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FOOD WASTE: A PRIMER

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ABSTRACT

World hunger is on the rise despite the fact that we now produce enough food for everyone on the planet. Food waste is a worldwide epidemic. It is a significant challenge and has become an issue of great global concern. It has been identified as a significant social, economic, and environmental problem. An effective food strategy must address the issue of food waste. It is time for the average person to realize that throwing away food is no longer acceptable. Effective food waste management is required to reduce landfill utilization and environmental impacts. This paper provides a primer on food waste.

Key Words: Food Waste, Food Loss, Food Saving, Food Recovery

1. INTRODUCTION

For some time to come, we will be occupied with the providing food, clothing, fuel, and shelter for nations. Food is an indispensable nutritional source for all humans. Food waste poses a threat to environmental and food sustainability in today's world. It is the single major contributor to total waste volume in landfills. It is becoming a central issue of this century, affecting both developed and developing nation. There is no society or culture in history that has no waste at all. Food wastage is severe in developed countries, particularly in United States and Europe. America is a society that has more than enough food to feed everyone, but the abundance is accompanied by tremendous waste. Currently, one third of the food produced globally for human consumption is lost or wasted. Some consider food waste as the dual responsibility of the government and

and the individual citizen. Figure 1 illustrates a typical food waste [1].

Food loss or food waste is the decrease in the quantity or quality of food. It occurs from post-harvest up to the retail level. Food waste or loss occurs at every stage of the supply chain: on the farm, during distribution, at the store, and in our homes. Food loss mainly an issue in developing countries, while food waste tends to be a major issue in developed countries. Food waste can be divided into eight types: fresh fruit, fresh vegetables, meat and fish, drink, bakery, dairy and eggs, meals [2]. Figure 2 shows edible food wasted by category [3].

Food waste is an economic issue as well as environment problem. It is essentially the waste of land, water, energy, labor, and capital resources that are used in the food production. It is increasingly becoming a national and international concern [4]. It greatly impacts the three pillars of sustainability: economic, social, and environmental aspects. Sustainability is a critical societal issue in food waste. Food wasting behavior is an issue related to sustainable development and consumption. Several factors and influences are responsible for sustainable behavior around food. These include education level, availability, convenience, attitudes, price, gender, and family background [5].

Food waste is also a health-related issue. Obesity has become a health crisis in America. Being overweight or obese is a risk factor for many diseases and conditions, including type 2 diabetes, hypertension, heart disease, stroke, liver disease, sleep apnea, and certain types of cancer. The responses of farmer's markets, food hubs and municipal compost, have been ineffective at addressing this problem [6].

2. REASONS FOR FOOD WASTE

Food waste is food that is lost during any of the four stages of the food supply chain [7]: (1) producers, (2) processors, (3) retailers, and (4) consumers. It is a component of food loss, which is the decrease in quantity or quality of food. The use of machinery in harvesting can cause waste, as harvesters may not be able to collect just ripe crops. Retail stores throw away large quantities of food that they cannot sell. Consumers are also responsible for food waste. They can reduce spoilage by planning

their food shopping, avoiding potentially wasteful purchases, and storing foods properly. Food waste may also be due to overbuying or letting food spoil.

Food is wasted in many ways. Food can be wasted by farms, consumers, retailers, supermarkets, manufacturers, restaurants, hotels, and even food banks. Consumers are the biggest food wasters. Government, through bills and legislation alone, will not solve all food waste problems. Food recovery groups are springing up all over the world, being concerned over the impact of waste on people and the environment. These include Feeding America, Food Recovery Network, Community Plates, MealConnect, and Further With Food. They are committed to reducing the needless waste of food so we can feed our families and feed people facing hunger -- children, seniors and families who need it most.

Food waste can be avoidable or unavoidable. Unavoidable food waste emerges from the preparation of food, i.e. peels, bones, shells, tea and coffee unds, etc., which are commonly not regarded as edible. Avoidable food waste consists of products that could have been eaten and food which was left to go bad (e.g. dry bread, rotten fruits and vegetables) [8].

3. REDUCING FOOD WASTE

What can we do to curb food waste and food loss? Food waste prevention is becoming a priority in many waste management policies worldwide. Food waste occurs at every point in the food system. It could be produced from four sources: raw material waste, food processing waste, post processing waste and post consumer waste. It could also come from the residential sector and the commercial sector such as restaurants, hotels, and hospitals. Addressing consumer food waste is one of the potential keys to achieve the national goals. We address food waste at the levels of food producers, retailers, and consumers.

