

Strengthening Food Security: A Conceptual Scholarly Examination of the Linkages between Food Loss and Food Waste

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Abstract

In this forthcoming qualitative research, a critical exploration of the vexing challenge of food loss and waste within the Malaysian context is undertaken. This inquiry engages with key stakeholders, including the Ministry of Agriculture and Food Security, alongside restaurant and foodservice providers. Utilizing in-depth interviews, the study unravels the underlying causes of food loss and waste, discerns the impact of government policies, scrutinizes the formidable challenges encountered by the foodservice industry, and spotlights sustainable practices as well as collaborative endeavours geared toward addressing this paramount issue. The envisioned findings are expected to unveil a multifaceted landscape of factors that contribute to food loss and waste. These encompass supply chain inefficiencies, intricate consumer behaviour patterns, and the formidable regulatory challenges that define this complex issue. The chosen research methodology, characterized by in-depth interviews, is aptly suited to unearth the nuanced struggles faced by restaurant and foodservice providers, offering valuable insights into the sustainable practices they employ to mitigate food waste and the cooperative initiatives fostering intersectoral collaboration. The significance of this impending study lies in its potential to craft policy recommendations and delineate strategies designed to bolster the reduction of food loss and waste. By shedding light on the intricate nature of this challenge and the evolving efforts undertaken to combat it, the research contributes to a future characterized by a more sustainable and conscientious food industry in Malaysia. The implications of this work extend to environmental conservation, economic efficiency, and the fortification of food security in the years to come.

.Keywords:

Food Loss, Food Waste, Food Security

1 Introduction

Food loss and waste constitute a significant issue in Malaysia, affecting food security, economic stability, and environmental well-being. Malaysia discards approximately 23,000 tons of food daily, which accounts for 53% of its total food production, as reported by the Food and Agriculture Organization (FAO) in 2021. The reasons behind this food loss and waste in Malaysia are multifaceted and resemble the factors discussed in the preceding section. Much like in other nations, the entire food supply chain in Malaysia, spanning from production and processing to distribution and consumption, contributes to this wastage. The country has observed a rise in the quantity of discarded food, leading to various environmental concerns (Ahmed & Siwar, 2013; Ahmad, Wong, & Elahi, 2017). Currently, the Malaysian government's actions and initiatives to combat food waste are primarily centered on landfill and incineration methods, which are neither sustainable nor comprehensive approaches (Lim et al., 2016; Sulaiman & Ahmad, 2018). These conventional waste management practices result in environmental pollution and fail to harness the potential value of discarded food. Consequently, there is an urgent need for the implementation of sustainable and holistic methods for handling food waste in Malaysia.

Food loss meanwhile, occurs at various stages of the production process and is influenced by factors such as climate change, land use practices, and ineffective crop management. In the production and distribution phases, inadequate infrastructure, limited storage options, and inefficient logistics also play a role. On the consumer side, behaviors like excessive shopping, improper food storage, and overordering at restaurants contribute to the significant food loss and waste in the nation (Ahmed et al., 2019). All of the aforementioned occurrences along the food supply chain have profound impacts on both the economy and society in Malaysia. It's estimated that the annual economic value of food waste amounts to approximately MYR 31 billion (USD 7.5 billion). This substantial sum of money could have been used to enhance the country's food security in the face of future uncertainties (FAO, 2018). Beyond the economic aspect, food loss and waste also have detrimental environmental effects, including increased greenhouse gas emissions, water usage, and land utilization (Ivanova et al., 2016). Therefore, reducing food wastage and losses in Malaysia has the potential to promote sustainable development and contribute to the nation's progress toward achieving the Sustainable Development Goals, particularly SDG 2 (zero hunger) and SDG 12 (responsible consumption and production).

In Malaysia, a range of strategies has been put into action to address food loss and waste, including initiatives like the "Food Bank Malaysia" project and the Malaysian Sustainable Palm Oil Certification Program. One of these approaches involves educational campaigns and awareness programs targeting consumers to encourage responsible consumption practices, proper food storage, and meal planning. The objective of these programs is to increase consumers' understanding of the significance of reducing food waste and provide them with the information and tools needed to make informed choices (Bernama, 2020). Furthermore, endeavors have been

undertaken to improve food distribution systems by establishing collaborative platforms and mobile applications that link businesses with surplus food to local charities and food banks. This streamlines the efficient redistribution of surplus food to individuals in need.

