The Last Food Mile Conference

Food Loss and Food Waste in the U.S. Supply Chain

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*Margaret Smith*

**FOOD WASTE REDUCTION, RECOVERY, AND RECYCLING**

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KEYNOTE PRESENTATIONS

Food Loss and Waste and the Environmental Footprint
Barbara Ekwall
Senior Liaison Officer, FAO Washington DC

Looking at the global context, the keynote speech will start by examining major trends in food security and nutrition and challenges ahead to feed a world of 9.2 billion people by 2050, 2.3 billion people more than today. It will look at urbanization, changing diets, rising middle class, natural resources and climate change. This is the context in which FAO is fulfilling its mandate to promote food security and nutrition for all, to preserve natural resources, and to promote economic development.

Reducing food loss and waste is an integral part of efforts in view of achieving a zero hunger world. Every year, the world wastes or loses 1.3 billion metric tons of food, roughly one third of the globe’s food production. A short video developed by FAO will help better understand what food loss and waste means. The presentation will then examine food loss and waste from the perspective of food security and nutrition, its implications for the environment, and the economic impact.

Food loss and waste is a complex issue. In a globalized world, the value chain for many food products is often very long and includes a great number of actors. The inter-dependence between the different links in this chain further contributes to the complexity: what happens at one point of the value chain can have a negative impact in other parts of the chain. The presentation will look at one case study developed by FAO, which examined loss and waste of maize in Kenya, which did show some unexpected results. It will highlight the importance of analysis and tools to design the response to food loss and waste in a coordinated and focused manner.

Many of the actors along the value chain, from the farmer who cannot harvest to the consumer who throws away food into the waste bin, are part of the private sector or people acting in their individual capacity. Yet, the way society is organized will have an impact on their behavior. Food loss and waste is thus also a matter of policies, of development priorities, of education and sensitization. The presentation will examine the role of different stakeholders along the value chain and showcase some of their contributions to reducing food loss and waste.

The presentation will argue that reducing food loss and waste is a low-hanging fruit that can make a considerable difference in reducing hunger and malnutrition, preserving the environment and contribute to economic development. In a world of limited resources, we not only need to produce more, we need to produce better and consume more intelligently.
Overview of Food Loss in the United States

Jean C. Buzby, PhD
Chief of the Diet, Safety and Food Economics Branch, Economic Research Service

The U.S. Department of Agriculture's Economic Research Service (ERS) estimates the amount, value, and calories of food loss at the retail and consumer levels in the United States. *Food loss* represents the edible amount of food, postharvest, that is available for human consumption but is not consumed for any reason. It includes cooking loss and natural shrinkage (e.g., moisture loss); loss from mold, pests, or inadequate climate control; and food waste. While ERS developed the Loss-Adjusted Food Availability (LAFA) data series to monitor food intake and diet quality, the food loss estimates have been used to inform the discussion of food loss and food waste. Using the LAFA data, ERS researchers calculated that in the United States, 31 percent—or 133 billion pounds—of the 430 billion pounds of the available food supply at the retail and consumer levels in 2010 went uneaten. The estimated value of this food loss was $161.6 billion using retail prices. ERS also estimated the calories associated with food loss: 141 trillion in 2010, or 1,249 calories per capita per day. The top three food groups in terms of share of total value of food loss are meat, poultry, and fish (30 percent); vegetables (19 percent); and dairy products (17 percent). In addition to presenting ERS’ estimates of food loss, Dr. Buzby will also provide the latest information on ERS’ efforts to improve the data and research on food loss, such as obtaining updated estimates of supermarket food loss estimates for fresh fruits, vegetables, meat, poultry, and seafood in the United States. She will also summarize findings from an ERS-sponsored National Academies workshop on the ERS’ Food Availability Data System (which contains the LAFA data series) and ERS’ food loss estimates.
Reducing Waste in the Retail Food Industry

Jihad Rizkallah
Vice President of Responsible Retailing for Ahold USA

Food waste is an expected and inevitable byproduct of any supermarket retailer operation. In the US, the supermarket industry is held to high standards and expected to provide high quality fresh products and make them readily available to consumers during the regular shopping hours and at times, around the clock. These expectations, coupled with the ongoing dilemma of the product shelf life as related to “Best used by XXX date”, or “Sell by XXX date”, along with issues related to efficient packaging have added to the complexity of resolving the food waste problem.

In addition to the waste generated by the in store food preparation processes, the quality control process of daily culling begs the question of what to do with unsold food and how to divert it from the waste stream. This presentation will address how Ahold USA and its retail divisions operating under the Stop & Shop banner in NE and NY, the Giant Martin’s in PA and VA, and Giant in MD are trying to deal with this issue. The practices currently in place include, marking down unsold product, reducing the waste by re-purposing the product, donations to food banks, composting, animal feed and last but not least planning to converting it to a renewable energy source (anaerobic digester), used to generate electricity.

A Systematic Analysis of Food Waste Reduction in the Potato Industry

David Masser
Sterman Masser Potato Farms

Sterman Masser, Inc. is committed to minimizing food loss throughout the process of growing, harvesting, and packaging a consumer ready product through the use of cutting edge technology industry leading techniques. Combining Integrated Pest Management with crop rotations and more resistant potato varieties, SMI has minimized the potential for crop destroying fungi and insects to propagate. In response to hazards from rocks in the soil and the stresses from harvesting we have acquired rock crushers capable of pulverizing everything down to a powder and new harvesters designed to reduce the stresses of harvesting. Potatoes, coming from the fields, enter our state-of-the-art cold storage facility that combines ideal climate conditions with treatment by gassing and sprout inhibitors to combat food loss due to decay and significantly extend the useable life of the potatoes. Potatoes entering SMI’s packing facility are processed with low impact techniques and equipment, on a First In, First Out policy designed to get product from the field to the consumer in the shortest possible time.

In the past, product not suited for table stock quality was simply removed and discarded. Today, thanks to the construction of the Keystone Potato Products facility, we can salvage what was
previously considered waste product. In the event of a natural disaster, KPP has the capacity to process every single potato, no matter what defect, to provide nourishment to those in need. Potatoes with small to moderate defects can be processed into fresh cut consumer products through automated equipment capable of identifying and removing those parts unfit for human consumption. Potatoes unfit for the fresh cut process, as well as the waste generated by that process, can be further refined into dehydrated products ensuring every single potato can be made useable for human consumption. Even the peel waste can be salvaged for use as feed for livestock.

Food, Water, and Energy
Robert Giegengack
Emeritus Professor of Earth and Environmental Sciences, University of Pennsylvania

While blatant food waste late in the production chain is apparent to most of us, less apparent is the inefficiency of resource use in the processes whereby we produce, harvest, process, package, store, and deliver the food that we eat.

We waste water: 72% of water “used” worldwide is applied directly to cropland, much of it via archaic technology. We move water from where it is plentiful to places where we imagine it will be more useful.

We waste nutrients, even those that we know are in limited supply, by careless or excessive application. Effluent from fertilized cropland has contaminated soils, groundwater, streams, and vast areas of the ocean.

We waste our wild fisheries by extraction beyond their capacity to recover, and by contaminating the water on which they depend. Exhaustion of marine fisheries was extensive before the first inventories were undertaken; thus, available baselines of fishery declines are not adequate to inform current management strategies.

We waste energy by pumping irrigation water against gravity, and in every stage of the food industry. Today, the US food industry invests 10 calories of energy for every food calorie delivered to an American household. Surviving subsistence-agriculture societies deliver as much as 50 food calories for every calorie invested. Most of those invested calories today come from fossil hydrocarbons.

We have largely eliminated natural ecosystems, replacing floral diversity with industrialized monoculture, and wild fauna with food animals, Fifty percent of the crops that we raise we use to feed food animals, which we then eat.

