

# A Novel Act of Food Wastage Reduction by Distribution

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**Abstract:** The purpose of Hunger Free is to free India from hunger. Every day over 20 crores Indians sleep without getting a meal. This problem can be solved by tackling the food wastage problem that occurs during big Indian weddings, Restaurants, etc. Hunger Free is a platform that provides a solution to this problem by connecting restaurants, various NGOs to the needy. Hunger Free is a web app designed and developed keeping in mind the difficulties NGOs or restaurants face to reach out to people.

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

## 1. Problem Statement

According to the United Nations Development Programme, about 40% of the food produced in India is wasted.[2] Even though the food produced in India is adequate, the UN has reported that about 190 million of the Indian population remain undernourished.[1] It is further estimated that the value of food wastage in India is around ₹92,000 crores per annum. These are some bleak statistics, but they should help us realize the magnitude of the problem of food waste, as much as inequity, in India. It has been recognized that no truly sustainable and developed country can exist without tackling the issue of food waste and some steps need to be taken sooner. [1]

## 2. Introduction

For the past few years, we've been seeing a lot of heat around the so-called term: Food Crisis, but what exactly is food crisis and how it is affecting our world and people around us is something we're unaware of because we're fortunate enough to have food readily available to us whenever we want and whatever we want.

But do we ever consciously even think about the amount of food that gets wasted?

Do we ever think about people who aren't even able to afford a meal per day?

Do we ever think about how food wastage is affecting our environment?

We too never gave much thought to this issue until we started digging a little deep down this lane.

Food Wastage has become a more prominent issue while cultivating self-awareness is still very hard. Why is it that some people have so much food, up to a point where they can just

throw away the uneaten food and while others have so little that they can't even fill their empty stomachs, or eat up to a point where their body is not malnourished?

While doing this research we came across statistics that were groundbreaking and figures which we never would have come across if it wasn't for this research itself.

Research shows that about one-third of the total food produced is never eaten and it eventually goes to waste.

Every year, about 40% of the total food produced eventually goes to waste, while it could have just served the purpose of filling someone.

Food Wastage is a relatively modern issue as in ancient times, this was not there because of limited food availability and because of how prudent our ancestors were about resources whether it be food or water, or just any other resource.

But over the last few decades, this mentality has seemed to fade away and we have lost the sight of this prudent mentality, just because of food being so readily available to us, by how we can just order our food online by clicking on our mobile phones, has made the hard-earned efforts and time factor involved in the production, making of food has made us lose the fact that food is something we can't live without.

Almost 40% of food produced in India is wasted each year due to fragmentation of the food system and inefficient supply chains. And this is just an estimate from the Food and Agriculture Organization (FAO). What's shocking is that this is the loss that occurs before food even reaches the consumer. As per the Food Waste Index Report 2021, a staggering 50 kg of food is thrown away per person every year in Indian homes.[3]

When food is lost or wasted, all of the resources that went into making it are wasted too. Globally this accounts for 1.4 billion hectares of wasted land and 250 km<sup>3</sup> of wasted water every year. That's a land area larger than Canada and India put together and enough water to fill up 100 million Olympic sized swimming pools! What's more, food loss and waste are responsible for 8-10% of global greenhouse gas emissions. These emissions not only come from the production and transportation of the wasted food, but they also come directly from the rotting food itself when it is broken down by microorganisms.

Despite all of this food going to waste, in 2019 nearly 1 in 10 people around the world faced severe food insecurity. Reducing

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food loss and waste by just 50% would provide enough food to feed all these people and then some.

The most significant amount of food waste generated is from our households. All the food waste eventually ends up in a landfill or in creating greenhouse gasses which affect the environment and add up to become the major cause of climate change. While the amount of food waste generated is increasing every year, no-waste and zero-waste kinds of terms are also becoming more popular, and more people are coming together to work and live a lifestyle that can help the environment and people living on earth but the statistics for people who are deliberately taking steps are almost next to none if we compare the waste they try to hold back or say no to while others keep on generating food waste and wasting food which could have helped someone in filling their bellies.

