The Economic and Environmental Impact of Food Waste

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Introduction

Food waste is becoming a bigger and bigger issue. Food waste mainly occurs at two separate stages in the food supply chain. These distinct points in the cycle are called food loss and food waste. It will be important to define these terms going forward. According to the United States Environmental Protection Agency (EPA), food loss refers to unused product from the agricultural sector. Meanwhile, food waste refers to food that has been served but not eaten, spoiled food, or inedible byproducts of food processing. When looking at the food supply chain, food loss occurs in the beginning of the process at farms and production facilities, and food waste occurs on the consumer side of the food supply chain, such as during distribution and consumption. In less developed countries, food loss is much more of a concern due to less effective farming practices and production facilities. On the other hand, America produces most of its waste during the consumer stage of the food supply chain. In fact, "each American generates nearly 200 pounds of food waste a year, estimated to be the highest amount of any country" (Bloom). This paper looks at both points of loss during the food supply chain and then goes into possible solutions for reducing and managing food waste.

There are many negative effects of food waste that this paper examines. First, there is the environmental impact of wasted food. Growing food spends resources that are ultimately wasted when food ends up going unconsumed. Land, energy, and water all end up being wasted, and this takes a toll on the environment. Food waste contributes to climate issues, which makes growing and producing food even more inefficient in the future. Farming is already an inefficient process, as it is very resource intensive, but wasting resources does not have to be an accepted cost of doing business. Minimizing food waste means that resources will be able to be used more efficiently and effectively. A more efficient use of resources also has economic benefits. Wasted

resources also mean wasted money, time, and labor in the food supply chain. It costs farmers money to grow the food, but they do not see revenue if food loss occurs before they can sell it. This is the same for distributors who buy the food from farmers but have food loss occur before it reaches the consumers. Consumers end up wasting their money when they buy food that they end up throwing out. Overall, the goal is to be sustainable economically, socially, and environmentally, and "Wasted food is the antithesis of the triple bottom line" (Tavill). Every player in the food supply chain can save money, and help the environment, by minimizing the amount of food waste that they produce.

Food Production

When looking at a topic such as food waste, it is best to begin with where the food comes from: farms. Back in the 19th century, most of the population lived in rural communities. This meant that people either farmed the own food that they consumed, or had their food supplied by a local farmer. This way of life was disrupted by urban expansion. People were leaving farms and moving into densely populated cities. The number of farms decreased and the size of remaining farms increased. This led to a shift in our countries' relationship with food. Farming went from being about sustenance to being about profit. City folks were having their food transported from far away. There was now a physical distance between people and their food. With this physical distance comes a mental distance as well. Now that people are not growing their own food, it is much easier to take it for granted. People now encounter their food at the grocery store instead of in the field like their ancestors had. This shift in our relationship with food is the basis for food waste steadily growing over the years.

When food is thrown out, more than just the food itself is wasted. For example, when someone throws out ground beef that they let spoil in their refrigerator, all of the time, resources, and labor that went into growing and processing the cow are wasted. Going back to the distance between consumers and their food, it might just seem like throwing out $6 of ground beef, but it goes deeper than just the food itself. Food is necessary for survival, so to a certain extent, these resources are going to be used anyway, but there is a big difference whether or not the food is consumed. Resources are not wasted when the food is consumed because it fulfilled a necessary role. However, when food is thrown out, the resources that created the final product are wasted.

To put this into perspective, "Getting food from farm to fork consumes 10 percent of the total U.S. energy budget, uses 50 percent of land, and swallows 80 percent of all freshwater consumed in the United States" (Gunders). The amount of food that our country produces drives our resource consumption through the roof. Once the food is grown on the farm, the food supply chain expands to transporting the food and storing it once it reaches its destination, whether that is domestically or abroad. This entire operation requires an insane amount of time, money, and labor to grow, produce, and transport food. However, "Despite the resources required to produce food, between 30 and 50 percent of food grown for human consumption in the United States never reaches a human stomach" (Nunley). This means that massive amounts of resources are being wasted in growing food that never ends up fulfilling its role of sustenance. Reasons for this can range all across the food supply chain. Maybe a farmer left a crop unharvested, food spoiled while it was being transported, or a consumer ended up buying food but never using it.

