for food waste reduction that's been adopted around the world, ReFED's *Roadmap to 2030* is a comprehensive blueprint for action that can help the food system cut food waste by 50% over the next ten years. We estimate that with a \$14 billion investment in food waste reduction solutions each year for the next ten years, the U.S. can achieve an annual reduction in food waste of 45 million tons, deliver \$73 billion in annual net financial benefit for the country, reduce GHG emissions by 75 million metric tons and rescue food equivalent to four billion meals for people in need each year, create 51,000 jobs over ten years – and achieve our 2030 reduction goal.



## Powered by the Insights Engine

Powering the *Roadmap to 2030*, ReFED's new Insights Engine is an online resource providing data and solutions to help you bring a food waste reduction initiative to life – including a granular analysis of food waste by sector, state, food type, cause, and impact; a comprehensive review of 40+ food waste reduction solutions; a detailed overview of the funding needed to implement each solution and the corresponding return; a directory of solution providers; and more.

[Launch the Insights Engine](#)





# Key Action Areas

A focus on these seven areas can make a meaningful reduction in the amount of food going to waste across the food supply chain. We've placed an emphasis on *prevention*-related action areas, as they typically have the greatest financial and environmental impact compared to the investment required, yet have received less attention than *rescue* and *recycling* in the past.

## Optimize the Harvest

Avoid overproduction, then harvest as much as possible. For wild-caught products, source only what is needed.

KEY INDICATORS (ANNUAL)	3.7M	\$8B	\$699.1M
	FOOD WASTE TONS DIVERTED	NET FINANCIAL BENEFIT	INVESTMENT NEEDED
466K	111.8B	0	
	MTCO <sub>2e</sub> REDUCTION	GALLONS WATER SAVED	MEALS SAVED



Dive into this Key Action Area

<b>PUBLIC</b>	
Government Project Finance	\$0
Government Tax Incentives	\$0
Government Grants	\$32.2M
<b>PHILANTHROPIC</b>	
Non-Government Grants	\$52.1M
Impact-First Investments	\$98.6M
<b>PRIVATE</b>	
Venture Capital	\$81.9M
Private Equity	\$81.9M
Corporate Finance & Spending	\$352.4M
Commercial Project Finance	\$0

### 4 Modeled Solutions

Imperfect & Surplus Produce Channels	\$5.1B Net Financial Benefit	2.9M Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Buyer Specification Expansion	\$2.7B Net Financial Benefit	667.6K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Gleaning	\$152M Net Financial Benefit	78.5K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Partial Order Acceptance	\$78.8M Net Financial Benefit	38.6K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>

Learn more about these modeled solutions and explore unmodeled solutions, best practices, and levers on our website.

## Enhance Product Distribution

Leverage technology to create smart systems that help efficiently move products to maximize freshness and selling time.

KEY INDICATORS (ANNUAL)	3.3M	\$8.4B	\$2.2B
	FOOD WASTE TONS DIVERTED	NET FINANCIAL BENEFIT	INVESTMENT NEEDED
7.1M	528.1B	0	
	MTCO <sub>2e</sub> REDUCTION	GALLONS WATER SAVED	MEALS SAVED



Dive into this Key Action Area

<b>PUBLIC</b>	
Government Project Finance	\$0
Government Tax Incentives	\$0
Government Grants	\$31.0M
<b>PHILANTHROPIC</b>	
Non-Government Grants	\$56.6M
Impact-First Investments	\$117.7M
<b>PRIVATE</b>	
Venture Capital	\$205.2M
Private Equity	\$205.2M
Corporate Finance & Spending	\$1.6B
Commercial Project Finance	\$0

### 5 Modeled Solutions

Intelligent Routing	\$2.7B Net Financial Benefit	1.1M Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Decreased Transit Time	\$2.5B Net Financial Benefit	1.0M Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
First Expired First Out	\$1.6B Net Financial Benefit	617.5K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Temperature Monitoring (Pallet Transport)	\$1.5B Net Financial Benefit	550.6K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Reduced Warehouse Handling	\$63.4M Net Financial Benefit	22.3K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>

Learn more about these modeled solutions and explore unmodeled solutions, best practices, and levers on our website.