Even Though food wastage is such a huge issue, still we get greenwashed into organic and sustainable products and food items, which help the environment in one way, but unfortunately doesn't help us in reducing food wastage while also going to end up as food being wasted.

Although food losses occur at all stages of the food supply chain, their main cause varies between countries.

In wealthier countries, more than 40% of food loss and waste occur at the retail and consumer stage, largely due to consumer behavior and food supply exceeding demand. Food losses in lower-income countries mostly occur earlier in the supply chain, due to poor harvesting techniques, insufficient storage and cooling facilities, and a lack of infrastructure for food transport and marketing.

Some say, food wastage is the DUMBEST PROBLEM, which make a lot of sense actually, like why is it that some people have so much food, that they have the rights and power to waste that food, and contrary to that, some people are so unfortunate that they can't even afford a meal per day or as according to FAO, nearly one in every three people, don't have access to adequate food. Food Scarcity, Food wastage, Food Insecurity, Hunger, Malnutrition, Undernutrition, Food Crisis, all these words are nothing but buzz words if we don't deliberately start taking some steps and conscious decisions.

When we think of FOOD WASTAGE, the first thought that comes to mind is that it is a global problem and we can't do anything on our own to solve this problem.

But only if we start to look closely in our kitchen, in cafes around us, in bakery's round us, in nearby restaurants, that is when we slowly start seeing that even if the problem is at a global level, still if we start making even the minuscule steps, they can help us in leading to a better world where we can come together for a cause to curb hunger, save the environment and make this world a little better place to live in.

In the end, it all comes down to the conscious decisions we make.

So, what can we do to reduce all of this food loss and waste? Well, let's begin at the start of the supply chain: we need to reduce food losses on the farm itself. Sub-optimal conditions, such as not enough water and too much heat, significantly reduce the growth potential of food crops and 20-40% of crops globally are lost to insects, pests, weeds, and diseases.

Global soil quality is also degrading, making it harder for plants to access the nutrients they need to grow and forcing farmers to rely on artificial fertilizers.

By improving soil quality and exploiting natural interactions between plants, animals, and their environment, farmers can improve crop yields while reducing waste and resource use.

If the government could help in providing farmers with effective and efficient harvesting technologies it will be very beneficial as a lot of food is often wasted or lost during the harvesting phase.

One of the biggest causes of food wastage and food loss in lower-income countries is storage: if food is left somewhere that is too hot or too damp it can easily spoil or rot. Improving storage facilities and transport infrastructure can therefore significantly reduce losses: if lower-income countries had the same access to refrigeration as richer nations, food losses could be reduced by 25%.

To solve this problem, we need to develop low-cost, off-grid solutions for food preservation, such as mobile solar-powered storage. Food processing and more durable packaging can also prevent food spoilage during storage, transport, and at the consumer stage, although we would need to consider the sustainability of the packaging that is used. Even so, innovation can only get us so far. Retailer and consumer behaviours will also need to change.

For example, supermarkets set very high standards for what food should look like, meaning that imperfect food is often discarded even if it is perfectly edible. Embracing these "ugly" foods at both the retail and consumer levels will significantly reduce how much gets thrown away.

Restaurants, retailers, and caterers can also reduce their waste by selling food in more appropriate portions and by donating uneaten goods to those who are unable to afford them.

But what can we do as individuals?

Well, we can start by planning ahead and only buying what we need. We can cook with leftovers and use our freezers to keep food fresh for longer. As well as encouraging less wasteful practices, we also need to be more aware of how to store food properly and how to tell if food is still safe beyond its expiration date.

As the world gets richer, consumer-level food waste is likely to become more and more of a problem. Therefore, we need to start becoming aware of the impacts of food waste and what we can do to make a difference, in order to help the environment and to help curb hunger.

### 3. Overview of Food Wastage

Food waste is a significant issue in India as a lot of food wastage takes place in lavish Weddings, parties, pubs, restaurants, etc.

