

Food Waste Management

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The research is focussed on the uprising issue of Food Wastage & it's consequence on the food chain, economy, and environment. Every year 1.3 billion tons of food is wasted globally which causes \$750 billion worth economic losses and a colossal damage to the environment. Food waste is intact energy resource that ends up rotting away in landfills which emits greenhouse gases in the environment, heating atmosphere thus leading to climate change. Wastage of food at such a massive scale is a result of negligence on the part of individuals, society, nation, and the world. In this paper We try to expand into various aspects that lead to the wastage of food, as per the various industries.

Keywords: Food waste management, Food wastage, World hunger, Global food security, Environment

INTRODUCTION

In countries like India 795 million, out of the world population of 7.6 billion people, don't have enough food to lead a healthy life or they are undernourished. That is approximately one out of nine people on earth. The reasons can be; firstly, that there is a shortfall in the food produced worldwide or second, there is massive food wastage phenomenon occurring. Looking further into these reasons, today the world is yielding one and half times more for an individual, roughly that is enough to feed close to 10 billion people. Despite this massive number, people across the globe don't have sufficient food, to conclude we can say that the food produced for the consumption of people is being intentionally or unintentionally wasted.

Food waste is an ethical issue of global scale. According to the Food and Agriculture Organization (FAO) of the United Nations, roughly one-third of all the food produced worldwide each year, for human consumptions is either lost or wasted. Every piece of food wasted is an opportunity lost to improve world hunger and global food security. To define food waste, it means food supplies (grains, vegetables, poultry, & meat) or drinks which was predetermined to feed people now lies in landfills as garbage despite it being fit for human consumption. The food thrown is either spoiled or expired chiefly due to economic

behaviour, poor stock management and neglect. This is happening is developed, developing and underdeveloped countries with each's contribution higher than the other.

Food Wastage in Developed Nations

We assume that developed nations, like United States of America, Canada or the United Kingdom, don't contribute towards food wastage, but you will be surprised to know that they add to the global food wastage on a massive scale and that too on a per capita basis. The developed nations grow their food in massive quantities due to the high subsidies and flood the market with their produce. With the overflow of the produce, the excess is kept in warehouses. If the food is kept for long-time in these warehouses, decays, therefore, reducing the eatable food. This is further reduced due to the consumer buying pattern and their obsession with aesthetic quality of food. Vegetables & fruits aside from being healthy tend to wilt, brown, bruise or discolour, this is something the consumers do not prefer to buy. Due to this buying pattern and thinking of the consumers, even grocers refuse to stock such imperfect looking food on their shelves or stands. Doug Rauch, the former president of Trader Joe's – an American grocery store - confirmed this pattern by saying, "Grocery stores routinely trash produce for being the wrong shape or containing minor blemishes."

This statement is assuming that this kind of non-aesthetically pleasing produce even reaches the stores, most of the times this produce is either left to rot in fields, hauled into landfills or fed to livestock. In Europe & North America, the per capita waste by

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a single consumer is between 95-115 kg a year. The industrialized countries exhaust 670 million tonnes of food worth US \$680 Billion. If the food currently wasted in Europe and North America is to be fed to people then it could feed 200 and 300 million individuals respectively.

Food Wastage in Developing Nations

It is not just the industrialized nations that have a high percentage of food wastage, but now the developing nations are also closing unto these numbers. This primarily takes place due to the poor infrastructure, dysfunctional distribution systems, and corruption. More than half of the produce in these countries doesn't reach the market and even less to the people who reside there. This is causing a loss of billions, children and adults are micronutrient undernourished, and blighting numerous lives. Wastage of food not only has a negative impact on the individuals of the nations but the economy and the environment. Economically, it is a waste of an investment which can reduce the income of a farmer and increase a consumer's expenses. Environmentally, the impact includes excessive emission of greenhouse gases, extensive & inefficient use of water, and minerals thus diminishing the natural ecosystem which we live in. In these nations, the wastage occurs at early stages of the chain and they can be traced back to the financial, managerial and technical constraints during harvest and the basic problem of storage and cooling units. These countries dissipate 630 million tonnes of food worth US \$310 Billion. In sub-Saharan Africa, south & south-eastern Asia, the per capita waste by a single consumer is between 6-11 kg a year. In developed nations, more than 40% losses transpire at the consumer and retail levels, while in the developing nations 40% of the losses transpires at post-harvest and processing levels. These losses that take place during harvest and storage converts into lost income for the farmers and high food prices for the consumers.

