



## Innovations to Address Food Loss and Waste in a North American Context

### Overview

The Fourth Session of the United Nations Environment Assembly (UNEA-4) will be held in Nairobi, Kenya from March 11 to 15, 2019 on the theme *Innovative Solutions for Environmental Challenges and Sustainable Consumption and Production*. In preparation for UNEA-4, the UN Environment North America Office and its partners will organize and host virtual consultation workshops in the US and Canada on January 22 focused on innovations to address food loss and waste. These workshops will encourage discussions about innovations in technology, governance, policy, and finance that can support the development of new business models, the next generation of products and services, new policy instruments & governance structures, and ultimately sustained lifestyle changes. Key questions, which will inform UNEA-4 discussions among world ministers of environments, include:

- What are the existing and proposed innovative solutions that can help address environmental challenges?
- What are the potential strategic partnerships, initiatives, and innovative solutions for sustainable consumption and production?
- What are the potential policy interventions; environmentally sound technologies; sustainable financing schemes; education, research and development; sharing of best practices; capacity building and awareness-raising; private and public partnerships; social innovations and new business that foster sustainable development?

Tackling the 30% of food in North America that is produced but never eaten represents an opportunity to address multiple global goals, from zero hunger to lower carbon emissions to responsible waste management. Because of the large amount of resources – water, energy, nutrients, labor, etc. – embedded in the food supply chain, any waste at the end of the supply chain represents a significant loss of effort, and reducing or redirecting that food loss and waste means less impact, lower carbon emissions, and potentially fewer hungry people.

Document prepared by



Food waste represents 20% of the material in landfills, where it turns into methane, contributing to the 25% of the region’s total greenhouse gases associated with food (Vermeulen, Campbell, and Ingram 2012). Beyond the cost to grow, process, and distribute the food, it also costs almost \$2B/yr in landfill tipping fees (CEC 2017). Simultaneously, about 44M people across the U.S. and Canada suffer from hunger and food insecurity (Feeding America, Food Banks Canada) while the caloric value of lost food is enough to feed 260M. While food loss and waste represent a major challenge for North America, there are increasing efforts by diverse regional actors and innovators working to address the issue of lost and wasted food.

This document provides background information on major sources of food loss and waste in the North American context, and focuses on the innovative solutions from different stakeholders working to reduce food loss and waste.

### Core Concepts

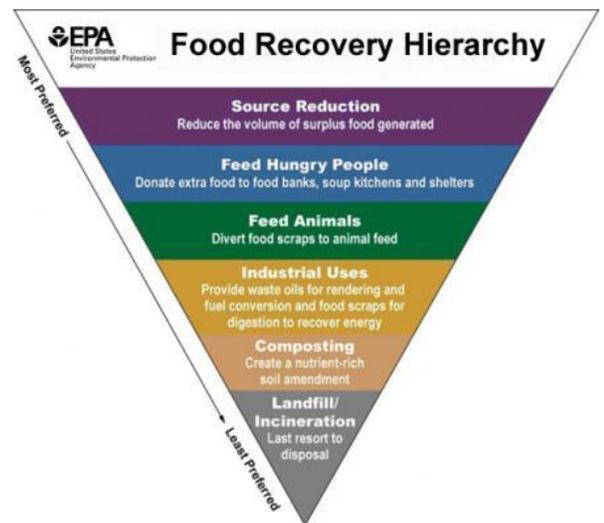
**Food loss** refers to food intended for human consumption but is damaged or otherwise unavailable for consumption between growth and final sale. This can include weather damage, rot or mold, inefficiency in processing, and more. Food loss is a larger portion of food system inefficiencies resulting from inadequate technology & management or poor infrastructure such as refrigeration.

**Food waste** refers to food intended for human consumption that is discarded or otherwise goes uneaten as a result of human choices. This includes edible but imperfect or visually unappealing produce, food purchased but not eaten by consumers at restaurants or for home consumption, safe food discarded by retailers based on ‘sell-by’ dates, and more.

The **food supply chain** is generally comprised of five major stages (adapted from CEC 2017)

- Agricultural production, including farm activities through harvest and bulk storage
- Processing, including treatment and packaging
- Distribution, including transportation and wholesale
- Retail & Food Service, including grocery stores, restaurants, corporate cafeterias, etc.
- Consumption, at both food service locations and through home preparation

The US EPA has also established a **food waste reduction hierarchy**, organized in terms of “most benefit to the environment, society and the economy”. This hierarchy starts with source reduction and moves through feeding people and animals, reprocessing, and finally composting as an alternative to landfilling (US EPA 2015).



## **Common Sources of Food Waste**

### *Overproduction*

In many different circumstances, more food is supplied than can be consumed or purchased, causing the remainder to be wasted. From a retail perspective, buffets or large portion sizes at many restaurants are a publicly visible source of food waste, although institutional cafeterias or catered events generate equal or greater amounts of excess food on a daily basis.

For home consumption, grocery stores will tend to overstock perishable goods in the interest of meeting unexpected demand, but then need to discard the excess on a consistent basis. This overstock is a business decision that wasted food is better than empty shelves and potential loss of business.

