

## #4 Organics

## Subcommittee Meeting #4 Summary – Upstream Organics January 26, 2022 9AM-12PM

Subcommittee meeting #4 of the Upstream Organics (#4-Upstream Organics) was convened virtually via Zoom on January 26, 2022 from 9AM-12PM, CST. Attendance for #4-Upstream Organics is provided in Table 1.

Table 1. #4 Upstream Organics Membership and Attendance

Name	Company	Attended 1/26/21
Michelle Hurd	Iowa Grocery Industry Association	Absent
Rich Stephens	Archer Daniels Midland Company	Present
Jennifer Trent	Iowa Waste Reduction Center	Absent
Aubrey Alvarez	Eat Greater Des Moines	Present
Jennifer Jordan	City of Iowa City Landfill and Recycling Center	Present
Aaron Holt	Sysco Foods	Absent
Christine Crow	Iowa Department of Education	Present
Brenda Windmuller	Iowa Department of Education	Present
Tim Woods	IDOT Freight Advisory Committee	Present
Kaveh Mostafavi	Eco-Care Supply/The Compost Ninja	Present
Christine Hradek	Iowa State University Extension Outreach	Present
Joe Harms	PDI	Present
Theresa Stiner	DNR Internal SMM Team	Present
Reid Bermel	DNR Internal SMM Team	Present
Laurie Rasmus	DNR Internal SMM Team	Absent
Mike Sullivan	DNR Internal SMM Team	Absent
Tom Anderson	DNR Internal SMM Team	Present
Jennifer Wright	DNR Internal SMM Team	Present
Jennifer Reutzl Vaughn	DNR Internal SMM Team	Present
Michelle Leonard	Consultant – SCS Engineers	Present
Christine Collier	Consultant – SCS Engineers	Present
Rosa Cruz	Consultant – SCS Engineers	Present
Karen Luken	Sub-Consultant – EESI <sup>(1)</sup>	Present

<sup>(1)</sup> Economic Environmental Solutions International

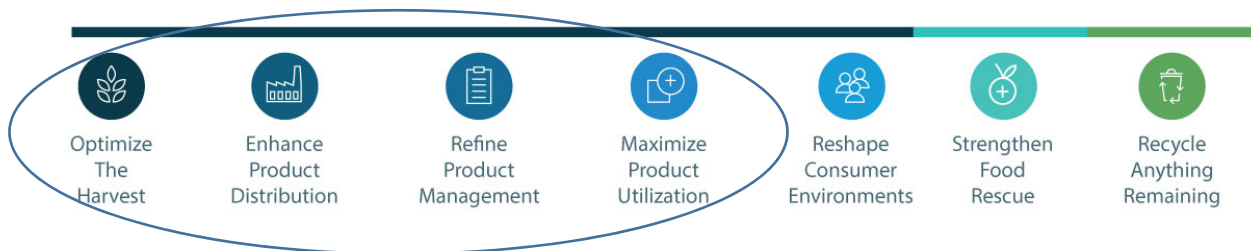
### A. Subcommittee #4 - Organics & Fibers Summary

The meeting began with the project consulting team reviewing the agenda for this meeting (see Attachment A), the overall objectives of the Sustainable Materials Management (SMM) – Vision for Iowa project, the process and goals of the project process, and the goals for today’s subcommittee meeting. The Stakeholder Meeting #3 schedule and Subcommittee responsibilities were also discussed. The slides presented for this Subcommittee meeting are included in Attachment B.

The goal for this meeting was to identify strategies to reduce upstream generated food waste in the state of Iowa. The project consulting team introduced participants to ReFED. ReFED is a national nonprofit dedicated to ending food loss and waste across the United States by advancing data-driven

solutions. ReFED has established a strategic planning document that has established a food waste diversion goal of 50% by 2030. A summary of this planning document is located in Attachment C. The planning document lists specific strategies that can be implemented to help achieve these goals and also includes interactive tools that model potential impacts. ReFED identified seven key action areas that focus on food waste prevention, rescue, and recycling in order to achieve the 50% reduction by 2030. These seven key action areas are illustrated in Figure 1 below.

Figure 1 – ReFED Key Action Areas



Four of these key action areas were discussed and potential strategies to reduce food waste upstream were presented and discussed. For some of the key action items, Subcommittee members discussed identified strategies and prioritized their implementation into an immediate (0-3 years) timeframe. The prioritized strategies identified by Subcommittee members are located in Attachment D.

The following is a brief description of the seven key action areas, the identified potential strategies, and a summary of Subcommittee member discussions for each.

- **Key Action Area - Optimize the Harvest (Prevention)**
  - 82% of food that reaches maturity is left behind after harvest. A quarter of the surplus is left behind, because its considered “not marketable”.
    - Subcommittee members agreed that this statistic was accurate for Iowa.
  - Presented Strategies:
    - Package and distribute surplus, off-grade, near expiration, or imperfect produce to retailers or consumers.
    - Adjust purchasing specifications to allow for imperfect produce.
    - Collect leftover product from fields after the initial commercial harvest (Gleaning).
    - Implement processes to only reject partial loads of produce.
  - Subcommittee Member Discussion:
    - Redefine what is marketable.
    - Find investors for post-harvest collection. Post-harvest is mostly done by volunteers and non-profits, this model is not sustainable since no one is being compensated for labor.

- Encourage schools to purchase imperfect foods. Each school district defines their own specifications for food purchasing and some already accept imperfect foods for chopping and cooking. There is an opportunity to educate food service directors.
  - Consumers need to know that imperfect foods are ok and safe to eat.
  - There used to be an organization called Iowa Choice Harvest that would process locally grown corn for schools. They would buy sweet corn from farmers and froze it for distribution to consumers and wholesalers. This was a farm to school program that could provide schools with locally grown corn.
  - Hy-Vee has participated in ugly produce sale, imperfect produce is sold for a discount to customers. A number of stores have participated but the option to participate was up to each individual store.
  - There are several stores that have exclusive relationships with Feeding America and only donate food to them. Feeding America is a reputable organization and stores deem them safe. Stores are concerned with their brand and food safety. If Feeding America does not have capacity to accept donations the stores will not donate to other organization. There needs to be merits that determine if a non-profit is a good and safe option for food donation to give stores more options for donations.
  - Some stores fear that if their food makes someone sick who received it from a donation, the store would face repercussions. The Good Samaritan Law should be looked at and possibly revised or updated.
  - Eat Greater Des Moines is a non-profit who collects donated food and distributes to various people or organizations in need. One way they have been highly successful is by having an activity fridge at Valley High School. This fridge is stocked with donated food that kids are able to eat during after school activities.
- **Key Action Area - Enhance Product Distribution (Prevention)**
    - Maximize freshness and selling time by using technology to create small systems to efficiently move products.
    - Presented Strategies:
      - Use intelligent routing – perishable products closer to destination
      - Decreased transit time
      - Priority over moving materials based on expiration vs. first in
      - Temperature monitoring
      - Reduce warehouse handling