For example, despite producing 28% of the world's bananas, India is only able to export 0.3% of it internationally. With the help of cold storage units, the number of exported bananas could increase from 4,000 to 190,000 containers thus creating 95,000 additional jobs and benefitting many small-scale farmers.

Food Wastage in India

In a CSR Journal report, it stated that "Indians waste as much food as the whole of United Kingdom consumes." With over 1.3 billion people in a nation

like India, millions are still sleeping hungry. In the Global Hungry Index - 2017, India ranks 100 among the 119 countries. Food wastage not only represent hunger, climate change or pollution, but also various glitches in the nation's economy, like inflation. Our traditions and culture play one of the major role in these situations where the policies of the government aren't responsible for such wastages. Here in India, the bigger the wedding, the bigger is the food wastage is expected to be. Today the number of individuals who are 119ungry in Indian are now more than 65 million, which is statistically higher than the population of few countries in the world. Wastage of food can cripple a nation's economy to such an extent that most of us are uninformed. Despite India's largest livelihood being agriculture, there is a struggle to feed its ever-growing population. Regardless of this fact, we are able to grow enough produce to feed each individual but this adequate production of food doesn't guarantee India's food security. As India is a developing nation 40% of our produce is lost during post-harvesting and processing level. The farmers in India do not have money to be technologically ahead of their counterpart in America, so they don't have the facility to store their produce in cold storage, therefore, they end up losing some part of their harvest to decay. Another aspect on which India's farmer lose out is transportation. For example, a farmer in the Vidharbha region of Maharashtra harvests his crops tomorrow, then he stores this produce in an open storage area, now before he is able to sell his produce to the wholesalers which are within 5-7 days of harvest he loses the produce due to decay or infestation of rats. From the field to the market it is a process of at least two weeks thus reducing the produce further. India suffers losses of up to £4.4billion in fruit and vegetables each year due to the absence of effective technologies to keep produce cool. A United Nations report states that India is ahead of China when it comes to wasting food items and both of these nations are the worst culprit of food wastage. An estimate of 230 cubic km of fresh water goes into producing food which is eventually wasted, this water is enough to quench the thirst of 10 crore people each year.

The State of Hunger in India

According to "The State of Food Security and Nutrition in the World, 2017" report, close to 190.7 million Indians are severely undernourished, it refers to 14.5% of the population. Further, in the report, it stated that 38.4% of the children are malnourished and 51.4% of the women in their

reproductive age (15-49) are anaemic. As mentioned above on the Global Hunger Index India ranks 100 out of 119 countries on indicators like - prevalence of stunting in children below 5 years, the mortality rate of children under 5 and proportion of undernourished individuals.

Food Waste & Environment

When you thought that wasting food had no other effect, you were wrong. Food wastage aside from impacting world hunger it also affects the environment. The already scarce natural resources have additional pressure every time food is lost or wasted. Greater the wastage of food along the chain the greater is the impact on the environment because we have to consider the natural resources and the energy that goes waste into producing, processing, transporting and storing the food items.

Once this food waste lands into the landfills it releases a powerful greenhouse gas - methane. This deadly gas with Carbon Dioxide and chlorofluorocarbons heat up the earth's atmosphere, in the end, causing global warming,

Prajal Pradhan, co-author of a research "Food Surplus and its climate burden", explained, "Agriculture is a major driver of climate change, accounting for more than 20 percent of overall global greenhouse gas emissions in 2010. Avoiding food loss and waste would, therefore, avoid unnecessary greenhouse gas emissions and help mitigate climate change."

Generators of Food Wastage

Major generators of food wastage in India are Hostels, Restaurants, supermarkets, individual residential blocks, airline cafeteria, and food processing industries.