### *Product labelling confusion*

The US and Canada both label products using a mixture of ‘Best by’, ‘Sell by’, or ‘Expiration’ dates. These terms lack legal definition in either country, and, per USDA, are intended to serve as guidance for stores or consumers for peak quality, without any relation to spoilage or safety (USDA FSIS 2016). However, they lead to confusion among consumers, who interpret them as a safety limit and discard unspoiled food that is past the stamped date.

### *Perception of liability from food donation by businesses*

Both the US and Canada have well-established ‘Good Samaritan’ laws that protect donors from liability over health risks from food donations made in good faith. However, many businesses remain unaware or unconvinced of these legal protections, impeding redistribution of food from both fresh (e.g. bagels from a bakery) or packaged (e.g. orange juice from a grocery store) sources. Awareness is shifting, and more locations are comfortable donating (Mugica 2017) but even with a low-risk legal framework in place, food waste happens in areas that also have hungry people.

### *Perception around ugly produce*

Most North American consumers have high aesthetic requirements, particularly for produce. This imposes a demand to early parts of the supply chain, limiting what portion of a harvested crop can be sold to retailers. A new wave of entrepreneurs are finding ways to use aesthetically unsalable produce in juices or processed products, but these efforts are still small and cannot use all crops.

## **Barriers to Implementing and Scaling Innovative Approaches**

The nonprofit ReFED is focused on tracking and advancing innovative solutions to food waste. According to ReFED’s Food Waste Innovator database, only 11 such companies existed in 2011 and now there are 69. (<https://www.refed.com/tools/innovator-database/>). In contrast, there were 1,910 startups founded in the U.S. in 2017 alone (CrunchBase). The relatively small number of innovators working on food waste can be traced back to a limited

market opportunity. The set of consumers willing to pay more for best practices is small. In many areas, the cost to collect, transport, and landfill food is still lower than that to collect, transport, and compost it, even with the value of the resulting compost (Layzer and Schulman 2014).

Moreover, the average North American household spends just 6.7% of its income on food each year, compared to 20% in South Africa or 30% for US households in 1950 (BLS 2006; USDA ERS n.d.). Food is not a large portion of a household budget, even with relatively high-intensity diets. As a result, wasting food does not impose significant economic harm on many households, and there is minimal value to capture for innovators aiming to reduce this waste.

Clear market opportunities do exist in several contexts. For pre-consumer produce that would be wasted because of aesthetics, value may come from [re]processing into new food products. For any pre-consumer sections of the supply chain, lower waste as a result of using a new service saves money for businesses. Food waste also has a direct value as an energy source when used in biodigesters or power plants, or as a source of nutrients through compost or direct animal feed. Finally, in the increasing number of areas with high landfill fees or policies that prohibit food or organic material from being sent to landfills, demand exists for cost-competitive management options.

As innovations are developed and piloted, they face a host of difficulties scaling up. Some are shared with the broader pool of startups, including access to sufficient funding. Others are more specific to the food or waste sector, such as access to USDA-certified facilities for any food processing, corporate customers' consistency standards for new products (limiting startups' ability to close large contracts), municipal restrictions on where waste facilities can be located, and chicken-and-egg problems between capital-intensive facilities and guaranteed demand for services from municipalities or organizational sources such as medical & academic cafeterias.

## **Potential Responses**

There have been broad efforts to raise awareness about the prevalence and impacts of food waste, both globally and in North America, over the past 7 years since the first major report estimating global food loss and waste at about 1.3 billion tonnes per year was published by FAO in 2011 (Gustavsson, Cederberg, and Sonesson 2011). A recent report from the Natural Resources Defense Council (NRDC) focusses on policy-driven changes, while the EPA's Food Recovery Program highlights retail and institutional actors (Mugica 2017; US EPA 2015).

NRDC and Trillium Asset Management make the business case for food waste reduction, highlighting the consequences of wasting food, the associated business risk that could impact financial performance, guidance for corporate action, and key examples of corporate leadership (Pearce and Berkenkamp 2017). The North America business community has

taken note of the challenges associated with food loss and waste and many innovators are working to create economically viable solutions.

### *Source Reduction*

Many barriers to reducing food waste result in people or organizations buying more food than necessary, with excess going to waste. Decreasing the amount purchased eliminates the need for the initial production and all upstream impacts that are associated with it. Classic examples grocery stores providing bulk sections and deli counters where customers can buy exactly the quantity required.

Specific innovative organizations around source reduction include:

*Spoiler Alert* works with grocery stores to do product-specific tracking for expiration dates and purchase planning, enabling more targeted promotions and lower purchasing closer to predicted consumer demand.

*Love Food Hate Waste*, launched by Metro Vancouver and now from the Canadian National Zero Waste Council, provides guidance to consumers about seasonal recipes, what and how much to buy to plan out healthy meals without waste, how to optimize their refrigerator to preserve food, and what food labels such as 'Best By' mean for safety.

