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A STUDY ON PROMOTION OF SUSTAINABLE CONSUMPTION BY COMBATING FOOD WASTAGE

AUTHORED BY - MADHUMITHA C L¹

Abstract:

The serious threat existing in any country is the wastage of food. With the increase of food insecurity, food wastage is a critical issue that is very much required to be addressed on a global level. Currently, there are about 60 billion people in the world who are suffering from malnourishment. If this situation persists, there will be a serious threat to mankind. The United Nations sustainable development goals aim to reduce the wastage of food by 2030. According to the food waste index report published on March 21 by the United Nations Environment Program highlights the food waste scale and indicates that global food waste is more than twice the size of previous estimates. This paper analyzes the review of existing regulations that help to mitigate the wastage of food and also to suggest certain recommendations to reduce food wastage at household, retails and restaurant level. The author also suggests the incorporation of artificial intelligence technology to scrutinize the levels of food wastage in order to maintain food security and to promote sustainable development.

Keywords: Sustainable consumption, Food security, AI technology.

Introduction:

A clear and tragic paradox exists between the growing amount of edible food that is lost throughout the supply chain or purposefully thrown out by consumers and the lack of food supplies for a significant portion of the world's population that still struggles with starvation.² Due to a growth in food variety and longer travel times between the source and consumption points as a

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² Lucifero, N. Food loss and waste in the EU law between sustainability of well-being and the implications on food system and on environment, J Sci Agriculture and Agricultural Science Procedia 2016; 8: 282-289

result of market globalization, the food supply chain has grown more complex during the past few years. Food loss and waste account for over one third of all food produced for human consumption worldwide or 1.3 billion tonnes annually. This problem is getting worse on a global scale. Food waste is a serious problem that affects the environment, the economy, society, and ethics. First of all, it wastefully uses resources, fills up landfill space, and emits greenhouse gases that contribute to climate change and global warming. Second, it entails substantial expenditures, which include the price of the items themselves as well as costs associated with manufacture, storage, shipping, and treatment. Lastly, leftover food that is still safe to eat can be donated to fight hunger, advance social equality, and ensure the food security of an expanding population. In order to increase the supply chain's resource efficiency, make food more accessible, and decrease hunger, it is imperative to prevent and reduce food waste. From agricultural production through the storage and shipping phases to the point of final household consumption, food is wasted along the whole supply chain. According to the Food and Agriculture Organization of the United Nations (FAO), food is lost and wasted in medium- and high-income nations most frequently later on in the supply chain, regardless of whether it is still fit for human consumption. The wealth in those nations and the decreased food prices are a couple of the causes behind this. However, food waste and losses are more common in developing nations at the beginning of the food value chain as a result of strict quality standards for shape, size, or appearance, inappropriate food packaging solutions, inadequate transport infrastructure, and inadequate storage, cooling, or market facilities.³

Sustainable Development Goals on Food Security:

The second Sustainable Development Goal is to end hunger worldwide by 2030. Around 161 million more people than in 2019, between 720 and 811 million people worldwide were hungry in 2020. Also in 2020, a staggering 2.4 billion people, or more than 30% of the world's population, lacked regular access to adequate food and were either moderately or severely food insecure. In just one year, the number increased by nearly 320 million. In 2020, stunting (low height for age) affected 149.2 million children worldwide, or 22.0 percent. This was a decrease from 24.4 percent in 2015.

Between 2014 and the beginning of the COVID-19 pandemic, there had been a gradual increase in the number of people going hungry and experiencing food insecurity. All forms of malnutrition,

³ <http://www.fao.org/save-food/resources/keyfindings/en/> (accessed 18/02/2023).

particularly in children, have been exacerbated by the COVID-19 crisis, which has pushed those rising rates even higher. The conflict in Ukraine is causing the greatest global food crisis since the Second World War and further disrupting global food supply chains.⁴

