#3 Organics & Fibers | Subcommittee Meeting #3 Summary – Organics & Fibers September 1, 2021 9AM-12PM

Subcommittee meeting #3 of the Organics & Fibers Subcommittee (#3-Organics & Fibers) was convened virtually via Zoom on September 1, 2021 from 9AM-12PM, CST. Attendance for #3-Organics & Fibers is provided in Table 1.

Table 1. #3 Organics & Fibers Subcommittee Membership and Attendance

Name	Company	Attended 9/1/21
Karen Rodekamp	ISU Dining, Iowa State University	Present
Michelle Hurd	Iowa Grocery Industry Association	Present[(1)]
Beth MacKenzie	University of Iowa	Present
Rich Stephens	Archer Daniels Midland Company	Absent
Jennifer Trent	Iowa Waste Reduction Center	Present
Aubrey Alvarez	Eat Greater Des Moines	Absent
Jennifer Jordan	City of Iowa City Landfill and Recycling Center	Present
Jon Koch	City of Muscatine	Absent
Scott Amendt	GreenRU, LLC & Chamness Technology, Inc.	Present
Kathy Morris	Waste Commission of Scott County	Present
Doyle Smith	City of Cedar Falls	Present
Alan Schumacher	Quincy Recycle Paper/Iowa Recycling Association	Present
Aaron Holt	Sysco Foods	Present
Theresa Stiner	DNR Internal SMM Team	Present
Reid Bermel	DNR Internal SMM Team	Present
Laurie Rasmus	DNR Internal SMM Team	Present
Mike Sullivan	DNR Internal SMM Team	Present
Tom Anderson	DNR Internal SMM Team	Present
Jennifer Wright	DNR Internal SMM Team	Present
Jennifer Reutzel Vaughn	DNR Internal SMM Team	Present
Michelle Leonard	Consultant – SCS Engineers	Present
Christine Collier	Consultant – SCS Engineers	Present
Jeff Phillips	Consultant – SCS Engineers	Present
Karen Luken	Sub-Consultant – EESI[(2)]	Present

[(1)]Present for first 22 minutes.
[(2)] Economic Environmental Solutions International

A. Subcommittee #3 - 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 #2 schedule and Subcommittee responsibilities were also discussed. The slides presented for this Subcommittee meeting are included in Attachment B.

The project consulting team then introduced guest presenter Michelle Hurd with the Iowa Grocery Association. Michelle presented a brief summary of the Iowa Grocery Association and a description of practices implemented by retailers to minimize food wastes. Some of these waste minimization practices include the following:

- Inventory control technologies to ensure products are rotated and used in a timely manner;
- Date code for end of shelf life for store inventory – Items that exceed this shelf life code are used as store samples.
- Damaged or bruised products are repurposed for recipes (i.e., salsa).
- Food scraps generated in their kitchens are collected for composting by a third-party.
- Partner with food pantry's across Iowa. Over 3 million pounds of food is donated each year by Iowa Grocery Association members.
- Retailers have increased their consumer education to help better understand the different between food safety labels (i.e., expiration dates) and food quality labels (i.e., best used by).

Michelle stated that retailers are committed to reducing food waste as managing this waste impacts their bottom line, but they also want to serve their community and meet their environmental responsibilities.

The project consulting team then introduced guest presenter and new subcommittee member Aaron Holt, Executive Chef with Sysco Foods and owner of Doolittle Farm LLC. Aaron provided a brief description of Sysco Foods, Doolittle Farm LLC, and then a summary of programs and organizations tied to the restaurant industry that are working to minimize food waste.

Aaron stated that approximately 25% of what is prepped for meals at restaurants or at homes is thrown away. Within the restaurant industry, there is an initiative to reduce the amount of waste generated within the kitchen and in the operations of a restaurant. These practices include the following:

- Zero waste cooking practices (i.e., capturing meal prep waste for use in other meals or for composting).
- Reuse and recycling of fryer oil.
- Require suppliers to use more reusable packaging and decrease the size of packaging.
- Require suppliers to use reusable pallets.
- Promote reduce, reuse, recycle.
- Eliminate plastic bottles for customers as well as employees.

Aaron stated that the biggest challenge is always moving the collected material from the restaurant (or from several centralized restaurants) to a location for proper management (i.e., compost).

Aaron mentioned that there are organizations that assist restaurants as well as residents with collecting and managing their organics wastes. For instance, Compost Ninja in Iowa City, Iowa offers services to collect organic waste from restaurants and residents for composting. Another example Aaron provided was The Wormery in West Des Moines, Iowa. The Wormery is a volunteer organization that collects

organic waste from local restaurants and operates a vermicomposting operation. The compost and worm castings are offered to program volunteers.

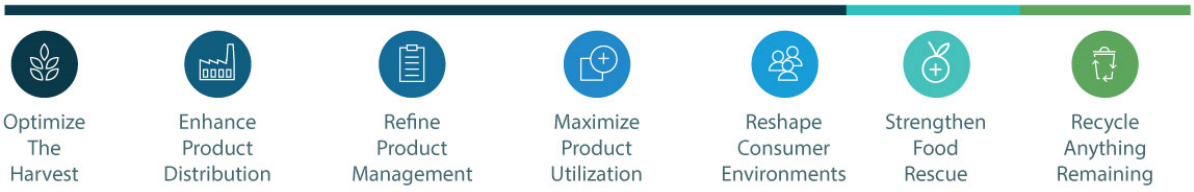
Several subcommittee members had questions concerning zero waste cooking practices and how prevalent these practices are within the restaurant industry. Aaron stated that these practices are taught in culinary schools as a way to minimize the production of waste primarily for the reduction of operational expenses. However, chefs are taking more of an interest in these practices to not only minimize costs, but also to demonstrate to their community their environmentally conscious behaviors.

The project consulting team then led participants through a discussion about what gaps there may be in Iowa as methods of diverting organics from disposal. Identified potential gaps include:

- Composting and aerobic digestion (AD) operation information (i.e., location, feedstock's used, production and expansion capacity, etc.).
- Adequate transportation and processing infrastructure to support increased organics management efforts.
- Regulations to support both environmental health and the ability for businesses to make profits.
- Food label requirements that are clearly understood by consumers. One subcommittee member suggested the possibility of changing labels from "best used by" to "donate by".

The project consulting team then 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.

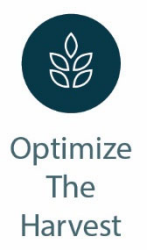
Figure 1 – ReFED Key Action Areas



Each of the seven key action areas was discussed and potential strategies to reduce food waste from the strategic plan was presented and discussed. For some of the key action items, Subcommittee members discussed identified strategies and prioritized their implementation into immediate (0-3 years), medium (4-10 years), or long-term (11+ years). The results of the completed prioritization items are located in Attachment C.

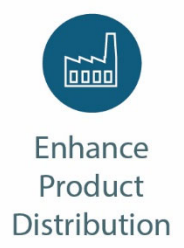
The following is a brief description of the seven key action areas, the identified potential strategies, and a summary of Subcommittee member discussions for each.

- **Key Action Area - Optimize the Harvest (Prevention)**



  - Avoid over-production, then harvest as much as possible.
  - 82% of food that reaches maturity is left behind after harvest. A quarter of the surplus is left behind, because its considered "not marketable"
  - Identified 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:
    - There appears to be a disconnect between different levels from food producers, to donation, to use.
    - Legislative change may be needed to battle the low fees at landfills for managing these materials. The material collected for composting or AD should be a higher value.
    - Work with appropriate state departments to more easily allow food waste to go to animals.
    - Corn and soybeans are the primary crops in Iowa. The waste from these crops are typically collected for alternative uses and have well established markets. Furthermore, it is unlikely that these crops would be well suited for gleaning efforts to capture unharvested food for human consumption.
    - There may be language within the proposed Farm Bill that will have more focus on managing food waste at the agricultural level than in the past. It is possible that proposed language may guide these planning conversations and later actions.
    - Some of what we are talking about here may already be occurring in other avenues (i.e., federal or state agencies, private organizations, etc.). Some of these identified strategies may help guide our path in the future.