- Subcommittee Member Discussion:
  - Ensure food is never outside of intended temperature range, this helps extend the foods shelf life.
  - Most distributors are already practicing measures such as intelligent routing and temperature control. Big companies require middle companies to do a good job handing food to avoid tarnishing the quality of their food and reputation.
  - Distributors can take measures to help divert food from landfills.
    - PDI currently has a zero waste five step program. PDI ensures stores that delivered products have a 7 day shelf life. If that cannot be met the food is offered to the store at a discount. If it is rejected by the store PDI employees can purchase the food for a discount. Unpurchased food is then donated to places like the animal rescue league. It will then move to an animal food program if it is deemed unsafe for human consumption. Lastly spoiled food goes to anaerobic digestion or organic composing. PDI will provide the Subcommittee with more information on their five step zero waste program.
  - The current costs of transportation from driver shortages, fuel cost soaring, rising wages just to retain drivers, the rising costs of the asset (trucks) itself makes transportation for the movement of the type products we're discussing incredibly challenge. The infrastructure (bridges in bad conditions) issues Iowa is facing only adds to the challenge. The Iowa DOT is addressing all of these issues and the Freight Advisory Council is working to make sure we stay focused on them as funding is made available.
- **Key Action Area - Refine Product Management (Prevention)**
  - Align purchases with sales as closely as possible, and when surplus arises, finding secondary outlets to accommodate it.
  - Build out systems and processes for optimal on-site handling.
  - Presented Strategies:
    - Improved intelligence around demand planning through systems or incorporating historical data in future decisions (i.e., machine learning) to aid in better forecasting and fulfillment.
    - Provide technology-enabled tracking of food loss and waste to highlight opportunities for reduction.
    - Application to alert consumers to markdowns or excess food at retailers or restaurants.
    - Dynamic pricing to help retailers automate and comprehensively update markdowns, optimizing price points to sell more product.

- Minimize on-hand inventory.
  - Decreased minimum order quantity.
  - Increased delivery frequency.
  - Assisted distressed sales.
  - Collect data on food generated by sector.
- Subcommittee Member Discussion:
  - Iowa schools are already using production records to minimize food waste.
- **Key Action Area - Maximize Product Utilization (Prevention)**
  - Design facilities, operations, and menus to use as much of each product as possible.
  - Rethinking the concept of waste by turning surplus and byproducts into food products through upcycling.
  - Presented Strategies:
    - Promote manufacturing byproduct utilization (upcycling).
    - Support active and intelligent packaging research.
    - Identify opportunities to reduce food waste from manufacturing and processing operations.
  - Subcommittee Member Discussion:
    - Change perception that if it cannot be sold it isn't valuable.
    - Standardize labels in store.
    - Educate consumers on what date labels on food mean. For example, most dates are not safety dates but guaranteed best quality dates.

Following the discussion of the key action areas the consulting team asked the Subcommittee to discuss how the DNR could play a role. Here were the suggestions:

- Provide stores and restaurants documentation on how to reduce food waste.
- Collect data on who is participating and who is not participating in food reduction.
- Increase public education on food date labels.
- Educate consumers on food safety, food prep and balancing grocery budgets to prevent food waste at home.
- Track how much food is ending up in the landfill and from where. Make this data publicly available.

## B. Research Request List

Through the discussions and in follow up discussions, various topics have been identified for further research. These are provided below.

- Good Samaritan law

### C. Other Notes

Other items of note from the #4- Upstream Organics meeting are as follows:

- The third Stakeholder Meeting will be held May 23, 2022. Subcommittee members in addition to other interested parties are invited and encouraged to attend. There are two planned meetings in March and April before the stakeholder meeting.

#### **Attachments:**

Attachment A: Agenda

Attachment B: PowerPoint Presentation

Attachment C: ReFED Roadmap to 2030

Attachment D: Additional Information

Attachment A  
Agenda

Attachment B  
PowerPoint Presentation



Attachment C  
ReFED Roadmap to 2030

Attachment D  
Additional Information

Attachment A  
Agenda

## Subcommittee Meeting #4 – Organics and Fibers - Upstream

January 26, 2022

9:00AM – 12:00PM (CST)

Virtual Meeting

### 1. Introductions

- a. Project Team
- b. Subcommittee Members

### 2. Background

- a. Sustainable Materials Management
- b. Iowa Vision for Iowa Project
- c. Prioritized Materials
- d. Organics Management In Iowa
- e. Organics Management in Other States
  - i. California
  - ii. Vermont
  - iii. Washington
- f. ReFED *Road Map to 2030*

### 3. Break

### 4. Developing Strategies

- a. Review consumer and end-of-life management strategies and timelines
- b. Review and assess ReFED upstream strategies
- c. Identify new upstream strategies
- d. Establish timelines for strategies

Attachment B  
PowerPoint Presentation



## Agenda

- 1. Introductions**
  - a. Project Team
  - b. Subcommittee Members
- 2. Background**
  - a. Sustainable Materials Management
  - b. Iowa Vision for Iowa Project
  - c. Prioritized Materials
  - d. Food and GHG emissions
  - e. Organics Management in Iowa
  - f. Organics Management in Other States
    - i. California
    - ii. Vermont
    - iii. Washington
  - g. ReFED Road Map to 2030
- 3. BREAK**
- 4. Developing Strategies**
  - a. Review consumer and end-of-life management strategies and timelines
  - b. Review and assess ReFED upstream strategies
  - c. Identify new upstream strategies
  - d. Establish timelines for strategies

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## Introductions



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## Committee Introductions

Name/Nickname

Organization

Your Experience with Organics

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## Expectations

Share your expertise

Ask a lot of questions

Be open to new ideas and concepts

Share information and solicit input from your co-workers, friends, and family

Please keep participating

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## What is SMM?