## Refine Product Management

Align purchases with sales as closely as possible and find secondary outlets for surplus. Build out systems and processes for optimal on-site handling.

KEY INDICATORS (ANNUAL)	4.6M	\$15.8B	\$3.9B
	FOOD WASTE TONS DIVERTED	NET FINANCIAL BENEFIT	INVESTMENT NEEDED
KEY INDICATORS (ANNUAL)	14.2M	852.7B	0
	MTCO <sub>2e</sub> REDUCTION	GALLONS WATER SAVED	MEALS SAVED



Dive into this Key Action Area

<b>PUBLIC</b>	
Government Project Finance	\$0
Government Tax Incentives	\$0
Government Grants	\$39.4M
<b>PHILANTHROPIC</b>	
Non-Government Grants	\$202.2M
Impact-First Investments	\$262.0M
<b>PRIVATE</b>	
Venture Capital	\$613.4M
Private Equity	\$220.2M
Corporate Finance & Spending	\$2.5B
Commercial Project Finance	\$0

### 9 Modeled Solutions

Enhanced Demand Planning	\$5.2B Net Financial Benefit		1.2M Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Waste Tracking (Foodservice)	\$3.8B Net Financial Benefit		1.0M Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Markdown Alert Applications	\$3.8B Net Financial Benefit		771.1K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Dynamic Pricing	\$1.1B Net Financial Benefit		461.8K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Assisted Distressed Sales	\$339.4M Net Financial Benefit		590.5K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Minimized On Hand Inventory	\$620.9M Net Financial Benefit		195.2K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Decreased Minimum Order Quantity	\$568.7M Net Financial Benefit		189.2K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Increased Delivery Frequency	\$374.0M Net Financial Benefit		138.6K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Temperature Monitoring (Foodservice)	\$15.5M Net Financial Benefit		4.2K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>

Learn more about these modeled solutions and explore unmodeled solutions, best practices, and levers on our website.



## Maximize Product Utilization

Design facilities, operations and menus to use as much of each product as possible. Upcycle surplus and byproducts into food products.

KEY INDICATORS (ANNUAL)	3.3M	\$4.8B	\$2.4B
	FOOD WASTE TONS DIVERTED	NET FINANCIAL BENEFIT	INVESTMENT NEEDED
KEY INDICATORS (ANNUAL)	9.8M	869.7B	0
	MTCO <sub>2e</sub> REDUCTION	GALLONS WATER SAVED	MEALS SAVED



Dive into this Key Action Area

<b>PUBLIC</b>	
Government Project Finance	\$0
Government Tax Incentives	\$0
Government Grants	\$96.1M
<b>PHILANTHROPIC</b>	
Non-Government Grants	\$96.1M
Impact-First Investments	\$96.1M
<b>PRIVATE</b>	
Venture Capital	\$288.4M
Private Equity	\$411.1M
Corporate Finance & Spending	\$1.4B
Commercial Project Finance	\$0

### 3 Modeled Solutions

Manufacturing Byproduct Utilization (Upcycling)	\$2.7B Net Financial Benefit		1.9M Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Manufacturing Line Optimization	\$328.2M Net Financial Benefit		967.1K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Active & Intelligent Packaging	\$1.7B Net Financial Benefit		451.8K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>

Learn more about these modeled solutions and explore unmodeled solutions, best practices, and levers on our website.

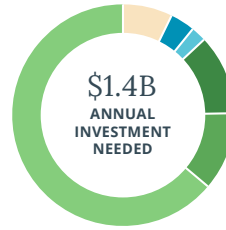




## Reshape Consumer Environments

Drive consumers towards better food management and less waste by creating shopping, cooking, and eating environments that promote those behaviors.

