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Carbon Footprint on Global Food Wastage

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Abstract – Universally, about 1.3 billion tons of foods are wasted each year. Other than financial, ethic and social perspectives, food wastage bears an extensive ecological weight. A carbon impression is the complete greenhouse gas (GHG) outflows caused legitimately and in a roundabout way by an individual, association, occasion or product."It is determined by adding the discharges coming about because of each phase of an item or administration's lifetime (material creation, fabricating, use stage, and end-of-life transfer). All through an item's lifetime, or lifecycle, diverse greenhouse gas might be discharged, for example, methane and nitrous oxide, each with a more noteworthy or lesser capacity to trap heat in the climate. These distinctions are represented by computing the global warming potential (GWP) of every gas in units of carbon dioxide counterparts (CO2e), giving carbon footprints a solitary unit for simple examination. The Center for Sustainable Systems' "Greenhouse Gases Factsheet" for more information.

Keywords – Food, Food Waste, Food Loss, Carbon Footprint, Water Footprint, Sustainable Actions to Reduce Carbon Footprint

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INTRODUCTION

The population of the world is increasing day by day. With the increase in population, the demand for food and the making of food are one of the highly pressing issues in the world today. Food loss is one of the most significant factors to combat hunger in the poorest countries of the world where people are deprived of enough food to eat. Food loss have great impact on the environment, food quality and food security for the poor people. In the context of overall waste production, food waste is the one which shows the highest quantity. From the food produced for the consumption by human beings, one third of it is wasted. Consequently, the infrastructures and resources that are used for producing the food are fruitless and the greenhouse gases that are emitted during the production of the food are for no purpose. The loss of the food is directly related to the waste of the resources that are utilized to create the food which includes land, fertilizers, water and energy. Production of the food which is not consumed leads to the excessive CO2 gas production in the environment without any benefit [1].

Today, an estimated 33% of entire food produce on the planet goes to waste. Which is equivalent to approx.1.3 billion tons of organic products, vegetables, meat, dairy, fish, and grain which never leave the homestead, get lost or ruined during conveyance, or are discarded in lodgings, markets, cafés, schools, or home kitchens. It could be sufficient calories to sustain each undernourished individual on the planet.

In any case, wasted food isn't only a social or philanthropic concern—it's a natural one. At the end while waste food, we additionally waste all the vitality and water it takes to develop, collect, transport, and bundle it. What's more, if food goes to the landfill and decays, it produces methane—an ozone harming substance considerably more powerful than carbon dioxide. About 11% of all the ozone harming substance outflows that originate from the food framework could be decreased on less chance which we quit wastes food. In the only us, the creation of lost or wasteed food produces what could be compared to 37 million vehicles of ozone harming substance discharges.

As the total populace keeps on developing, our test ought not be the means by which to develop more food, yet to sustain more individuals while wasting less of what we as of now produce. Fortunately, there are a lot of moves we can make at the customer level to have a noteworthy effect. From conveying remains to those deprived to freezing food, shopping more intelligent, and treating the soil to keep unappetizing pieces out of landfills, we would all be able to find a way to check our emissions.

Here are a couple of tips to assist you with beginning:

- Plan ahead and purchase just what you need. Setting off to the store without an arrangement or on a vacant stomach can prompt purchasing more than we need. To keep your kitchen on track, attempt to eat remains, consider dinners you may eat out, and preserve a deliberate space from pointless buys by arranging your basic food item list early.

- Use your cooler. While have more advantages to eating new food, solidified food can be similarly as nutritious. They likewise remain consumable for any longer. A ton of fish, for instance, is solidified before it arrives at your market and afterward defrosted and put in plain view. That implies it will just remain new for a couple of days. By purchasing solidified fish, you can broaden the time span of usability of the item impressively. Preparing and solidifying food—particularly produce—before it turns sour is an unexpected technique to abstain from hurling it.

- Be creative with leftovers before you shop, use the food you already have. Website like Big Oven, Super cook, and MyFridgeFood allow you to scan for plans dependent on fixings as of now in your kitchen. You can likewise utilize applications like Epicurious and Allrecipes to benefit as much as possible from what's in your cooler and storeroom.