Promoting sustainable agricultural methods, including precision farming, organic farming, and integrated pest management, is a priority to minimize crop damage and optimize resource utilization, ultimately reducing food loss. Additionally, research and development endeavors are concentrated on enhancing packaging and storage technologies to extend the shelf life of food products and prevent spoilage during transportation and storage (MPOB, 2018). Collaboration involving government agencies, non-governmental organizations, and industry stakeholders is another crucial aspect, facilitating the formulation of comprehensive policies, guidelines, and standardized approaches for food waste reduction. However, despite the inspiring nature of these efforts discussed so far, the outcomes remain uncertain, as the volume of wasted food in the country continues to be a cause for concern. In fact, quantifiable results or reports regarding the effectiveness of these initiatives or programs are not readily available or easily accessible.

Having said that, there is a pressing need for accurate and dependable data regarding the scale of the issue, the contributing factors, and the efficacy of programs aimed at reducing food loss and waste in this country. The absence of consistent and reliable methodologies for quantifying the extent of food wastage is a significant global challenge, and this holds true for Malaysia (FAO, 2014). Malaysia could potentially address this issue by adopting a standardized and uniform approach, such as the Food Loss and Waste Accounting and Reporting Standard developed by the World Resources Institute (WRI, 2021). However, it's worth noting that even this method has yet to gain universal recognition.

Up to this point, it has been established that food loss and waste constitute a global challenge with noteworthy environmental, societal, and economic repercussions. Existing literature on this subject has predominantly concentrated on the food service supply chain, where there is a consensus that food loss and waste primarily stem from deficiencies in infrastructure, technology, and managerial skills in food production and transportation, as well as issues related to poor coordination and communication between various production stages and consumer behaviors (Bhattacharya, Nand, & Prajogo, 2021; Lemaire & Limbourg, 2019; Magalhães, Ferreira, & Silva, 2021). Nevertheless, the majority of the research conducted so far has primarily centered on the interface between suppliers and retailers within the supply chain, often overlooking the comprehensive understanding of food loss and waste occurring across all layers or stages in the supply chain (Bhattacharya et al., 2021; Chaboud & Daviron, 2017).

The government's current initiatives and endeavors are constrained to the use of landfill and incineration methods, which are neither sustainable nor comprehensive. This underscores the need for a coherent framework that incorporates strategies for source reduction, recycling, and recovery. These strategies are designed to reduce the generation of food waste, transform waste into valuable resources, and ensure surplus

food reaches those in need. Nevertheless, the absence of clear and all-encompassing policies hampers the implementation of sustainable practices. To tackle this issue, a well-defined framework, coupled with supportive policies, regulations, and incentives, is imperative. Such a framework would encourage waste reduction, promote recycling and recovery efforts, and nurture responsible consumption.

Hence, the objective of this conceptual paper is to bridge this gap by concentrating on the assessment, influential factors, and potential remedies pertaining to food loss and waste occurring within the supply chain, specifically at the level of retailers, which, in the context of this investigation, pertains to restaurants and foodservice providers. Restaurants and foodservice providers are acknowledged for their significant role in generating a substantial portion of food waste within the broader food supply chain. The foodservice industry exhibits a distinctive trait characterized by frequent food turnover and often operates with slim profit margins, making it particularly susceptible to inefficiencies that contribute to food waste generation (Phool et al., 2022 & Lins et al., 2021).

By delving into this specific aspect, the study aims to provide valuable insights that can inform the development of effective strategies to reduce food loss and waste at these crucial stages of the supply chain. The central issue revolves around the necessity for sustainable and comprehensive approaches to managing food loss and waste in Malaysia. This project will also shed light on the multifaceted challenge of food loss and waste within the foodservice industry. By exploring the perceptions of foodservice providers regarding the causes of waste, evaluating current measurement methods, and identifying implementation challenges, it seeks to develop a holistic framework that can drive sustainable and integrative food waste management practices. This study represents a significant step toward addressing an issue that impacts not only the foodservice industry but also society as a whole, and it is poised to offer valuable insights and practical solutions for a more sustainable and responsible approach to food management.

2 Literature Review

2.1 The Concept of Food Loss and Food Waste

The terms "food loss" and "food waste" are occasionally used synonymously, despite their distinct definitions. Food waste primarily occurs towards the final stages of the food supply chain, mainly at the consumer level, where edible items are discarded. In contrast, food loss takes place earlier in the chain, encompassing processes from production to distribution, involving the spoilage or wastage of food before it reaches the consumer. Both of these expressions have significant ramifications for global food security and sustainability, impacting economic, social, and environmental dimensions worldwide.

2.1.1 Food Loss

Food loss refers to the reduction in the quantity or quality of food that occurs at the inception of the food supply chain, spanning from food production to distribution. This can be attributed to inadequate practices in harvesting, packaging, storage, transportation, as well as market and economic factors. The Food and Agriculture Organization (FAO) defines food loss as occurring when food becomes unavailable for human consumption due to losses during production, postharvest handling, storage, processing, or distribution (FAO, 2021a).