- **Key Action Area - Enhance Product Distribution (Prevention)**



  - Maximize freshness and selling time by using technology to create small systems to efficiently move products.
  - Identified 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:
    - There are several food warehouse and transportation companies servicing Iowa retailers. Transportation managers are struggling with a labor shortage as the entire transportation industry is competing for limited drivers with experience and required certifications (i.e., commercial drivers license, etc.).
    - Is there a way to provide information to direct rejected loads from retailers to other users (i.e., food bank)? Perhaps we can communicate with and educate those at higher levels in corporations to encourage them to consider diverting materials to alternative uses rather than disposal.
    - Continue to encourage, promote, and support local food rescue programs.
    - Contact food transportation industry representatives (i.e., Iowa Motor Truck Association, Sysco Foods, PDI, etc.) to see if they would be interested in participating in this project.

- **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.
  - Identified 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 fulfilment.
    - 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:
  - We should ask the Iowa Grocery Association about consumer trends. Do customers buy a day or two or weeks-worth of groceries? Is there any statistical data that correlates demographics with purchasing practices?
  - A large grocer in Iowa recently gave a presentation that they were looking to change the model of their stores to sell more prepared foods. This may change what is being transported (i.e., less canned goods and more prepared foods which may reduce shelf life and/or require refrigeration in warehouse and transportation).

- **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.
- Identified Strategies:
  - Promote manufacturing byproduct utilization (upcycling).
  - Support active and intelligent packaging research.
  - Identify opportunities to reduce food waste form manufacturing and processing operations.
- Subcommittee Member Discussion:
  - No discussion.

- **Key Action Area - Reshape Consumer Environments (Prevention)**

- Households are the greatest source of food waste in the US, making this a critical area for action.
- 37% of all surplus food is generated by consumers.
- Identified Strategies:
  - Create smaller size options for menu items to reduce over portioning and plate waste.

- Sell pre-measured ingredients to cook specific meals.
- Conduct advocacy campaigns to raise awareness and educate consumers about ways to prevent food waste.
- Standardize food label dates to two phases (quality and safety).
- Optimize food packaging size and design to ensure complete consumption by consumer by reducing spoilage.
- Develop education campaigns focused to reduce plate waste on buffets.
- Change K-12 lunch programs.

- Subcommittee Member Discussion:
  - The Department of Natural Resources (DNR), Iowa waste Exchange (IWE), and the Iowa Waste Reduction Center (IWRC) have worked with the Iowa Department of Education to implement food waste reduction initiatives. Switching order or lunch to recess was discussed but rejected primarily because it didn't change the amount of time students had to eat.
  - The IWRC works with IWE to perform waste sorts for schools that are interested in determining the types and volumes of food waste.
  - K-12 lunch programs is low hanging fruit and has mostly already been taken care of or has good momentum. The focus should be more on generators rather than schools.
  - Most of the people that have a lot of left over food from a restaurant take their food home. However, the question becomes based on those people, how many of them then eat this food or later just throw it out.
  - Changing the size and shape of plates in a food service setting can directly impact the amount of food waste generated. Using bowl shape plates rather than traditional plates decreased the food wastage by nearly 50%. May want to share the results of this study with other institutional cafeterias.
  - The DNR has given grants for removing trays from dinning halls and installing water bottle filling stations.
  - We as a state haven't done a great job in collecting data and making it accessible.
  - The challenge with education and advocacy campaigns becomes how to craft these messages so that they aren't "insulting" or "patronizing".
  - Our messaging has to be careful. If we say don't waste food. It comes off as the University is trying to cut costs. If the message comes from the students, it helps with the results.
  - When you couple food waste with compost – food waste can sometimes increase because the consumer feels that it is ok to "waste" the food because it

is being managed in a more preferred method than disposal. In these cases, perhaps the message should be more focused on the environmental impacts.

- Buffets have a variety of reasons that they do not want smaller plates. From an environmental perspective, customers use more small plates and this increases the amount of water and energy they use to clean plates.
- A survey performed by the IWE of educational institution facilities indicated that they were interested in getting support (i.e., financial and technical) for managing their food waste.
- For the pre-packaged meal commercial programs, are they producing food waste during the manufacturing of these meals and what are they doing with their food scraps?
- What are other states doing for education? California is very progressive.

- **<u>Key Action Area - Strength in Food Rescue (Rescue)</u>**

  - Just 3% of surplus food ends up being donated, with the greatest portion coming from grocery retail.
  - Distribution and logistic challenges contribute to these low percentages of food being donated.
  - <u>Identified Strategies:</u>
    - Donation education.
    - Donation transportation.
    - Donation storage and handling capacity.
    - Donation coordination and matching.
    - Donation value added processing.
    - Edible food recovery legislation.
  - Subcommittee Member Discussion:
    - Getting edible leftover food transported to those that need it is really important. We want to ensure those efforts are supported.
    - Need to investigate if there are other resources available that can help provide financial or technical support for those interested in distributing donated food.
    - Even if resources are available for funding and technical support – it still takes staff time to do the work. However, most programs don't fund staff.
    - While SMM policies in Iowa aren't officially established, we recognize that the way we are managing our waste today isn't the best way.
    - Discussion concerning that SMM may cause organizations to increase their costs and therefore may be against SMM.

- While we aren't against SMM in Iowa, we recognize that the current funding structure isn't sustainable. Increasing fees on landfills isn't an answer either as this may drive waste out of state to other cheaper facilities. Waste leaving Iowa reduces revenue receive and therefore the services and programs supported by these revenues would need to adjust.
- We need to keep in mind that the SMM project is looking at the materials and how we manage them. This will help drive the broader discussion regarding legislation and funding.
- There was a stakeholder group in Iowa that had previously developed several white papers on organic waste management strategies.

- **<u>Key Action Area - Recycle Anything Else (Recycling)</u>**

  - This Key Action Area was not discussed due to the meeting time expiring.
  - Identified Strategies:
    - Create an inventory of composting and AD facilities.
    - Feed food scraps to livestock.
    - Target communities with no landfill gas systems.
    - Create organic waste sheds.
    - Establish compost standards.
    - Facilitate innovative processing technologies.
    - Define compostable versus biodegradable.
    - Food scraps disposal ban.
    - Organic waste disposal ban.
    - Provide organic waste collection to all residents and businesses.
    - State to produce recycled organic waste products (i.e., compost, renewable gas, etc.).
    - Increase compost and AD infrastructure.
  - Subcommittee Member Discussion:
    - No discussion due to the meeting time expiring.

B. Research Request List

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

- Consider inviting the following to participate in future Subcommittee Meetings:
  - Composting Ninja in Iowa City
  - Severs Family Farm
  - ISU Extension Office representative – Composting and agriculture perspective
  - Iowa Department of Agriculture and Land Stewardship (IDALS)
  - Farm Bureau
  - Table to Table and/or Feeding America
  - Food Warehousing and/or Food Transportation Representatives:
    - Iowa Trucking Council (Freight Advisory Council)
    - Iowa Motor Truck Association
    - PDI
    - Sysco
  - Kitchen Practices and Education Program Representatives:
    - Zero Cooking representative or a restaurant that has embraced this approach.
    - Culinary curriculum developers and schools
- Request Farm Bill language to determine what policies may influence SMM practices in Iowa.
- Collect Iowa Organic Waste Management White Papers.

C. Other Notes

Other items of note from the #3-Organics & Fibers meeting are as follows:

- Second Stakeholder Meeting will be held on September 30, 2021. Subcommittee members in addition to other interested parties are invited and encouraged to attend.

