

## DIMINISHING FOOD LOSS AND WASTE: A CHALLENGE TO MAINTAIN SUSTAINABLE FOOD CHAIN AND COMBAT THE GLOBAL PROBLEM OF HUNGER AND MALNUTRITION

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### Abstract

*Malnutrition is a global issue that no country can afford to avoid. According to recent reports, the number of hungry people rises from 785 to 822 million from the year 2015 to 2018. Though food production is increased from the past few decades to make up the increasing demand for food, the loss of food and the wastage of food that occurs from the agricultural field to the consumer end are highly alarming. About one-third of agricultural production gets wasted every year. The judicious use of these food wastes can attenuate the crisis of hunger and malnutrition. Food loss and wastage of food not only signify wastage of wasting food particles but also inevitably address the wastage of most important available resources like land capable of agriculture, water footprints, energy, manure, chemical compounds, money and manpower. Climate change is another factor that disrupts food production. These two factors together challenge food security which is a basic human right. To a certain extent, food loss can be reduced by the use of proper food handling, use of technology etc., and edible wasted biomass can be transformed to harmless, alimental and simpatico products that can alleviate the nutrient deficiencies as well as undernutrition and enhance the sustainability of the total food system. Though loss and waste of food are not only the principal reason behind undernutrition through the reduction of the loss and wastage of food, the global problem of hunger and malnutrition can be eradicated to a certain extent. Thus, this research paper tries to discuss the cause, revival of the loss of food and wastage of food along with how the conversion of these wastes can produce nutritious food products that can not only maintain a sustainable food chain but also can alleviate the global problem of malnutrition.*

**Key words:** biomass, food commodities, food loss, food security, malnutrition.

### INTRODUCTION

The problem of scarcity of food increases with the growing population of the world and 98% of people from developing countries are deprived of adequate food to sustain a healthy life.

Studies by Engstorm and Carlsson-Kanyama (2004) and Kader (2005) revealed that about 30-40% of food losses occur in the nations where the agricultural infrastructure is poor and if these losses can be prevented there will be an enormous effect on food safety and security.

FAO has distinguished the terms of food “losses” and “waste” (FAO, 2013b). Namely, “Food loss” can be defined as the food which lost its edible biomass during its department throughout the food supply chain. The foods get damaged and spoiled and of reduced quality, before it reaches the market for the consumers. Food loss is an unlimited process or the institutional/legal framework.

“Food waste” refers to the food that maintains its quality throughout the food supply chain but

thrown away or discarded which is related to the behaviour of the consumer and the retailers. The lack of awareness and a mindful choice to throw food away lead to the wastage of large amount of food.

“Waste” of food mostly takes place in developed countries and is related to the behaviour of consumers. It occurs because they have high per capita earnings and as a result, the opportunity cost of time becomes lower in numerous countries with medium/high-income rate (Hall et al., 2009). Furthermore, food “losses” mainly takes place in developing countries. Because food losses primarily associated with technical limitations such as inappropriate harvesting practice, lack of storage and cooling facilities and financial limitations and managerial boundaries. Per capita “food wasted” by people in Europe and North America was stated to be 95-115 kg per year. But, in sub-Saharan Africa and South and South-East Asia, per capita wastage is only 6-11 kg/year (Gustavsson et al., 2011) - Figure 1.

In the US, yearly 40 million tons of food discarded by households, foodservice and retailers and this amount are adequate to give food to all the malnourished people around the world. Famine would disappear from the world if the quarter amount of food is saved which is wasted in the US, UK, and Europe (Stuart, 2009). An estimation of global hunger in 2013 reported that “the world produces enough food to feed everyone”. But still, coincidentally, it was estimated that one in eight people or some 870 m people are undernourished.

The loss and wastage of food are symbolising the gap between the production and consumption of food at the consumer level, which is commonly seen in the whole world via the food value chain.

## MATERIALS AND METHODS

Relevant research papers and reviews were searched on several scientific databases such as Google Scholar, PubMed, Scopus and Science Direct. The search was mainly focused on food losses and waste, their prevention, climate change and food loss, and malnutrition. The following terms were searched for selection of relevant papers such as “food loss”, “food waste”, “climate change”, “malnutrition”, “hunger”, “famine”, “global data on the loss and wastage of food”, “reduction of the loss and wastage of food”.

The selected research papers were reports, observations, basic studies, relevant reviews preferably with global data. Importance was given to more recent reports, reviews and original articles mainly published in the last ten years. The number of reports and articles has increased each year as the importance given to the reduction of the loss and wastage of food to reduce the incidence of chronic hunger and malnutrition.

## RESULTS AND DISCUSSIONS

### 1. Food loss and wastage toward the food supply chain

The wastage of food occurs in all stages of the food supply chain. Agricultural products are travelled a long way and gone through various stages up to packaging before they reach the market, specifically, to the buyers or consumers.

Finally, not only the product changes its originality but also lost some of its major parts in this process (Hoering, 2012).

There are two different scenarios in developed and developing countries that should be considered while considering the reasons for food waste. The difference is mainly based on economic capacity, manpower, technical knowledge, educations and opportunities to go into the chain of food supply system.

Lipinsky et al. (2013) stated industrialized Asian nations and developed nations are accountable for fifty-six percentage of total loss and wastage of food. Simultaneously, total loss and wastage of food in nations which are developing account for forty-four percentage. As the studies conducted in 2011, global food loss is 36.17% that was primarily at the consumer level. In developed countries, the major loss of food materials occurs at the consumer level. At the same time developing countries witness the loss mainly occurs during the production level (Pachón, 2013).