This section of the paper looks specifically at the growing and processing part of the food supply chain. Although America is one of the most advanced countries in farming and food processing procedures, we still produce an immense amount of food waste in getting food to the

consumer. Starting at farms, more than 6 billion pounds of food are left unharvested in the field or unsold by the producer each year (Gunders). There is food that is left in the field unharvested, or harvested but unwanted by buyers. This could be for many reasons, including "overplanting, labor shortages, or food-safety scares" (Levin). These can be considered forecasting errors that can be accounted for next time. However, another reason for food being left unharvested is because it does not meet certain cosmetic standards. An apple that may be used for apple sauce because of its odd shape, size, or color is a smart way to use nutritious, otherwise perfectly fine produce. However, this is not the case for all crops. Therefore, food that was cared for all the way to harvesting is left to rot because it does not meet our beauty standards. "Ugly food" marketplaces are directly tackling this issue and will be discussed later on in the paper.

Moving on to food processing plants we see even more food waste. Most of the food inside of a typical grocery store in America can be traced back to a production facility. The 21st century has an offering of processed foods that has never been seen before. Previously, many people ate a diet of whole natural foods. Now, that is no longer the case. Food production plants receive whole foods and produce an incredible variety of foods from them. All of this processing means that waste will be generated as a byproduct. In fact, for every 100 pounds of product made in the United States, an average of 3,200 pounds of waste are generated (Hawken). Many processing plants just see waste as a cost of doing business. Food loss at production plants is "planned and accounted for as 'yield losses'" (Tavill). Since these processing plants are businesses seeking a profit, the best way to appeal to them is through money. A more efficient plant that repurposes scraps instead of throwing them away generates less waste, and in turn they can generate more profit. A simple analogy would be rolling unused scraps of cookie dough together to create more cookies instead of just throwing them out. However, not all waste can be

repurposed as easy as that. Some parts of processed food are just simply unusable, and this is where creative waste solutions come in. These possible solutions will be explored later in the paper but examples include composting, recycling into energy, or turning into animal feed.

Consumer Food Waste

Working through the food supply chain, we now end up on the consumer side of things. This is where waste is no longer created by flaws within the supply chain system, but instead due to personal decisions made by the consumer. As consumers, we have a habit of purchasing more than we need. When we take more than we can use, we are creating offset waste. Something is already wasted by the time a consumer buys it if they have no use for it. That product, in this case food, is not waste when it is thrown away, it is already waste when it is bought. This image of walking around the grocery store with a cart full of waste, and then paying hard-earned money for waste, would create more conservative consumption habits. However, the exact opposite is taking place. Our food system tricks us. We walk into the grocery store and we see fully stocked shelves and believe that there is a never-ending supply of food. This is when people get stuck in a cycle of buying a head of lettuce each week just to throw it out the next. Do you really care if you spend an extra $3 each week? Well, that money, and that waste, adds up.

Over the course of a year, the average family of four wastes $2,200 worth of food each year on groceries that are purchased but never consumed (Bloom). Assuming that a regular grocery trip for this family of four is $200, that means that they could pay for 11 grocery trips with the amount of money they throw away each year. This is not a small amount of money to waste. Over the last 50 years, this trend of waste has increased over 50 percent (Hall). Food

waste is a problem that is far outpacing food waste solutions. In 2010, Americans threw away over 34 million tons of food (EPA). This is about one-third of the total human food supply that is wasted annually (Gunders). These numbers can feel like they are too big to do anything about, but they all start with the decisions we make as consumers.

There are flaws within the food supply chain regarding government regulation and private business procedure, but the consumer themselves can make a big difference depending on their consumption habits. In fact, "the end stages of the supply chain – food retail, foodservice, and households (consumers) – have been identified as key targets for waste reduction efforts in developed countries" (Ellison). Households especially are seen as key targets for waste reduction because they produce so much waste relative to their size. Households generate the greatest amount of waste in our food system with an estimated 76 billion pounds annually. Reasons for so much waste include over-purchasing, neglecting leftovers, improperly storing food, and trouble with portion size and expiration dates. These small incidents throughout the week fill up trash bins, and collectively fill up landfills. Luckily, the fix is just as small. By being a smarter consumer when at the grocery store or out to eat, one can make a dent in the amount of waste they produce.