"Sustainable materials management is an approach to using and reusing materials most productively throughout their entire life cycles"

It represents a change in how our society thinks about the use of natural resources and environmental protection

Source: USEPA

## What Isn't SMM?

- Product Bans without LCA on alternative products
- Landfill diversion requirements without:
  - Strategies to reduce generation
  - Sufficient infrastructure and funding to collect and process
  - Assessment of impact on greenhouse gas emissions; especially at landfills with landfill gas to energy systems
  - Assessing the impact of GHG emissions from transporting recyclables across country/world
  - Viable off-take markets

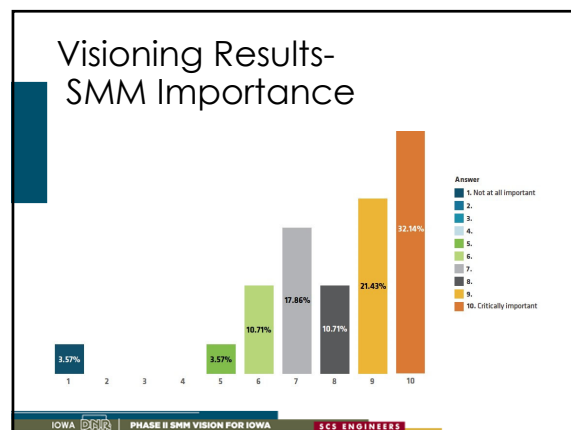


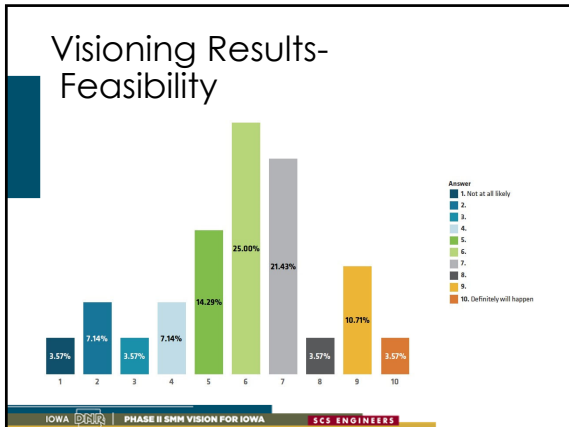
## Goal

Establish a clear direction for implementing an SMM system with immediate, medium and long-term strategies

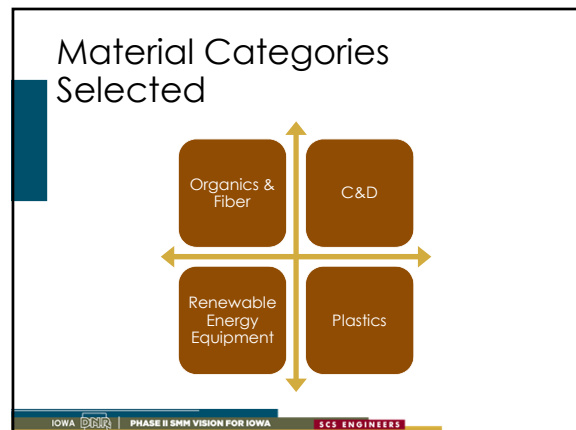
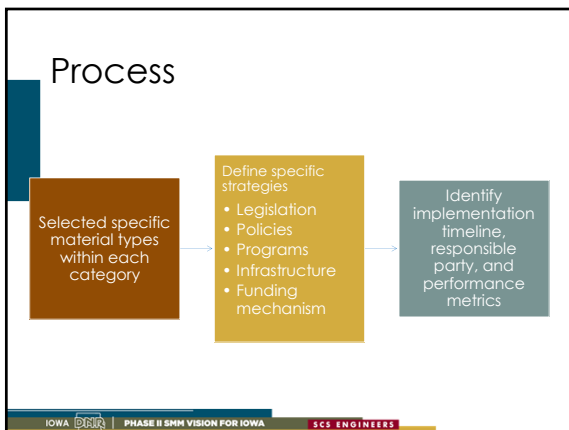
## Phase I

- Occurred between November 2018 and October 2019
- Included:
  - Initial strategy meeting
  - Planning meetings
  - Benchmarking study
  - Vision for Iowa Think-Tank
  - Surveys
  - Focus groups
  - Think Tank Report
  - SMM Vision Report





- ### Phase II
- Began in 2020
  - Will end in 2022
  - Contents
    - Stakeholder Workshops
    - Subcommittee Work Sessions
  - Two Stakeholder Workshop held Approximately 50 Participated via Zoom
    - Business, waste industry, education, municipalities, consulting, and state government
  - Three Organic Subcommittees held
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- ### Materials
- | Organics   | Fibers   |
|--|--|
| <ul style="list-style-type: none"> <li>• Yard trimmings</li> <li>• Agricultural waste</li> <li>• Edible food</li> <li>• Pre-consumer spoiled food</li> <li>• Post-consumer food scraps</li> <li>• Biosolids</li> <li>• Manure</li> </ul> | <ul style="list-style-type: none"> <li>• Office paper</li> <li>• Newspaper</li> <li>• Magazines</li> <li>• Corrugated cardboard</li> <li>• Packaging</li> <li>• Fiberboard</li> <li>• Junk mail</li> </ul> |
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### Background on Organics

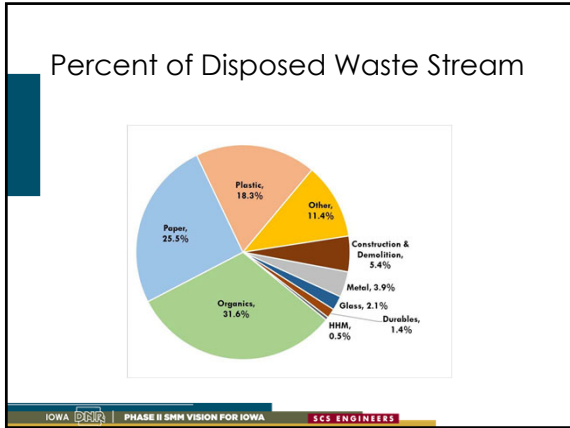
#### Food Waste

**THE FACTS ON FOOD WASTE**

- 1/3 of all food produced in the world is wasted
- 1.3 billion pounds of food waste is generated every year
- Enough to feed 3 billion people
- In a world where 805 million go hungry every year, food waste doesn't make sense.

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### Food and GHG Emissions

- Food accounts for 10-30% of a household's carbon footprint, typically a higher portion in lower-income households. Production accounts for 68% of food emissions, while transportation accounts for 5%
- Food production emissions consist mainly of CO<sub>2</sub>, N<sub>2</sub>O, and CH<sub>4</sub>, which result primarily from agricultural practices
- Meat products have larger carbon footprints per calorie than grain or vegetable products because of the inefficient transformation of plant energy to animal energy, and due to the methane released from manure management.

### Food and GHG Emissions

- Methane is an extremely powerful greenhouse gas, responsible for around 30 percent of warming since the pre-industrial era
- Most human-caused methane emissions come from three sectors: fossil fuels, such as oil and gas processing; landfills and waste; and agriculture, chiefly related to livestock
- "Cutting methane is the strongest lever we have to slow climate change over the next 25 years" – UNEP
- Unlike CO<sub>2</sub>, which stays in the atmosphere for centuries, methane breaks down quickly and most is gone after a decade, meaning action can rapidly reduce the rate of global warming in the near-term.