The issue of food loss is a significant global concern, with a particularly severe impact in less affluent nations where infrastructure and technology are often limited, and the food supply chain is less developed. According to the FAO, approximately 1.3 billion tonnes of food, which constitutes 14 percent of the world's food supply, are lost annually (FAO, 2021a). The substantial economic cost of food loss is estimated at \$940 billion globally (FAO, 2021a). It is essential to emphasize the social consequences of food loss, particularly its adverse effects on impoverished communities by exacerbating food and nutrition insecurity.

2.1.2 Food Waste

Conversely, food waste pertains to the disposal of food that remains suitable for consumption. While it can occur in retail establishments and eateries, it is most commonly observed at the consumer level. Food waste can be attributed to various factors, including excessive production, product expiration, spoilage, and individuals purchasing more food than necessary and discarding the surplus. According to the FAO, food waste is defined as the removal of food from the food supply chain for purposes other than consumption (FAO, 2021b).

Food waste is a global issue that is escalating, particularly in industrialized nations where the abundance and affordability of food contribute to higher wastage. It is estimated that approximately 1.3 billion tons of food go to waste each year, amounting to roughly one-third of the total food production (FAO, 2021b). The economic impact of food waste is substantial, with a global estimated value of around \$1 trillion (FAO, 2021b). Furthermore, food waste carries significant environmental consequences, as it intensifies greenhouse gas emissions, water and land usage, and other environmental challenges.

Food loss and food waste are interconnected issues that significantly affect the world's food supply and sustainability. When food deteriorates or becomes damaged, it can become unsuitable for human consumption and is discarded as waste, resulting in food loss. Conversely, reducing food waste can contribute to a reduction in food loss by lowering the demand for food production and alleviating pressure on the food supply chain to increase production. These two challenges have far-reaching implications for global food security and sustainability.

Hence, in order to mitigate food loss and waste, it is imperative to formulate a comprehensive strategy involving governments, consumers, and producers. The key measures for reducing food loss and waste entail investments in infrastructure and technology, heightening consumer awareness and education, enhancing consumer knowledge, and implementing regulatory measures aimed at incentivizing and overseeing food waste reduction.

In recent years, researchers have dedicated significant attention to the intricate issue of food loss and waste due to its profound implications for global food supply and sustainability. This research review centers on the origins, consequences, and potential remedies related to food loss and waste. The objective is to provide readers with a comprehensive overview of the research conducted in this field.

2.1.3 Causes of Food Loss and Waste

Food loss and waste can be attributed to a diverse array of factors that have repercussions for both food producers and consumers. Within the production and distribution phases, food losses occur due to various issues encompassing inadequate harvesting practices, suboptimal storage conditions, inefficient transportation methods, and improper packaging techniques, all of which are compounded by market dynamics and economic influences (Bellemare et al., 2017; FAO, 2011; HLPE, 2014). Conversely, at the consumer level, food waste arises from factors such as overproduction, product expiration, and spoilage, and is further exacerbated by consumer behaviors, including the tendency to purchase more food than required and discard leftovers (Parfitt et al., 2010; Stenmarck et al., 2016). These multifaceted challenges contribute to the overall issue of food loss and waste within the food supply chain, demanding comprehensive solutions and concerted efforts across all stages of the food journey.

2.1.4 Consequences Food Loss and Waste

The act of losing and wasting food carries significant repercussions for individuals, the environment, and the economy. When food goes to waste, it results in financial losses for farmers and other stakeholders, while individuals in vulnerable communities grapple with hunger (FAO, 2011; HLPE, 2014). The environment suffers as food waste contributes to greenhouse gas emissions, depletes water resources, and generates other ecological challenges. Moreover, food waste exacts a financial toll on consumers, retailers, and foodservice providers (FAO, 2013; Parfitt et al., 2010).

To curtail food loss and waste, it is imperative to develop a comprehensive strategy involving farmers, consumers, and policymakers. Key approaches to minimize food loss and waste include investing in upgraded infrastructure and technology, enhancing consumer awareness and education, and instituting regulations and incentives to promote and oversee reductions in food waste (Bellemare et al., 2017; HLPE, 2014; Stenmarck et al., 2016).

Numerous studies (Buzby et al., 2014; O'Driscoll et al., 2019) underscore the potential of food redistribution and recovery programs in reducing food waste and addressing food insecurity. These programs involve the collection of surplus food from stores, restaurants, and various sources and its distribution to shelters, food banks, and other organizations assisting those in need.