Attachments:

Attachment A: Agenda

Attachment B: PowerPoint Presentation

Attachment C: Additional Information

Attachment A
Agenda

Subcommittee Meeting #3 – Organics and Fibers

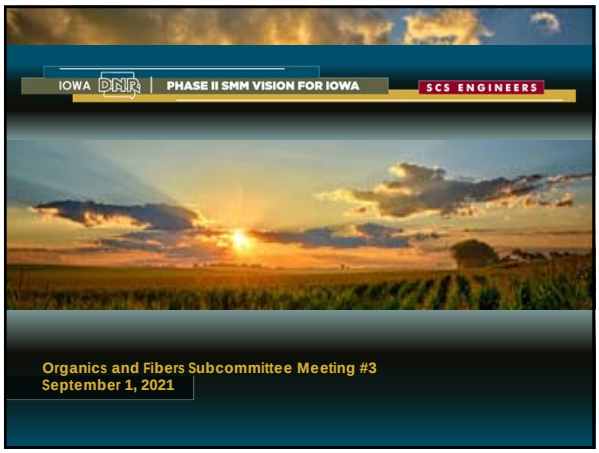
September 1, 2021

9:00AM – 12:00PM (CST)

Virtual Meeting

1. Recap SMM Goal, Process, and Schedule
2. Guest Speaker
3. Fundamental Questions
4. Potential SMM Strategies
5. Break
6. Prioritize Strategies
7. Next Steps
    a. Stakeholder Meeting#2 (September 30, 2021)
    b. Future meetings dates and logistics

Attachment B
PowerPoint Presentation



Agenda

- **Recap SMM Goal, Process, and Schedule**
- **Guest Speaker**
- **Fundamental Questions**
- **Potential SMM Strategies**
- **Break**
- **Prioritize Strategies**
- **Next Steps**
  - Stakeholder Meeting#2 (September 30, 2021)
  - Future meetings dates and logistics

Goal

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

Process

Select specific material types within each category → Define and prioritize specific strategies
- Legislation
- Policies
- Programs
- Infrastructure

→ Identify implementation timeline, responsible party, funding measures, and performance metrics

Material Types Selected

Organics & Fibers	Plastics	Renewable Energy Equipment	Construction & Demolition
Edible Food	Single-Use PET Water Bottles	Wind Turbines	Interior Building Components
Pre-Consumer Spoiled Food	Plastic Film/Bags	Solar Panels	Roofing Materials
Compostable/AD Paper, Food and Yard Waste	Polystyrene (Styrofoam)	Storage Batteries	Drywall, Plaster and Gypsum Board
			Treated and Untreated Wood

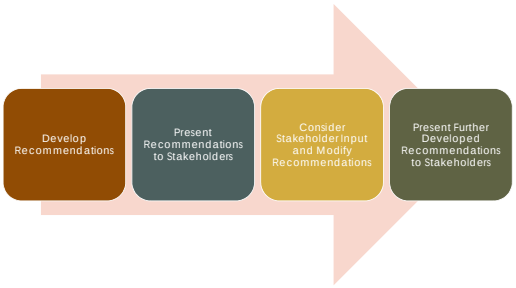
Subcommittee Role

Finalized Material-Specific Groups	Continue as Active Working Groups	Size and Composition May Change • Combination of Invitation and Application • Composition is Fluid
Representation of Various Interests Reflecting Material Life Cycle	Make Recommendations to the Stakeholders	Vital to Project Progress and Success

Stakeholder Group Role

- Provide various perspectives on how SMM will be adopted and implemented in Iowa
- Provide on-going guidance to subcommittees
- Will consider and endorse subcommittee recommendations

Subcommittee Recommendation Process



Phases of SMM Process

- Phase I: What is it and should we do it?
- Phase II: Prioritization and timing of what we should do and how we should accomplish it
- Phase III: Ongoing Implementation

Today's Focus

- Discuss strategies
- Prioritize strategies
  - short, medium, and long-term
- Identify additional data needs

Where Do We Go Next

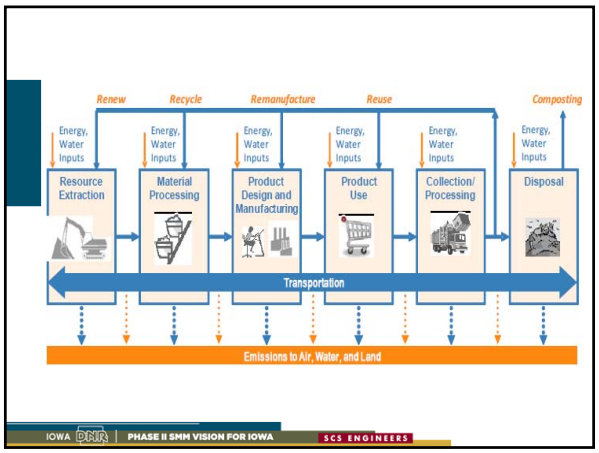
- Present strategies and rankings to the Stakeholder Group on September 30th
- Receive input from Stakeholder Group
- Reconvene to
  - Reevaluate strategy ranking
  - Identify implementation timelines, responsible party, funding measures, and performance metrics for short-term strategies
  - Will require additional meetings
- Present implementation requirements to Stakeholder Group

Stakeholder Meeting #2: Sept 30th

- Subcommittees Present Recommendations
- Led by Appointed Representative
- Assistance from Facilitators
- Breakout rooms for Further Discussion

Agenda

9:00 – 9:15	Welcome and Introductions
9:15 – 11:30	Subcommittee Updates
11:30 – 11:45	Initial Group Comments/Breakout Selection
11:45 – 12:30	Lunch Break
12:30 – 1:15	Breakout #1
1:15 – 1:20	Switch Break
1:20 – 2:05	Breakout #2
2:05 – 2:30	Wrap Up and Next Steps



Presentations

Fundamental Questions

Fundamental Questions

- What are the environmental impacts of disposing edible food, pre-consumer food scraps and compostable/AD paper, food and yard waste
- What are the Iowa prevention and landfill diversion gaps:
  - Education
  - Data
  - Regulations
  - Policies
  - Infrastructure
  - Funding

ReFED *Road Map to 2030*

Who Is ReFED?

Anna Vinogradova Sustainability Director, Walmart	Ben Gray Chief Operating Officer, Upcycled Food Association	Brian Roe Professor, Ohio State University
Cassie Bartholomew Program Manager, StopWaste	Christy Cook VP Customer Success, Leanpath	Claire Cummings Waste Programs Manager, Bon Appetit Management Company
Darby Hoover Senior Resource Specialist, Natural Resources Defense Council	Denise Osterheus Senior Director of Corporate Affairs, The Kroger Co.	Diane Curelli Manager, Environmental Risk & Sustainability, General Mills
Greg Baker Professor and Executive Director, Santa Clara University and The Center for Food Innovation and Entrepreneurship	Hannah Friedman Investment Associate, Closed Loop Partners	Hannah Koski Head of Sustainability and Social Impact, Blue Apron
Jean Buzby USDA Food Loss and Waste Liaison, USDA	Jeff Clark Expert Exchange Director, National Restaurant Association	Jeff Yorzyk Director of Sustainability, HelloFresh US
Kai Robertson Lead Advisor, FLW Protocol, World Resources Institute	Karen Hanner Director, Food Sourcing and Strategic Partnerships, The Global FoodBanking Network	Kari Armbruster Zero Hunger | Zero Waste Project Manager, The Kroger Co.

Who Is ReFED?

Kathleen Cacciola Vice President, Enterprise Sustainability, Aramark	Laura Moreno Senior Environmental Scientist, CalRecycle	Leigh Prezkop Program Specialist, World Wildlife Fund
Lisa Johnson Independent Consultant and Adjunct Assistant Professor, LKJ Consulting and North Carolina State University	Liz Baldridge Interim Managing Director, Manufacturing Food Industry Partnerships, Feeding America	Lorenzo Macaluso Director, Green Business Services, Center for EcoTechnology
Marjorie DePuy Senior Director, Supply Chain and Sustainability, FMI - the Food Industry Association	Martine Boswell Environmental Scientist, CalRecycle	Megan Cornish VP External Affairs, FoodMaven
Meghan Stasz Vice President, Packaging & Sustainability, Consumer Brands Association	Monica McBride Director, Agriculture and Environmental Metrics, World Wildlife Fund	Ned Spang Assistant Professor, UC Davis
Nell Fry Senior Manager, Sodexo	Nora Goldstein Editor, Biocycle	Ricky Ashenfelter CEO & Co-Founder, Spoiler Alert
Roni Neff Associate Professor, Johns Hopkins Bloomberg School of Public Health Center for a Livable Future	Stacia Betley Manager of Sustainability Integration, Amy's Kitchen	Steve Dietz Vice-President of Development, Food Donation Connection
Steve Finn	Steve Linkhart	Sunny Reelhorn Parr

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Optimize the Harvest

Optimize The Harvest

- Avoid over-production, then harvest as much as possible. For wild-caught products, source only what is needed.
- 82% reached maturity but was left behind after harvest
  - A quarter of the surplus is left behind, because it's considered "not marketable"

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Potential Strategies

Optimize The Harvest

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

Optimize The Harvest

Collecting leftover product from fields after the initial commercial harvest

Implement processes only reject partial loads of produce

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Optimize the Harvest

Optimize The Harvest

KEY INDICATORS (ANNUAL)	
3.7M FOOD WASTE TONS DIVERTED	466K MT CO2E REDUCTION
$8B NET FINANCIAL BENEFIT	111.8B GALLONS WATER SAVED
$699.1M INVESTMENT NEEDED	0 MEALS SAVED

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Discussion

Optimize The Harvest

- What can be done in Iowa to optimize the harvest?
- What agencies, organizations and/or individuals be included in this process to optimize the harvest in Iowa?
- What role can DNR play?
- Are there other strategies?