### Overview

1. Food Recovery in CA is much like food recovery in the rest of the country.
2. It is predicated on the willingness of commercial businesses (Edible Food Generators) to donate.
3. It is about to scale up because of ground-breaking SB 1383 (Short-Lived Climate Pollutants) legislation: requires reduction in organic waste disposal to landfill by 75% by 2025.
4. Food waste (edible and inedible) accounts for 18.1% of total state landfill disposal = nearly 6 million tons each year.
5. The law also requires the recovery of 20% of the edible food currently being disposed in landfill by 2025.


## Jurisdictional Requirements

1. Provide organic waste collection to all residents and businesses so as to divert waste from landfill.
2. Establish an edible food recovery program.
3. Conduct outreach and education to all affected parties, including generators, haulers, facilities, food recovery organizations, and city/county departments.
4. Evaluate jurisdictions' implementation readiness via Capacity Planning.
5. Procure recycled organic waste products like compost, renewable natural gas, etc. to be used by municipalities.
6. Inspect and enforce compliance.
7. Maintain accurate and timely compliance records and reporting to CalRecycle.

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## VT Universal Recycling Law (Act 148)

- Disposal ban for certain items
  - Recyclables
  - Leaf and yard debris
  - Food scraps
- Requires parallel collection
- Phased-in food scrap diversion
  - July 1, 2020: all food scraps
- MA, CT, RI, CA have laws; NY, NJ, MD on the way.



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## National Food Reduction and Recovery

State of Washington

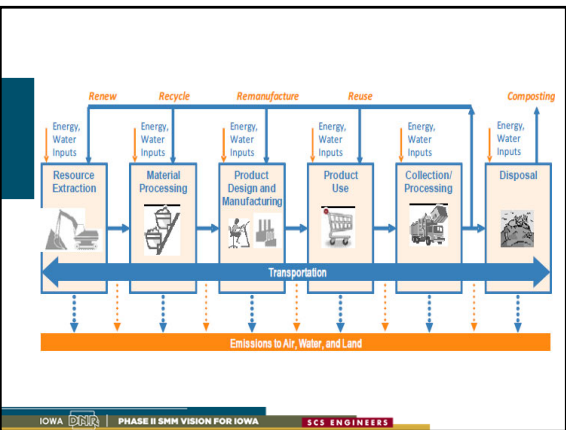
- Support national date labeling standards.
- Strengthen Good Samaritan Law
- Increase markets for lower-grade produce
- State grant funding for food waste prevention, rescue, and recovery
- Infrastructure investment in schools
- Mapping food system flows
- Improve donation transportation
- Community food hubs
- Develop an emergency food distribution plan for Washington Schools
- 20-minute seated lunch minimum in Washington schools
- Recess before lunch in Washington schools

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### REDUCING FOOD WASTE FROM A LIFE-CYCLE PERSPECTIVE

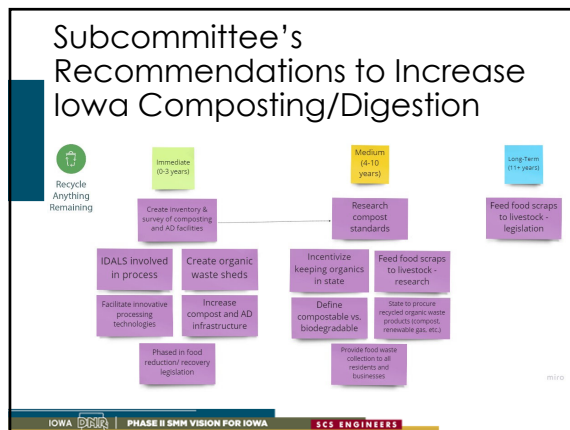
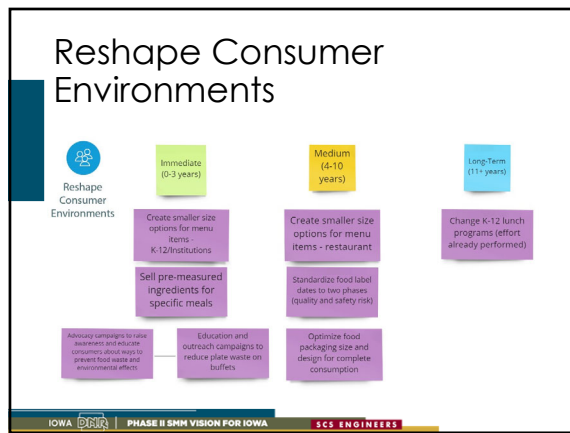
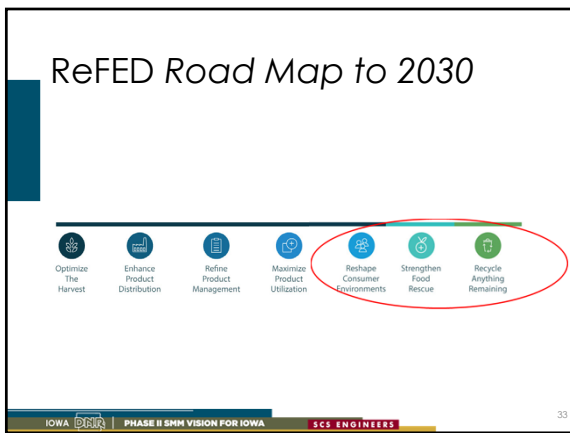
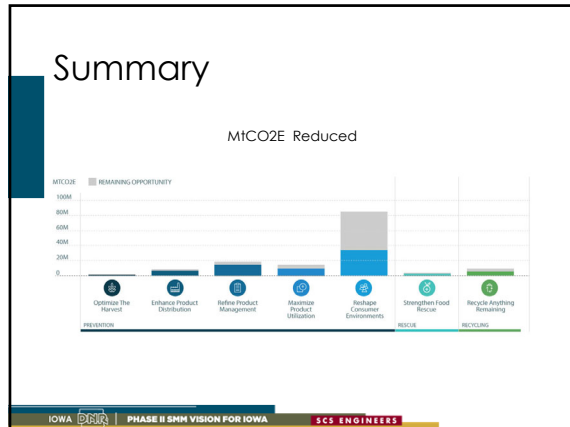
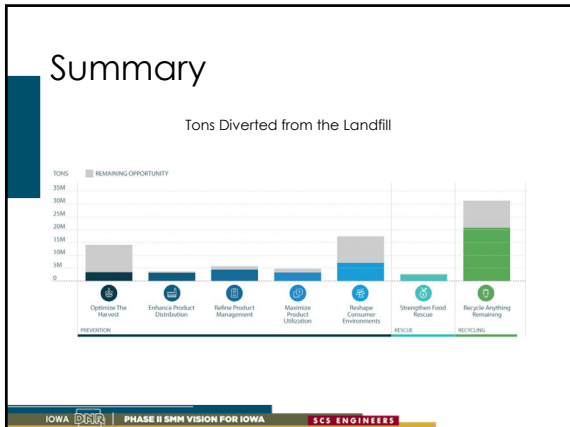
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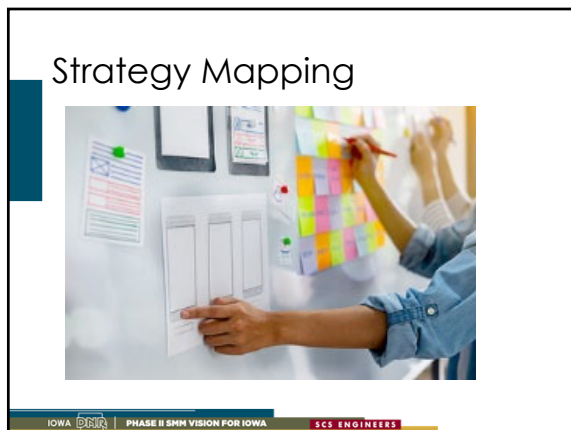
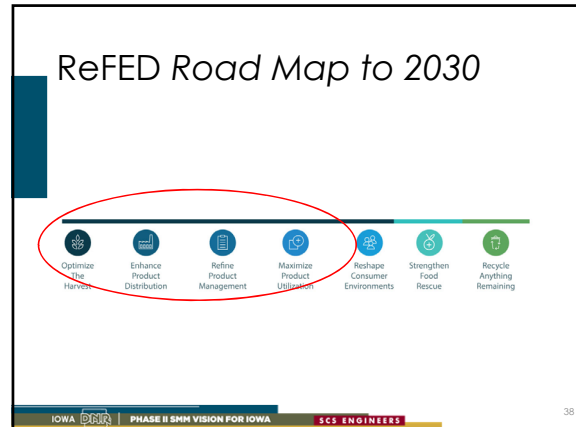
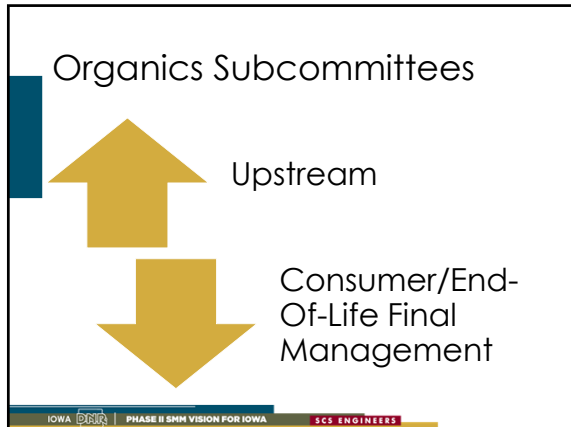