We have not exploited opportunities to develop alternative food sources via hydroponic systems, aquaculture, insectivory, nutrient recycling, etc.
In 1900 the Earth supported 1.6 billion people, many of them not well. Futurists of that time estimated that the carrying capacity of Earth was not higher than 2.5 billion people. Today we feed 7.2 billion people more calories/person than was the case in 1900, higher in the food chain, and on less land than was under cultivation in 1900. This has been achieved via development of a synthetic fertilizer industry, by selection of high-yielding crops, by energy-intensive cultivation practices, and, most recently, by genetic manipulation of food plants and animals. We have not extended the global carrying capacity by reverting to traditional agricultural practices.

Even with these advances, we do not feed 7.2 billion people well. However, nutrition deficiencies are more the consequence of distribution inefficiencies than of inadequate supply.

The systems that now produce food for 7.2 billion people can accommodate many more, as even newer technical advances are developed and implemented. But the most obvious and immediate strategy to feed the people we now have, and the people we expect, is to reform current practices to reduce waste in every stage of the food industry.

The global food industry has come a long way. Rational analysis and judicious inventiveness can substantially advance the capacity of that industry to accommodate a larger human population.
CONSUMER LEVEL WASTAGE

Household Food Waste: Quantification, Understanding and Reduction Campaigns
Tom Quested
Waste & Resources Action Programme

The United Kingdom is one of the few countries in the world to have a household food waste prevention campaign that has demonstrated an impact on national levels of food waste. Operated by WRAP (the Waste & Resources Action Programme), the Love Food Hate Waste campaign has been running since 2007; it has raised awareness of the issue and supported the public in cutting food waste in their homes.

In his talk, Tom will discuss the evidence that was crucial to establishing and maintaining the Love Food Hate Waste Campaign. He will explain how key reports – such as The Food We Waste – were able to bring the issue to the attention of the nation and greatly advance the cause of the campaign. Since 2007 a body of research around household food waste has been developed with a large proportion commissioned or undertaken by WRAP. This has deepened and broadened understanding of the issue of food waste, allowing decisions in the design and deployment of the campaign to be based on strong evidence.

This research draws on a range of disciplines, including sociology, psychology, economics, statistics, operational research and waste analysis. Tom will discuss some of the key conclusions that have emerged from this research, how they have been used and how transferable this knowledge may be to other countries, including the USA. He will also outline some of the important knowledge gaps that exist and how these could be filled in the near future.

Consumer Challenges in Reducing Food Waste
Jonathan Bloom
Journalist and author

Wasted food is a particularly galling aspect of our broken food system. The juxtaposition of hunger and waste on this planet is both an affront to common sense and morally callous. Food waste is even more appalling when you consider the environmental impact of modern agriculture. Squandering 30 to 40 percent of available calories while 15 percent of American households are food insecure is ethically and ecologically unsustainable.

There is near universal agreement on the scale of the food waste problem, but little accord on what solutions to prioritize. Where shall we push for action on food waste and where shall we as societies act? We have just enough knowledge to answer that question. While we don’t know exactly how much food is lost at each step of the food chain, we do know that farms and homes represent the two largest sources of wasted food. Focusing on the latter, there’s good and bad news there. Unfortunately, we as individuals leave plenty of room for improvement. Yet, we
also have a great amount of agency to impact America’s food waste problem if we all do our part and a responsibility to do so.

As consumers and eaters, we have a vital role to play in reducing food waste—at restaurants and supermarkets and in our homes. There are myriad challenges to minimizing waste in all three settings, not least of which are apathy and inertia. The relative cheapness of food devalues it. Meanwhile, the perception that food must look perfect prompts a ripple effect of waste throughout the food chain. And our abundant food supply creates a perception that we don’t have to be careful with our food.

For the most part, though, these challenges are anything but insurmountable. And it is worth emphasizing that if we all act individually, there will be a collective shift on food waste. With a little attention and a desire to reduce the amount of food waste we’re creating, consumers can dramatically reduce their household food waste and prompt restaurants and retailers to do the same.

**Source Reduction: Automated Food Waste Tracking Systems for Foodservice Operators to Minimize Waste**

Andrew Shakman
CEO, LeanPath

Americans waste more than 40 percent of the food we produce for consumption. Within the U.S. out-of-home restaurant and foodservice industry, operations typically throw out 4-10% of food purchases before they even reach a consumer’s plate. That adds up to $8-$20 billion dollars in the industry that’s wasted every year. At the same time, the environmental impact of the food that’s being thrown out is tremendous—consuming precious resources during production and ending up in a landfill, emitting harmful methane gas emissions.

It’s time for the foodservice industry to take proactive steps to prevent food waste. Reducing food waste is one of the best ways to boost an operation’s bottom line while running a more sustainable and socially responsible business.

This session will explore how foodservice establishments across the country are successfully minimizing food waste. Food waste prevention advocate, and founder of LeanPath, Andrew Shakman, will describe innovative approaches to measure, monitor and reduce food waste. He will also describe the role that behavioral science plays in changing staff members’ view of food waste and how an operator can foster a positive, collaborative team culture centered on food waste reduction. Case studies from hotels, universities, hospitals and restaurants will highlight how foodservice establishments of many types have leveraged measurement systems to minimize pre-consumer food waste by 50 percent or more.
This session will leave attendees with a clear playbook for actions that foodservice operators can take to prevent food waste, and ideas for the support structure which policymakers and other actors may provide to motivate this activity.

**What You Will Learn:**
- Forces driving food waste in foodservice operations
- The triple bottom line impact of food waste prevention
- Using measurement and team engagement to cut food waste in half

**Household Food Waste Pilot Project**

Tom O'Donnell  
US Environmental Protection Agency (NAHE)

The U.S. Environmental Protection Agency’s focus on reducing the amount of food reaching landfills must target waste that comes from households or lose an important opportunity to encourage sustainability and decrease health and environmental impacts of food waste. The EPA Food Recovery Challenge offers a hierarchy of activities to reduce landfilled or incinerated food waste. In order of priority they are: waste prevention, feeding needy people, feeding animals, industrial use including energy generation, and lastly composting. The Hierarchy is prescriptive; solutions are implemented according to circumstances. The environmental, social, and economic impacts of food waste are most effectively addressed by prevention and avoiding waste in the first place. However, proven methods for prevention are not necessarily obvious, easy, or quick.

Illustrating the magnitude of the problem, the U.S. Department of Agriculture estimated that 31% of edible food that reached retailers and consumers in 2010 was never eaten (The Estimated Amount, Value, and Calories of Postharvest Food Losses at the Retail and Consumer Levels in the United States) (Buzby, 2014). That represents 133 billion pounds of food with a retail value of $161 billion. Perhaps surprisingly, approximately 21% is consumer loss. We spent $115 billion on food that we never ate!

EPA’s West Coast Climate and Materials Management Forum recognized in 2011 that an effective tool was needed to help people reduce their household food waste. The Food Too Good To Waste initiative focusing on waste reduction was borne from the efforts of this group. Beginning in 2012 and continuing today, pilot projects from around the country are collecting critical data and information about the performance of the Initiative.

Food Too Good To Waste provides a system for people to measure food waste. When put into practice, people learn: what food they waste and why, and how to reduce it. After measuring their food waste, participants are shown simple tools to shop smarter, store food properly, prepare food to last longer, and how to enjoy leftovers. This all helps people understand why food is just too meaningful to throw away.
Results from pilot projects demonstrate total household food waste prevention of 15 to 25 percent. In a four-person home, this can amount to $400 or more in edible food cost savings every year along with significant environmental benefits, which people also enjoy creating! EPA’s Food Recovery Challenge teaches new sustainable ways for people to manage their food at home while dramatically reducing the amount of food that they throw away.