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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

Potential Strategies

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

Decreased Transit Time

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

Potential Strategies

Use technology temperature monitoring (pallet transport)

Reduce warehouse handling

Enhance Product Distribution

KEY INDICATORS (ANNUAL)	
3.3M FOOD WASTE TONS DIVERTED	7.1M MT CO2E REDUCTION
$2.2B INVESTMENT NEEDED	528.1B GALLONS WATER SAVED
$8.4B NET FINANCIAL BENEFIT	0 MEALS SAVED

Discussion

What can be done in Iowa to Enhance Product Distribution?

What agencies, organizations and/or individuals be included in this process to Enhance Product Distribution in Iowa?

What role can DNR play?

Are there other strategies?

Refine Product Management

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

Potential Strategies

Refine Product Management

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

Potential Strategies

Refine Product Management

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

Potential Strategies

Refine Product Management

Minimize on-hand inventory

Decreased minimum order quantity

Potential Strategies

Refine Product Management

Increased delivery frequency

Assisted distressed sales

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

Refine Product Management

Refine Product Management

KEY INDICATORS (ANNUAL)	
4.6M FOOD WASTE TONS DIVERTED	14.2M MT CO2E REDUCTION
$3.9B INVESTMENT NEEDED	528.1B GALLONS WATER SAVED
$15.8B NET FINANCIAL BENEFIT	0 MEALS SAVED

Discussion

Refine Product Management

- What can be done in Iowa to Refine Product Management?
- What agencies, organizations and/or individuals be included in this process to Refine Product Management in Iowa?
- What role can DNR play?
- Are there other strategies?

BREAK (10 Minutes)

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

Potential Strategies

Promote Manufacturing Byproduct Utilization (upcycling)

Support Active & Intelligent Packaging Research

Identify opportunities to reduce food waste from manufacturing and processing operations

Maximize Product Utilization

KEY INDICATORS (ANNUAL)	
3.3M FOOD WASTE TONS DIVERTED	9.8M MT CO2E REDUCTION
$2.4B INVESTMENT NEEDED	869.7B GALLONS WATER SAVED
$4.8B NET FINANCIAL BENEFIT	0 MEALS SAVED

Discussion

- What can be done in Iowa to Maximize Product Utilization?
- What agencies, organizations and/or individuals be included in this process to Maximize Product Utilization in Iowa?
- What role can DNR play?
- Are there other strategies?

Reshape Consumer Environments

Households are the greatest source of food waste in the US, making this a critical area for action

37% of all surplus food is generated by consumers

Potential Strategies

Create smaller size options for menu items to reduce over-portioning and plate waste

Sell pre-measured ingredients to cook specific meals directly to consumers to minimize waste of raw ingredients

Potential Strategies

Conduct large-scale advocacy campaigns to raise awareness and educate consumers about ways to prevent food waste in their homes

Standardize food label dates to two phrases, one to indicate quality and another to indicate safety risks

Potential Strategies

Optimize food packaging size and design to ensure complete consumption by consumers and avoid residual container waste

Develop education campaigns focused to reduce plate waste on buffets

Potential Strategies

Change K-12 lunch programs

Reshape Consumer Environments

KEY INDICATORS (ANNUAL)	
7M FOOD WASTE TONS DIVERTED	34M MT CO2E REDUCTION
$1.4B INVESTMENT NEEDED	1.6T GALLONS WATER SAVED
$27.4B NET FINANCIAL BENEFIT	0 MEALS SAVED

Discussion

- What can be done in Iowa to Reshape Consumer Environments?
- What agencies, organizations and/or individuals be included in this process to Reshape Consumer Environments in Iowa?
- What role can DNR play?
- Are there other strategies?

Strengthen Food Rescue

Just 3% of surplus food ends up being donated, with the greatest portion coming from grocery retail

Distribution and logistics challenges contribute to this

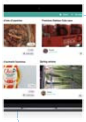
Potential Strategies

Donation Education

Donation Transportation

Potential Strategies

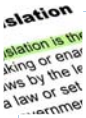
Donation Storage Handling & Capacity



Donation Coordination & Matching

Potential Strategies

Donation Value-Added Processing



Edible Food Recovery Legislation

Strengthen Food Rescue

KEY INDICATORS (ANNUAL)	
2.3M FOOD WASTE TONS DIVERTED	2.7M MT CO2E REDUCTION
$1.4B INVESTMENT NEEDED	298.7B GALLONS WATER SAVED
$8.8B NET FINANCIAL BENEFIT	3.9B MEALS SAVED

Discussion

- What can be done in Iowa to Strengthen Food Rescue?
- What agencies, organizations and/or individuals be included in this process to Strengthen Food Rescue in Iowa?
- What role can DNR play?
- Are there other strategies?

Recycle Anything Remaining

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

Potential Strategies


Create an inventory of composting and AD facilities


Feed food scraps to livestock


Target communities with no LFG systems

Potential Strategies


Create organic waste sheds


Establish compost standards


Facilitate innovative processing technologies

Define compostable versus biodegradable

Potential Strategies


Food scraps disposal ban


Organic waste disposal ban


Provide organic waste collection to all residents and businesses

Potential Strategies


State to procure recycled organic waste products (i.e., compost, renewable gas, etc.)


Increase compost and AD infrastructure

Recycle Anything Remaining

KEY INDICATORS (ANNUAL)	
20.9M FOOD WASTE TONS DIVERTED	6.8M MT CO2E REDUCTION
$2.2B INVESTMENT NEEDED	0 GALLONS WATER SAVED
0 NET FINANCIAL BENEFIT	0 MEALS SAVED

Discussion

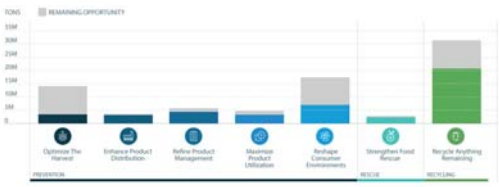
Recycle Anything Remaining

- What can be done in Iowa to Recycle Anything Else?
- What agencies, organizations and/or individuals be included in this process to Recycle Anything Else?
- What role can DNR play?
- Are there other strategies?

BREAK (10 Minutes)