- Blend, bake, or boil. Fruits and vegetables which are further than ripe may not seem attractive, except to doesn't mean that they can't still taste yummy in recipe. Try using your wilting, browning, or imperfect produce to make sweet smoothies, bread, jams, sauces, or soup stocks.

- Talk it up. Preventing food waste is the best method to contract its effect on the planet. We abstain from delivering food that we don't eat, we can spare the land, water, and vitality that would have been utilized to make it. What's more, mindfulness is a decent initial step; as indicated by ReFED, instructing buyers about food waste could avoid 2.3 million tons of ozone harming substance discharges.

FOOD

Food can be defined as the product that is produced with the intention to be consumed by the human beings [2]. Food includes all those processed or unprocessed items or substances that are intended or expected to be consumed by the human beings.

FOOD LOSS

Food loss as defined by the Food and Agriculture association of United Nations [3] is food lost or wasted intentionally or unintentionally during the supply chain from the initial stage of production to consumption at homes. Food loss occurs when food is spilled or damaged before reaching its final stage where it can be consumed; this mainly occurs in the initial stage of food production. The main causes for the food loss are lack of equipment, knowledge, infrastructure, skills and sometimes natural calamities. Figure 1 shows the global food loss in percentage of different commodities in the different stages of food chain.

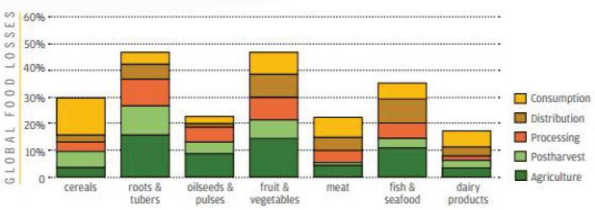

Figure 1: Global food losses

FOOD WASTE

The food that is ready for the consumption but is not consumed and wasted is called food waste. Food waste is intentional as it is the waste discarded by the consumers after failing to plan the proper meal schedule, which results in food spoilage after the expiry date; sometimes food is wasted because of the excessive supply in the markets, and in some cases retailers do not accept the food because it falls short of the quality and aesthetic standard. [3]

FOOD LOSS IN FOOD SUPPLY CHAIN

Food supply chain represents the stages from the production of food to consumption. There occurs a food loss in every stage of the food supply chain. The food supply chain is generally categorized in five different stages in which food loss happens in several different ways:

- Food loss in production phase: Food is lost during or immediately after the harvesting of the crop on the farm such as fruits bruised during picking, crops that are sorted out after harvesting due to not meeting the quality standards and crops left in the farm as a result of the poor mechanical devices that are used for harvesting.

- Food loss during handling and storage: This includes the edible food that is eaten by the pests and the food that is damaged by fungi or any other contamination. In case of animal meats, this also includes the deaths during the transport to slaughter houses.

- Food loss during processing and packaging: This is the loss during the processing in

industrial or domestic fields or loss while packaging. Some examples of this are milk that is spilled out during pasteurization and during processing and the fruits or grains that are discarded because they are not found for processing.

- Food loss during distribution and market: This is loss of the food during the distribution of the food. This also includes the losses that occurs in wholesale and retail market. Some examples of this kind of loss are edible product that are sorted out not reaching the quality, products that surpasses the expiry dates before being purchased and food that is drop or harmed in the market.

- Food loss in consumption phase: This is describing such as food loss in the home, in the business of the consumer or in the restaurant. These include the food which is discarded due to the quality matters and the food that is not eaten after purchased or cooked. [4]