**Food Waste Away-from-Home in the Beijing Urban Area—An Estimate Based on First-hand Data**

Shengqui Cheng\(^a\), Liwei Gao\(^a\), Xiaojie Liu\(^a\), Xiaochang Cao\(^{a,b}\), Lingen Wang\(^a\), Junfei Bai\(^f\), Shiwei Xu\(^d\), Gang Liu\(^e\), Dan Zhang\(^d\), Wen Yu\(^d\), Yao Liu\(^{a,b}\), Qi Qin\(^{a,b}\), Peng Yang\(^f\), Yu Wang\(^f\)

\(^a\) Institute of Geographic Sciences and Natural Resources Research, CAS, Beijing, China
\(^b\) University of Chinese Academy of Sciences, Beijing, China
\(^c\) China Agricultural University, Beijing, China
\(^d\) Agricultural Information Institute of CAAS, Beijing, China
\(^e\) Norwegian University of Science and Technology, Trondheim, Norway
\(^f\) Inner Mongolia Agricultural University, Hohhot, China

Reducing food waste is attracting growing public attention in China, and is widely acknowledged to contribute to abating interlinked sustainability challenges such as food security, climate change, and water shortages. However, the pattern and scale of food waste throughout the consumer stage is poorly understood in China, despite growing media coverage and public concerns in recent years. This paper aims to the estimate food waste away-from-home in the Beijing urban area, mainly based on first-hand surveys.

During the first-hand surveys in the catering sector in the Beijing urban area in 2013, 187 restaurants were investigated, which can be divided into large, middle, small, canteen and fast food categories. Finally, 3833 samples were been collected, and each sample included two parts: a consumer questionnaire, and the weight of food waste generated.

The main conclusions are as follows: (1) It is estimated that about 79.69 g food waste were generated per capita and per meal away-from-home in the Beijing urban area. Obviously, the food waste varied greatly depending on the type of restaurant. For example, the generation in large restaurants was more severe, up to 3 times that in fast food restaurants. (2) The food waste generated comprises many different food groups; the most prominent by weight were cereals (25%), vegetables (41%), meats (13%), seafood products (11%), poultry (7%), legumes (1%), eggs (2%), and dairy products (less than 1%). (3) According to different purposes and motivations of the meals, the estimate of food waste is: friends meeting (109 g), public events (95 g), family parties (62 g), working meals (63 g) (4) Causes of food waste away-from-home identified in urban China predominantly involve: lack of awareness, portion sizes, individual food preferences, income, and age of the diner. (5) On this basis, the study estimates annual food waste generation away-from-home in the Beijing urban area at approximately 298×10^3 tonnes.

*The Last Food Mile Conference*
requiring the inputs of about 93441 hm$^2$ arable land, 774020 hm$^2$ grassland, 2461 hm$^2$ water area and $829 \times 10^3$ m$^3$ water wasted without benefit to the consumer.

**Estimation of Food Waste in Schools: A Case Study in Beijing**

Shengqui Cheng*, Yao Liu$^{a,b}$, Xiaojie Liu*, Xiaochang Cao$^{a,b}$, Yu Wang*, Qi Qin$^{a,b}$

*a Institute of Geographic Sciences and Natural Resources Research, CAS, Beijing, China
*b University of Chinese Academy of Sciences, Beijing, China
*c Agricultural Information Institute of CAAS, Beijing, China

Food waste issues have recently drawn great attention worldwide, for its great effects on food security, nutrition and environmental sustainability. Being a large country with more than 1.3 billion people, China has been facing very serious challenges in feeding its people, especially given the processes of rapid industrialization and urbanization.

Students in elementary and middle schools are in significant stages of physiological and psychological growth. Their attitudes towards food waste, in some ways, may significantly impact the tendency to waste food, so research on food waste by students should not be neglected. The purpose of this study was to gather information on food waste in schools, including the amount of food wasted, its causes, and the possible measures for improvement.

A food waste study in schools was conducted in 2014, the first stage began in ten middle schools, two elementary schools, and two food supply companies. We interviewed managers, workers, students, and teachers; and finished with 1000 student-questionnaires.

The main conclusions are as follows: (1) Around 131.5 g food/cap/day is wasted in school, which consisted of staple foods (45%), vegetables (30%), meat (15%), and other categories like soup and oil (10%). The food wasted in school accounted for nearly 23% of the total food supply. (2) Scaled up to the entire city of Beijing, 98.6 tons of food was wasted for each meal, equaling 4.7% of Beijing’s kitchen waste, at a cost ¥1.97 million. (3) The main causes involved poor food service management, inefficient food supply patterns, portion sizes, lack of awareness of food waste and environmental protection, etc. (4) The measures for reducing food waste include: better communication between school and family, education on food security and environmental protection, and adopting buffet-style dining instead of the traditional style.

**Coordinating Local Growers with Food Pantries: The AmpleHarvest Experience**

Gary Oppenheimer
AmpleHarvest.org

The growing challenge of nourishing 50 million food-insecure Americans has historically been made all the more difficult because America’s 42 million home and community gardeners, 35% of all households, have been largely denied the opportunity to share their fruit, vegetables,
herbs and nuts with their neighbors in need.

As a result, food pantries/soup kitchens have generally offered only processed food while nearby produce was left to rot in the garden, or worse, thrown away adding to the waste stream and methane emissions at nearby trash dumps.

It also turned healthy, locally grown and freshly harvested food into food waste.

That is now history.

Since 2009, AmpleHarvest.org has been the disruptive solution that has taken advantage of the legacy infrastructure (the food pantries and nearby growers), universally available technology (the Internet) and both the backlogged supply of fresh food and the pent up frustration of millions of growers who up to now were forced to watch the food go to waste.

AmpleHarvest.org works to educate, encourage and enable growers across all 50 states to share their bounty with a local food pantry for the rest of their gardening life. This benefits an ever increasing number of participating food pantries/soup kitchens (now past 7,000) as they become visible and accessible to local growers in rural, suburban and urban communities.

The “just in time” logic built into AmpleHarvest.org, arranging for food donations just before the clients arrive, eliminates the need for extra refrigeration and storage – problems that have also prevented acceptance of food donations in the past.

Lastly, given the viral nature of the campaign, as each grower learns about the nearby pantry, they become a vector for further spreading that awareness to their neighbors.

AmpleHarvest.org has no “boots on the ground”, no scheduled pickups and no regionalization.

Indeed, AmpleHarvest.org never actually touches the food. It simply bridges the supply that has historically been in search of a need, to the desperate need that never knew a solution was already available.

In the near and long term, this improves both the health and the wealth of America while also benefiting the environment – all at no cost to the donor.

The magic of AmpleHarvest.org is that by moving information instead of food, we’ve moved ending food waste and hunger into the cloud.

Rolling Harvest Food Rescue

Cathy Snyder

President and Executive Director

Rolling Harvest Food Rescue began in 2009 when Founder and Executive Director Cathy Snyder began to volunteer at a food pantry in Hunterdon County, New Jersey. Soon after, a bountiful farmers’ market opened up less than a mile away. Snyder quickly realized that she was able to enjoy the taste and benefits of the market products simply because she had a car and
disposable income, a luxury many of the food pantry clients were lacking. Returning to the food pantry the following week, continuing to hand out yet more mac and cheese, high-sodium soups and bruised bananas to struggling, food-insecure families at their most vulnerable felt unacceptably unfair and wrong, and she knew she was going to find a better way. Fresh, locally-grown fruits and vegetables are simply out of reach financially for both the food pantries and the families they help. Paradoxically, the foods that most can afford are unhealthy foods with the least amount of nutrition, often leading to diabetes, high blood pressure and even obesity.

Ms. Snyder saw that there were many local farmers and food producers who want to share their excess vegetables and fruits with neighbors in need, but lacked the time and staff it would take to ensure effective distribution. Additionally, food pantries and other hunger-relief social service sites often lacked volunteer help to collect the bounty from local farms. Rolling Harvest Food Rescue now fills this nutritional and logistical gap by collecting fresh produce and meats from these generous farms when it is most convenient for the farmer, growing long-term relationships with both the producers and the hunger-relief sites we serve.

Rolling Harvest has now delivered more than one and a half million servings of locally grown, mostly organic fresh fruits and vegetables, including regular donations of organic healthy meats to food pantries, shelters, soup kitchens, and senior housing sites throughout Bucks County in Pennsylvania and into Hunterdon and Mercer Counties in New Jersey.