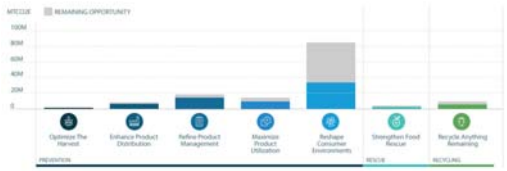
Summary

Tons Diverted from the Landfill



Summary

MtCO2E Reduced



Where Do We Go Next

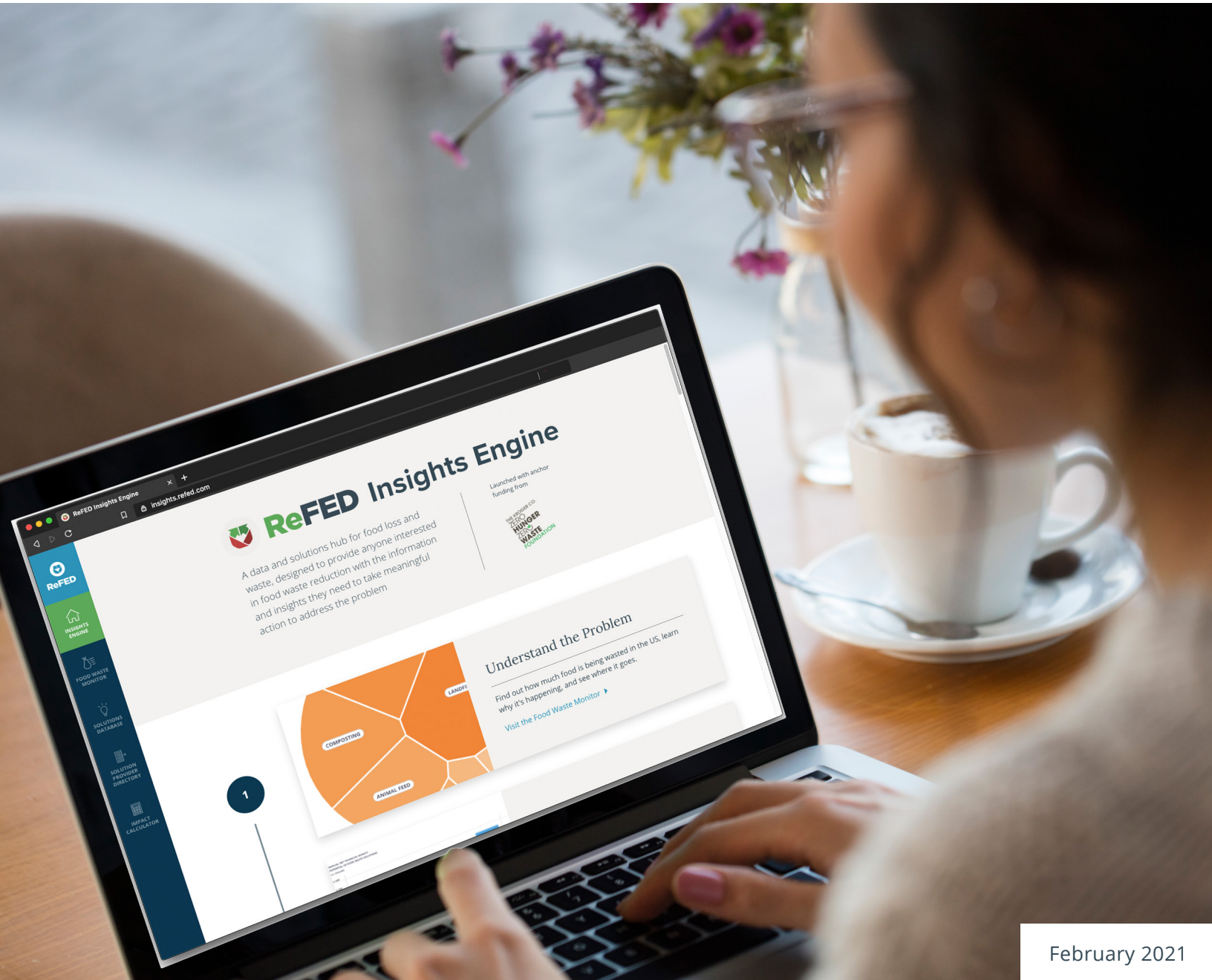
- Present strategies and rankings to the Stakeholder Group on September 30th
- Receive input from Stakeholder Group
- Reconvene to
  - Reevaluate strategy ranking
  - Identify implementation timelines, responsible party, funding measures, and performance metrics
- Present implementation requirements to Stakeholder Group

Attachment C
Additional Information

ReFED

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

At-A-Glance



February 2021

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nielsen

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ATTICUS TRUST

THE CLANEIL FOUNDATION

CROWN FAMILY PHILANTHROPIES

THE FINK FAMILY FOUNDATION

GENERAL MILLS

HARBOURTON FOUNDATION

THE HINDAWI FOUNDATION

KENNETH GOLDMAN DONOR FUND

PETER WELLES

POSNER FOUNDATION OF PITTSBURGH

SPRING POINT PARTNERS

WALMART FOUNDATION

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ANONYMOUS DONOR

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.

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.

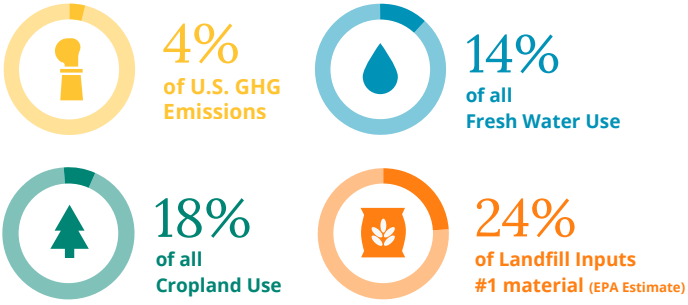
In 2019, the U.S. let a huge 35% of the 229 million tons of food available go unsold or uneaten. We call this "surplus food," and while a very small portion of it is donated to those in need and more is recycled, the vast majority becomes "food waste," going straight to landfill, incineration, or down 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:

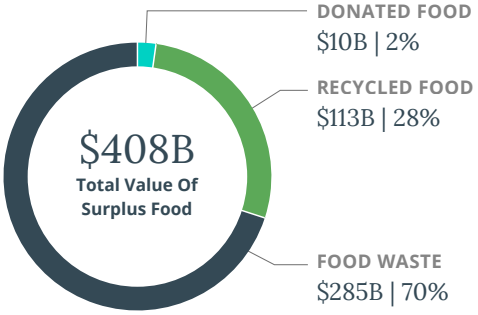


◃ Food Security

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.

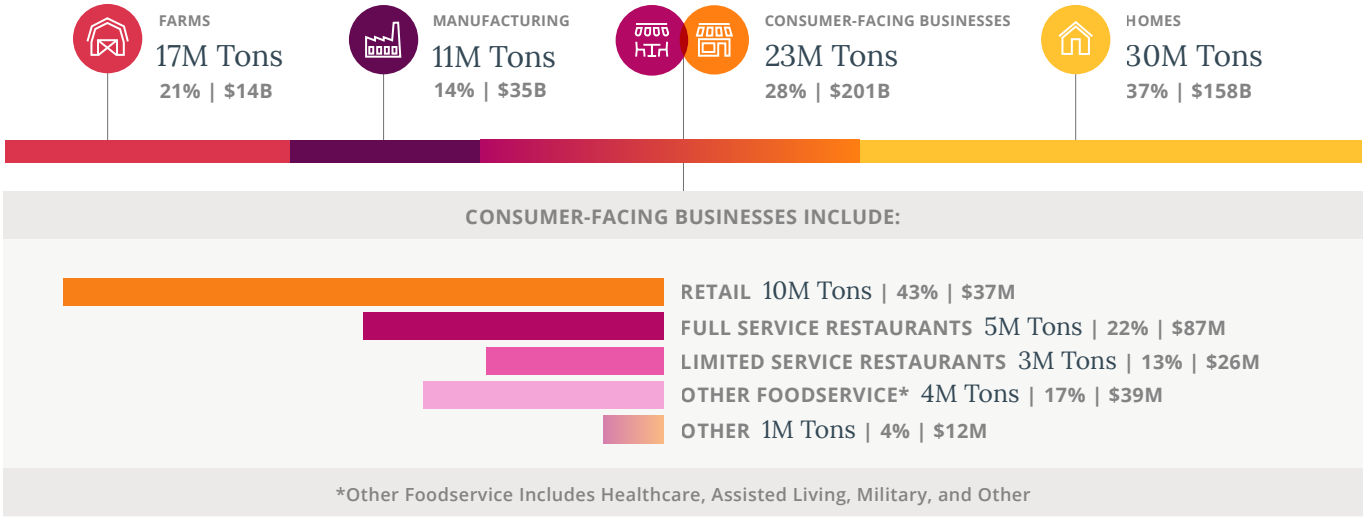
Economic ▹

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.



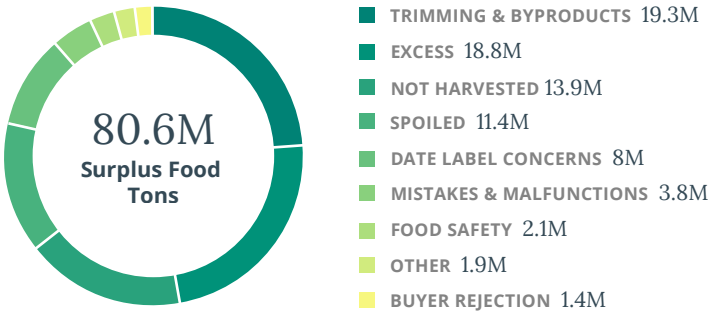
Where Does Food Waste Occur?

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.