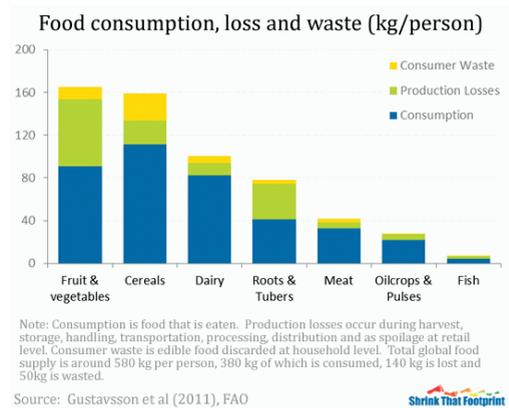


Figure 1. Food consumption, loss and waste (kg/person)

### 2. Food loss, waste and global climate change

Food production and wastage of food are responsible for greenhouse gas production which was estimated to be 3.3 million tons. This accelerates climate change. Studies also revealed that food waste is responsible for the third biggest emission of greenhouse gases. The main reason behind this is the energy used during food production as well as the use of a large amount of fossil fuel during production and processing of food, cooking and transport of food materials to the market worldwide. The food which is thrown away or discarded

produces methane gas produced at landfills is another reason for global warming (Figure 2).

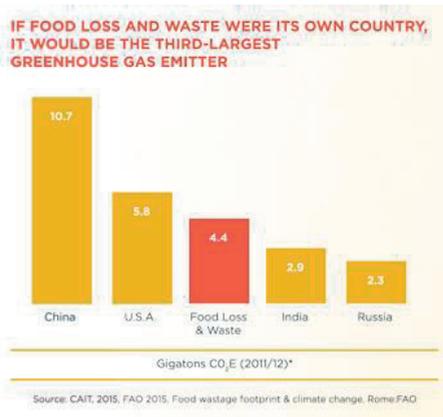


Figure 2. Impacts of food waste on climate change

### 3. Estimation of the loss and wastage of food

Though some primary materials on the loss and wastage of food were evaluated the international works of literature do not supply adequate data on this matter. Most studies were taken by Tristram Stuart (2009) and the FAO, and particularly on the investigation carried out by Gustavsson on behalf of the FAO. Depending on various stages of the supply chain of food, it was estimated that, at the various stages in the time of production, the global food loss is 24%, 24% during the post-harvest stage and at the consumer level it is 35%. And altogether, these multifarious stages are responsible for more than eighty percentage of the loss and wastage of food globally (Lipinsky et al., 2013). Research conducted by The World Bank Group (2014) stated that there is a role of socioeconomic status in case of the loss and wastage of food. It was found that lower-income group families waste less food compared to high-income families. A study by the Institution of Mechanical Engineers (2013) showed that wheat consist of 21 million tons is wasted in India every year due to a lack of proper storage facility and distribution system. According to Pachón (2013), about 230 million people in India went hungry per day. FAO statistics (2013) highlighted that 557 million Asian people are suffering from starvation. At the same time, food loss in developing countries like Africa, South and Southeast Asia and Latin America were attributed to the loss of crops in the field and

post-harvest losses. According to Stuart (2009), the US, Europe and the UK manage to produce double amount of food which is dietary required for their inhabitants. But half of food also is wasted in the supply chain of food system.

### 4. Food loss, waste and malnutrition

The amount of food that is lost and concurrently wastage of food remains edible for human consumption. Pascoe (2011) stated that fifteen percentage of the food that is wasted can supply enough food for the malnourished habitants of Mexico. Food security does not only depend on the food supply problem, but it also involves accessibility i.e. purchasing capacity and food prices. Improving the proficiency of the food supply chain can help to reduce the price of the food and therefore increase access for the consumers (FAO, 2011). There should be collaboration between governments and other agencies to establish a sustainable food environment for people. Major criteria should include food supply, food system, food environment and change behaviour of the consumers (World Cancer Research Fund/American Institute for Cancer Research, 2018). Food loss at the production level should be checked by the developing countries as the number of malnourished people is high in those regions. Public health initiatives for improving the health of the population must take into account the food system within-country but also from a global point of view (Waterlander et al., 2018) and include priorities to target a decline of risk factors and disease (International Council for Science, 2017).

### 5. Prevention of the loss and wastage of food

There are a variety of reasons for the loss and wastage of food in developed and developing countries. In poor countries, food loss mainly occurs at the production and post-harvest level while in rich countries food gets wasted at the buyers' level. Developing countries should organize their farmers for diversifying and up scaling their production and marketing. Food and packaging industries should work together and invest to improve the infrastructure and transportation facilities. Involvement of the public and private sector is also necessary for achieving these goals. While in developed countries, different strategies are needed for

reducing food loss. Increasing awareness among consumers, retailers and food industries is also needed. There is a need to discover good and valuable utilization for the food which is wasted (FAO, 2011).

In addition to this, the wasted food or the edible biomass can be converted to nutrient-rich, safe and appealing foods that help to improve the nutrient intake of the vulnerable groups. The recovery of wasted biomass into the food supply chain also promotes a sustainable food system (Augustin et al., 2019).

## CONCLUSIONS

This work highlighted the loss and wastage of food, some probable reasons for wastage of food in the total value chain. Research findings indicated various anomalies in each step in developed and developing countries though the data is difficult to find especially in the case of developing countries. This discussion related to the loss and wastage of food pointed out that food loss is common in countries which are developed while the incidence of food waste is high in developed countries. Both are vastly responsible for economic loss and related to the food security and public health. In addition to that, the discarded food is not only wastage of wealth but also a loss of natural resources. The data also showed that if the world's food loss and food waste can be reduced to a minimum, there will be no incidence of famine and malnutrition. Therefore, awareness is necessary both at the production and consumer level to minimize the loss and wastage of food for a better future of our world

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