



Foundation for Food and Agriculture Research Convening Event Summary Report

From Food Waste to Food Security and Beyond: Identifying Research Gaps Across the Food System

November 16-17, 2017 | Arlington, Virginia

On November 16-17, 2017, the Foundation for Food and Agriculture Research (FFAR) held a convening meeting in Arlington, Virginia, to address challenges, innovations and advances in reducing the amount of food waste. Participants included representatives from academia, industry, government, and the non-profit sector. The convening event explored future directions towards greater food security and provided a unique forum for thought leaders across diverse sectors to identify knowledge gaps, high-impact targets for FFAR program development and opportunities for cross-sector collaboration.

The event agenda and graphic recordings from the event can be viewed [here](#).



Participants at Day 2 of the FFAR Convening Event on Food Waste and Loss.

The FFAR Food Waste and Loss Challenge Area

The Food and Agriculture Organization of the United Nations (FAO) estimates that one third of food produced for human consumption is either spoiled or wasted, yet one in eight households in the United States is food insecure ([FAO, 2011](#); [USDA-ERS, 2017](#)). Food waste and loss poses unique challenges across each stage in the supply chain that will require collaboration and input from various stakeholders across both the public and private sectors.

"The most innovative and impactful research programs are informed by broad expertise and stakeholder input. On behalf of the Foundation for Food and Agriculture Research, thank you to the attendees of this event for your engagement on the important topic of food waste. We look forward to advancing science that supports reducing agricultural losses across the food system."

-Dr. Sally Rockey, FFAR Executive Director

FFAR recognizes that inefficiencies in the food system and losses in agricultural production as well as consumer behavior have a detrimental impact on food security and the environment. As part of FFAR's mission to **build unique partnerships to support innovative science addressing today's food and agriculture challenges**, FFAR is seeking groundbreaking research on sustainable food waste reduction strategies, including the development of environmentally sound alternative uses of food waste within and outside the food system.

The FFAR Food Waste and Loss Challenge Area includes, but is not limited to, research that leads to the development of novel uses for agricultural waste (beneficial use), improves storage and distribution that leads to food loss

reduction, develops tracking and monitoring, minimizes spoilage through pre- and post-harvest innovation, changes behavior to reduce food waste and ways to recycle unavoidable food waste. FFAR aims to continue to leverage public-private partnerships to fund innovative research to address these important challenges, forge greater food security and decrease negative environmental impacts through innovative sustainable food waste reduction strategies.

Goal of the Convening Event

The goal of this event was to identify challenges and key knowledge gaps related to food waste that could be addressed through research and would be game-changing, accelerating the reduction of food waste across the entire supply chain.

Attendees explored areas of research and scientific innovation related to:

- Inefficiencies in agricultural and food production;
- Measurement methodologies, monitoring and reporting;
- Food waste prevention and reduction; and
- Alternative uses of food waste within and outside the food system.

In addition to three panel discussions featuring prominent experts in the field, attendees were given several opportunities to participate in the conversation, which led



A snapshot of a graphic recording from the FFAR Food Waste to Food Security and Beyond convening event.

to a rich discussion of the challenges in food waste and loss, and where research support from FFAR could have the greatest impact.

Convening Event Overview

Dr. Sally Rockey, FFAR Executive Director, opened the meeting with a brief introduction to FFAR and the Foundation's interest in food waste and loss. Dr. Rockey noted that identifying, understanding, and addressing food waste challenges through game-changing research could only be accomplished through collaboration. The objective of the event was for participants to learn from one another's experiences and unique perspectives. Bringing diverse stakeholders together to leverage collective knowledge, the event was designed to uncover opportunities for new research that could inform more effective and data-driven solutions.

Dr. Rockey's remarks were followed by an overview of the agenda and meeting objectives presented by FFAR Senior Scientific Program Director, Lucyna Kurtyka, who oversees the Food Waste and Loss Challenge Area.