(<https://lovefoodhatewaste.ca/>)

Meal kit companies such as *Blue Apron* or *Plated* can show reductions in food waste as a result of being able to plan meals for thousands of people based on what food is available from suppliers – matching effective demand to agricultural availability – and deliver exactly the amount of each ingredient that customers need. Newer entrants to this sector such as *Sun Basket* are also eliminating much of the single-use plastic associated with many separate ingredients.

### *Feeding people*

Traditionally, food banks and soup kitchens have played a key role in redistributing food from established actors such as grocery stores, particularly for canned or otherwise preserved food. Adapting digital technology to coordinate many different actors, new volunteer groups have appeared in cities across North America to shuttle extra food to local shelters or soup kitchens (Walla 2019).

Starting in 2015, grocery stores in Quebec have coordinated increased donations to food banks. The program now encompasses over 600 stores and handles over 10,000 tonnes of food per year, with coordination by Food Banks Quebec overcoming logistical complexity for individual pairs of stores and food banks (Food Banks of Quebec 2017). A broader institutionalization of this program from outside North America comes from France, which has banned grocery stores from throwing away edible food since 2016.

Upcycling food entrepreneurs, mainly start-up companies, use food waste, typically pre-consumer food waste, and transform it into a new material or product with a market value. Some examples of these entrepreneurs include:

*Copia:* Working with hotels, corporate cafeterias, hospitals, and other institutions, Copia matches uneaten food with local actors who can use it to feed hungry people. They provide pickup and delivery, and automate the paperwork for claiming tax deduction in the US, enabling them to operate as a for-profit service that feeds people and saves money.

(<http://www.gocopia.com>)

*ReGrained:* in 2013 this San Francisco-based company piloted the first ReGrained granola bar. ReGrained utilizes the byproduct of beer brewer's grain and transforms this waste into nutritious and delicious snack bars (<https://www.regrained.com/>).

*Enterra Feed Corporation:* in 2018 this British Columbia-based pioneer became the first insect meal product to be approved in North America for the aquaculture industry. Enterra converts pre-consumer food waste into highly nutritious feed for poultry, aquaculture, and pets using insect fly larvae (<http://enterrafeed.com/>).

### *Composting*

For post-consumer food waste, most food is spoiled or inedible. Municipal-scale composting has evolved from a focus on yard and agricultural waste to industrial-scale facilities that can take waste animal products along with produce and grass clippings. This has enabled many communities to bring in composting as an alternative to sending organic matter to landfills. Overall, 45% of households in Canada in 2011 composted kitchen scraps (Government of Canada 2013). A well-tracked value for the US is not available, but a 2013 survey estimated it at 38%. The most sophisticated large city is San Francisco, which has had curbside compost collection since 2000 and mandated separation of food waste from landfill materials since 2009 (Layzer and Schulman 2014).

Establishing legally binding mandates serves as a great incentive to develop better organic waste management and increase composting. At a state or provincial scale, Nova Scotia has banned organic waste from landfill disposal since 1998, driving a move towards composting in many municipalities. Vermont's Act 148 bans the landfilling of all food scraps by 2020 (<https://dec.vermont.gov/waste-management/solid/universal-recycling>) and has motivated entrepreneur action.

For a set fee, *Grow Compost* of Vermont, a food scrap hauling and composting businesses, collects and records the quantity of food scraps generated by each customer, such as hospitals, schools, and restaurants. Consumers paying for this service received certificates on their greenhouse gas emission reduction and energy saving from diverting their food scraps from landfills, which are later utilized to promote their responsible business practices (<http://www.growcompost.com/>).

## *Materials & Energy*

As a final option before landfilling, food waste can be used as a source material if it is separable, or as a source of energy through either anaerobic biodigesters that produce fertilizer and methane-rich biogas, or through incinerators that produce electricity.

*BioLogiq*: this Idaho-based innovator produces bioplastics out of waste potato starch. This new bioplastic innovation is stronger than conventional plastics, which results in utilizing less plastic to do the same job (<https://www.biologiq.com/>).

*Quantum Biopower*: a Connecticut-based company pioneering the cause of turning food waste into electricity and natural gas production in the Western Hemisphere, a common practice in Europe. Via anaerobic digestion, Quantum processes 40,000 tons of food waste a year from local businesses and produces enough electricity to power 1,000 homes (<http://www.quantumbiopower.com>).

## **Questions for Discussion**

With this background understanding of the issue of food loss and waste and examples of current innovative approaches from North America, the consultation workshop will aim to solicit ideas on additional approaches that stakeholders can pursue, along with ways to eliminate barriers to new approaches succeeding. Participants are invited to consider the following questions for discussion at the January 22 workshop:

- What have North America stakeholders observed as **major trends** related to innovations to address food waste in the past two years?
- What are the drivers of, and most **common barriers** to, innovation in food systems and waste streams for North America?
- How do **various sets of actors** influence these drivers and barriers, and how can they most effectively respond to them in order to enhance sustainable food production and mitigate food loss and waste?
- How can successful experiences in food loss and waste management be **catalyzed and scaled-up**?

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