## ReFED Road Map to 2030

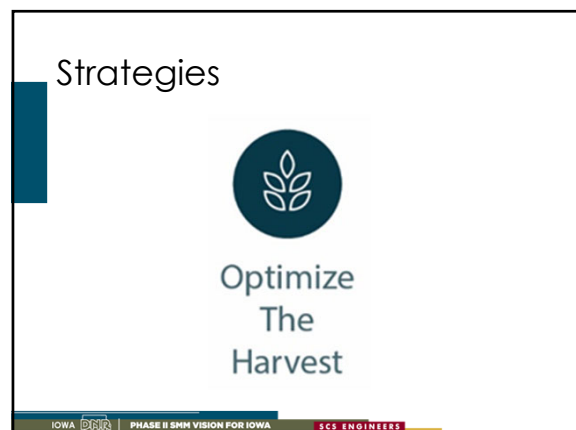
- Optimize The Harvest
- Enhance Product Distribution
- Refine Product Management
- Maximize Product Utilization
- Reshape Consumer Environments
- Strengthen Food Rescue
- Recycle Anything Remaining

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- ### Strategy Mapping
- What is/can be done in Iowa to progress these strategies?
  - What can your organizations/businesses do to define/implement these strategies?
  - What role can IDNR play?
  - What are the policy, infrastructure, financial implications of these strategies?
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## Optimize the Harvest



- 82% reached maturity but was left behind after harvest
  - A quarter of the surplus is left behind, because it's considered "not marketable"



Does This Statistic Reflect Iowa Agriculture?

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## Potential Strategies






Package and distribute surplus, off-grade, near-expiration, or imperfect produce to retailers or consumers.




Adjust purchasing specifications to allow for imperfect produce

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## Potential Strategies

Collecting leftover product from fields after the initial commercial harvest



Implement processes only reject partial loads of produce

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## Strategies



### Enhance Product Distribution

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## Enhance Product Distribution





Maximize freshness and selling time by harnessing the power of technology to create smart systems to efficiently move products


Food loss during transportation relatively low during transportation, but room for improvement

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## Potential Strategies

Use intelligent routing – perishable closer to destination (cold chain management)




Decreased Transit Time

Display until  
e by


Move product based on what will expire first, rather than when it was received

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## Potential Strategies



Use technology temperature monitoring (pallet transport)



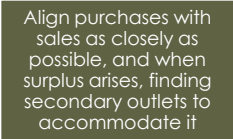
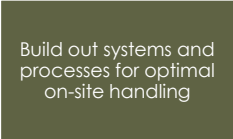
Reduce warehouse handling



Enhance Product Distribution

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## Refine Product Management


Refine Product Management

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## Potential Strategies



Improved intelligence around demand planning through systems or incorporating historical data in future decisions, often using machine learning to aid in better forecasting and fulfillment.



Provide technology-enabled tracking of food loss and waste to highlight opportunities for reduction



Refine Product Management

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## Potential Strategies



Develop applications that alert consumers to markdowns or excess food at retailers or restaurants




Establish dynamic pricing to help retailers automate and comprehensively update markdowns, optimizing price points to sell more product




Refine Product Management

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## Potential Strategies



Minimize on-hand inventor.



Decreased minimum order quantity



Refine Product Management

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## Potential Strategies



Increased delivery frequency



Assisted distressed sales



Collect data on Food generated by sector (i.e. commercial, institutional)



Refine Product Management

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# Maximize Product Utilization



Designing facilities, operations, and menus to use as much of each product as possible

Rethinking the concept of "waste" by turning surplus and byproducts into food products through upcycling

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# Potential Strategies




Promote Manufacturing Byproduct Utilization (upcycling)

Support Active & Intelligent Packaging Research

Identify opportunities to reduce food waste from manufacturing and processing operations

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What's Next?