WHAT'S NEEDED

40+
SOLUTIONS

$14B
INVESTMENT ANNUALLY

POLICY CHANGES

INNOVATION

ENGAGEMENT

WASTE REDUCTION

45M
ANNUAL FOOD WASTE DIVERSION (TONS)

IMPACT PER YEAR

- **$73B** NET FINANCIAL BENEFIT
- **4T** GALLONS IN WATER SAVINGS
- **75M** TONS GHG EMISSION REDUCTION POTENTIAL (MT CO2e)
- **4B** MEALS FOR PEOPLE IN NEED
- **51K** JOBS CREATED THROUGH SOLUTION IMPLEMENTATION OVER 10 YEARS

Powered by the Insights Engine

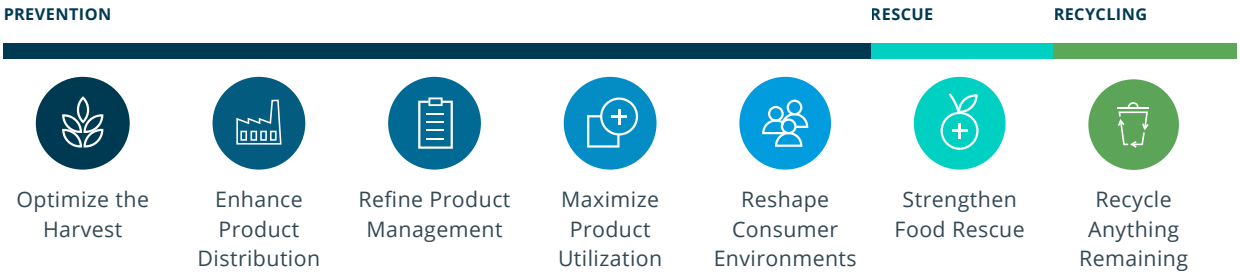
Powering the *Roadmap to 2030*, ReFED's new Insights Engine is an online resource providing data and solutions to help you bring a food waste reduction initiative to life – including a granular analysis of food waste by sector, state, food type, cause, and impact; a comprehensive review of 40+ food waste 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

Roadmap to 2030: Reducing U.S. Food Waste by 50%

Key Action Areas

These are the seven areas where the food system must focus its efforts over the next ten years to prevent, rescue, and recycle food at risk of going to waste.



Solutions

Within each action area are a range of solutions, including those that we've modeled using key data points, promising solutions that we're still gathering data on, and best practices that many organizations have already worked into their operations.

Levers

Key levers include important supporting efforts that enable or accelerate the adoption of solutions, including *financing, policy, innovation,* and *engagement.*

Stakeholder Recommendations

Each stakeholder has a unique role to play to advance solutions adoption and food waste reduction across the key action areas. These recommendations outline specific calls to action for each sector of the food system, as well as funders and policymakers.

Producers | Manufacturers | Retailers | Foodservice | Policymakers | Capital Providers

Get a high-level overview of the *Roadmap to 2030* on the following pages, then visit refed.com/2030Roadmap to dig into the details. Explore ReFED's Insights Engine for food waste reduction solutions, data, and insights that you can implement now.

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
MTCO2e REDUCTION	GALLONS WATER SAVED	MEALS SAVED

Dive into this Key Action Area

PUBLIC	
Government Project Finance	$0
Government Tax Incentives	$0
Government Grants	$32.2M
PHILANTHROPIC	
Non-Government Grants	$52.1M
Impact-First Investments	$98.6M
PRIVATE	
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	Fact Sheet
Buyer Specification Expansion	$2.7B Net Financial Benefit	667.6K Food Waste Tons Diverted	Fact Sheet
Gleaning	$152M Net Financial Benefit	78.5K Food Waste Tons Diverted	Fact Sheet
Partial Order Acceptance	$78.8M Net Financial Benefit	38.6K Food Waste Tons Diverted	Fact Sheet

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
MTCO2e REDUCTION	GALLONS WATER SAVED	MEALS SAVED

Dive into this Key Action Area

PUBLIC	
Government Project Finance	$0
Government Tax Incentives	$0
Government Grants	$31.0M
PHILANTHROPIC	
Non-Government Grants	$56.6M
Impact-First Investments	$117.7M
PRIVATE	
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	Fact Sheet
Decreased Transit Time	$2.5B Net Financial Benefit	1.0M Food Waste Tons Diverted	Fact Sheet
First Expired First Out	$1.6B Net Financial Benefit	617.5K Food Waste Tons Diverted	Fact Sheet
Temperature Monitoring (Pallet Transport)	$1.5B Net Financial Benefit	550.6K Food Waste Tons Diverted	Fact Sheet
Reduced Warehouse Handling	$63.4M Net Financial Benefit	22.3K Food Waste Tons Diverted	Fact Sheet

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.

Dive into this Key Action Area

KEY INDICATORS (ANNUAL)

4.6M	$15.8B	$3.9B
FOOD WASTE TONS DIVERTED	NET FINANCIAL BENEFIT	INVESTMENT NEEDED
14.2M	852.7B	0
MTCO2e REDUCTION	GALLONS WATER SAVED	MEALS SAVED

PUBLIC
- Government Project Finance $0
- Government Tax Incentives $0
- Government Grants $39.4M

PHILANTHROPIC
- Non-Government Grants $202.2M
- Impact-First Investments $262.0M

PRIVATE
- 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	Fact Sheet
Waste Tracking (Foodservice)	$3.8B Net Financial Benefit | 1.0M Food Waste Tons Diverted	Fact Sheet
Markdown Alert Applications	$3.8B Net Financial Benefit | 771.1K Food Waste Tons Diverted	Fact Sheet
Dynamic Pricing	$1.1B Net Financial Benefit | 461.8K Food Waste Tons Diverted	Fact Sheet
Assisted Distressed Sales	$339.4M Net Financial Benefit | 590.5K Food Waste Tons Diverted	Fact Sheet
Minimized On Hand Inventory	$620.9M Net Financial Benefit | 195.2K Food Waste Tons Diverted	Fact Sheet
Decreased Minimum Order Quantity	$568.7M Net Financial Benefit | 189.2K Food Waste Tons Diverted	Fact Sheet
Increased Delivery Frequency	$374.0M Net Financial Benefit | 138.6K Food Waste Tons Diverted	Fact Sheet
Temperature Monitoring (Foodservice)	$15.5M Net Financial Benefit | 4.2K Food Waste Tons Diverted	Fact Sheet

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.

Dive into this Key Action Area

KEY INDICATORS (ANNUAL)

3.3M	$4.8B	$2.4B
FOOD WASTE TONS DIVERTED	NET FINANCIAL BENEFIT	INVESTMENT NEEDED
9.8M	869.7B	0
MTCO2e REDUCTION	GALLONS WATER SAVED	MEALS SAVED

PUBLIC
- Government Project Finance $0
- Government Tax Incentives $0
- Government Grants $96.1M

PHILANTHROPIC
- Non-Government Grants $96.1M
- Impact-First Investments $96.1M

PRIVATE
- 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	Fact Sheet
Manufacturing Line Optimization	$328.2M Net Financial Benefit | 967.1K Food Waste Tons Diverted	Fact Sheet
Active & Intelligent Packaging	$1.7B Net Financial Benefit | 451.8K Food Waste Tons Diverted	Fact Sheet

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.

Dive into this Key Action Area

KEY INDICATORS (ANNUAL)

7M FOOD WASTE TONS DIVERTED	$27.4B NET FINANCIAL BENEFIT	$1.4B INVESTMENT NEEDED
34M MTCO2e REDUCTION	1.6T GALLONS WATER SAVED	0 MEALS SAVED

PUBLIC
- Government Project Finance $0
- Government Tax Incentives $0
- Government Grants $104.0M

PHILANTHROPIC
- Non-Government Grants $54.9M
- Impact-First Investments $29.0M

PRIVATE
- 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	Fact Sheet
Meal Kits	$6.5B Net Financial Benefit | 1.7M Food Waste Tons Diverted	Fact Sheet
Consumer Education Campaigns	$6.1B Net Financial Benefit | 1.4M Food Waste Tons Diverted	Fact Sheet
Package Design	$2.4B Net Financial Benefit | 649.5K Food Waste Tons Diverted	Fact Sheet
Standardized Date Labels	$2.4B Net Financial Benefit | 582.4M Food Waste Tons Diverted	Fact Sheet
Trayless	$366.1M Net Financial Benefit | 104.2K Food Waste Tons Diverted	Fact Sheet
Small Plates	$355.9M Net Financial Benefit | 95.6K Food Waste Tons Diverted	Fact Sheet
Buffet Signage	$194.6M Net Financial Benefit | 52.3K Food Waste Tons Diverted	Fact Sheet
K-12 Education Campaigns	$25.5M Net Financial Benefit | 14.8K Food Waste Tons Diverted	Fact Sheet
K-12 Lunch Improvements	$13.2M Net Financial Benefit | 7.1K Food Waste Tons Diverted	Fact Sheet

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.