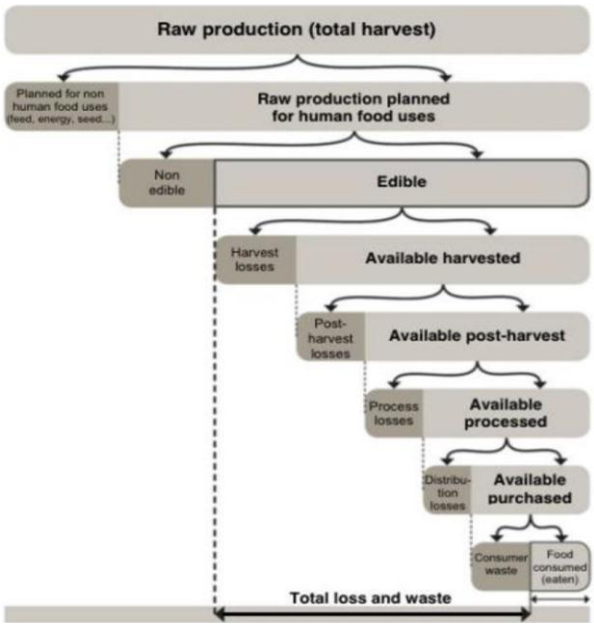

Figure 2 shows the pattern of food losses in a food supply chain.

EMISSION OF GREENHOUSE GASES OR CARBON FOOTPRINT

Carbon footprint of the product is defined as the amount of the greenhouse gases that is emitted by the product in its total lifecycle. This consists of the GHG emissions from the starting phase of the agriculture and from energy used in the farm and non-energy related emissions, emissions from the soil and the livestock [5].

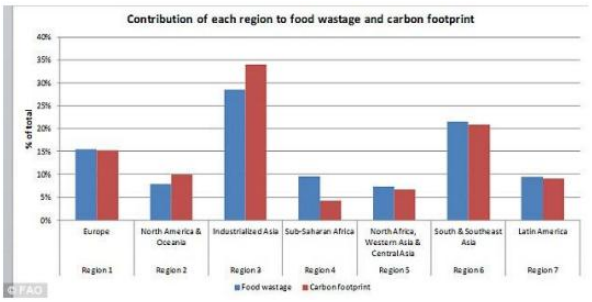

Figure 2: Contribution of each region to food waste and carbon footprint

Figure 2 illustrates the average carbon intensity of the different region of the world. Figure shows the variations because of the mixes of commodities that are wasted in each region. North America's carbon intensity is greater than that of Europe because of the higher amount of meat in the waste. Carbon intensity of the sub Saharan Africa is lower because of the share of the starchy roots in the waste which is above 50 percent. The carbon intensity of industrialized Asia seems high due to the wasted cereals. Agriculture is a main function in climate change. Greater than 20 percent of the global greenhouse gases emission was from the agriculture in 2010. Through evade food loss and food waste we can control the emission of the GHG and lessen the severity of the climate change. [6] Due to food supply chain, the greenhouse gases are produced at all stages starting from the agricultural procedure and the inputs that are needed for farming, manufacturing process, refrigeration in store, preparation of the food and disposal of the waste. In the farm GHGs that are excessive are oxides of nitrogen from the soil and from the application of fertilizers that are rich in nitrogen and methane is another dominant GHG in the farm produce from ruminant digestion. Outside the farm CO2 is dominant gas in other phases of the food supply chain and also small amount of the refrigerant gas can be counted. Methane gas is produced from the food waste that is placed in the landfills in the process of decomposition. Landfills are not the only source of the GHG from the food wastes. In this context we need to consider the resources utilized to create the food and processing. Only a small percentage of the wasted food is composted and a maximum quantity ends up in the landfills, emission of methane gas from the landfill is considered as the biggest resource of GHG emissions. The carbon footprint from the food waste is estimated to be about 3.3 billion tones of CO2 corresponding which is released in the atmosphere each year. [7]

WATER FOOTPRINT

Water is used in everyday basis for drinking, cooking, washing, flushing and watering the land. Only 5 percent of our daily water footprint is from the

daily household use and gardening. The remaining 95 percent of our daily water footprint is from the food we consume and the produce we purchase. [8] Agriculture uses about 70 percent freshwater of the globe. Increase in production is directly proportional to increase in use of the water. The relation clarifies that when the food is wasted the water is lost. In 2007, blue water footprint for the wastage food globally was about 250 Km3. The major contributors for the blue water footprint are meat, cereals and fruits. [9] An normal families throw absent one third of the food which is bought. Water footprint for food for the normal families is about 15.15 m3 a day which makes about fifty-five hundred cubic meters annually. One third of that makes about 1850 cubic meters of water which is wasted every year by an average family.