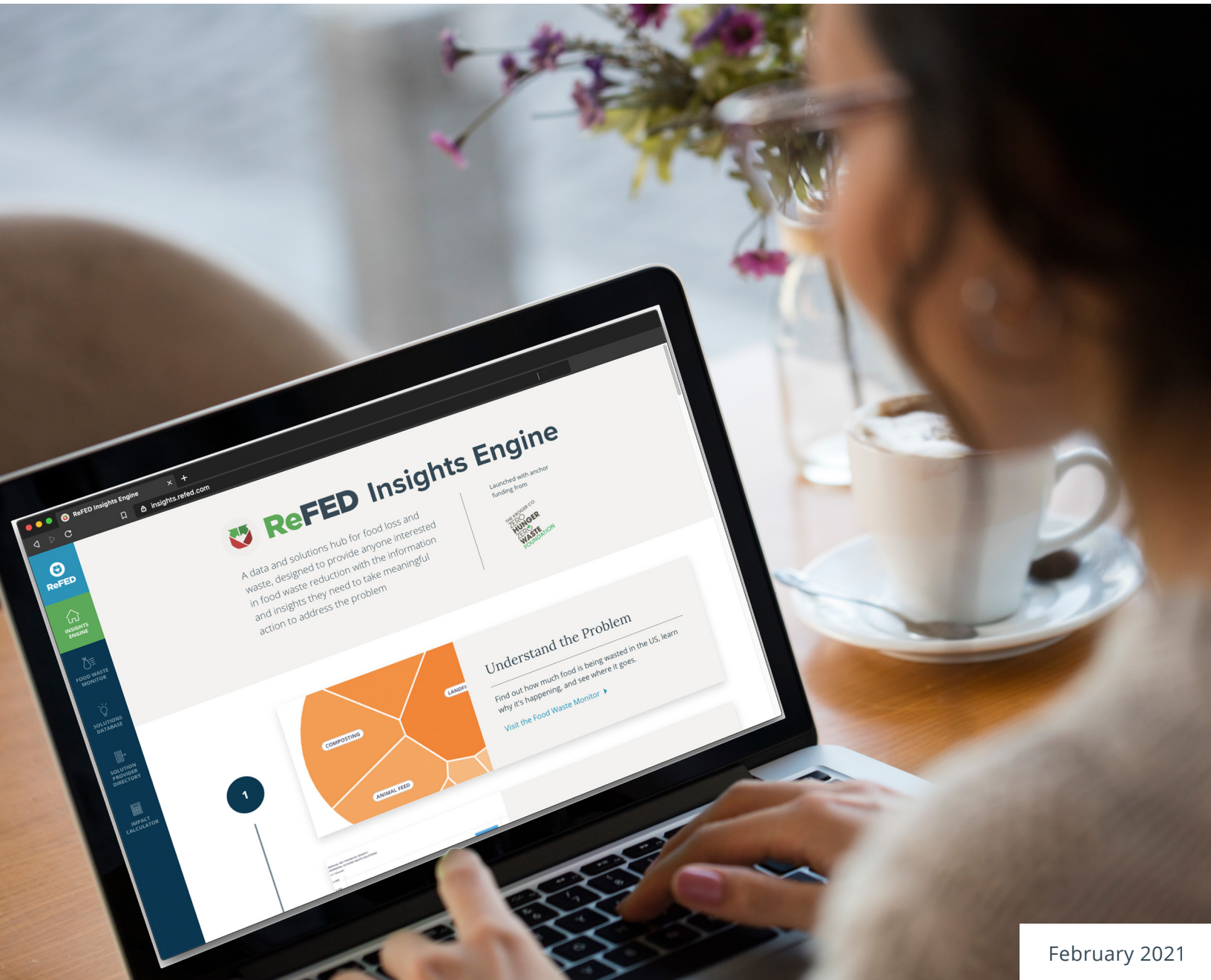
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Attachment C  
ReFED Roadmap to 2030





# Roadmap to 2030: Reducing U.S. Food Waste by 50% and the ReFED Insights Engine At-A-Glance



# Acknowledgements

## Funders

This effort would not be possible without the generous support of:

Anchor Funder



Additional funding came from:

**AJANA FOUNDATION**

**ARJAY R. & FRANCES F. MILLER  
FAMILY FOUNDATION**

**ATTICUS TRUST**

**THE CLANEIL FOUNDATION**

**CROWN FAMILY PHILANTHROPIES**

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In-Kind Funders



## 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.

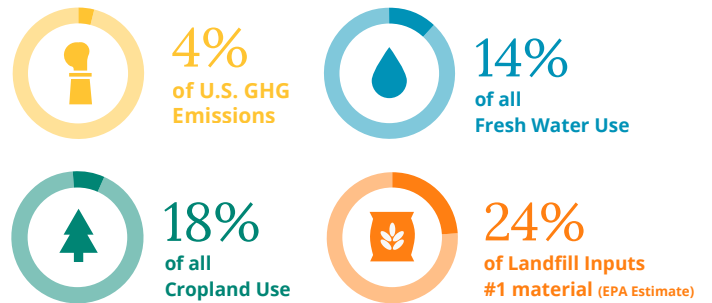
That’s almost 130 billion meals’ worth of food that we’re letting go unsold or uneaten each year, worth almost 2% of U.S. GDP. And the impacts of surplus food and food waste on our climate and environment are enormous, since food that is never eaten still requires resources to grow, harvest, transport, 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:

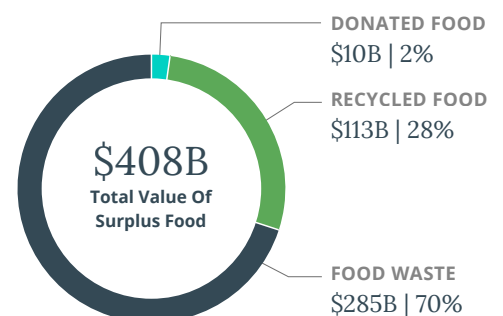


### ◀ Food Security

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.