All economic indicators point to a persistent need for healthy food and help for 15-20% of our neighbors (children, seniors, and families) who continue to struggle with government cutbacks, lack of employment opportunities and a minimum wage that is not manageable. Rolling Harvest exists to increase access to fresh produce and healthy food choices for this portion of the population by effectively capturing and redistributing excess food resources from committed growers in the PA/NJ region.

Local and Regional Food Systems in the South-central Appalachians for Enhanced Food Security

Margaret Smith
Department of Crop and Soil Environmental Sciences, Virginia Tech University

Local communities and regional networks are currently exploring the strategy of developing local and regional food systems in order to enhance food security. The relationship between food consumption and production must be tested at various scales and across geographies in order to describe how place-based diets and food waste occurring throughout the food supply chain influence agricultural land use and the degree to which a discrete agricultural land base can feed a population. This thesis used two models to integrate data from across the agricultural and nutritional sciences to test the capacity of regional food systems to meet complete diet food need in the south-central Appalachian foodshed. First, a complete diet approach was
applied to the entire foodshed to test the influence of animal product and fat consumption on the land requirements of food production. The quantity of specific regionally-adapted plant and animal food commodities for six diet patterns were estimated following USDA recommendations at the farm gate and on the consumer’s plate after accounting for food losses and waste occurring throughout the cycle of production, processing, distribution, retail, cooking, and spoilage. This annualized consumer food demand was then compared to county-based Census of Agriculture land use data to determine agricultural carrying capacity. Second, a sub-regional geospatial foodshed model used site-specific soil and current land cover datasets to estimate the spatial distribution of food production capacity relative to the per capita food needs determined by the complete diet model. Together, these studies contribute information from a data-user perspective for stakeholders and planners interested in quantifying the capacity of regional food systems to meet total food needs.
The Challenge and Opportunity in Food Waste

Steven M. Finn
RespnsEcology; University of Pennsylvania Organizational Dynamics

The problem of global food waste was referred to as a “conundrum” in a recent NY Times article by Emma Bryce. It is indeed a conundrum, and much more. It is a complex problem at global, national, regional, and individual levels. In short, food waste is a massive challenge, with elements of a “social mess.” But it is also a colossal opportunity -- and one that cannot be missed.

The world’s population currently exceeds 7.2 billion, of which nearly one billion are hungry and nearly two billion suffer from micronutrient deficiencies per FAO. Yet estimates of global food waste and losses along the supply chain range from 30% to 50% of all food produced for human consumption, with a corresponding waste of all associated resources (most notably water) and substantial environmental harm. By 2050, just 35 years from now, the global population will exceed 9 billion. This brings the ultimate (and urgent) challenge: successfully feeding that increased population while preserving the environment.

Feeding 9 billion global citizens in a sustainable manner requires optimizing use of food resources and all associated inputs. In the developed world, this requires mindset change. We need to recognize excess food as a valuable resource – not as waste – and seek to optimize it. Such change starts with increased awareness and education, but it hinges on action. We must overcome the culture of abundance which leads to massive waste from farm to market to fork. Consumers and retailers must collaborate, changing attitudes toward “perfect” produce and 24x7 stocks of infinite variety. Retailers must alter operations to reduce “accepted” levels of food waste and efficiently repurpose excess. Legislators must enact change to demystify “sell-by” dates and incentivize alternatives for excess food beyond landfill. Producers and retailers must form innovative partnerships to redirect excess food to high value uses. Forward-thinking organizations that embrace this opportunity will achieve triple bottom line benefits in the form of an inspired workforce, improved community relations by reducing environmental benefit, and financial savings through reduced costs. In so doing, they will drive positive change through the food system.

Such change is hard, but essential: A world of hunger, rising obesity due to poor nutrition, resource shortages and environmental damage is not sustainable -- nor is it a secure world.
Animal Feed from Food Waste
James D. Ferguson, VMD, MS, ACVN, ACT
University of Pennsylvania, School of Veterinary Medicine

Municipal landfills received 36.4 million tons of food waste in 2012, representing 14.5% of all municipal waste. Looking ahead to 2050 when the world population will exceed 9 billion people, the needed increase in food supply may exceed 70% of current supply. Reducing food waste could provide a significant buffer to help with world food supply. In addition, disposal of food waste to landfills is not a sustainable means of disposal. A priority in reducing food waste is diverting edible food to food banks and other institutions which can utilize edible food. However, for food not acceptable for humans and inedible residues may be effectively used as animal feed. Currently the US produces about 375 billion pounds of animal feed annually for pets, livestock, horses, and fish. About 25% of animal feed is derived from by-products of the oil, milling, rendering, and processing industries. A further hidden source of animal feed includes food refusals for shelf-life, packaging errors, blemishes, and other reasons. The food manufacturing sector reports it diverts about 30.6 billion pounds or 70% of total food waste to animal feed. The retail and wholesale industries divert about 14% of food waste or 0.53 billion pounds of food waste to animal feed. Significant barriers exist to using more food waste as animal feed. Barriers exist on the food manufacturing supply side and also on the nutritionist end user side of the relationship. Logistics of collection, transport, and storage create problems for both supplier and user as food waste contain a high water percentage and have poor stability, degrading easily with prolonged unrefrigerated storage. Regulations for food safety mandate only certain food items may be fed to certain animal species and specify heating requirements for safety. Nutritional variability and variability of supply make it difficult to use on a routine basis in many farm situations. Collection and processing prior to farm delivery would mediate much of the variability of nutrient content and supply, but would require an intermediate handling and processing facility to make more available as animal feeds.

The U.S. Food Waste Challenge and Other Federal Initiatives Targeting Food Waste
Elise Golan
Director for Sustainable Development, Office of the Chief Economist, U.S. Department of Agriculture

Food waste, which is estimated at between 30-40 percent of the food supply in the United States has far reaching social, economic, and environmental ramifications. In this talk, Elise Golan will examine the federal government’s primary initiatives targeting food waste, including the U.S. Food Waste Challenge. The objective of the U.S. Food Waste Challenge, which was launched by the U.S. Department of Agriculture and the Environmental Protection Agency in 2013, is to build real momentum in the United States to reduce, recover, and recycle food
waste. By joining the U.S. Food Waste Challenge, organizations and businesses demonstrate their commitment to reducing food waste, feeding the hungry in their communities, and reducing the environmental impact of wasted food. Challenge participants can work with EPA experts to get technical assistance to set and meet quantitative food waste reduction goals. The Challenge’s inventory of activities will help disseminate information about the best practices to reduce, recover, and recycle food waste and stimulate the development of more of these practices. The inventory of activities and participants will also provide a snapshot of the country’s commitment to—and successes in—reducing, recovering, and recycling food waste. By October 2013, the Challenge had over 1,000 participants. Other federal initiatives include tax benefits and limited liability protection to businesses donating food, investments in market infrastructures, and research on new technologies and systems for reducing food waste and its impacts.

Recovering Food, Fighting Hunger: Feeding America’s National Program
Karen Hanner
Managing Director of Manufacturing Product Sourcing for Feeding America

It is staggering that nearly 40% of food produced in the US ultimately goes to waste while over 49 million Americans may go to bed hungry.

Feeding America has partnered with all segments of the food industry for over 35 years to help capture more than 2.5 billion pounds annually of safe unsold food for 46 million hungry clients across the country. And now the nation’s largest hunger relief and waste diversion organization is working more aggressively with retailers, food service providers, manufacturers and the agriculture community to create new programs and processes to help ensure more food feeds communities and does not go to waste.

Feeding America’s Store Donation Program nationally coordinates with over 16,000 Retail Grocery locations to rescue over 1.2 billion pounds of product, dairy, protein and bakery; newest focus is on empowering, training, and supporting agencies to expand capacity and reach as well as building infrastructure and partnering with donors in more cost effective models.

Online Marketplace (OM) is Feeding America's newest food rescue initiative for the Food Service sector, created to capture a portion of the 22 billion pounds of wasted food currently being generated locally via cafeterias, convenience stores, restaurants, hotels. The OM program provides access to food that has been economically challenging to recover for food banks using traditional food rescue models.