RESEARCH METHODOLOGY

This research is quantitative research. It is an exploratory research. These research methodologies will give us an insight into food wastage and help us to develop various potential sources to the wastage and the reasons for the same. Food wastage is quantified by generating statistical data through numerous sources; measurable data is used to formulate the facts and uncover a pattern in research in relevance to food wastage.

Structured data collection methods are utilized in order to deduce the facts related to food waste management in India. Data collection is done from different surveys, paper surveys, mobile surveys,

longitudinal studies, website interceptors and systematic observations.

The study will focus on the overview of food wastage in India, followed by major sources causing food wastage and significant reasons which are causing food wastage in our country. Research comprehends the statistical data depicting the percentage of food waste all over the country.

Research elucidates the food waste pyramid. Food waste pyramid is subdivided into two categories - waste management, waste avoidance. Waste avoidance has sub-levels to reduce, feed people in need, & feed livestock; whereas waste management has two sub-levels of compost & 100% renewable energy disposal.

DATA ANALYSIS

Research Aim and Structure

Food waste is the most challenging issue humankind is facing in today's world. Nowadays food systems are extremely inefficient. With largest agricultural sector in the world and population more than 1.3 billion people, India's farming output has a significant impact on global food security.

India produces enough food to feed entire country like Egypt. We are wasting 67 million tons of food every year, according to a government survey. 67 million is more than the national output of a country like Britain. Wastage made every year is more than enough to feed an entire Indian state for a year.

Aim

This paper seeks towards the overview of food waste in consideration of its major sources with a vision of identifying the significant reasons of the food wastage.

Structure

With this objective structure of research mounted in this paper is as follows: Firstly, an overview of global food wastage in India is depicted; Secondly, major area contributing to food wastage are identified; Thirdly dominant reasons accountable for food wastage are set out in the paper; Fourthly statistical data portraying the volume of food wasted and adverse effects of the food waste on our country; Finally, the food waste pyramid.

OVERVIEW OF FOOD WASTE IN INDIA

Food wastage is an alarming issue in India. Canteens, weddings, restaurants, hotels, family

functions, social household spurt out a lot of food. According to United Nations development programme, about 40 % of food which is produced is wasted in India. Roundabout 21 million tonnes of wheat is wasted every year. According to the agriculture ministry, Rs. 50,000 Crore worth food is wasted each year in our country.

According to food and agriculture organization (FAO), a prodigious 1.3 billion tonnes of food is being wasted annually. One-third of the total global food production is wasted, costing world economy around Rs 47 lakh Crore. This formidable acceleration in food wastage is breeding nearly 3.3 billion of tonnes of greenhouse gases, thereby affecting the environment. Wastage of rice is a serious issue as, decaying of rice inhibits Methane, which is most potent global warming gas.

According to National Resource Defence Council (NRDC), 40% of food is not eaten out of all which is produced in the US; whereas in South Asia, India, China 1.3 billion tonnes of food is wasted every year.

In terms of food wastage (agriculture, poultry, dairy) India ranks 7th with the Russian Federation. The foremost reason for being on the lower part of the scale is the utilization of land. In India major chunk of land is utilized in agriculture and this, in turn, explains the wastage of cereals, pulses, fruits, and vegetables occurring in India.

Meat accounts for 4% of food wastage but contributes 20% to the economic cost of wastage. Wastage of fruits and vegetables is 70% of total produce but it, in turn, contributes 40% of the economic cost of wastage. Food loss and waste generated contributes 8% of total greenhouse gas emission.

MAJOR AREAS OF FOOD WASTAGE

In developing countries, most of the food loss occurs in the production chain and it adversely affects the farmer. According to FAO 30-40% of food is lost before sold in the market. This loss occurs due to inappropriate use of inputs, improper post-harvest storage, wretched processing, and transportation facilities. India losses so much of its food wealth as it lacks in cold storage facilities. According to a recent study conducted by IIM Kolkata, India can only offer cold storage to its 10% of its total production.