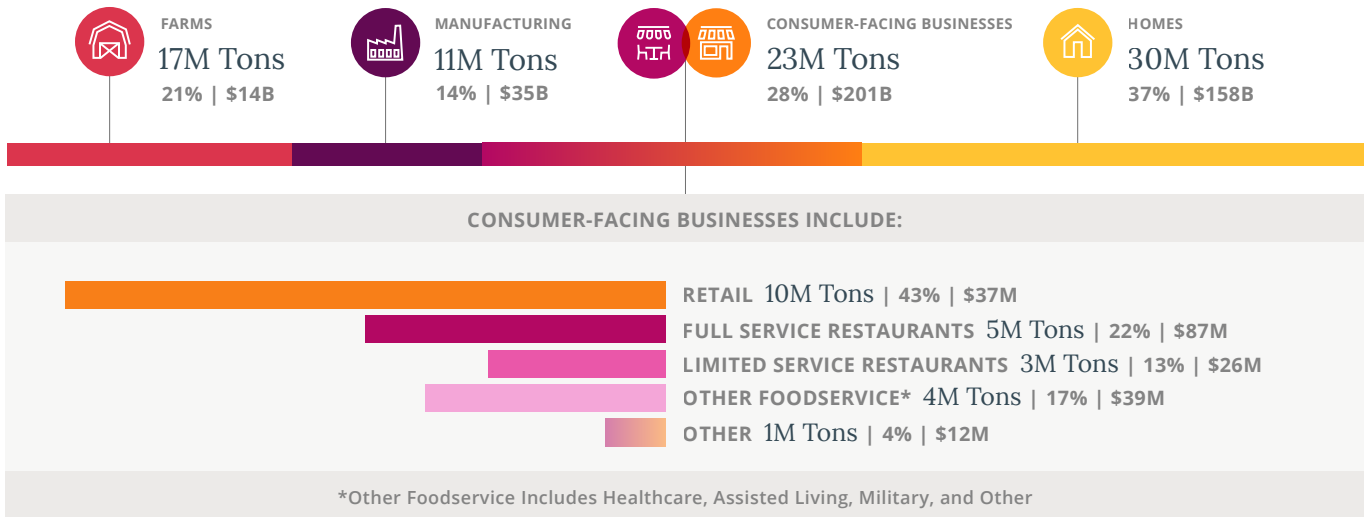
### Economic ▸

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.



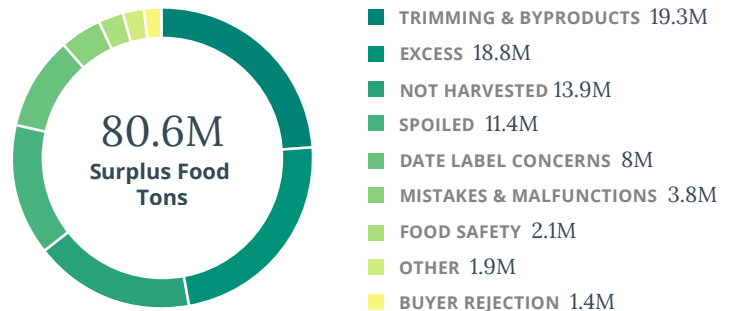
# Where Does Food Waste Occur?

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

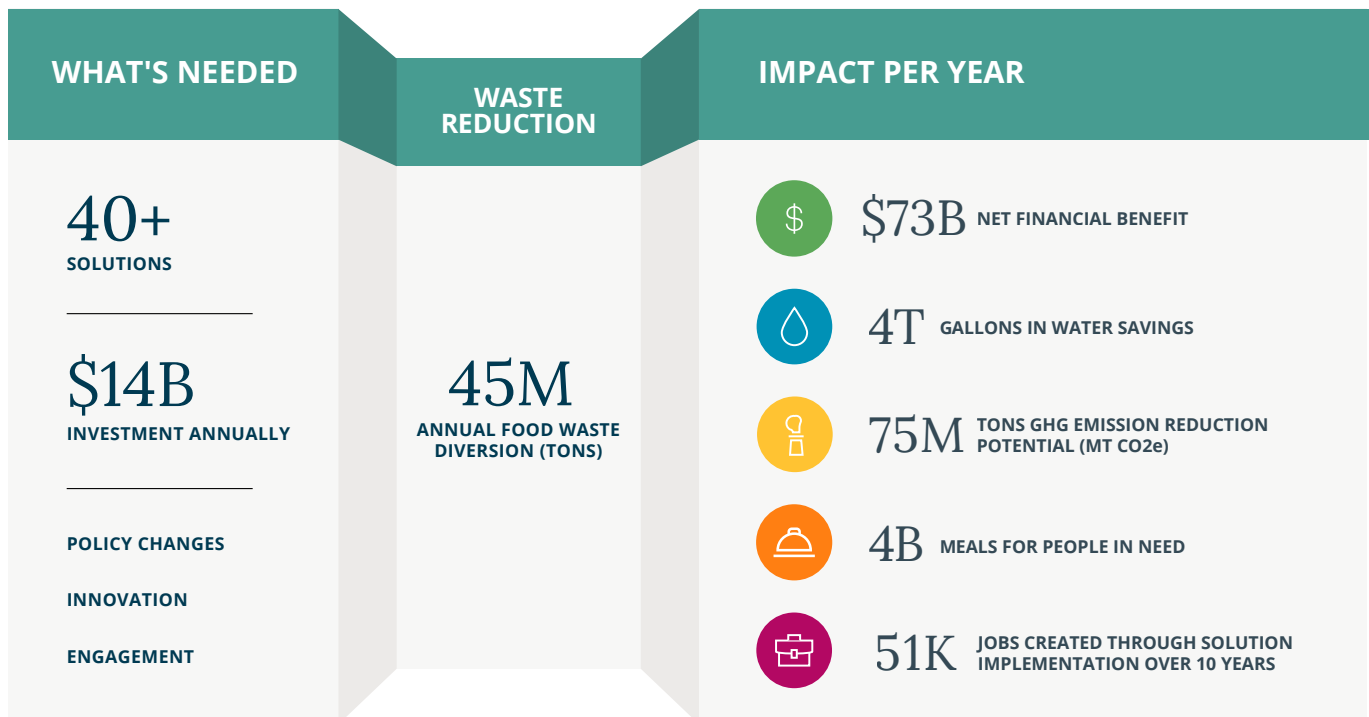
COVID-19 has upended our food system, and its effects have been felt across the entire supply chain. While there are no firm numbers yet, initial estimates – along with anecdotal evidence – suggest an increase in food waste in 2020. The forced closures of foodservice businesses and a surge in consumer 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.