Panel Discussions

The **first panel** discussion, moderated by Dr. Roni Neff at Johns Hopkins Bloomberg School of Public Health, served to set the stage for discussing the issue of wasted food and framing current research needs within the food system. The objective of this session was to encourage participants to challenge how they think and talk about research in hopes of producing innovative approaches that would bring game-changing solutions and the answers to "why" and "how" research can be accomplished.

Each panelist provided a brief overview of the issues leading to wasted food and identified the greatest challenges and opportunities for food waste reduction based on their experiences and research findings to-date. Challenges identified by this panel included:

- Need for more systematic mapping and gathering of granular data (e.g., diverse geographic settings and sectors) on what, where, and why food gets wasted across the food chain. This includes understanding what portion of wasted food is food that could have been eaten.
- Need for data and general understanding around which solutions actually work, and in what context. In order to scale solutions, the sector needs to build the evidence base of proven impact.
- Convincing public—consumers, industry, and policymakers—that reducing food loss and waste is important. How to make it convenient for the consumer?
- Need to understand what drives food waste at different points in the system. Where can consumers reduce food waste and where are structural changes upstream from the consumer required?

PANEL 1: SETTING THE STAGE – IDENTIFYING FOOD WASTE RESEARCH NEEDS ACROSS THE FOOD SYSTEM

Moderator

Roni Neff, Ph.D., Johns Hopkins Bloomberg School of Public Health

Panelists

Yvette Cabrera, Rockefeller Foundation

Elise Golan, Ph.D., USDA Office of the Chief Economist

Chris Cochran, ReFED

Brian Roe, Ph.D., The Ohio State University

- Building food systems that reduce loss and waste even if this issue is not of priority to general public.
- Lack of coordination between waste generators and capital providers; between different departments or teams within individual companies.
- Lack of action. Beyond commitments and beginning to measure, waste generators can be slow to implement and evaluate solutions.
- Need to establish consistent food loss and waste measurement across and within the food supply chain through a Gold Standard Measurement System for wasted food that would include consumer data (to allow for testing relationships between household waste and, for example, food intake and nutritional composition; food prices, sales and other marketing elements; different food sources) and could be used to calibrate other methods with a lower burden (e.g., recall surveys, waste stream analysis).
- Lack of integration of food waste measurement with other food-focused communities of practice in healthcare, food safety, and conservation agriculture.
- Need to understand policy interactions across the supply chain and across the food waste reduction hierarchy, including what policies and market order specifications encourage overproduction and food loss in food production.

The **second panel**, moderated by Kai Robertson, Lead Advisor for the Food Loss & Waste Protocol at the World Resources Institute, included an in-depth analysis of measurement gaps in determining the amount and causes/drivers of food waste and loss across the food chain. Panelists discussed numerous challenges, including:

- Data needed to inform good policy
 - What and why food items are being wasted, and where in the food chain are they wasted the most?
 - How do patterns of business level waste relate to food safety regulations and health code?
 - Incentives for implementing waste-reducing changes. It is assumed that saving money, creating alternate/additional revenue streams, reducing tax burden will all motivate waste-reducing practices. But how powerful (relative to each other) are these incentives? And how well do they resonate with different types of business?
 - What are the current average costs of source reduction, upstream recovery, and downstream diversion? At what scale of business are these costs manageable?
 - Estimates of the monetary, caloric and nutritional value of what is being lost.