It is predicted through a survey that more than 58 percent of the food that people produce for consumption is wasted every day. [4]

India ranks 100 among 119 countries in the Global Hunger Index. More than 65 million people in India sleep hungry which is higher than the population of a few countries. Just because of this, close to 200 million Indians are undernourished. [4]

There is a perception that the Indian people have which is, that they do not waste food, we consume according to what we need. But, that's not the case because 15-20 Kg of food is being wasted by an individual in India in a year. The quantity of food wasted in India is equivalent to the food consumption by the U.K. The technologically developed countries are emphasizing more on this issue, that less food can be wasted and can be distributed to the needy and poor those who cannot afford a proper meal even. But in a country like India which has a huge population to feed and that too in a Developing Nation it is a big challenge to use or develop such applications because a large portion is not fond of the technologies.

Most people consider that there is only a physical impact of food waste and they neglect what harm it causes to our environment. When wasted food lands into landfills it releases a greenhouse gas- Methane. This gas with CO<sub>2</sub> and Chlorofluorocarbons heats up with Earth's atmosphere, at the end which causes Global Warming. No such actions have been taken or none of the technologies gave it any importance. In India, only 1 application was executed to reduce food wastage and help the needy, which is:

Indian Food Waste Reduction Application (No Food Waste). No Food waste is an application from India that allows restaurants, food stalls, and parties to inform about their excessive leftover foods so that needy people can collect them for their usage. This application collects those foods and distributes those among the homeless people, slum dwellers, orphanages as well as nursing homes. The users can also notify them by showing hunger points, and they will distribute the food there. The only requirement is They take food only if it is prepared two hours before.

These applications have changed the use of artificial intelligence by providing food to needy people. It is considered one of the best uses of software development. However, food wastage is still a bad habit. Food wastage reduction has decreased a lot due to the usage of this application, but people need to be more sensitive and careful so that a better world can be created where no food is wasted.

#### 4. Major Areas of Food Wastage

##### 1) *Pre-consumption losses*

India wastes over 40% of its food every year due to fragmented food systems and poor supply chains. This is the amount of food that is lost before it reaches the customer.

##### 2) *Food waste in households*

problem in our homes. According to the Food Waste Index Report 2021, Indian households waste 50 kg of food per person per year.

##### 3) *Emission of greenhouse gases*

Excess food waste frequently ends up in landfills, where it produces potent greenhouse gases with serious environmental consequences.

##### 4) *The pandemic's impact*

The Covid-19 pandemic not only exposed but also worsened the problem of food waste. Following the enactment of a lockdown last year, India's grain surplus reserves — estimated to be 65 lakh tonnes in the first four months of 2020 —

continued to rot in godowns across the country. For the poor, particularly daily-wage workers, food became exceedingly scarce. Inefficiency of government programmes, lack of transparency in income creation, insufficient storage facilities, and a lack of complete and accurate inventories are all difficulties in the Indian food supply chain.

#### 5. Volume of Food Wasted

Every year, over 931 million tonnes of food are thrown out. Households contribute 61%, food service contributes 26%, and retail contributes 13%. Waste reduction could have social, economic, and environmental advantages. Food waste is expected to be cut in half by 2030, as per the UN's Sustainable Development Goals.[5]

According to a United Nations report, 931 million tonnes of food are thrown away each year, accounting for 8-10% of world carbon emissions.

According to the UN Environment Programme's (UNEP) Food Waste Index Report 2021, about 17% of global food production may be wasted, with households accounting for 61% of waste, food service for 26%, and retail for 13%. Climate change, loss of biodiversity, and pollution are all issues that must be addressed. [5]

#### 6. Adverse Effect of Food Wastage

##### 1) *Methane is generated when food is thrown*

When food is thrown out, it ends up in landfills, where it rots and produces methane, a greenhouse gas 28 times stronger than CO<sub>2</sub>. We can avoid over 11% of greenhouse gas emissions by diverting food waste from landfills to an innovative food waste treatment system. The methane emitted by food waste lingers in our environment for 12 years, trapping the majority of the heat from the sun. Although methane is a short-lived gas, it accounts for 20% of all greenhouse gas emissions. Food waste results in fewer methane emissions into the atmosphere. [6]

##### 2) *Food waste is the same as fuel waste*

Oil, diesel, and fossil fuels are used to grow, transport, store, and cook food. Harvesting machinery, for example, consumes a lot of fuel, as does carrying food from the farm to the warehouse, as well as machinery that sorts, cleans, packages, or prepares food. Oil, diesel, and other fuels are used in a lot of these machines. Furthermore, landfills are always located outside of cities.