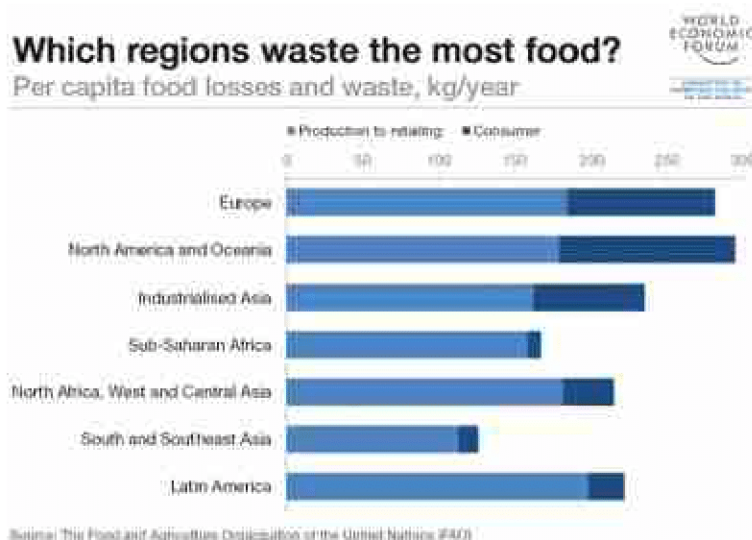
The unfledged supply chain management in India is adding up as a burden to food safety and eventually due to this immature management in supply chain India is projected as a major contributor in food wastage in both pre- and post-harvesting phases. It is recorded that 25% of water goes to drain which is used in cropping food, whereas today millions of Indians are still deprived of fresh water.

Dominant Reason of Food Waste

There are multiple and complex reasons for food wastage across the food value chain.

FARM - Food loss initially starts at the production level. Lower market prices and higher labour cost makes it impossible for the farmer to harvest all that they produce. Despite gleaning and far -to-food-bank to recover this unharvested food, the clear majority is left in the field to be tilled under.

MANUFACTURERS - Customer demands for a wide variety of products cause inefficiencies during this highest recycling level among food processors and manufacturers. Each time production line is



changed it should be emptied and cleaned. Products can require trimming for use in end products, leading to edible parts going unused.

CONSUMER FACING BUSINESSES - Customer demands variety and consistency of food availability that strains inventory management and food purchasing. Higher customer demands for freshness leads businesses to dispose of safe, edible food when it is perceived to past its prime.

HOMES - The demand of variety and lot of food create waste at home. For example, a consumer prefers a different kind of cuisine, but she/he may not have the proper knowledge to repurpose the food and store it properly. Most of the food cooked or bought is unplanned, which leads either to over purchasing and food spoilage. Many families are tempted to buy a lot of food at one time in as they are getting the deal of low-cost per unit. Lack of standardization of Date label, often makes consumer throw away the food which causes 20% of food wastage from homes.

Most Wasted Food

Roundabout 80% of the food waste comes from perishable foods, which includes dairy products, meat, fish, fruits vegetables and some grain products such as bread and other bakery items. Whereas non-perishable food - pasta, canned goods, highly processed shelf-stable products are generally wasted less as they are not spoiled easily. Perishable food often gets discarded because they quickly lose their shelf life and are inexpensive. Fruits and vegetables are least expensive and fastest spoiling food. Seafood and meat are two least wasted and most expensive food type.

VOLUME OF FOOD WASTED

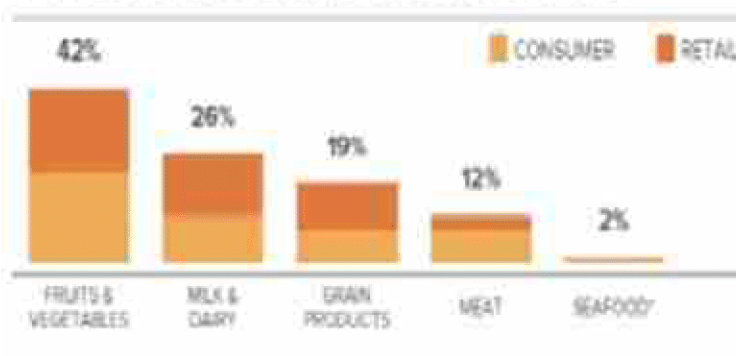
Different varieties of food are being wasted across the world. Some of them are briefed below:

1. CEREAL

Wastage of cereal is a significant problem as it majorly impacts the carbon emission. Rice wastage is particularly noticeable, as it emits methane while decaying and this methane combine with numerous other gases to pollute the environment.