Around 161 million more people when compared to 2019, between 720 and 811 million people worldwide were hungry in 2020. Also in 2020, a staggering 2.4 billion people, or more than 30% of the world's population, lacked regular access to adequate food and were either moderately or severely food insecure. In 2020, stunting (low height for age) affected 149.2 million children under 5 years old, or 22.0 percent, a decrease from 24.4 percent in 2015. The current annual decline rate of 2.1% must double to 3.9% in order to meet the goal of reducing the number of stunted children by 5% by 2025. 45.4 million, or 6.7%, of children under the age of five will be affected by wasting (low weight for height) in 2020. The proportion of nations afflicted by high food prices, which had been relatively stable since 2016, significantly increased from 16% in 2019 to 47% in 2020.⁵ The objective of the Food Waste Index Report is to support SDG 12.3 objectives. By presenting the most extensive collection, analysis, and modeling of food waste data to date, it generates a new estimate of global food waste and releasing a method for measuring food waste at the household, food service, and retail levels in order to report on SDG 12.3 and track national progress toward 2030. Using this method, nations will produce solid evidence to guide a national strategy to prevent food waste. The evidence will be sensitive enough to detect changes in food waste over two or four years and allow for meaningful comparisons between nations worldwide.⁶ Food waste is a major issue around the world, and while there is still much that can be done to stop it, some nations have passed legislation to make it illegal to throw away food. Governments from numerous nations collaborate with the commercial sector and have set high goals for reducing food waste in the future. Yet, few nations have actually passed legislation to encourage this as soon as possible. Below are the nations that have legislations against food wastage.

France:

In February 2016, France passed a groundbreaking regulation to combat food waste, requiring stores to donate any unsold food instead of destroying it. This regulation, which forbade its destruction and encouraged donations, served as the impetus for the fight against food waste. After

⁴ <https://www.un.org/sustainabledevelopment/hunger/> (accessed on 20/02/2023)

⁵ <https://www.un.org/sustainabledevelopment/progress-report/> (accessed on 20/02/2023)

⁶ <https://www.unep.org/resources/report/unep-food-waste-index-report-2021> (accessed on 20/02/2023)

its implementation, its reach has been progressively expanded as shown by fresh decrees and legislation. Although food waste in France is lower than the average for the EU, it occurs more evenly throughout the entire food supply chain. Food waste at the consumer level in the EU accounts for 53% of wastage but in France it is only 33% of wastage which includes collective catering and restaurants. 14% more occurs at the retail level, while the remaining 86% occur within the production and process processes. The initial law, enacted in 2016, prohibits the destruction of unsold food goods and encourages food donation as a way to reduce food waste. In order to reduce food waste across the board, it first concentrated on the retail industry. Nevertheless, by adopting a food waste hierarchy, it also created a framework for food waste prevention. Then, a number of additional requirements were put into place through decrees and regulations that strengthened and expanded the 2016 law's application to catering and food distribution while also setting general goals to minimize food waste by 50% by 2025.⁷

Italy:

Since 2016, Italian law allows retailers to donate food scraps to food banks and charities. Businesses are exempt from penalties under the law if they donate food past its sell-by date, and there are tax incentives available proportional to the amount of donated food. Food producers can also donate food that they would otherwise throw away. The general goal of the law is "to decrease waste for each of the stages of food, pharmaceutical, and other product manufacturing, processing, distribution, and administration, through the implementation of specified priorities." In order to do this, emphasis is placed on promoting and enabling the gift of pharmaceuticals and food surpluses in solidarity, with a focus on human use. The law forbids the waste of food and applies to both supermarket goods and farm-fresh produce.⁸

South Korea:

The Korean government gave food waste a high priority by building the infrastructure needed to manage it, studying obstacles to implementation, communicating with restaurant owners, educating the general public before the rollout, and eventually enforcing noncompliance. The meticulously planned phases of implementation assisted in gaining public support for the plan, which in turn increased public trust because residents witnessed the system's effectiveness.

⁷ https://zerowasteurope.eu/wp-content/uploads/2020/11/zwe_11_2020_factsheet_france_en.pdf (accessed on 25/02/2023)

⁸ https://zerowasteurope.eu/wp-content/uploads/2020/11/zwe_11_2020_factsheet_italy_en.pdf (accessed on 25/02/2023)

The Korean government has been implementing waste management strategies since the middle of the 1980s with the intention of requiring producers to reduce waste at the point of manufacture. The 1986 Wastes Control Act, which was amended in 2007, defines the roles and responsibilities of producers and consumers in waste management and mandates that the environment minister develop a national waste management strategy every ten years. The volume-based waste fee system, which was implemented in 1995, required producers to pay the cost of disposal and made them accountable for the waste they produced, resulting in a 23 percent decrease in domestic waste.