As a result, trash is delivered long distances through garbage trucks that run on gasoline or diesel. When these fuels are used, damaging greenhouse gases are released into the atmosphere. Food waste wastes a lot of gasoline or oil at the back and front end, which has a big influence on our environment.

##### 3) *Food waste equates to land waste*

In terms of food waste, there are two types of land waste. The land that is used to grow food and the land that is utilized to dispose of waste food. Arable and non-arable land are the two types of land. Crops can only be cultivated on arable ground, therefore non-arable soil is not suitable for growing crops. These pastures are ideal for animals because they are not arable.

Non-arable land is used for animal production on about 900

million hectares.

Agriculture covers over 11.5 billion hectares of the world's land surface.[6] It is not an issue to use land for growing crops or raising cattle. Food waste is the main issue. We never really think about what we throw away with our food.

4) *Biodiversity is harmed by food waste*

Biodiversity refers to the whole range of life found in an ecosystem, including different species and types of organisms. Deforestation is carried out in order to rear or expand animals. This has a negative impact on our natural flora and animals. When the number of animals increases, more natural land is converted into pastures.

The more livestock graze on land, the less arable it becomes. The land loses its natural diversity and becomes less natural. Marine fishes are collected in vast numbers without comprehending the impact that their population decline has on our biodiversity.

7. Food Waste Management

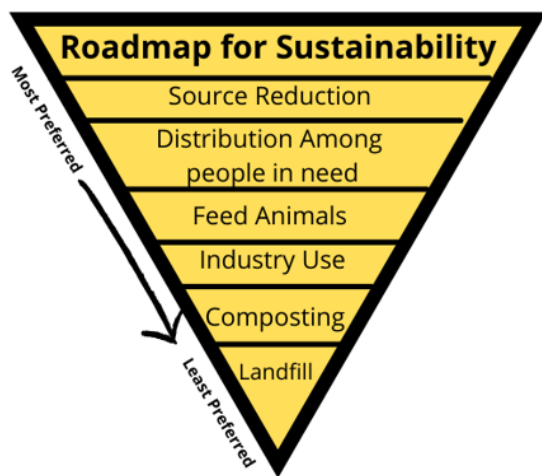


Fig. 1. Conceptual diagram representing the food wastage management pyramid

The following pyramid shows the roadmap towards sustainability. It includes the following steps:

1) *Source reduction*

It is suggested that the volume of surplus food generated must be reduced. This has incredible benefits which includes reduction in methane production, reduction in pollution etc.

2) *Distribution*

The food produced can be distributed to the people in need. A large number of people sleep on empty stomachs. The food instead of being thrown must be distributed.

3) *Feeding animals*

Food can also be fed to animals like dogs, cats which can easily be found on the street. There are also many organizations which can help in feeding animals. Companies can also contact nearby zoos where the surplus food can be converted to feed animals.

4) *Industry use*

Food scraps, manure can be sent to the industry for processing. Anaerobic digestion is a process through which bacteria break down organic matter—such as animal manure,

wastewater biosolids, and food wastes—in the absence of oxygen. [7] Fats, lipids and oils should not be sent directly to the landfills, they can clog. These must be processed. Industry requires these products in a lot of processes.