Partnerships with Food Manufacturing companies enable over 800 million pounds of food to feed people and not animals or go to landfill. New work by Feeding America with USDA/FSIS has revised guidelines to enable more food to be donated that had previously been destroyed. Pilots are also now in place with food banks for on-site USDA inspection opening even more opportunities for donating protein items.
New multi-partner programs led by Feeding America and food banks, have engaged growers, processors and distributors in the Agriculture segment to rescue produce from the field that would have otherwise been plowed under or left to rot, and convert it into a usable, shelf-stable format for food bank clients.

These are just a few examples of Feeding America’s leadership and continued commitment to ending hunger while at the same time helping ensure that as much food as possible is used for its highest value: feeding people.

Recovering Food, Fighting Hunger: Philabundance’s Innovation

Bill Clark
Former Executive Director of Philabundance and current Visiting Fellow at the Wharton Social Impact Initiative

For 13 years, Bill Clark was CEO of Philabundance, the Delaware Valley’s largest hunger relief organization and one of the preeminent members of Feeding America, the nation’s food bank network. Philabundance was collecting and distributing 3-4 million pounds of food annually when Bill became the Executive Director in 2001. Faced with ever increasing demand for help and during the country’s worst recession since the great depression, Philabundance innovated a number of food sourcing efforts by working with the Port of Philadelphia, the nation’s largest port of entry for imported produce, area farms, area retailers and manufacturers in a constant effort to find the food needed to address hunger in the Delaware Valley. By 2013 Philabundance was capturing and distributing to families in need, over 25 million pounds of food that otherwise would have been disposed of. More than 65% of this food is highly perishable fruits and vegetables. Increasingly required to augment the supply of donated food with foods purchased at wholesale, Bill and Philabundance extended their work in providing greater access to affordable nutritious food by creating the country’s first nonprofit supermarket in Chester, PA.

Before opening Fare & Square in 2013, Chester had been without a full service grocery store to service its 35,000 inhabitants for over a decade. This had led to the USDA declaring it, and much of the surrounding community, a “food desert”. Chester was a community with severe levels of economic disadvantage as evidenced by 32 % of its population living below the poverty line and 44.5% of the population classified as Food Insecure. According to a survey conducted by Philabundance 53.8% of Chester residents reported they had too far to travel to get access to nutritious foods.

This supermarket, Fare & Square, offered an entirely new operating model for provisioning communities in need. The capital for building acquisition, refit construction, fixtures and initial stocking inventory was secured by government and charitable sources. With virtually no real estate costs, the need to turn a profit or reward investors, Fare & Square is able to offer prices that are generally lower than any other local option. In addition, those households receiving SNAP or WIC benefits are eligible for an additional 7% - 10% off all items in the store. After one
year in operation, open 12 hours a day, 7 days a week, *Fare & Square* now services about 10,000 households with an entire range of grocery and perishable foods including extensive produce and dairy offerings, fresh meats with an in-store butcher and a delicatessen. Still running with the need for a small operating subsidy, it is expected to reach break-even by its second year anniversary.

**Food Rescue at the Farm through Gleaning**

Steven M. (Mike) Waldmann  
Executive Director, Society of St. Andrew

According to the USDA, each year, we waste about 96 billion pounds of food in this country, including this year. At the same time we have about 40 million Americans who don’t get enough to eat. If you do the math, we are wasting about one and a quarter tons of food for every hungry man, woman, and child in this country. We are throwing away more than enough food than is needed to feed every hungry person in the U.S. We have already beaten hunger in America – we simply continue to allow it to exist. It doesn’t need to be that way; we let it be that way.

Doesn’t it make sense to simply bridge the gap between all that excess food and the people that need it? There is a way to actually do that and it is having great success.

There are two main points of large volume food waste. One is right in the fields at harvest time where produce that isn’t yet ready to be picked or doesn’t meet tight specifications is simply left behind to rot. The other is in the produce packing and distribution centers where food that is harvested goes through a grade-out process before it is packaged for shipping to grocery stores. Billions of pounds of excess food is loaded into trucks and taken to landfills and dumped as waste, although it is perfectly good to eat. Food waste is the second leading cause of methane gas in our atmosphere.

Each year the Society of St. Andrew coordinates with thousands of farmers and packing facilities, tens of thousands of volunteers and thousands of feeding vital programs in all 48 contiguous states to save and distribute 30-40 million pounds of this healthy but excess bounty. Society of St. Andrew is recognized as our nation’s premier gleaning organization and we save and distribute fresh produce in all 48 contiguous states. Using good stewardship practices for food, and all resources, we are able to feed the hungry in America at a cost of just 2¢ per serving with total overhead costs of just 3.2%.

www.endhunger.org
Case Study: A Food Service Provider's Holistic Approach to Sustainable Waste Management

Claire Cummings
Waste Specialist, Bon Appétit Management Foundation

Bon Appétit Management Company (www.bamco.com), the University of Pennsylvania’s food service provider, operates more than 500 cafés corporations, universities, and museums in 32 states. Well known as a pioneer in environmentally sound sourcing policies, Bon Appétit has developed programs addressing local purchasing, the overuse of antibiotics, sustainable seafood, cage-free eggs, the connection between food and climate change, farmworker welfare, and food waste reduction.

Bon Appétit Waste Specialist Claire Cummings will share examples of both the company’s successes and challenges in fighting waste in the food system. Bon Appétit works first and foremost to prevent waste from happening in the first place. The company achieves source reduction through innovative programs such as Imperfectly Delicious, the first initiative of its kind to work with farmers to rescue imperfect, wholesome produce from going to waste through strategic purchasing and creative cooking. Bon Appétit strives for waste prevention in its kitchens and cafés through stem-to-root cooking techniques, waste tracking, trayless and other educational campaigns, and reusable to-go container programs. At University of Pennsylvania this past year, Bon Appétit was able to achieve a 99.3% reduction in disposable takeout containers for the 2013 to 2014 Academic Year, going from 171,000 clamshells to an impressive 1,167 clamshells used in Residential Dining Cafes.

Bon Appétit believes that any food that is left over and still safe to eat after service should be donated to people in need rather than sent to a compost bin. Bon Appétit has been on the forefront of the national food recovery movement and has played an integral role in making food recovery a common practice on college campuses. The company has partnered with organizations such as the Food Recovery Network (FRN) to develop a universal guide to food donation for chefs and managers, and is proud to be the first business to get Food Recovery Certified, a new certification by FRN to recognize businesses that are donating their excess food to people in need.

Composting: Closing the Food Loop

Nora Goldstein
Editor, BioCycle

After reducing the quantity of food wasted, and maximizing recovery and distribution of edible food, the next step in the food supply chain is composting the nonedible food to replenish soils — and in turn grow more food to put back into the supply chain. The optimum scenario is to close that loop as close to the sources of consumption. Increasingly, this is happening in
communities via urban agriculture, community gardens and local farms and composting operations. To optimize this closed loop of food production, recovery and recycling, the food waste generated needs to be free of contaminants, especially plastic and glass. This requires an investment in training and education at the source, and having the proper tools to maximize separation efficiency. This is also a point in the food supply chain where wasting of food can be identified, with information fed back into food purchasing, food preparation and donation programs. The final step is to optimize composting systems to produce high quality compost that can be incorporated back into soils for fertility and organic matter.

This presentation provides:

1) National data on composting trends in the U.S. based on the 2014 State of Composting In The U.S. report (Institute for Local Self-Reliance and BioCycle) and BioCycle’s online directory, www.findacomposter.com. A national snapshot survey found that food waste composting sites comprised less than 10% of all facilities in the U.S.; over 70% compost only yard trimmings. A 2013 update of composting facilities in www.findacomposter.com identified over 500 permitted to receive food waste.