The United Nations have recognized the importance of conscious consumer habits by issuing Sustainable Development Goal 12.3. Their goal: "*By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses"*. That, in one sentence, is the focus of this entire paper. They put special emphasis on retail and consumer level waste, the second half of the supply chain, by giving a specific goal of halving that number. That goal can be reached by people making more mindful decisions as a consumer. The first step in reducing waste is to not create it

in the first place. SDG 12.3 is very similar to the U.S. Food Waste Challenge, a program sponsored by the United States Department of Agriculture and Environmental Protection Agency. This challenge also specifically targets reducing waste at the consumer level. “To date, over 170 colleges and universities have joined as participants in the U.S. Food Waste Challenge, with campus dining services being a key target for waste reduction efforts” (USDA). America only has 4 percent of the global population, but we produce 30 percent of its waste (Gunders), and initiatives like these helps to reduce our country’s waste production.

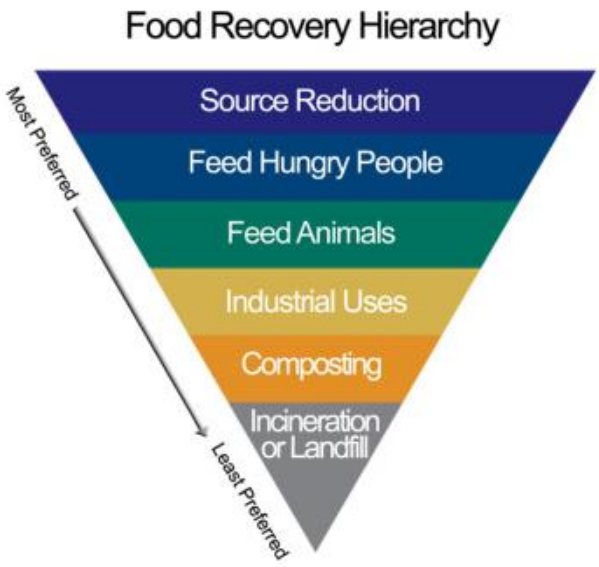
Looking at consumer level food waste, there are not just environmental and economic concerns, but moral ones as well. Our country is in a position where some people have an abundance of food and others are struggling to have food on their table. It is startling that this dichotomy exists all while we are producing absurd amounts of food waste. At least 49 million Americans, or 15 percent of the population remain hungry (Bloom), while the number of food waste climbs each year. Many families are classified as food insecure, which the USDA defines as “having limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways”. This is a sad definition, especially keeping in mind that perfectly fine food gets thrown away. Some kids go to bed hungry while other kids refuse to eat dinner because they do not like what is served. How can we take more than we need, and throw it out, knowing that somebody else could really use it? That is the kind of reflection that leads to more conservative consumption habits. Now, being a more conscious consumer is not going to directly feed the hungry, for real change to take place we need to consider the distribution of food. That is a completely different topic, but this would require an overall of our nation’s food distribution infrastructure. This problem goes a lot deeper than donate your leftovers, but the moral implications of waste should still be considered. Not

only does wasting food hurt the environment and your wallet, but there are moral dilemmas to consider as well.

Possible Solutions

When looking at how to solve the problem of food waste, there are many factors to consider. The biggest factor to keep in check is our own expectations. Food waste is at the intersection between how we produce food and how we dispose of waste. Therefore, the problem of food waste does not have one single solution that will fix everything. If we produce less food, but still dispose of all food waste in landfills, then we will see a smaller scale of the same problems that we face now. Likewise, if we efficiently dispose of all food waste, but still produce the same amount of food, then we are making things harder for ourselves. The best approach is to produce less food and dispose of the remaining waste in an efficient, effective manner. One without the other does not give us the best results possible.

The following graphic is from the US Environmental Protection Agency featuring a Food Recovery Hierarchy:



First, the most preferred method is source reduction. The best way to reduce the amount of waste that we produce is to reduce the amount of surplus food generated. This goes back to the idea of being a more conscious consumer. By being a more conscious consumer, we can change the habits of food suppliers through changing our own consumption habits. If people stop over-consuming then suppliers will stop over-producing. There will be no benefit to producing extra if there are no consumers for it. This approach would require long-term discipline as consumers in order to see real change occur. However, this approach will yield the best results.

Second, there is the option to feed hungry people. This is a great option. Feed people with your surplus food instead of just throwing it out. Donating to food banks, soup kitchens, and shelters has multiple benefits. Most importantly, it helps people in need. Also, it reduces the amount of food that ends up in a landfill. One snag in this option is that there are many rules in place about donating food. The red tape makes donating food a bit of a hassle in some cases, and it requires more effort than just feeding the trashcan, but the good that it does is well worth it.