1.Food Producers: Addressing food waste at the primary production stage of the food system is critical. There are a number of causes of on-farm food waste including discrepancies between supply and demand for food products, rejection of food based on aesthetic and/or quality standards, pests, weather, inappropriate irrigation, inappropriate use of fertilizers and packaging, inappropriate harvesting, and unsuitable storage method. Addressing food waste at the farm level may be beneficial as food wasted on farm is often in edible condition. Food waste occurring at the farm level is difficult to measure [9].

2.Food retailers: Once food is finished with harvesting and transportation, it is ready to be sold in the retail. Food retailers, including the supermarkets, represent the end of the supply chain and the interface between the food industry and customers. They have a powerful role to play in food waste prevention. They may be considered to be legitimately engaging in socially responsible behaviors to lower food waste [10]. Retailers have a powerful and unique opportunity to guide consumers to waste less and contribute to food waste avoidance. They can do so by making it convenient, attractive, and normal to waste less food. Doing this offers a three-way win-win-win relationship between what is good for consumers, the environment, and for retailers. Retailers can take various food waste avoidance actions including pricing, communication about food waste issue, collaboration with other actors, and in-store management [11].

3.Customers: Household food waste originates in three predictable stages: shopping, storing, and serving. This means that food can be purchased but never prepared, prepared but never served, or served but never eaten [12]. Everyone has a part to play in reducing food loss and waste. Throwing out your food contributes to climate change. Consequently, it is time to realize that throwing away food is no longer acceptable. We need to change our attitudes towards food waste. The following tips are designed to help you minimize food waste at the grocery store, at home, and during meals [13].

- Shop smart and buy only the things needed for the meals. use grocery lists, and avoid impulse buying.
- Check your refrigerator and cupboards to avoid buying food you already have.
- Keep your fridge organized so you can clearly see foods.
- Have a proactive strategy to use the food you have with the aim of wasting less.
- Pickling, drying, canning, fermenting, freezing, and curing are all methods you can use to make food last longer.
- Donate nutritious and untouched food to food banks to help those in need.
- If you have to throw something away such the leftovers, then compost the food waste and convert food waste into a useful resource.
- Wasted or unwanted food can be used for things other than human consumption such as being used to feed animals.
- Food waste can be biodegraded and reused to fertilize soil.

There are endless ways you can reduce, reuse, and recycle your food waste. Do your part to minimize food waste impact, reduce your impact on the environment, and take some pressure off Mother Nature.

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4. TECHNOLOGIES FOR FOOD WASTE RECOVERY

Minimizing food waste is the best way to reduce the environmental impact of food waste.

The Food recovery hierarchy is shown in Figure 3 [14]. The three primary treatments for organic wastes are landfilling, waste to energy incineration (WTE), and biological treatment.

Human-computer interaction (HCI) and persuasive technologies can be used to reduce food waste in households by creating an interactive and social platform for users. These commercially available technologies are designed to: (i) increase the technology's benefit and value to users, and (ii) promote reduced domestic food wastage. The Internet Fridge, FridgeCam, and the Colour Code Project are typical examples of such an intervention [15].

Other technologies including composting, microwave drying, anaerobic digestion (AD), liquefaction, rendering, gasification, mechanical biological treatment (MBT), IoT-based smart garbage system, RFID-based garbage collection system, magnetic separation technique, urban metabolism, etc. Most of these technologies are covered in [16].

The call for zero waste is a recent phenomenon that is getting more and more attention. Today zero waste is a slogan and an economic or visionary goal. Cities and nations like Australia, Argentina, India, and New Zealand implemented zero-waste strategies. Big corporations like Toyota, Nike, and Xerox have followed suit [17].