KEY INDICATORS (ANNUAL)	7M	\$27.4B	\$1.4B
	FOOD WASTE TONS DIVERTED	NET FINANCIAL BENEFIT	INVESTMENT NEEDED
KEY INDICATORS (ANNUAL)	34M	1.6T	0
	MTCO <sub>2e</sub> REDUCTION	GALLONS WATER SAVED	MEALS SAVED



Dive into this Key Action Area

<b>PUBLIC</b>	
Government Project Finance	\$0
Government Tax Incentives	\$0
Government Grants	\$104.0M
<b>PHILANTHROPIC</b>	
Non-Government Grants	\$54.9M
Impact-First Investments	\$29.0M
<b>PRIVATE</b>	
Venture Capital	\$166.4M
Private Equity	\$165.4M
Corporate Finance & Spending	\$908.2M
Commercial Project Finance	\$0

### 10 Modeled Solutions

Portion Sizes	\$9.0B Net Financial Benefit		2.4M Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Meal Kits	\$6.5B Net Financial Benefit		1.7M Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Consumer Education Campaigns	\$6.1B Net Financial Benefit		1.4M Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Package Design	\$2.4B Net Financial Benefit		649.5K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Standardized Date Labels	\$2.4B Net Financial Benefit		582.4M Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Trayless	\$366.1M Net Financial Benefit		104.2K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Small Plates	\$355.9M Net Financial Benefit		95.6K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Buffet Signage	\$194.6M Net Financial Benefit		52.3K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
K-12 Education Campaigns	\$25.5M Net Financial Benefit		14.8K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
K-12 Lunch Improvements	\$13.2M Net Financial Benefit		7.1K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>

Learn more about these modeled solutions and explore unmodeled solutions, best practices, and levers on our website.



## Strengthen Food Rescue

Further the rescue of high-quality, nutritious food by increasing capacity, addressing bottlenecks, and improving communication flow.

KEY INDICATORS (ANNUAL)	2.3M	\$8.8B	\$1.4B
	FOOD WASTE TONS DIVERTED	NET FINANCIAL BENEFIT	INVESTMENT NEEDED
KEY INDICATORS (ANNUAL)	2.7M	298.7B	3.9B
	MTCO <sub>2e</sub> REDUCTION	GALLONS WATER SAVED	MEALS SAVED



Dive into this Key Action Area

<b>PUBLIC</b>	
Government Project Finance	\$0
Government Tax Incentives	\$97.2M
Government Grants	\$228.5M
<b>PHILANTHROPIC</b>	
Non-Government Grants	\$697.2M
Impact-First Investments	\$206.0M
<b>PRIVATE</b>	
Venture Capital	\$21.3M
Private Equity	\$0
Corporate Finance & Spending	\$104.9M
Commercial Project Finance	\$0

### 5 Modeled Solutions

Donation Education	\$4.5B Net Financial Benefit		1.1M Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Donation Transportation	\$2.5B Net Financial Benefit		642.7K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Donation Storage Handling & Capacity	\$826.6M Net Financial Benefit		265.4K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Donation Value-Added Processing	\$429.6M Net Financial Benefit		190.8K Food waste Tons Diverted	<a href="#">Fact Sheet</a>
Donation Coordination & Matching	\$594.9M Net Financial Benefit		143.7K Food waste Tons Diverted	<a href="#">Fact Sheet</a>

Learn more about these modeled solutions and explore unmodeled solutions, best practices, and levers on our website.



## Recycle Anything Remaining

Find the highest and best use for any remaining food or food scraps in order to capture nutrients, energy, or other residual value.

Dive into this Key Action Area

KEY INDICATORS (ANNUAL)	20.9M FOOD WASTE TONS DIVERTED	\$293.7M NET FINANCIAL BENEFIT	\$2.2B INVESTMENT NEEDED
	6.8M MTCO <sub>2</sub> e REDUCTION	0 GALLONS WATER SAVED	0 MEALS SAVED