Food disposal in landfills was outlawed by the Korean government in 2005. Five years later, they started a pilot program to get rid of food waste. Under this program, people in 144 local regions were held financially responsible for the food waste they made. The government was developing the infrastructure for a national system to dispose of food waste at this time. Every Korean resident was required to properly dispose of their food waste and pay by weight when it was implemented in 2013. Noncompliance results in fees from the government.⁹

China:

According to an investigation carried out by the Institute of Geographic and National Resources Research and the World Wide Fund for Nature, more than 35 million tonnes of food are lost or wasted annually in China, which is about 6% of the country's total food production and is sufficient to feed 30 to 50 million people. At the end of the supply chain, between 17 and 18 million tonnes of food are wasted, accounting for approximately half of that total. at retail or consumption, implying that food that has already been prepared and cooked is literally being thrown away. During a meeting of the National People's Congress (NPC) Standing Committee in April 2021, Chinese lawmakers decided to pass a law against food waste.

The law, which aims to protect China's food security, responds to President Xi's calls for greater awareness of food security and primarily targets restaurants, which are China's largest consumer of food waste. First, there is a ban on having too many leftovers to stop hosts from ordering too much food to impress their guests. Any customer who brings in an excessive amount of food that

⁹ <https://keia.org/the-peninsula/south-koreas-food-waste-system-is-a-model-for-developed-nations/#:~:text=In%202013%2C%20it%20was%20rolled,that%20opens%20by%20RFID%20chip>. (accessed on 25/02/2023)

has not been consumed may be subject to additional charges from the restaurant. Restaurants are free to set their own prices, but customers must see them clearly. Second, caterers are obligated to remind clients of their responsibilities regarding food frugality. A fine of up to 10,000 yuan, or approximately \$1,580 USD, could be imposed on restaurants found guilty of inducing or misleading behavior. Restaurants that consistently throw away a lot of food could also face a fine of up to 50,000 yuan (7,900 dollars). Thirdly, competitive eating and bingeing cannot be live streamed by online bloggers. A fine of up to 100,000 yuan (USD\$15,800) could be imposed on anyone who distributes such content, and media outlets could even be forced to close if their violations are deemed to be severe.¹⁰

United States:

The U.S. 2030 Food Loss and Waste Reduction goal, the first-ever domestic goal to reduce food loss and waste, was announced on September 16, 2015, by the Environmental Protection Agency (EPA) and United States Department of Agriculture (USDA). By the year 2030, the objective is to reduce food loss and waste by half. The United States can improve food security, save money for families and businesses, and reduce climate and environmental impacts caused by food loss and waste by pursuing this objective. The federal government, led by the Environmental Protection Agency, the Food and Drug Administration (FDA), and partners in state, tribal, and local government, as well as communities, organizations, and businesses, is aiming to achieve this objective.¹¹

Indian Scenario:

Up to one third of all food is thrown away or destroyed before it can be eaten, according to the Food and Agriculture Organization of India. This stands rather than the 800 million individuals around the world, who don't have satisfactory food. Food waste makes up 19 percent of all waste found in landfills, which helps produce greenhouse gases. Food waste isn't just a problem for hotels. Only slightly more than half of the food at a hotel buffet is consumed, which not only contributes to waste but also reduces the already slim profit margins of the foodservice industry

¹⁰ <https://earth.org/food-waste-in-china/#:~:text=China%20Food%20Waste%20Law&text=First%2C%20excessive%20leftovers%20are%20banned,excessive%20quantities%20of%20uneaten%20food> (accessed on 25/02/2023)

¹¹ <https://www.epa.gov/sustainable-management-food/united-states-2030-food-loss-and-waste-reduction-goal> (accessed on 28/02/2023)

by throwing away the remaining 40%.¹² In the beginning of 2017, the Indian government stated that food waste at weddings, hotels, and restaurants needed to be regulated. However, the retail sector's concerns have not yet been specifically addressed.