In the same vein, food that is going to be wasted can be turned into animal feed. Animals can eat things that would be inedible for humans. What is considered scraps to us could be food for animals that we will eventually consume. Recycling food waste into our future food is an efficient way of handling waste and providing ourselves with food in the future. As Tavill writes, “Most of these ‘inedible’ food waste streams, if they cannot be further processed into food components, can be ‘recycled’ for animal feed, energy recovery or other industrial purposes, composting or soil amendments through land application.” This idea of “recycling” food waste also applies to the options of industrial use and composting. Oils can be rendered into fuel and food scraps can be digested to recover energy. Food can still serve a purpose, even when it is considered to be waste.

Composting has been popular in the United States since the 1960's J.I. Rodale introduced American gardeners to the benefits of composting for better soil quality. Since then, composting has continued to gain traction through the country. Now, facing an alarming amount of food waste being produced, it is time for local governments to implement municipal composting programs. There are multiple benefits to composting. First, it diverts waste from landfills. Second, it improves soil quality. As the US Environmental Protection Agency advocates, "Properly composted organics improve soil health and structure, improve water retention, support more native plants, and reduce the need for fertilizers and pesticides." With improved soil quality, future food production becomes more sustainable and requires less resources. Healthier soil also means fewer chemical fertilizers being used, which are harmful to both the environment and humans.

There is no argument that a city-scale composting initiative would not work due to San Francisco's success. Because of their strong composting and recycling programs, San Francisco has "reduced the amount of trash that they send to landfills by 80 percent and composts 225,500 tons of organic material each year". Other communities are taking notice to the advantages of composting, as the number of composting programs has grown by 65 percent in the last five years. Composting is key in the effort to reduce and recycle food waste. Composting takes organic materials, food or otherwise, that have no more use and turns them into a useful resource. It is not impossible to predict that composting facilities will eventually outnumber landfills.

As seen as the bottom of the hierarchy, landfills should be the absolute last choice in discarding of food waste. However, landfills are the most used method in this hierarchy. In 2018, EPA estimates that:

> *"About 63 million tons of wasted food were generated in the commercial, institutional, and residential sectors, with about 32 percent being managed by animal feed, bio-based materials/biochemical processing, codigestion/anaerobic digestion, composting, donation, land application, and sewer/wastewater treatment."*

This means that 68 percent of that year's food waste, or just under 43 million tons, were disposed of in landfills. If the use of landfills continues to outpace all other food recovery methods *combined*, then there is no chance of solving the problem of food waste. When looking at landfills, "more food reached landfills and combustion facilities than any other single material in our everyday trash." (US EPA) When food is sent to a landfill, the nutrients never return to the soil and the organic material rots and produces methane gas. Over a 20 year period, methane gas is 56 times more potent than carbon dioxide, and landfills are the third-largest source of methane emissions. Compare the disadvantages of landfills to the advantages of composting; reduced food waste, a more sustainable food system, and fighting against global warming and pollution.

Conclusion

Every time that we eat, we are producing food waste. Even if we eat everything on our plate and all of the leftovers in the fridge, then there is still waste that was created in the production of the meal. This is just the reality of our situation; we can not completely eliminate food waste. It would be impossible to be totally efficient in our production and consumption. There will always be some waste. However, that is not an excuse for the incredible amounts of waste that we produce. There is "necessary waste" which we cannot eliminate, and then there is "unnecessary waste" which is created from over-producing and over-consuming. Food requires

a massive amount of resources to be grown, produced, and transported to our tables. Wasted food means these resources were also wasted. However, most consumers are not cognizant of this because there is a disconnect. Food is grown so far away from us that we lose sight of the entire supply chain that occurs. Likewise, food is disposed of us so far away that we lose sight of that as well. This leads to people consuming and wasting without a second thought. Therefore, the problem of food waste occurs at the intersection of food production and food waste. Both of these issues must be addressed in order to make a change in the amount of food waste that we produce. The most important contribution an individual can make is producing less surplus by being a more conscious consumer. Then, the remaining "necessary waste" can be recovered through various methods such as donating and composting. Food waste is gaining recognition as a legitimate problem, and action needs to be taken now. Converting food waste into a resource will have enormous environmental, social, and economic benefits.

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