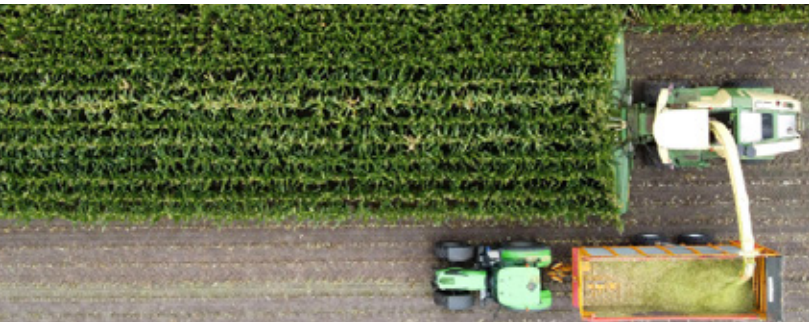


<b>PUBLIC</b>	
Government Project Finance	\$714.2M
Government Tax Incentives	\$0
Government Grants	\$493.2M
<b>PHILANTHROPIC</b>	
Non-Government Grants	\$58.2M
Impact-First Investments	\$99.8M
<b>PRIVATE</b>	
Venture Capital	\$44.1M
Private Equity	\$848K
Corporate Finance & Spending	\$205.0M
Commercial Project Finance	\$617.3M

### 6 Modeled Solutions

Centralized Composting	\$49.4M Net Financial Benefit   13.8M Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Centralized Anaerobic Digestion	\$171.4M Net Financial Benefit   3.8M Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Co-digestion At Wastewater Treatment Plants	\$71.0M Net Financial Benefit   3.0M Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Home Composting	\$4.9M Net Financial Benefit   93.6K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Livestock Feed	-\$1.5M Net Financial Benefit   60.4K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>
Community Composting	-\$1.5M Net Financial Benefit   57K Food Waste Tons Diverted	<a href="#">Fact Sheet</a>

Learn more about these modeled solutions and explore unmodeled solutions, best practices, and levers on our website.

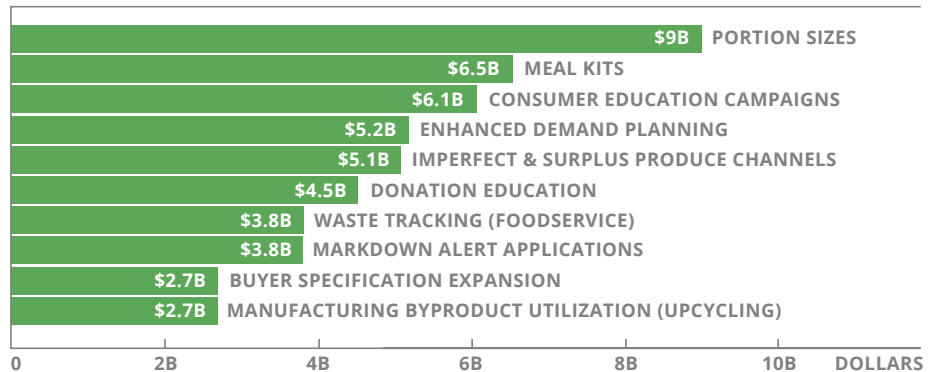


# Solutions

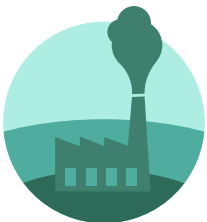
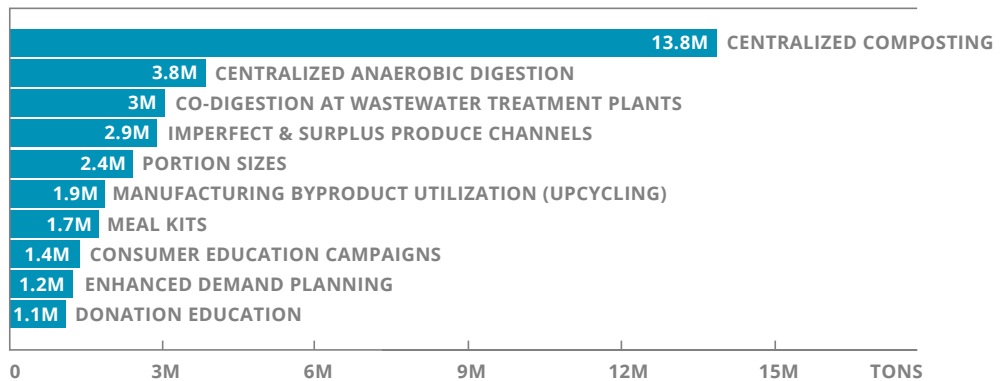
The ReFED Insights Engine features a deep-dive analysis of more than 40 food waste reduction solutions spanning our seven key action areas. Some are simple, some are more complex, some are existing best practices, and some are brand new breakthroughs. Many have a strong potential for investment returns, and others are already being implemented successfully by businesses and organizations that are actively seeking funding partners to help scale their efforts.