PANEL 2: GAPS IN MEASURING THE AMOUNT AND DRIVERS OF FOOD WASTE/LOSS

Moderator

Kai Robertson, World Resources Institute

Panelists

Ashley Zanolli, Oregon Department of Environmental Quality

Pete Pearson, World Wildlife Fund

Nicole Civita, J.D., University of Arkansas

- Consumers' approach to "ugly" but safe food. What kinds of cosmetic defects are acceptable? This could help with policies to foster secondary markets while still making harvest economically viable for the farmer.
- Need to study (gather data on) the efficacy, efficiency, and relative value of particular interventions currently in practice (gleaning, secondary markets, plowing under, complementary value chains, any enterprise models, etc.)
- Enabling assessment of progress in reducing the generation of food waste on a community wide-scale, which is beyond measuring the amount of food donated and diverted from landfills.
- How can technology like block chain improve tracking in the food system?
- Stakeholder engagement in data gathering
 - Recognizing that food is being wasted. This includes composting food that could have been sold or donated.
 - Identifying an accountable point person to coordinate data collection in business establishments.
 - Establishing processes and procedures for data collection.
 - Understanding the difference between surplus food that is wasted and the potential of food scraps ("inedible parts").
 - Supporting the value of tracking surplus food/inedible parts sent to any destination.
- Data quality and collection in business establishments
 - Existing waste management records may not be reliable.
 - Individual locations may have multiple vendors (even for same destination).
 - Data may reside across multiple departments.
 - Data systems do not talk to each other.
 - Nutrient contents of various commercial food wastes are not well known, limiting broader utilization.
 - Food waste and loss data may be mixed with other waste streams.
- Consumer data
 - Reasons for spoiled and wasted food.
 - Time and ease of measurement.
 - Date labeling. At what decision point are date labels providing information upon which consumers are making choices that ultimately result in waste?
 - Most cities and states only track "food waste" without including the loss reasons, types, and quantities of foods. This information is needed to enable action across the entire hierarchy and develop targeted strategies to reduce supply chain barriers that are leading to wasted food in homes.

- Edibility of whole plants. Until there is a market for nutrient rich foods that are edible, but not currently seen as food (e.g., cauliflower, Brussel sprouts, broccoli leaves), those foods will not make it into distribution channels.
- Disconnect between food intake (consumption/healthy eating) research and food waste/loss research.
- Lack of information on household food waste composition.
- Need to assess impact of merchandising and packaging preferences on food waste in homes.

The final, **third panel**, on *Prevention and Reduction of Wasted Food Generation*, was moderated by Ashley Zanolli, Senior Policy Advisor at the Oregon Department of Environmental Quality. Panelists addressed challenges and discussed research needs in the four elements of the food chain:

- On-farm
 - Lack of or limited access to processing equipment during peak harvest times.
 - How can existing processing technology prevent food loss and waste?
 - Prioritize collaboration and look at the upstream. How could the existing transportation fleets and reusable totes used by agricultural cooperatives be utilized for delivering leafy greens, fruits and vegetables to food insecure communities?
 - How to turn by-products generated on farm into new value-added products (e.g., whey, once a waste, was transformed into a multi-million dollar industry)?
 - Analyze co-products for export, including seasonality and pricing.
 - How to minimize agricultural surplus? How to make it accessible to communities in rural areas and food deserts?
 - How to rescue products that are still safe to eat (e.g., milk)?
 - How to cycle phosphorus and nitrogen (to nourish humans, animals, and the land)? How to create renewable nitrogen?
- Food manufacturers
 - Human behavior and incentives behind it.
 - Time-limited biological reality of food.

PANEL 3: PREVENTION AND REDUCTION OF FOOD WASTE GENERATION

Moderator

Ashley Zanolli, Oregon
Department of Environmental
Quality

Panelists

Erin Fitzgerald, Dairy
Management, Inc.