5. BENEFITS OF REDUCING FOOD WASTE

Managing food sustainably and reducing food waste can help businesses and consumers save money, feed the hungry, and conserve resources for future generations. Reducing

food waste offers a wide range of potential benefits that include [18]:

- Less food loss and waste would lead to better resource management with positive impacts on climate change and livelihoods
- Reducing food loss and waste is critical to creating a zero hunger world
- Contributing to targets for diverting biodegradable waste from landfill
- Reducing waste disposal costs as landfill costs increase
- Lessening environmental impacts associated with landfill (toxicity in leachate, landfill gas emissions, etc.)
- Decreasing greenhouse gas emissions by removing the putrescent content from landfill sites
- Contributing to targets for diverting biodegradable waste from landfill
- Reducing waste disposal costs as landfill costs increase
- Conserves energy and resources**,** preventing pollution involved in the growing, manufacturing, transporting, and selling food
- Supports your community by providing donated untouched food

6. CHALLENGES

When it comes to food waste, huge barriers exist in terms of geography, technology, and management. The complex causes of consumer food waste make it difficult for food chain supply, public policy makers, campaigners, and non-governmental organizations to develop successful food-waste reduction programs. Attempts to quantify the actual magnitude of food wasted globally are constrained by limited data, particularly from developing nations [19]. Interactions between agriculture and the environment are complex.

Food waste is responsible for 8 percent of global human-made greenhouse gas emissions. One way for reducing food waste is to increase awareness through education. This is basically environmental education that allows individuals to explore environmental issues, engage in problem solving, and take personal action to improve the environment.

7. CONCLUSION

The volume of American food waste is staggering. Enormous quantities of nutritious food are wasted in landfills across the globe. Without doubt, food waste is a major contemporary global issue. It is a moral, economic, environmental, and health-related problem.. Food waste is really a massive market inefficiency. Such an inefficient system strains the environmental, social, and economic systems on which it depends. Some regard food waste as one of the biggest problems facing mankind today.

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Food waste is a major challenge for the food supply chains, government, agencies, and consumers. The drive to minimize food waste is gaining attention in the nongovernmental sectors such as hospitals, hotels, and restaurants. More information on food waste can be found in books [17, 20-24] and journals on food waste such as *British Food Journal.*

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Figure 1 A typical food waste [1].

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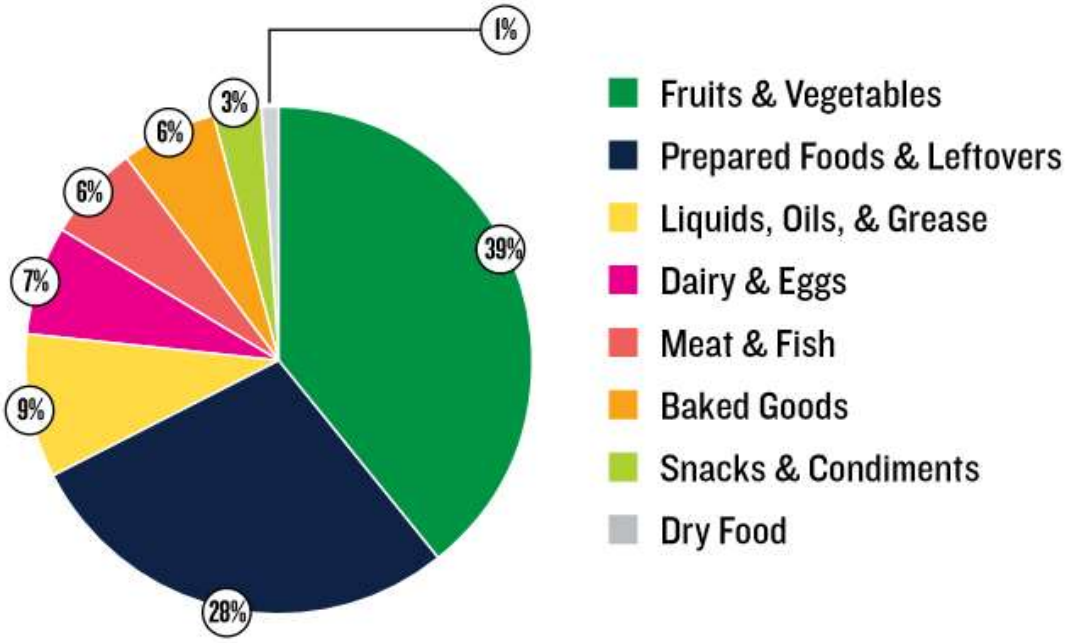

Figure 2 Edible food wasted by category [3].

Figure 3 Food recovery hierarchy [14].

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