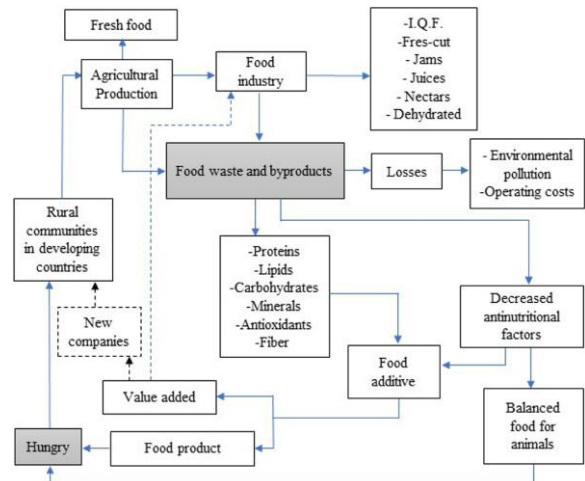


Fig. 2. Conceptual diagram of the use of food waste and byproducts in the minimization of hunger

5) *Composting*

There are certain inedible parts to the food that might still remain. This can be used for composting. It helps in providing nutrients to the plants and vegetation. Composting has various benefits; it reduces gas emissions by a significant number [9].

6) *Landfill*

The remains of the food can be sent off to disposal. This is also called incineration. This is the end point of the roadmap for sustainability.

8. Technology in Food Waste Management

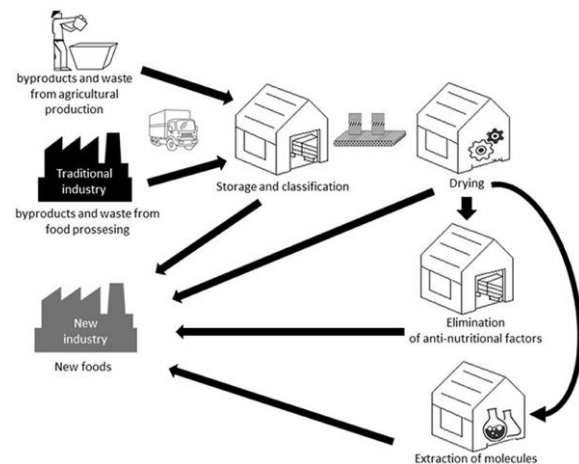


Fig. 3. Technological perspectives for the use of food waste and byproducts in the development of food

Technology can be used to provide solutions to this problem. There are various ways in which technology can help us. This includes the advanced machinery to provide portals which can help in the even distribution of the food supply.

## 9. Conclusion

Hunger and food wastage has become a worldwide problem. Developing countries to developed countries all are suffering its consequences. On one hand people are losing lives due to hunger and on the other the surplus food produced goes into waste. Uneven access to resources like food, famine, and natural disaster has caused shortage of food.

The solution to food wastage and hunger lies in planned distribution of food, well-built waste management systems and use of biomaterials. Even distribution of food could play a major role not only in solving the problem of food wastage but also of hunger. This can be done by building technologically advanced systems which can be accessed by millions of people looking for food. It could be a simple portal or an application. Another solution would be to build better waste management systems using technologically advanced machinery. This could leave less food material which would land in the landfills.

Finding a solution to the food wastage problem is the need of the hour. Deaths due to hunger are increasing day by day.

Famine, pollution and natural calamities have added to this problem. We all must come together and help reduce food wastage by producing enough and distributing to the needy.

## References

- [1] Chintan India. Problem Statement: It is further estimated that the value of food wastage in India is around ₹92,000 crores per annum.
- [2] Harshita Tyagi, 2020. Times Now News World Food Day 2020: How food waste affects the economy.
- [3] The Indian Express 2022 "India has a food wastage problem. Here's how individuals can make a difference."  
<https://indianexpress.com/article/opinion/columns>
- [4] Ayesha Anzer, Hadeel A. Tabaza, and Wedad Ahmed, "A Food Waste Reduction Mobile Application."
- [5] United Nations, 2nd Sustainable Development Goals (SDGs): No Hunger
- [6] Roopika Nigam & Sanjana Sharma, Food Waste Management, Amity Journal of Energy and environmental studies.
- [7] EPA. 2022 "How does anaerobic digestion work"  
<https://www.epa.gov/agstar/how-does-anaerobic-digestion-work>
- [8] Frontiersin, 2022, <https://www.frontiersin.org>
- [9] EPA, 2022, "Reducing the Impact of Wasted Food by Feeding the Soil and Composting."  
<https://www.epa.gov/sustainable-management-food/reducing-impact-wasted-food-feeding-soil-and-composting>