Bob Branham, Second Harvest
Heartland

Karrie Denniston, Walmart
Foundation

- Identification of root causes of avoidable food waste with tracking tools to support implementation an evaluation of prevention strategies. Test tools with small- to medium-size companies in addition to large corporations.
- Limitations of technology or lack of advanced technology, equipment, packaging, etc.
- Risk perception and risk avoidance.
- Unintended consequences of regulation. Policy focus should be on harmonization and updating outdated legislation to ensure it is not part of the problem. New policy, where necessary, should be "predictably flexible" policy frameworks that enable businesses to map investment opportunities during the transition to a low-carbon economy.
- Insufficient awareness on the quantity of wasted food. Need to employ tools to assess economic and environmental impacts and make a business case for where cost savings are.
- Need for quantifying and tracking progress (environmental and social impacts, next savings, etc.).
- Need to promote value chain collaboration and transfer of knowledge.
- Need to lead employees through change, including engaging and empowering employees to connect with customers.
- Retail
 - Importance of creating both business and societal values. Global retailers have global responsibility for reducing food waste and loss.
 - Effective actionable interventions are needed, including improvements to flow of food products, discounts and merchandising of “ugly” fruits and vegetables, donations, and recycling.
 - Pilot changes to merchandising, such as mix-and-match promotions and structural changes to displays that reduce unsold or culled food in the retail environment.
 - Consumer education is critical, especially about date labeling, and the safety and nutritional value of “ugly” produce.
 - Shrink reduction strategies, or prevention strategies to reduce unsold food are often thought of as operational efficiencies, not sustainability strategies, and can become disconnected from plans to address food waste.
- Foodservice and facility management
 - Lack of or limited access to client’s data on food waste. This is critical in identifying where the biggest impact could be made.
 - Food waste at catering facilities is a function of infrastructure efficiency.
 - Research-based messaging that enables action across the entire food recovery hierarchy is needed to help get front-line workers on board through effective education and change management.

Additional research needs across the entire supply chain included:

- Creating actionable measurement approaches that allow businesses to understand where/why food loss and waste is happening and easily transform measurement data into new waste reduction practices.
- Asset mapping where research is being done to address supply chain issues that lead to wasted food.
- Studying the relative impact of wasted food and packaging. Where is packaging a value add? What is the relationship between packaging attributes (packaging size, package resealability, storage and handling instructions) and wasted food in homes?
- Researching with governments, nonprofit organizations, retailers, and food service across the food supply chain to test the effectiveness of consumer behavior change campaigns to reduce food waste in homes.

These informative talks opened up to engaging discussions with additional audience input and commentary from panelists. Following each panel, audience members were invited to pose questions to the panel as well as participate in informal “at-your-table” discussions. The final day of the meeting included breakout group sessions, in which attendees were divided into topic-specific groups and tasked with identifying promising areas for future research.

Challenges & Research Questions

During the first day of the event, participants worked in small groups during the “at-your-table” discussions to identify pressing challenges and research gaps in the food waste and loss area. With respect to drivers of food waste, the top challenges identified included:

- Getting meaningful food waste metrics—different data collection & research methodologies
- Accessing and sharing research and knowledge
- General understanding around which solutions work and in what context
- Social, behavioral & policy aspects—every day best practices; incentives for food waste prevention and reduction
- Understanding drivers of food waste (e.g., agronomic practices, market needs, logistics across the food chain, food access & affordability, shelf life, food safety concerns, dietary practices)
- Development of new technologies vs. consumer acceptance



Food waste challenges identified by individual responses during the 2017 FFAR food waste and loss convening event.

- Unknown impact of “zero food waste” at the micro and macro levels
- Metrics of success

From the individual comments gathered, the image on the right above represents the challenges that were identified, many of which align with those identified during the “at-your-table” discussions. The main challenges identified during these discussions included:

- Business priorities to measure and share data;
- Standardized measurement, including sector methodology and common metrics;
- Determining the market value of food waste;
- Behavioral drivers and consumer behavior, including incentives to reward change;
- Environmental impact of food waste; and
- Food safety.

Breakout Group Discussions

On day two of the event, participants were divided into four groups to brainstorm about moonshot-type ideas on alternative uses of both wasted food and the inedible parts of food within and outside the food system.

Breakout Group 1: Fruits and Vegetables

Of the many research opportunities identified by individuals participating in this group, the two most popular concepts among participants were:

1. Economic instruments aimed at balancing supply and demand to reduce food production surplus, and
2. Research on how to process raw commodities into useful products (e.g., novel, cold process technologies; pulsed light; microwave; radio frequency).