2) Effective separation practices at the source of generation. These include placement of containers in food prep and dining areas, container options for large-scale generators, signage in multiple languages and photos/illustrations of what can be included. Given employee turnover in many food-related sectors, training and education should be conducted as frequently as needed. Immediate feedback from organics haulers and composters (e.g., digital photos) when contamination is found assists in ongoing training. Management buy-in and support of the food waste diversion program — similar to food donation — is critical to long-term success.

3) Key benefits of amending soils with compost to optimize food production. This includes moisture retention in amended soils, fertility, and less compacted soils that are able to infiltrate water, especially during heavy rain events.

4) Closing the Food Loop case studies. These will include several urban farms with community composting operations that receive source separated commercial and residential food scraps; conveniently located composting sites that service the food supply chain; and on-farm composters (and anaerobic digesters) that process clean food scraps streams from the food supply chain and utilize the compost in food production.

Recycling for Small Island Tourism Developments: Food Waste Composting at Sandals Emerald Bay, Exuma, Bahamas

Kathleen Sealey
Department of Biology, University of Miami

The ability for small islands to meet sustainability goals is exacerbated by the costs of transporting goods on, and then, wastes off the islands. At small scales, recycling can be
prohibitive and complicated by labor costs; the need to profitably recycle and manage solid waste output from tourism is complicated by scale and available technologies. An on-going, multi-year study documents the amount of solid waste generated on Great Exuma, The Commonwealth of The Bahamas, since 2010 with benchmarking, then limited recycling of food waste generation by an all-inclusive resort, Sandals Emerald Bay. For the island of Exuma, the rapid increase in the rate of accumulation of solid waste associated with a large destination resort has led to an increase in pests such as rats and flies, along with an increased occurrence of fires associated with unburied solid waste. Solid waste has accumulated faster than the island solid waste management can absorb. Food waste composting is an ideal solution once challenges can be addressed; issues encountered included the limitations of physical space for food waste separation, the increased human resources and training required, the long-term corporate commitment and the requisite government oversight.

**Fish Processing Waste to Food and Feed Ingredients**

Peter J. Bechtel

USDA/ARS Southern Regional Research Center, New Orleans, LA

In the 1990's a symposium was held in Alaska to explore ideas to increasing the utilization of the large amount of fish waste produced annually from fish harvested for human consumption. Approximately, 65% of the harvested fish weight was underutilized tissues such as heads, viscera, skin, and frames. This conference used the phrase “One Billion Pounds of Protein” to catch the imagination of the public about the amount of protein available from these underutilized parts of fish.

The USDA/ARS initiated a research project in partnership with the University of Alaska to work on increasing the utilization of fish processing waste produced in Alaska from wild caught fish and more recently at the Southern Regional Research Center in New Orleans from aquaculture reared fish. The phrase “fish waste” has been gradually replaced with “fish byproduct”, indicating that more of fish processing byproducts could be used as the raw materials for making human food and animal feed ingredient.

Today much of the fish processing byproduct is made into oils and fish meals and an increasing amount of fish processing byproduct is being made into food products and ingredients designed for the human consumption. Products for human consumption are often higher-valued products and options for maximizing edible yield from fish can include utilizing fish mince, tongues, cheeks, fish heads, stomachs, liver and roe/milt. Other examples of products made from fish byproducts are oils, protein powders and functional food ingredients. Other benefits of utilizing fish processing byproducts include a cleaner environment and greater resource utilization.

Peter.bechtel@ars.usda.gov
Edible Films from Dairy By-Products
Laetitia Bonnaillie and Peggy M. Tomasula
Dairy and Functional Foods Research Unit, Eastern Regional Research Center, USDA-ARS

Edible thin films for food packaging applications are being manufactured in our laboratory using protein-rich dairy byproducts and surpluses such as non-fat dry milk (NFDM), whey and casein, and enhanced with other edible additives, co-polymers, or polysaccharides, such as pectin. Edible, protein-based packaging films have the distinct advantage of protecting food products while at the same time reducing packaging waste and increasing the nutritional value of the food. Films fabricated from calcium or sodium caseinate (CaCas or NaCas) are clear, strong and water-soluble, and are generally plasticized with glycerol or sorbitol for added flexibility. Films made from casein that is precipitated from milk via carbon dioxide (CO$_2$-casein) are more water-resistant than CaCas and NaCas films, and also more opaque. While casein-based films are excellent oxygen barriers, superior to many synthetic films, they are extremely sensitive to moisture and do not stretch as well as synthetic packaging films. In our laboratory, we are performing the in-depth physical and mechanical characterization of different casein-based films as a function of the manufacturing parameters, pre- or post-treatments, the formulation, additives, as well as the environmental conditions during manufacture, storage and testing of the films. Casein/glycerol films as thin as 0.02 mm are strong, flexible, and highly hygroscopic and used as free-standing films or coatings. Casein films are useful as models to design other food-based film materials, and as templates to develop and optimize lower-cost films utilizing NFDM or whey, blended with caseinate. NFDM and whey contain more than 50% lactose, which causes films to crystallize and become brittle; the addition of CaCas or NaCas, and the incorporation of different additives, such as pectin, together with the strategic manipulation of the formulation and manufacturing parameters and environmental storage conditions, can improve the strength of the films and prevent the lactose from crystallizing, to preserve flexibility. State-of-the-art technologies such as humidity-controlled dynamic mechanical analysis (DMA) and thermo-gravimetric vapor-sorption analysis (VSA) are being employed to analyze the effects of large and small manufacturing, compositional, and environmental changes on the mechanical, structural, barrier, moisture-sorption and solubility properties of different milk-protein films to pinpoint their potential range of commercial applications.

Biodegradable Bioplastics from Food Wastes
LinShu Liu and Peggy M Tomasula
Dairy and Functional Foods Research Unit, Eastern Regional Research Center, USDA-ARS

An estimated 1.8 billion tons of waste are created annually from food processing in the US, including the peels, pulp, and pomace (PPP) generated from fruits and vegetables when they are converted into frozen or canned products or pressed into juice. PPP currently is sold as animal feed at low cost, but a large portion is discarded at an additional cost. The profitable use of food
processing waste requires a strategy to enhance the competitiveness of the US food industry and cost effective ways to protect the environment from contamination. We have developed a method to make biodegradable bioplastics from food wastes in combination with other biodegradable materials such as poly (lactic acid) (PLA), a biodegradable material derived from fermentation of biomass. Some of these bioplastics are shown in the figures. The bioplastics may be produced using existing equipment employed by the plastics industry. The resulting bioplastics possess mechanical properties that make them strong enough for use as food containers. They have enhanced water resistance and are totally biodegradable. Other examples of byproducts from food processing include the residue from corn ethanol fermentation, known as distiller’s dried grains with solubles (DDGS). The production of DDGS has increased from 2.7 million tons in 2000 to 32.5 million tons in 2010. Experts predict that DDGS will soon outpace their consumption rate as animal feed. To convert DDGS to bioplastics is an attractive way to overcome this obstacle and is currently under research in our laboratory.

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*From Left to Right: Film from pectin and PLA; film from pectin and glycerol; plates from sugar beet pulps and PLA, sheets from sugar beet pulp and PLA (up) and banana peels with PLA.*

**Agricultural Initiatives: Exploring Hunger Relief and the Agricultural Community**

Rachel Hoh, Monika Crosby and Lisa Hodaei
Philabundance

As of 2013, hunger and food insecurity affects 1 in every 7 Pennsylvania residents according to Feeding America. Within the Delaware Valley, nearly 900,000 people are at risk for chronic hunger and malnutrition. Philabundance has been fighting hunger since 1984, becoming the largest hunger relief organization in the region. We deliver food through our direct neighborhood distribution programs and a network of 400 member agencies across the Delaware Valley. Our member agencies include food cupboards, shelters, emergency kitchens, daycare and senior centers. These partnerships have resulted in Philabundance providing food to approximately 75,000 people each week.