The Department of Consumer Affairs acknowledged the difficulty of regulating overindulgence in terms of purchase and consumption in a report on food waste caused by the hospitality industry. Print and electronic media were used to promote education and increased awareness of food waste as the primary solutions to India's food waste issue. Yes, early awareness of our responsibility to reduce food waste is essential for altering our society's approach to hunger and food scarcity. However, in addition to implementing easy-to-implement and effective measures that retail sectors in other nations have already developed, we must continue to comprehend how our unique distribution system can meet the needs of millions of Indians who are starving.¹³

The Food Safety and Standards Authority of India (FSSAI) aims to encourage individuals to donate food and grocery items to charitable organizations so that they can be distributed to those in need. To establish an ecosystem for food recovery, the FSSAI has launched the 'Save Food Share Food Share Joy' initiative. The goal of this initiative is to connect beneficiaries, surplus food distribution agencies, and food companies. The establishment of the Indian Food Sharing Alliance (IFSA), a nationwide network of food collection and recovery organizations in India, is one of the main features. With regulatory support, food safety training, and efforts to build capacity, this network will be a common platform for this cause that will benefit all of them equally.¹⁴

To begin, addressing the issue in a more methodical and appropriate manner necessitates an understanding of food loss and waste as distinct processes. Food loss typically occurs during the production, storage, processing, and distribution stages from the farm up to the retail level, despite the lack of a clear distinction between the two. Typically, it occurs as a result of storage, infrastructure, packaging, and marketing restrictions. On the other hand, food wastage refers to the loss of food at the household, food service, and retail levels. It is generally the result of

¹² <https://www.netsolwater.com/how-to-solve-food-waste-in-hotels-of-india.php?blog=3648> (accessed on 25/02/2023)

¹³ <https://www.chintan-india.org/sites/default/files/2019-09/Food%20waste%20in%20India.pdf> (accessed on 28/02/2023)

¹⁴ https://www.fssai.gov.in/upload/media/FSSAI_News_Donation_Financial_27_08_2019.pdf (accessed on 01/03/2023)

carelessness or the choice to discard food.¹⁵

In India, the government has collaborated with public and private stakeholders to implement SAMPADA, the national policy for developing an integrated cold supply chain for agricultural products. SAMPADA stands for "Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters." Fruits and vegetables, which are perishable, necessitate immediate policy interventions. Based on the lessons learned from Operation White (milk is lost at a rate of 0.92 percent), the government's new program, "Operation Greens," can develop more integrated solutions. Food loss can be reduced through a sub-national policy that encourages farmers to use more efficient harvesting techniques. Based on past experiences, food loss in the supply chain could be reduced by better aggregating farmers through farmer producer organizations (FPOs) and shortening the time between harvest and sale. Adequate policy measures like "food for assets" that encourage afforestation and the development of community infrastructure, can assist in reducing consumer food waste. Policies that are supported by evidence, precise measurements of food loss and waste, and a national food processing policy are the most pressing requirements at this time. To address the issue holistically, policymakers and institutions must collaborate with private institutions, including civil society and other stakeholders.¹⁶

How Artificial Intelligence help to Combat Food Wastage?

Nearly every area of technology makes extensive use of autonomous systems or Artificial Intelligence-based systems. It makes it possible for the world to effectively solve problems, computerize the food industry, and transform products produced by the food industry.¹⁷ There are two broad categories of the significant roles that Artificial Intelligence plays in the food industry: Food quality management and food security management.

One of the most time-consuming and labor-intensive processes for manufacturing units in the food processing industry is the correct ordering and packaging of food products. As a result, Artificial Intelligence-based systems are capable of handling such a laborious task, reducing the likelihood

¹⁵ <https://www.newindianexpress.com/nation/2020/oct/05/1550-tonnes-food-grains-wasted-at-fcigodowns-during-lockdown-says-government-data-2205893.html> (accessed on 01/03/2023)

¹⁶ https://thebulletin.brandtschool.de/food-loss-and-waste-reduction-policy-in-india-role-of-private-and-public-institutions#_ftn5 (accessed on 02/03/2023)

¹⁷ G. Soltani-Fesaghandis and A. Pooya, "Design of an artificial intelligence system for predicting success of new product development and selecting proper market-product strategy in the food industry," *International Food and Agribusiness Management Review*, vol. 21, no. 7, pp. 847–864, 2018.

of error and accelerating industry production.¹⁸ The improvement of artificial intelligence based frameworks is a provoking errand because of the anomalies in shapes, variety, and sizes of vegetables and organic products. In order for an Artificial Intelligence-based sorting and packaging system to be developed, a significant amount of data is required for the system's efficient training.¹⁹