Dive into this Key Action Area

KEY INDICATORS (ANNUAL)

2.3M FOOD WASTE TONS DIVERTED	$8.8B NET FINANCIAL BENEFIT	$1.4B INVESTMENT NEEDED
2.7M MTCO2e REDUCTION	298.7B GALLONS WATER SAVED	3.9B MEALS SAVED

PUBLIC
- Government Project Finance $0
- Government Tax Incentives $97.2M
- Government Grants $228.5M

PHILANTHROPIC
- Non-Government Grants $697.2M
- Impact-First Investments $206.0M

PRIVATE
- 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	Fact Sheet
Donation Transportation	$2.5B Net Financial Benefit | 642.7K Food Waste Tons Diverted	Fact Sheet
Donation Storage Handling & Capacity	$826.6M Net Financial Benefit | 265.4K Food Waste Tons Diverted	Fact Sheet
Donation Value-Added Processing	$429.6M Net Financial Benefit | 190.8K Food waste Tons Diverted	Fact Sheet
Donation Coordination & Matching	$594.9M Net Financial Benefit | 143.7K Food waste Tons Diverted	Fact Sheet

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.

KEY INDICATORS (ANNUAL)

20.9M FOOD WASTE TONS DIVERTED	$293.7M NET FINANCIAL BENEFIT	$2.2B INVESTMENT NEEDED
6.8M MTCO2e REDUCTION	0 GALLONS WATER SAVED	0 MEALS SAVED

Dive into this Key Action Area

PUBLIC

Government Project Finance	$714.2M
Government Tax Incentives	$0
Government Grants	$493.2M

PHILANTHROPIC

Non-Government Grants	$58.2M
Impact-First Investments	$99.8M

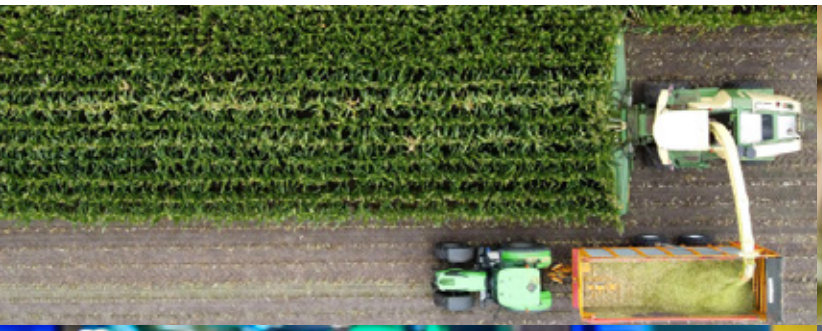
PRIVATE

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	Fact Sheet
Centralized Anaerobic Digestion	$171.4M Net Financial Benefit	3.8M Food Waste Tons Diverted	Fact Sheet
Co-digestion At Wastewater Treatment Plants	$71.0M Net Financial Benefit	3.0M Food Waste Tons Diverted	Fact Sheet
Home Composting	$4.9M Net Financial Benefit	93.6K Food Waste Tons Diverted	Fact Sheet
Livestock Feed	$-1.5M Net Financial Benefit	60.4K Food Waste Tons Diverted	Fact Sheet
Community Composting	$-1.5M Net Financial Benefit	57K Food Waste Tons Diverted	Fact Sheet

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

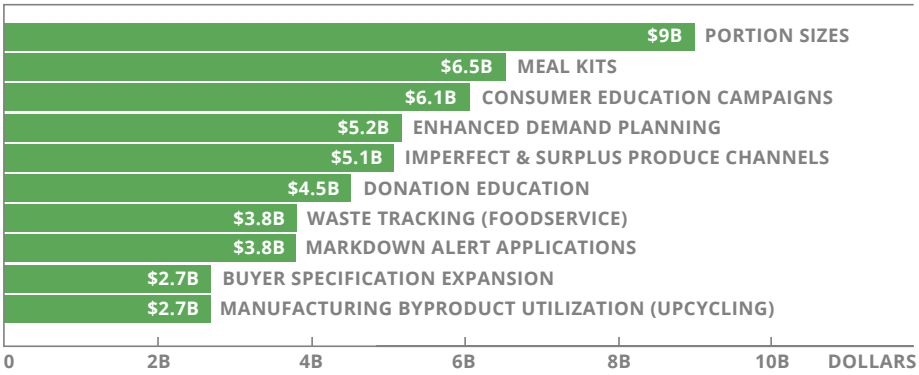




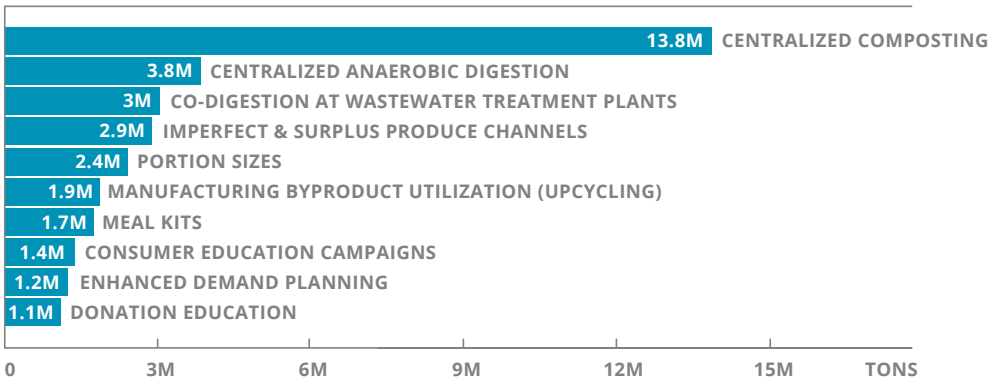

Solutions

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.

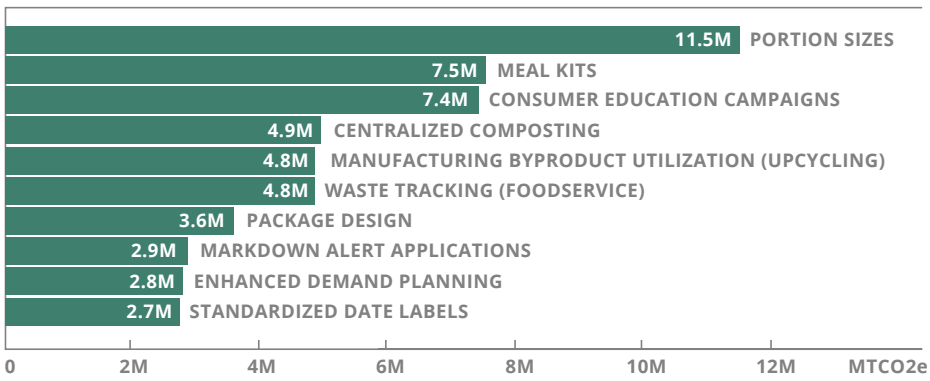
Top Ten Solutions | NET FINANCIAL BENEFIT