Traditionally, Philabundance has secured food through donor partners such as manufacturers, retailers and community food drives. As food insecurity grows, we must continue to expand our supply of donations. One such option lies in the evaluation and expansion of agricultural initiatives. When looking at the current agricultural productivity of our service area, Philabundance is fortunate to be surrounded by a rich farming community with great potential.
for collaboration and growth. In order to capitalize on this potential, Philabundance launched an Agricultural Initiatives program in 2012 that partnered with local farms to harvest fresh, excess produce to distribute to those in need.

This paper will serve as an overview of the partnerships between hunger relief agencies and the agricultural community as they work together to provide fresh food to those who need it most. The study closes with suggestions for the future of Philabundance’s Agricultural Initiatives program based on current trends in hunger relief programming.

**Online Marketplace: Feeding America’s Platform to Facilitate Local Food Rescue Programs at a National Scale**

Parul Thukral, Michael McManiman, Jake Krain, and Lisa Hodaei
Feeding America and Philabundance

Online Marketplace (OM) is Feeding America's newest food rescue initiative created to capture a portion of the 22 billion pounds of wasted food currently being generated locally via cafeterias, convenience stores, restaurants, hotels, etc. The food available in this channel is generally highly perishable, requiring more frequent, expedited collections and available in smaller volumes per pick-up. These characteristics not only raise food safety concerns, but can also make the food economically challenging to recover for larger regional food banks, using traditional food rescue models.

Food Banks have expressed a need for tools and resources to more efficiently and effectively capture food in this new frontier. The OM program, being supported by the Feeding America national office, was designed to help fill these common needs of facilitating and advocating for the donations on behalf of the local hunger relief safety net and its member agencies. Online Marketplace’s **technology platform** enables food banks to oversee a network of local donor-agency relationships, while also serving as a platform to record and receipt agency-empowered collections. With this, OM is not only an opportunity to source more food into the national food bank network, but a technology solution for donor management, driving efficiency and increasing donor satisfaction.

Philabundance, in partnership with Bon Appétit Management Company, UPenn Dining Services, Feeding America and the local Salvation Army, is piloting the Online Marketplace platform to explore its potential in our own back yard. The goal is to increase efficiencies and have flexibility to cultivate willing, regular donors in the Greater Philadelphia area with smaller volumes of prepared and perishable donations to keep good food closer to home. By empowering our local hunger relief network and facilitating the linkage of local donors to partner agencies, we anticipate the ability not just to increase donations, but to foster more collaborative, community connections and build a movement through these relationships to consider hunger unacceptable in our communities.
CONSUMER FOOD BEHAVIOR

Psychological Basis of Food Wasting Behavior  
Paul Rozin, Department of Psychology  
University of Pennsylvania  

Why do we waste food? One set of reasons is because it is so easy to do it. For most Americans, food is relatively cheap, and we are lazy. More importantly, we serve too much, so there are often leftovers. American portion sizes are much larger, than, for example, French portion sizes. A third, and perhaps the principal reason, is that there is something unsavory, for many people, about leftovers. They can be conceived of as “used” or “psychologically contaminated” food. Portion size and psychological contamination will be the focus of this presentation.

Food Marketing: Impact on Consumer Purchasing and Food Discards  
John Stanton  
Professor of Food Marketing, Saint Joseph's University  

Everyone shares some blame for food wastes but food processors and retailers have done more than their fair share. This talk will focus on sources of food waste by food industry and offer suggestions as what can be done to reduce the wastes.  

Three areas will be identified: farmers, food processors, and food retailers. In many cases the food industry will state that they are just responding to consumer desires so solutions involve collaboration between the two.

U.S. Consumer Knowledge, Attitudes and Behaviors Related to Food Waste  
Roni Neff, PhD SM  
Johns Hopkins Bloomberg School of Public Health  

Introduction: As food waste prevention efforts expand in the U.S., there is a need for evidence to inform them, as well as baseline data to assist in tracking progress. While a body of research informs consumer-level waste-reduction efforts internationally, we cannot presume how results might translate to the U.S. context, given differences in culture, society, food system, infrastructure, policy and geography. Accordingly, we performed a nationally representative consumer survey of knowledge, attitudes and behaviors.  

Methods: The survey was administered online to 1,010 individuals in April 2014.  

Results: Respondents commonly reported being aware of food waste as an issue, making efforts to reduce it, feeling knowledgeable about how to do so, and performing behaviors known to reduce waste. Three-quarters said they throw out less food than the average American. Among
motivators for waste reduction, saving money and setting an example for children topped the list, with environmental concerns ranked last. The most common reasons for discarding food were concern about food poisoning and a desire to eat only the freshest food. There were modest differences based on age and parent status, but not by race, education, socioeconomic status, or rural/urban residence.

Discussion: The survey provides valuable information about respondents’ perceptions. It is not possible to determine the extent to which their self-reports might reflect unawareness, aspirational reporting, or social desirability bias; nor to assess the actual quantity of their waste. Regardless, the findings suggest consumers may respond well to messages treating them as already-knowledgeable and engaged, and to messages focused on budgets. They suggest benefits of modifying messages about food safety and freshness in order to expand acceptability of still-safe and still palatable older foods. Lastly, they suggest consumer-endorsed opportunities to shift business practices.

Conclusion: This first national survey directly focused on food waste can yield critical insights as the field develops, and can provide a baseline to assist in tracking progress.

Legal Issues, Food Labeling, and Policies Related to Food Recovery
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Food recovery – diverting unused and unsalable food from the waste stream and donating it for higher and better uses – is a straightforward, easily implemented, and elegant way to address the fundamentally irreconcilable problems of food waste and food insecurity. Unfortunately, many food businesses hesitate to engage in food recovery because they erroneously believe it to be fraught with legal, practical, and reputational risks. Fortunately, there are robust, easy to understand, and consistent legal protections designed to facilitate food recovery across the United States.

The federal Bill Emerson Good Samaritan Food Donation Act exempts those who make good faith donations of food and grocery products to non-profit organizations that feed the hungry from liability for negligently caused harm arising from the consumption of properly donated food. With a bit of education about this law, as well as some basic planning and employee training, food businesses can safely, sustainably, and responsibly rescue wholesome food from its shameful fate in the landfill, recapture precious resources, and potentially access valuable federal and state tax benefits, all while helping to feed hungry people in their communities.

To remain within the protections of the Bill Emerson Act, however, donors and recipients must comply with all applicable federal, state and local standards pertaining to food quality and labeling. Because the process of identifying specific standards that may pertain to recovered food can be daunting, the development and dissemination of legal informational resources is
essential. For example, understanding the legal significance of food product dating, navigating local food codes, being aware of permitting requirements or prohibitions of feeding food waste to animals are all essential to the formation of mutually beneficial, collaborative relationships among food donors, recipients and regulators. For these reasons, the Food Recovery Project endeavors to both educate stakeholders on the legal dimensions of food recovery and advocate for strategic policy reforms that will further promote the widespread adoption of low-risk, high benefit food recovery programs.