Although it has not yet been implemented on a large scale, the efficiency of robotics can now be utilized in the food-based industries thanks to AI advancements. A wide variety of robotics are being used in the food industry, such as drones for food delivery and robotic arms for food processing.²⁰ By the year 2030, McKinsey claims that AI will be able to eliminate a significant amount of food waste and resolve such issues. By introducing additional regenerative leisure farming practices, it is possible to achieve such surprising statistics.²¹ It demonstrates that humans are not effectively utilizing the resources at their disposal. Smarter farming techniques can take the place of conventional farming practices. In this, a variety of sensors are used to gather data. Machine Learning algorithms are used to process the collected data before making the right choices. Farmers can make decisions quickly and accurately using these. The following are some Artificial Intelligence-based suggestions for reducing food waste:

- While some explanations focus on the fruit's maturity, others focus on the microorganisms that can boost the development of fruits and vegetables without the use of artificial fertilizers.
- Manufacturers can get rid of ground testing by getting paid by artificial intelligence, which will save them a lot of money in capital.
- Each process in farm-based food supply chain management is managed and examined using computer vision technology; then, there will be a rapid decrease in food waste.
- Computerized reasoning based food global positioning frameworks will empower us to sell food in front of it transforming into squander. Using this, more people and farmers can connect to purchase food products.

¹⁸ S. Tripathi, S. Shukla, S. Attrey, A. Agrawal, and V. S. Bhadoria, "Smart industrial packaging and sorting system," in *Strategic System Assurance and Business Analytics*, pp. 245–254, Springer, Singapore, 2020.

¹⁹ T. Dewi, P. Risma, and Y. Oktarina, "Fruit sorting robot based on color and size for an agricultural product packaging system," *Bulletin of Electrical Engineering and Informatics*, vol. 9, no. 4, pp. 1438–1445, 2020

²⁰ B. Melander, B. Lattanzi, and E. Pannacci, "Intelligent versus non-intelligent mechanical intra-row weed control in transplanted onion and cabbage," *Crop Protection*, vol. 72, pp. 1–8, 2015.

²¹ V. Filimonau, E. Todorova, A. Mzembe, L. Sauer, and A. Yankholmes, "A comparative study of food waste management in full service restaurants of the United Kingdom and the Netherlands," *Journal of Cleaner Production*, vol. 258, Article ID 120775, 2020.

There are a few benefits of artificial intelligence in the food industry, one of which is that almost all food processing industries now use AI to improve demand-supply chain management, precise logistics, predictive analysis, and system precision. The digitization of the systems that manage the demand-supply chain eventually prompts returns and provides a better understanding of the circumstances. The amount of data that can be examined by artificial intelligence is far beyond what can be done by humans. Computer based intelligence assists industry with decreasing the chance to commercial center also what's more, further develop concurrence with doubts. The cost of labor will go down, production will move at a faster rate, and the quality of the products will improve as a result of automated ordering.

Conclusion:

India is home to 25% of the world's hungry people, despite the fact that the country produces enough food to feed its entire population. In order to eradicate hunger and malnutrition in India, the holistic approach to food security requires ensuring the availability, accessibility, and quality of nutritious food. The ecosystem is under more pressure to produce enough food as a result of rising population, changing climate, and pressure from land use. A predominantly greater part of India's ranchers are little and minimal ranchers for example holding short of what one hectare of land. Despite the fact that many are unable to generate sufficient income to keep their families from falling into poverty, increasing their productivity is essential for meeting India's future food requirements.

Significant food losses, most of which are caused by poor post-harvest management and a lack of storage facilities, add to the difficulty of ensuring food security. In India, the majority of food waste is produced by domestic, commercial, agricultural, and industrial sources. A comprehensive approach to its management is essential because food waste is a serious concern. Concerns, management strategies, and future perspectives regarding food waste management in India are examined in this article.

The necessity of safeguarding nutrition and food security was once more emphasized at the last meeting of the G20 agriculture ministers in September 2020, which was held almost immediately following the Covid-19 pandemic. India will be in charge of the G20 in 2023, so it makes sense for India to stress the significance of reducing food loss and waste. In the lead-up to the G20 summit in 2023, a partnership with civil society to mobilize public opinion to significantly reduce

food waste can yield significant results.

Finally, India has 135 million people. Social campaigns like "Swachh Bharat Abhiyaan" can control food waste, and we should all take responsibility for not wasting food on our plates. This should become a habit in society, and the concept of not wasting food should be incorporated into early education and general awareness.