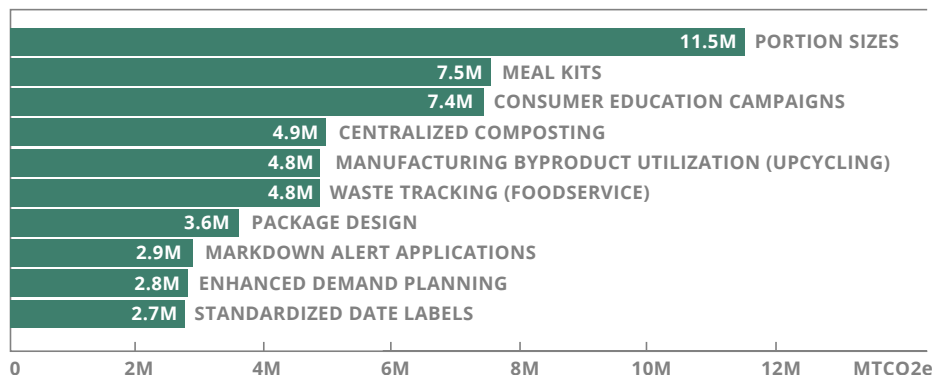
## Top Ten Solutions | NET FINANCIAL BENEFIT



## Top Ten Solutions | TONS WASTE DIVERTED



## Top Ten Solutions | GHG EMISSIONS AVOIDED IN MTCO2e



# Levers

These essential tools can facilitate the implementation – and scaling – of food waste reduction solutions:



## Financing

In the fight against food waste, capital plays an integral role in funding the development and adoption of food waste solutions – many of which have a strong potential for investment returns. Effective action against food waste requires a smart matching of the correct type of capital with the appropriate opportunity, and in many cases, multiple types of capital are required to fund food waste reduction solutions from conception to adoption.



## Policy

Policy and regulation are especially effective in overcoming challenges by 1) changing incentive structures, especially when there are misaligned incentives between who is funding a solution and who is receiving the benefit; 2) driving scaled adoption of early-stage technologies; and 3) bringing about changes that market forces alone don't address. Additionally, federal policy plays an important role when differing state policies can make solutions implementation difficult (e.g., by standardizing conflicting date labeling requirements).



## Innovation

The implementation of existing solutions can reduce a significant amount of food from going to waste across the supply chain. But there is still a need for new innovations to accelerate the adoption of these solutions and to develop new products, technologies, and business models to close the gaps where solutions either don't exist or are struggling to adequately scale.



## Engagement

Multi-stakeholder or systems-level communication, education, and training can facilitate the adoption of food waste reduction solutions. Because it's a system-wide problem, reducing food waste often requires collaboration among different sectors; building and using cross-sector relationships can accelerate adoption or even enable solutions to be implemented in the first place.

[Learn More About Levers](#)

# Top Stakeholder Recommendations

## Here's How You Can Reduce Food Waste

Food waste is a system-wide problem, and it requires everyone throughout the food system to make changes to the way they're currently doing business. Many solutions require more than one stakeholder to implement, but the benefits can be experienced broadly as well. Those that are not directly connected to the food system – including Capital Providers and Policymakers – also have an important role to play.



### Producers

- **Identify alternative markets:** Build relationships with alternative markets to diversify sales channels and find new markets for crops otherwise left in the field, such as fast-growing “imperfect” product companies and online marketplace platforms.
- **Propose new buyer arrangements:** Propose new arrangements with buyers that 1) expand product specifications in a minimal but impactful way; 2) establish new contract types such as whole crop purchasing; and 3) lead to better upstream communication of demand, including data tools that could facilitate this.
- **Establish donation channels:** Build direct relationships with food recovery organizations and gleaners to have greater options to capture donatable product.
- **Participate in emerging tools and efforts:** Engage with existing and emerging technical tools and collaborative efforts (e.g., harvest data collection platforms, planting schedule coordination, etc.) to better align production with market demand and track harvest and yield patterns over time.