Analysis of the Food Waste Stream in a University of Pennsylvania Dining Hall
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Pilot research was conducted by a team of students in the Politics of Food class at the University of Pennsylvania, with the aim to characterize the different streams of food waste arising from a single dining hall on the university campus. There is little available information about food waste streams at this level of detail. This study builds on the work of a previous group of students, who developed a proposal for an institutionalized food recovery program that Penn Dining and Bon Appétit Management Corporation agreed to put to trial in a single dining hall for the 2014-2015 academic year. The present team continues to collaborate with Penn Dining and Bon Appétit, with the goal of identifying food waste streams comprising the total waste from an all-you-can-eat style dining facility. This site offers an ideal context, as the dining hall closes between each meal service, thereby allowing for more accurate data collection and reduced interference with kitchen operations. Food waste streams were measured from a single meal period (dinner) over the course of 10 days (weekdays of two weeks), including: unavoidable (kitchen trims during food preparation), recoverable (cooked but not served), non-recoverable (service station remains), and plate waste (dumped by individual dinners). Daily plate waste ranged from 110-167 lbs, with a mean of 138 lbs and a standard deviation of 21 lbs; whereas the other three food waste streams (unavoidable, recoverable, and non-recoverable) averaged between 13-17 lbs each. On a percentage basis, plate waste accounted for 76% of the total food waste with the other streams accounting for 7-9% each. Plate waste per person averaged 0.64 lbs over the 10 days (ranging 0.43 to 0.99 lbs), compared to the average 0.18 lbs "perceived" to be wasted by the typical diner surveyed. Our data indicate that over the 10 days a considerable amount of food (169 lbs) could be recovered from this particular dining hall, which would be enough to feed 140 people (one meal is 1.2 lbs, according to Feeding America). The amount of plate waste generated by every two diners would be enough to feed a third person. Furthermore, our results provide strong evidence that food waste reduction and prevention must focus on the consumers. We need to improve our understanding of factors that affect consumer behavior and identify ways to raise awareness, encourage responsible eating habits, and change wasteful behaviors in order to build a sustainable food system. This work is done with supervision from faculty in the School of Arts and Sciences, and the Veterinary School, as
Food Waste at West Philadelphia’s Samuel B. Huey Elementary School: Engaging Middle School Students in Food Waste Issues

Shayla, Djibril, Ethan, and Jarrett Stein

This fall a team of three 8th grade students at Samuel B. Huey Elementary School in West Philadelphia (52nd and Pine) worked together with a staff and graduate student at the University of Pennsylvania to implement a participatory action research project to better understand how much school food is wasted and why it is thrown away. The Food Service Division of the School District of Philadelphia is the 5th largest in the country, serving 29 million meals per year at a cost of approximately $85 million. Although thousands of meals are delivered each day and served, free of charge, to all students attending public schools in Philadelphia, there is little data on how much of this food is actually consumed. In a survey of 434 SDP workers conducted in 2013, 64% reported that at least half the food served at school is wasted. For our project, we measured school food waste using several different strategies. The research team measured plate waste on 3 occasions between October and November by weighing and sorting individual Kindergarten classroom waste. This was conducted by measuring total school food weight (food + serving containers), weight of individual serving containers, and then total waste. The waste was also sorted into categories so the number of unopened food containers could be measured. Kindergarten classrooms were chosen as research sites because the eating is self-contained and data collection was more efficient and accurate. Surveys, interviews, and photo-voice were also used to measure attitudes and beliefs about food waste among the upper grades. Our findings suggest that on average, approximately 35% of food is wasted in Kindergarten classrooms. Furthermore, when vegetables are served in individual serving containers about half are thrown out without being opened. These findings have significant implications, both nutritionally and financially. The most nutrient dense foods are the same foods most likely to be wasted. Wasting food is wasting money that could be spent on more palatable offerings. After the food is thrown out, the amount of waste is also related to the amount the school district needs to spend on waste management. We need to focus our energy on serving healthy foods the kids that they want to eat, and also increase education and professional development across the school food team- from administrators, to school food staff, to noon-time aids and teachers, to the students themselves.
The Effect of Public Policy on Food Rescue in Western Massachusetts

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Food waste occurs at multiple points in the food chain, and has negative effects on producers, distributors, consumers, and the environment. In this survey-based study, we examined food system constituents’ awareness of two policies in order to assess the gaps in current food rescue practices. The federal Bill Emerson Food Donation Act (BEA) of 1996 permits good faith food donation without fear of legal ramifications. The EPA’s Food Waste Recovery Hierarchy prioritizes the preferred order of waste reduction measures as follows: (1)Source reduction; (2)Feeding hungry people; (3)Feeding animals; (4)Industrial Uses; (5)Composting; and (6)Incineration/Landfill.

The study addressed two main questions: (a) Is the BEA achieving its purpose of encouraging local farmers, grocers and restaurants to donate excess food? (b) To what extent are local farmers, restaurants and grocers following the priority order laid out in the EPA Food Waste Recovery Hierarchy? I surveyed four groups of constituents in the western Massachusetts food system: Farmers (producers), Grocery stores (distributors), Restaurants (commercial consumers), and Food Bank agencies (food rescue non-profits). From a total of 204 surveys, average response rate across sectors was 32% (highest response was from farmers, 47%, and lowest response rate from food banks, namely 16%).

Survey results revealed widespread ignorance of the BEA (94% of farmers had never heard of the Act, and 75% of respondents from the restaurant/grocery sector). Food rescue agencies were the best informed regarding this federal legislation (less than 2 in 5 agencies surveyed did NOT know about the BEA).

We also found that the EPA’s waste disposal hierarchy is followed inconsistently: although slightly more than half of the restaurants we surveyed DID focus on source reduction (since less waste=higher profits), only 8% donated to feed hungry people, and 38% went immediately to composting. Not a single farmer surveyed practiced source reduction; less than half of them gave food waste either to people or livestock, and 56% skipped the first four steps in the hierarchy and went directly to composting.

The findings suggest two fruitful avenues for future collaborations: 1) there is an urgent need for organizations such as the Food Recovery Network (in the university/college food service realm) and the Food Donation Connection (prepared foods from restaurants, hotels and hospitals) 2) a campaign publicizing the federal Bill Emerson Food Donation Act could be an enormous help in moving excess food in the food chain to feed hungry people. Although grocers in Western Massachusetts do donate significant amounts of unsold and expired groceries to hungry people (via food banks), excess prepared restaurant foods are generally composted and miss the opportunity to feed the hungry.
WeHateToWaste.com

Jacquie Ottman
Founder and Principal, J. Ottman Consulting; Founder, WeHateToWaste.com

WeHateToWaste.com is an online forum for influential consumers, brands and other organizations committed to promoting long term culture change by openly discussing strategies and practical ideas for preventing wasted food, water, energy and materials at home, at work and on the go.

It was founded in 2012 by J. Ottman Consulting, pioneers in green marketing and eco-innovation since 1989 and advisors to Fortune 500 companies and U.S. government ecolabel programs including Energy Star and USDA Certified Biobased.

In founding WeHateToWaste.com, we hope to further our mission of meeting consumer needs sustainably by:

- Uncovering new strategies and practices for aligning business goals with waste prevention;
- Creating new knowledge by spotlighting best practices for preventing waste at home, at work and on the go across cultures around the world;
- Working proactively with businesses, government, and not for profits to co-create new products, services, messages and programs that can empower all consumers to live better via a enlightened, contemporary approach to waste prevention.

Guided by a proprietary thinking about how to live better by fostering a ‘no-waste’ mindset, conversations, stories and offline interactions among WeHateToWaste community members are mined for deep insights about strategies that can empower leaders to accelerate the market trend away from the disposable society towards more sustainable lifestyles, and establish a no-waste culture within their organizations.

Conversations at WeHateToWaste.com for preventing food waste have included a wide range of topics touching all aspects of the EPA’s Food Recovery Hierarchy including source reduction through shopping practices, portion control, food preservation through innovative packaging and technologies, innovative recipe development, food redistribution, and composting. Yet more conversations have spotlighted challenges associated with food expiration dates, cultural norms and strategies for encouraging consumers to eat underutilized food and instilling responsibility in children for the food they consume.
Going Hungry in the Land of the Plenty
Christopher Putvinski
University of Pennsylvania

Last year food insecurity was an issue for 49 million Americans, more people than there are in Canada. At the same time, the US is wasting up to 40 percent of its food supply. The goal of this documentary will be to answer one question: How is it that, with almost half of the country’s food supply headed for dumpsters or rotting in fields, 49 million Americans can find themselves confronting food insecurity? Questions and points which will be touched upon include the following: The link between poverty and hunger; what it is like to face hunger; how disadvantaged neighborhoods lack healthy food choices; what types of federal assistance are available, and perhaps the shortfalls, or benefits, of these; and, finally, why so much food is going to waste when so many people are struggling to feed themselves. Interviews with experts—government and elected officials, academics and volunteers—who are leading the fight to tackle poverty and hunger will be utilized, as will stories from those who face food insecurity on a daily basis. To illustrate the point about food waste, tours of dining facilities and their levels of food waste will be filmed, as will interviews with experts.