FOOD WASTE BREAKDOWN (BY WEIGHT AND BY TYPE)



*While there is limited seafood wasted at the consumer level, large amounts of seafood are wasted during the production phase, with some estimates of up to 50% wasted as a result of seafood bycatch.



2. DAIRY
3. FISH AND SEA FOODS
4. FRUITS AND VEGETABLES



5. MEAT

6. OIL SEEDS & PULSES

7. ROOTS & TUBERS



ADVERSE EFFECT OF FOOD WASTAGE

Maximum food is wasted at the time of production, handling, storage phase. It is estimated that about 50 % of food is wasted during upstream. And the remaining food is wasted in downstream that accounts for processing, distribution, and consumption stages.

According to FAO middle and higher income group showed food loss waste during downstream waste or consumption phase. Developing countries were more likely lose food at upstream phase due to the shortage of harvest techniques and infrastructure.

Remaining food left is wasted along the food chain. It has an adverse environmental impact; as we take into consideration of energy and natural resources utilized in processing, storing, cooking and transportation.

1. Food waste which lands up in landfill emits a large amount of Methane. These gases cause emission of infrared radiations which heats up the environment and leads to change in climate & global warming.
2. A large amount of fresh water and groundwater is also wasted. By throwing 1 kg of beef we waste 50,000 liters of water. Similarly, we waste 100 liters of water when we pour one glass of milk down the drain.
3. Millions of gallons of oil are wasted every year to produce food which is wasted and goes uneaten.
4. Agriculture chiefly is responsible for alarming threats to plant and animal species which are at stake; estimated by the International Union for Conservation of Nature (IUCN)
5. Home composting diverts up to 150 kg of food wastage per year from local collection authorities.

FOOD WASTE PYRAMID



Waste Avoidance

- **REDUCE** - This level seeks towards saving food at first place of our utilization. Proper planning should be executed to avoid overproduction scenarios. Better storage conditions should be adopted in order to stretch the shelf life of the product. The alternative market should be discovered in order to keep food in human food chain.
- **PEOPLE IN NEED** - Surplus food should be directed to organizations and charities which can redistribute the food. This should be done in long run to avoid alarming wastage of food.

- FEED LIVESTOCK- Food which is unfit for human consumption should be feed to livestock in order to avoid wastage. Legally permissible bakery, fruit, vegetables and dairy products should be directed to farm animals.

Waste Management

- COMPOST AND 100% RENEWABLE ENERGY - Unavoidable food waste should be sent for composting for fertilizer production. This unavoidable food is 100% renewable fuel for electricity, heat or transport.
- DISPOSAL - Unavoidable food should not be buried inside the land where environment-friendly alternatives are available. This practice can lead to land pollution which in turn would harm our natural resources adversely.

CONCLUSION

Food waste is a result of throwing away good eatable food before it even reaches the mouths of humans. Food storage is causing the untimely death of approximately 3.1 million children under the age of five across the world. Wastage of food is a real issue faced by the society concurrently with other environment-related issues.

We often see, hear or read of situations which bear the news of starvation-related deaths in India and worldwide while our total output seems to contradict the statement above. Food scarcity in India or worldwide is a man-made problem as nature is pushing its level best to complete the ever-growing demand of humans. It's high time that we start working towards bridging this gap. We should start thinking every time we buy food in excess or eat it on how can we make the most of it without wasting a single drop of water or a single piece of food. It is never too late to rectify a mistake; a moment of opportunity is a year of opportunities. By working together in eradicating world hunger, we can make a humungous difference saving tons of food, millions of money and billions of lives. What difficulties would your firm have in using the enterprise modelling technique if it already has an existing database management system in place? Justify your answer

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