### Manufacturers

- **Upcycle byproducts:** Dedicate R&D resources to create upcycled product lines for edible byproducts.
- **Optimize manufacturing lines:** Reengineer processes and product design to reduce waste during production and product line changeovers.
- **Improve package design:**
  - Create packaging solutions that enable transferability between supply chains, such as foodservice to retail.
  - Employ packaging solutions that reduce household waste, such as sub-packaging, resealing, active and intelligent packaging, smaller sizes, and usability information.
  - Implement industry-recommended standardized date labeling and extend dates for quality-based date labels where possible.
- **Recharge distressed sales:** Recharge distressed sales through doubled-down internal efforts or external solution providers, as there is often more opportunity there.
- **Allow donation:** Eliminate any mandatory destruction requirements in vendor agreements, allowing for donation instead.



## Retailers

- **Enhance demand planning:** Optimize forecasting and inventory management systems throughout operations with demand planning informed by machine learning.
- **Employ dynamic pricing models:** Implement dynamic pricing and markdown strategies such as markdown alert apps that increase sales of short-life product.
- **Implement advanced distribution technologies:** Implement technologies that will inform product quality and shelf life, such as early product analysis and detection, and incorporate intelligent routing solutions using dynamic decision-making based on product freshness.
- **Buy more of what is grown:**
  - Strive for stable buyer-grower relationships and innovative purchasing models, such as whole-crop purchasing, to ensure full utilization of product grown.
  - Revise product specifications to accept broader cosmetic variety, using more of what is actually grown; where not feasible, create established “imperfect” product lines.
- **Assist customers with food management:** Educate and assist consumers in better home food management through in-store information, food preparation services (e.g., meal kits, on-demand cutting or butchering), appropriate promotions, and customized product tips.



## Foodservice

- **Offer reduced portion sizes and “à la carte” choices:** Discourage plate waste by reducing portion sizes and/or offering customers flexibility in portion sizes, sides, and à la carte options.
- **Track waste:** Implement waste tracking processes to inform production, menu planning, and inventory management.
- **Design low-waste menus:** Implement low-waste menu design solutions, including smaller menus, product repurposing, and whole-product utilization.
- **Sell end-of-day product:** Employ dynamic pricing options for end-of-day sales, such as late happy hours or using markdown alert apps.
- **Establish donation relationships:** Establish relationships for collection of extra food for donation, either directly with organizations or through matching software solutions.



# The Role of Funding

Effective action against food waste requires a smart matching of the correct type of capital with the appropriate opportunity, and in many cases, multiple types of capital are required to fund food waste reduction solutions from conception to adoption. The *Roadmap to 2030* reviews the role of nine capital types in supporting food waste reduction.



PUBLIC		
Government Project Finance		\$714.2M
Government Tax Incentives		\$97.2M
Government Grants		\$1.0B
PHILANTHROPIC		
Non-Government Grants		\$1.2B
Impact-First Investments		\$909.2M
PRIVATE		
Venture Capital		\$1.4B
Private Equity		\$1.1B
Corporate Finance & Spending		\$7.1B
Commercial Project Finance		\$617.3M

## Key Insights



### Significant Involvement Is Needed by the Ultimate Solution Adopter

Adopting solutions will require food businesses to contribute financial and human capital, as well as overall behavioral change. Many food waste solutions have an expected return on investment that can meet the return thresholds of these entities; they just need to understand the direct, measurable, and tangible benefit to the business in order to devote organizational bandwidth to these opportunities. Corporate investment decisions largely occur because many solutions are simply good business decisions. Many food waste prevention solutions can positively impact corporate operations, thereby requiring the use of Corporate Finance and Spending. Certain solution providers or technology companies whose customers are food businesses may also be viewed as strategic targets for acquisition.



### Catalytic Capital can De-Risk Innovation and Adoption

Catalytic Capital tends to be the first money in, thereby having a multiplier effect that stimulates larger amounts of future funding and overcomes system-level barriers. Many food waste solutions with valuable social and environmental benefits are overlooked by more traditional funders due to marginal profitability or the lack of proven, market-based, revenue-generating business models. Catalytic Capital (including Government Grants, Non-Government Grants, and Impact-First Investments) can uniquely shift the economics of these projects above the necessary hurdle rate to attract market-rate financing.