Food waste and food loss is not only degrading the climate, but also it has a greater impact on economy. Hanson Craig research [10] has shown that wasted food in a household or in a restaurant costs about $1600 (about €1400) per year in the US for a family of four, and about $1060 (about €900) per year for an average house hold in United Kingdom. In China about the cost of $32 billion (about €27.5 billion) food is wasted annually. The perspective of sub-Saharan Africa, $4 billion (about €3.5 billion) worth of food is lost after harvesting. According to the estimates of Food and Agricultural organization $940 billion (about €810 billion) value of food is wasted or lost annually through a complete food supply chain. [11]

SOLUTIONS AND SUSTAINABLE ACTIONS WAYS TO REDUCE CARBON FOOTPRINT

- Eat restricted, vegetarian, or organic foods. For non vegetarians, reinstate various beef utilization by chicken.[12-14]
- Walk, bike, carpool, utilize accumulation transfer, or take a best-in-class automobile.[15]
- Smaller house utilize less power. Normal family unit vitality use is most noteworthy in houses (82.3 million BTU), trailed by manufactured houses (59.8 million BTU), condos with 2-4 units (53.5 million BTU), and lofts with 5+ units in the structure (34.2 million BTU).[16]
- Utilizing a low-stream shower head can spare 350 pounds of CO2 every year. Set the temperature to 120°F can assist to develop the water heating appliance efficiency.[17]
- Switch off TV, PC, and different hardware whilst not being utilized to decrease your carbon impression by a great many pounds of CO2 every year. Unplug unused gadgets to additionally lessen your footprint.[18]
- Choose power effective lighting. The chance to each home in the U.S. supplanted their 5 most utilized lights with Energy Star bulbs, the decrease in carbon discharges would be comparable to expelling 10 million vehicle from the road.[19]
- Recycling a large portion of a family unit's waste can spare 2,400 pounds of CO2 for every year. Purchasing items with insignificant bundling likewise lessens waste. For each 10% of waste decrease, 1,200 pounds of CO2e are kept away from.
- Shop brilliant and buy things with a relatively low carbon impression whenever the situation allows. A few makers have started evaluating and distributing their items' carbon impressions.
- Replacing 80% of molded rooftop zone on business structures in the U.S. with sun based intelligent material would counterbalance 125 mmt CO2 over the structures' lifetime, proportionate to killing 31 coal control plants for one year.[20-21]
- Replacing the worldwide armada of transportation holders' rooftop and divider boards with aluminum would spare $28 billion in fuel

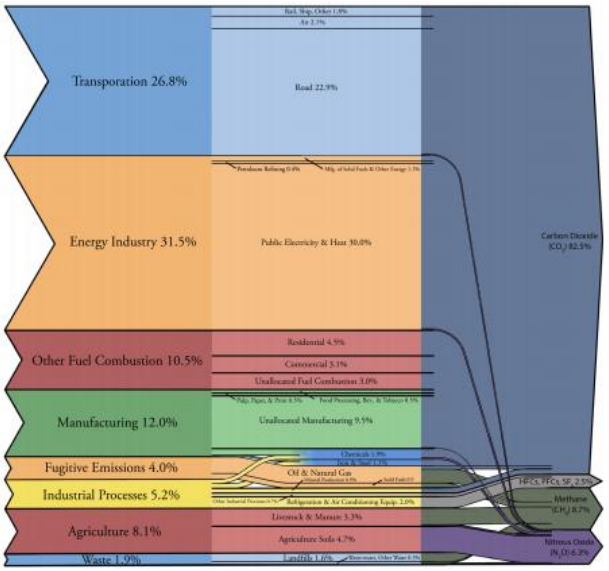

Figure 3: U.S. Greenhouse Gas Emissions, 2012

CONCLUSION

Food waste is major contributor in the emission of the carbon and other harmful gases that directly or indirectly help in the degradation of the environment. The quantity of the food which is dissipate about the one third of the food to produced worldwide, which in number is about 1.3 billion tons. Food waste happens during the food supply chain. Developed as well as developing or underdeveloped countries all

are contributing to the food waste. Reducing the food waste would help to minimize the emissions and helps to mitigate the degradation of the environment with economy of the world. The basis for this project can be found in the impacts of food waste on carbon emissions, in the environment and economy with the aim to find out the environmental impacts and economic impacts caused by food waste.

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