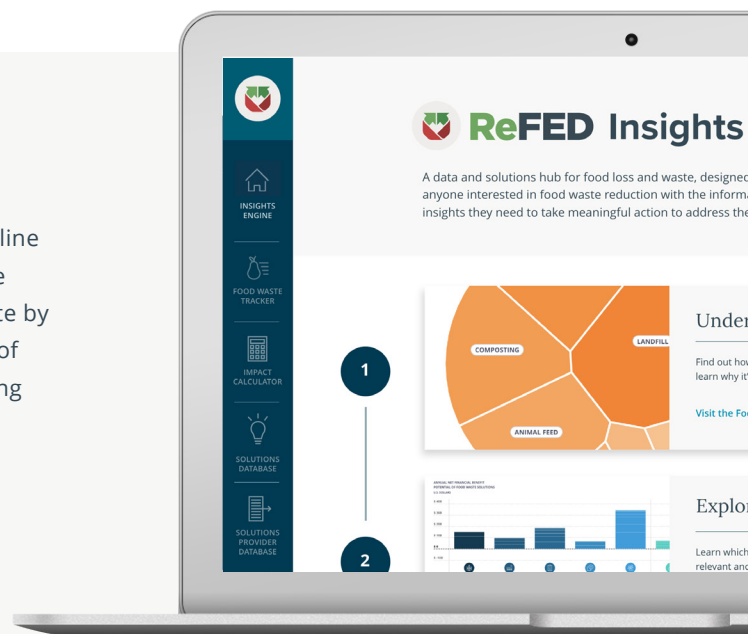
In line with the "Target-Measure-Act" framework for food waste reduction that's been adopted around the world, ReFED's *Roadmap to 2030* is a comprehensive blueprint for action that can help the food system cut food waste by 50% over the next ten years. We estimate that with a \$14 billion investment 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	\$20.2M
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.

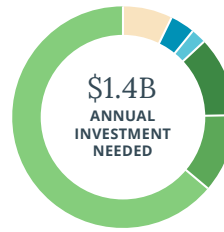




## Reshape Consumer Environments

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>

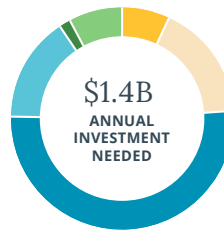
Learn more about these modeled solutions and explore unmodeled solutions, best practices, and levers on our website.



## 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.

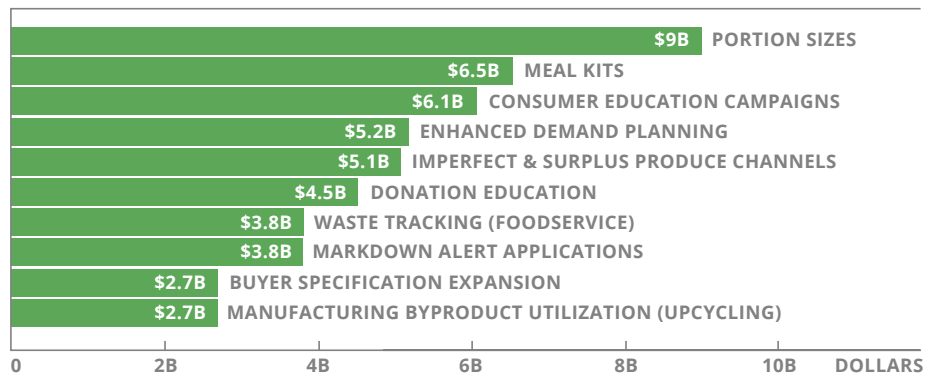


# Solutions

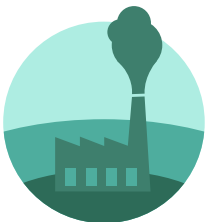
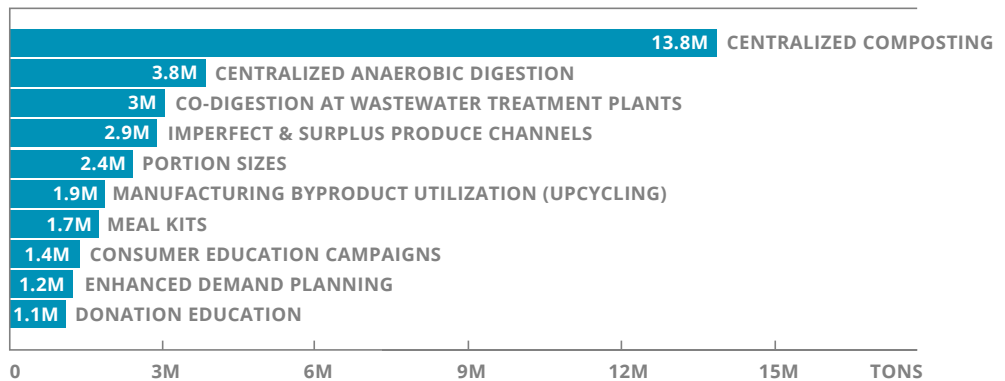
The ReFED Insights Engine features a deep-dive analysis of more than 40 food waste reduction solutions spanning our seven key action areas. Some are simple, some are more complex, some are existing best practices, and some are brand new breakthroughs. Many have a strong potential for investment returns,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



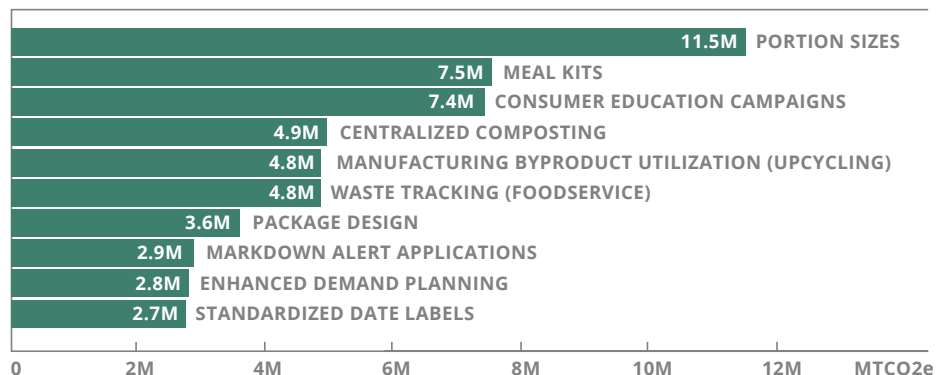
## Top Ten Solutions | NET FINANCIAL BENEFIT



## 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.



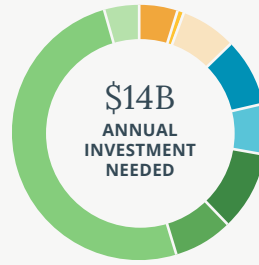
## Foodservice

- **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

Attachment D  
Additional Information

# Identified Upstream Organic Strategies

Revisit Iowa  
good Samaritan  
Law (expand,  
update, reflect  
changes)

Determine  
where food  
is available  
for donation

Create an  
adult food  
waste media  
campaign

Establish criteria  
for determining if  
a non-profit is a  
good partner for  
food donation

Educate/manage  
expiration/best  
buy dates

Guidance to grocery  
stores for managing  
food donations and  
other management  
options

Education to  
change  
perception of  
imperfect food

Identify  
geographic  
food waste hot  
spots in Iowa

Public  
acknowledgement/  
recognition program  
through DNR for  
stores/companies  
doing it well

Increase  
transportation  
and storage  
options for  
donated food

Work with IA Dept of  
Education to create  
food waste and  
economic/environmental  
impact  
curriculum