## Plenty of Alpha to Go Around for Private Investors, Including Venture Capital

With ever-increasing funding round sizes, the first – of possibly many – food waste unicorns (Apeel Sciences), and growing recognition of the significant profit boosting potential for food companies in a tight margin business, private investors, especially venture capitalists, have an important role to play in scaling and firmly establishing food waste as an investment category. Particularly, this form of capital can continue to fund cutting-edge innovation (especially as technology and reducing food waste often go hand-in-hand, including hardware- and software-driven solutions) and disruptive business models with a large potential total addressable market. We have seen new market-based innovations continuing to emerge with no signs of slowing down, as well as several early stage food waste solution providers beginning to become household names, challenging existing later stage and legacy brands and services.



## Building Infrastructure with Commercial and Government Project Finance

Project Finance is necessary to cover the sheer size of financial commitment for the build-out of facilities, equipment, and transportation, which are required to collect edible food for donations and sustainably dispose of food that was originally going to landfill. In a low interest rate environment, Project Finance can now be sourced at a historically low cost. Enabling equipment and technologies, such as grinders for centralized composting and depackagers for centralized anaerobic digestion, are not necessarily products that get the most attention but are vital for these processes. Local and regional capital in the form of philanthropy can also be useful in funding gaps in financing or higher-risk opportunities.

[Review All Funding Recommendations](#)



# The Role of Policy

The *Roadmap to 2030* includes a series of legislative and regulatory recommendations developed in collaboration with the Harvard Food Law & Policy Clinic and arranged by the themes below. The enactment of these and other related policies can be the critical linchpin in driving solutions adoption to help achieve the nation's 2030 food waste reduction goal.



## Key Policy Areas

### Better Organic Waste Management

Organic waste bans are one of the most powerful ways to not only require recycling, but act to incentivize preventative measures and food donations while also enabling measurement. Federal, state, and local governments can disincentivize, limit or ban food from landfills, and eliminate restrictions on food scraps in animal feed.

### Funding for Infrastructure

Government-funded capital investments are critical for donation storage and capacity-building projects, temperature-controlled food distribution, and streamlined development of food waste reduction and waste management infrastructure.

### Funding for Innovation

Government-funded research can support market expansion and product utilization. Recommended projects to fund include farm-level yield and loss research, crop preservation and post-harvest loss prevention technologies, spoilage-inhibition technologies, and upcycled food R&D.

### Improvements to Tax Laws

Laws can be adjusted to incorporate alternative tax credits for food donations by farmers, expand food donation tax deductions to include non-profit sales and transportation services, allow application of beginning inventory donations to current year losses, and eliminate tax deduction for edible food discards that incentivize waste.

### Expanded Food Donation Policies

Federal and state governments can work to expand food donation programs, clarify guidance on food safety for donations, strengthen liability protections, and incorporate donation requirements into operational guidelines for government agencies and their contractors.

### Consumer Education

Federal, state, and local governments can drive full-scale consumer education campaigns, changes to school lunch programs, and industry changes to address the confusion and lack of awareness that results in waste.

[Review All Policy Recommendations](#)

# An Opportunity for Action

Food waste is often considered to be a singular problem, but it's an entirely different situation when hundreds of tons of broccoli go unharvested on a farm compared to a half-full platter of uneaten potatoes scraped into the trash at home. And that can make the challenge of reducing food waste by 50% by 2030 seem daunting – if not impossible.

We believe it can be done – and we're not alone. In fact, our Insights Engine analysis shows that the amount of food waste in the United States has leveled off since 2016 after increasing 11.9% in the earlier part of the decade – and per capita food waste has actually *declined* 2% over the last three years. Across the country and around the world, businesses, governments, funders, and more are recognizing the importance of implementing food waste reduction solutions. They realize that food waste reduction can protect our climate and natural resources, and help support those facing food insecurity – while also growing our economy and creating jobs. The *Roadmap to 2030* and the Insights Engine can help the food system move from awareness about the problem to bold action. Many of the solutions we analyzed are ready to be implemented today, and there's a compelling business advantage for companies to act quickly.