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

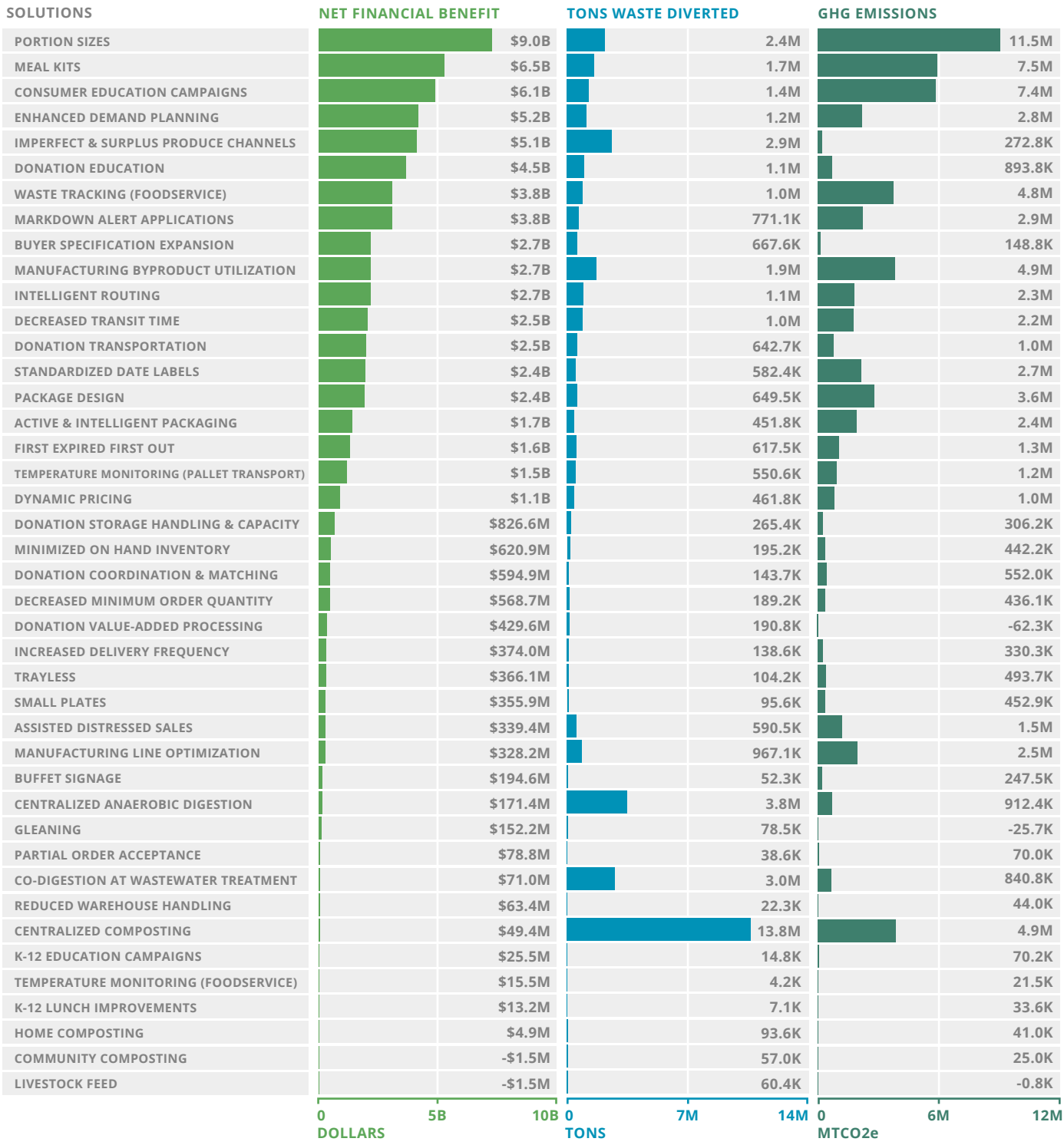
Food waste is often considered to be a singular problem, but it's an entirely different situation when hundreds of tons of broccoli go unharvested on a farm compared to a half-full platter of uneaten potatoes scraped into the trash at home. And that can make the challenge of reducing food waste by 50% 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



Launch Insights Engine

Optimize The Harvest

Immediate (0-3 years)

Medium (4-10 years)

Long-Term (11+ years)

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

Adjust purchasing specifications to allow for imperfect produce

Collect leftover produce after initial commercial harvest

Implement processes to only reject partial loads of produce

Reshape Consumer Environments

Immediate (0-3 years)

Medium (4-10 years)

Long-Term (11+ years)

Create smaller size options for menu items - K-12/Institutions

Create smaller size options for menu items - restaurant

Change K-12 lunch programs (effort already performed)

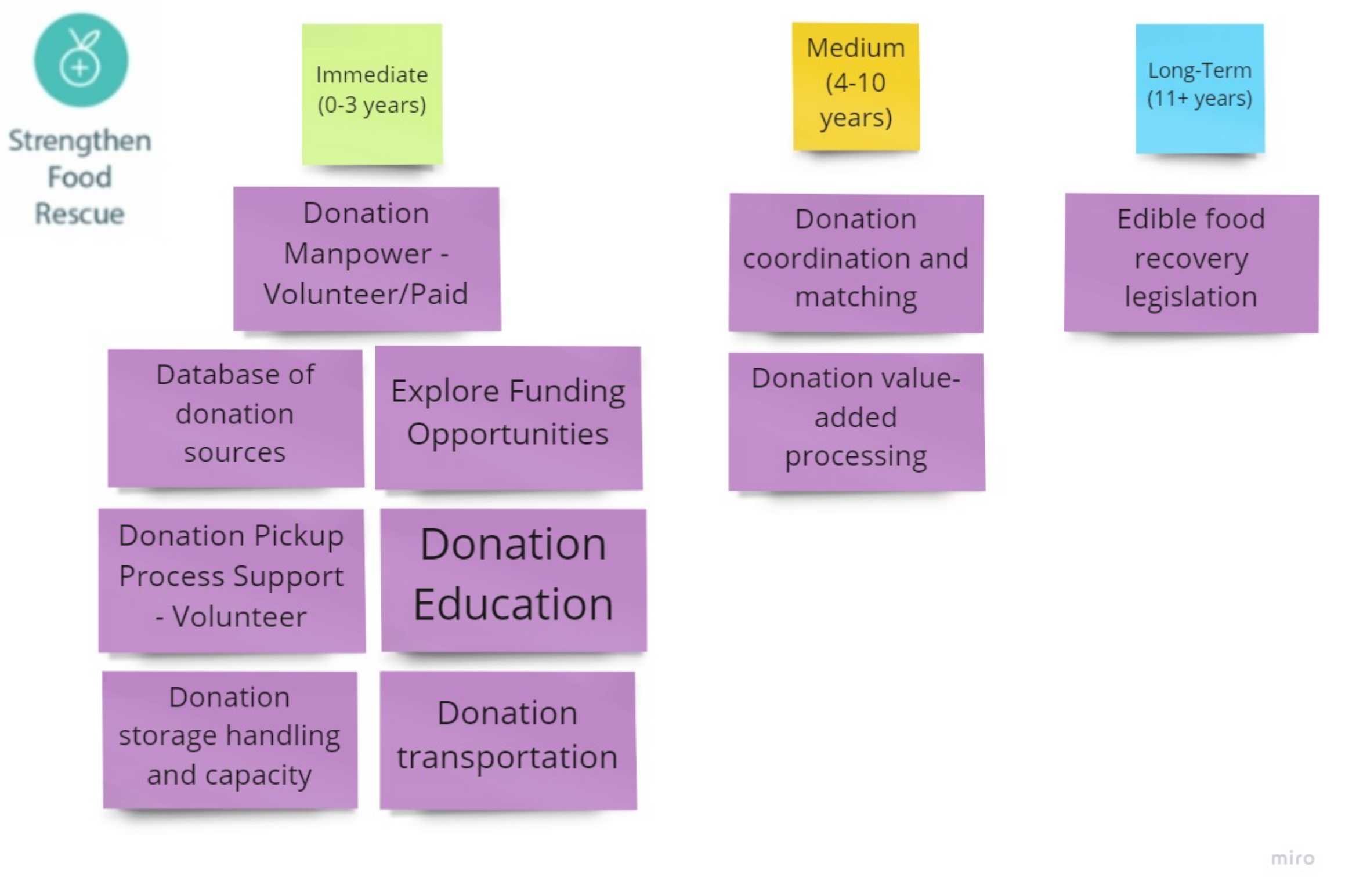
Sell pre-measured ingredients for specific meals

Standardize food label dates to two phases (quality and safety risk)

Advocacy campaigns to raise awareness and educate consumers about ways to prevent food waste and environmental effects

Education and outreach campaigns to reduce plate waste on buffets

Optimize food packaging size and design for complete consumption


Strengthen Food Rescue
Immediate (0-3 years)
Medium (4-10 years)
Long-Term (11+ years)
Donation Manpower - Volunteer/Paid
Donation coordination and matching
Edible food recovery legislation
Database of donation sources
Explore Funding Opportunities
Donation value-added processing
Donation Pickup Process Support - Volunteer
Donation Education
Donation storage handling and capacity
Donation transportation
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