Breakout Group 2: Innovative Food Technologies/Processes for Whole Product Utilization

Participants in this group categorized their research questions as follows:

1. *New Processing Technologies* – Clean label processing
2. *Dynamic Processing/Distribution* – Overcoming logistical barriers (e.g., sanitary design of waste stream handling and cold chain optimization for the small producer – scale processing)
3. *Infrastructure* – Improving capability and flexibility of

BREAKOUT GROUPS: ALTERNATIVE USES FOR FOOD WASTE WITHIN AND OUTSIDE THE FOOD SYSTEM

Moderators

Lawrence Baker, Ph.D.,
University of Minnesota –
Group 1: Fruits and Vegetables

Sabrina Correll, Grocery
Manufacturers Association –
*Group 2: Innovative food
technologies/processes for whole
product utilization*

Yebo Li, Ph.D., Quasar Energy
Group – *Group 3: Renewable
Resources*

Bob Branham, Second Harvest
Heartland – *Group 4: Creating new
markets for food waste and by-
product utilization within and outside
the food system*

processing – irregular supply, access/handling process (e.g., food ambulance and food port systems, commercial kitchen/regional processing facility). Another notable mention in this category was the utilization of slack infrastructure such as an “Airbnb/Uber” model.

4. *Market Development* – Master plan for best use of specialty crops/animal agriculture
5. *Consumer Research* – Technologies that help consumers choose food sustainably

Breakout Group 3: Renewable Resource

In this group discussion participants identified two major challenges:

1. Food waste/loss as feedstock is currently poorly understood, highly variable, and widely distributed.
2. The overall impact and value of large-scale deployment of anaerobic digestion and other food waste/loss-to-energy technologies is unknown.

These challenges led to the following top three research needs:

1. *Appropriateness of scale* – sources (commercial vs. residential), anaerobic digestion infrastructure, regulatory environment.
2. *Map of the available uses for food waste* – ranking of these uses in a common framework.
3. *Characterization of the waste (source material)* – What is important to anaerobic digestion? What is possible to collect and from where? Processor has more information on the value of their “waste.”

Breakout Group 4: Creating New Markets for Food Waste and By-product Utilization Within and Outside the Food System

This group identified challenges and a set of research questions related to animal feed, new product creation, and bio-based products. Two major research questions defined included:

1. Is there an opportunity for in-home maximization?
2. Where in the nutrient cycle can technology have the biggest impact? What would be its cost and the adoption rate?

Next Steps

Recommendations from this convening event and from the FFAR Food Waste and Loss Advisory Council will help inform FFAR research priorities in food waste and loss, including the development of future funding opportunities at FFAR that may take the shape of requests for applications (RFAs), prize competitions, and/or direct-funding of a multi-partner public-private consortium to achieve FFAR’s research objectives.

In addition to these efforts, FFAR will offer funding opportunities under the 2018 [Seeding Solutions program](#). This will be an open call to the scientific community to come forward with bold, innovative, and potentially transformative research proposals in each of FFAR Challenge Areas, including Food Waste and Loss. Please [visit our website](#) to find out more information on our current opportunities.

Join the Conversation on Food Waste and Loss Research

Submit your comments, questions, and suggestions or tell us about your food waste and loss research [online](#).

To stay up to date on future funding opportunities, please join the *Food Waste and Loss email list*: <http://bit.ly/ffarfoodwastelist>

Many thanks to our Steering Committee members for their hard work and support of this event!

Steering Committee on the FFAR Event on Food Waste to Food Security and Beyond

Bob Branham, Second Harvest Heartland

Katy Franklin, ReFED

Erin Fitzgerald, Dairy Management, Inc.

Elise Golan, Ph.D., USDA Office of the Chief Economist

Andrew Harig, Food Marketing Institute

Roni Neff, Ph.D., Johns Hopkins Bloomberg School of Public Health

Denise Philippe, M.Ed., MCIP, Metro Vancouver Collaboration Initiatives

Brian Wansink, Ph.D., Cornell Food and Brand Lab

Ashley Zanolli, Oregon Department of Environmental Quality

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Join Us

FFAR looks forward to continuing to build strong public-private partnerships within the agriculture community and welcomes your input. Please feel free to contact our Scientific Program team at foodwaste@foundationfar.org to learn about how you can engage with FFAR.