Our hope is that these resources serve as a data-driven playbook that can guide food waste reduction efforts over the next ten years. We invite you to join us in making the most of this opportunity – and in creating a sustainable, resilient, and inclusive food system for us all.

[Explore the Entire Roadmap](#)



# Full ReFED Solutions Analysis

SOLUTIONS	NET FINANCIAL BENEFIT	TONS WASTE DIVERTED	GHG EMISSIONS
PORTION SIZES	\$9.0B	2.4M	11.5M
MEAL KITS	\$6.5B	1.7M	7.5M
CONSUMER EDUCATION CAMPAIGNS	\$6.1B	1.4M	7.4M
ENHANCED DEMAND PLANNING	\$5.2B	1.2M	2.8M
IMPERFECT & SURPLUS PRODUCE CHANNELS	\$5.1B	2.9M	272.8K
DONATION EDUCATION	\$4.5B	1.1M	893.8K
WASTE TRACKING (FOODSERVICE)	\$3.8B	1.0M	4.8M
MARKDOWN ALERT APPLICATIONS	\$3.8B	771.1K	2.9M
BUYER SPECIFICATION EXPANSION	\$2.7B	667.6K	148.8K
MANUFACTURING BYPRODUCT UTILIZATION	\$2.7B	1.9M	4.9M
INTELLIGENT ROUTING	\$2.7B	1.1M	2.3M
DECREASED TRANSIT TIME	\$2.5B	1.0M	2.2M
DONATION TRANSPORTATION	\$2.5B	642.7K	1.0M
STANDARDIZED DATE LABELS	\$2.4B	582.4K	2.7M
PACKAGE DESIGN	\$2.4B	649.5K	3.6M
ACTIVE & INTELLIGENT PACKAGING	\$1.7B	451.8K	2.4M
FIRST EXPIRED FIRST OUT	\$1.6B	617.5K	1.3M
TEMPERATURE MONITORING (PALLET TRANSPORT)	\$1.5B	550.6K	1.2M
DYNAMIC PRICING	\$1.1B	461.8K	1.0M
DONATION STORAGE HANDLING & CAPACITY	\$826.6M	265.4K	306.2K
MINIMIZED ON HAND INVENTORY	\$620.9M	195.2K	442.2K
DONATION COORDINATION & MATCHING	\$594.9M	143.7K	552.0K
DECREASED MINIMUM ORDER QUANTITY	\$568.7M	189.2K	436.1K
DONATION VALUE-ADDED PROCESSING	\$429.6M	190.8K	-62.3K
INCREASED DELIVERY FREQUENCY	\$374.0M	138.6K	330.3K
TRAYLESS	\$366.1M	104.2K	493.7K
SMALL PLATES	\$355.9M	95.6K	452.9K
ASSISTED DISTRESSED SALES	\$339.4M	590.5K	1.5M
MANUFACTURING LINE OPTIMIZATION	\$328.2M	967.1K	2.5M
BUFFET SIGNAGE	\$194.6M	52.3K	247.5K
CENTRALIZED ANAEROBIC DIGESTION	\$171.4M	3.8M	912.4K
GLEANNING	\$152.2M	78.5K	-25.7K
PARTIAL ORDER ACCEPTANCE	\$78.8M	38.6K	70.0K
CO-DIGESTION AT WASTEWATER TREATMENT	\$71.0M	3.0M	840.8K
REDUCED WAREHOUSE HANDLING	\$63.4M	22.3K	44.0K
CENTRALIZED COMPOSTING	\$49.4M	13.8M	4.9M
K-12 EDUCATION CAMPAIGNS	\$25.5M	14.8K	70.2K
TEMPERATURE MONITORING (FOODSERVICE)	\$15.5M	4.2K	21.5K
K-12 LUNCH IMPROVEMENTS	\$13.2M	7.1K	33.6K
HOME COMPOSTING	\$4.9M	93.6K	41.0K
COMMUNITY COMPOSTING	-\$1.5M	57.0K	25.0K
LIVESTOCK FEED	-\$1.5M	60.4K	-0.8K

Launch Insights Engine