Furthermore, research emphasizes the significance of involving consumers in efforts to combat food waste. This can be achieved through education and awareness campaigns, alterations to food packaging, labelling, and portion sizes, as well as educational and awareness initiatives (Gustavsson et al., 2011; Quedsted et al., 2013). Behavioral interventions, such as providing feedback on food waste and offering incentives to minimize waste, have also demonstrated promise in reducing food waste in households (Bucher et al., 2016; WRAP, 2021).

In essence, food loss and waste are intricate challenges with profound impacts on the environment, society, and the economy. Resolving these issues necessitates a comprehensive approach involving a spectrum of stakeholders, from farmers to consumers to policymakers. As indicated by research, key strategies for reducing food loss and waste encompass increasing consumer awareness and education, investing in technological and infrastructural enhancements, implementing policy measures to promote and regulate food waste reduction, and enhancing food production and storage practices. Initiatives aimed at food redistribution and recovery, along with behavioral and educational interventions for consumers, can collectively contribute to reducing food waste and addressing food insecurity.

2.2 Food Security Theory

The concept of food security asserts that all individuals within a population should have access to an adequate supply of safe, nutritious food that allows them to lead healthy and active lives. It is a fundamental tenet that ensures the well-being of people, communities, and nations. This principle is grounded in the belief that having sufficient food is a fundamental human entitlement, and insufficient access to food can result in detrimental consequences for both individuals and society at large.

The United Nations Food and Agriculture Organization (FAO), frequently referenced for this definition, defines food security as the condition where "all individuals, under all circumstances, have the physical, social, and economic means to obtain sufficient, safe, and nourishing food that satisfies their dietary requirements and preferences for a healthy and active lifestyle" (FAO, 2015, p. 5).

In recent decades, the concept of food security has received extensive attention and scrutiny. A significant focus of research has been on identifying the factors contributing to food insecurity, including issues like poverty, conflict, climate change, and various forms of social and economic disparities (Maxwell, Smith, & Wiggins, 2016). Another avenue of inquiry has explored diverse strategies to address food insecurity, such as enhancing agricultural output, optimizing food distribution systems, and advocating for policies that support food security (FAO, 2018).

Various theories have been proposed to elucidate the complexity and multifaceted nature of food security. For instance, Amartya Sen's (1981) entitlement theory posits that a society's resource distribution and its capacity to access food are intricately interconnected. This theory underscores that individuals' entitlement to food is contingent on factors like their economic means, social standing, and political influence, among other variables.

An additional significant theory within the realm of food security is the household food security model. This model asserts that a family's food security status is contingent upon several elements that influence their ability to procure and consume food efficiently. These factors encompass income, employment status, the presence of social safety nets, access to land and other resources, as well as employment status (Cox & Edwards, 2016).

In summary, food security theory is a significant field of research aimed at ensuring that everyone has access to an ample supply of safe and nutritious food. Food security is a complex concept that has been extensively examined and discussed in recent decades. Theoretical frameworks like the entitlement theory and the household food security model have provided valuable insights into the causes of food insecurity and potential solutions.

The fundamental objective of food security theory is to guarantee that all members of a population can access sufficient safe and nutritious food, enabling them to lead healthy and active lives. Food loss and waste significantly diminish the available food supply, particularly affecting individuals already at risk of food insecurity. This has substantial implications for food security (FAO, 2011). To achieve food security, it is crucial to monitor and address food loss and waste.

The overarching aim of food security theory is to minimize food loss and waste, which is precisely what this study seeks to accomplish. This research has the potential to enhance food availability and food security by investigating the causes of food loss and waste and proposing measures to mitigate them.

Historical research has underscored the complexity of food loss and waste as multifaceted issues that require comprehensive approaches (FAO, 2018). Therefore, further research should concentrate on bridging the gaps between how food loss and waste are measured, their underlying causes, and strategies to mitigate them. This approach can guide policies and initiatives aimed at enhancing food security by reducing food loss and waste.

3 Methodology

3.1 Research Design

This qualitative research methodology aims to provide a comprehensive understanding of food loss and waste from the perspectives of key personnel in the Ministry of Agriculture and Food Security and the Quick Service Restaurants (QSRs). As

for the Ministry of Agriculture and Food Security personnel, semi-structured interviews will be conducted with selected personnel. The interviews will focus on topics such as government policies and initiatives related to food loss and waste, challenges faced, and potential solutions. Meanwhile, QSR sector is chosen based on the complicatedness of its operation that may mirrors all the four (4) major types of foodservice systems, namely conventional, commissary, ready prepared and assembly serve. Perhaps, their procedures in dealing with food loss and waste is more 'visible' as compared to other restaurant sectors given that their operation is full-fledged for 365 days a year with no off-peak season. Owing to these characteristics, the selection of this sector is appropriately justified where QSR ways of dealing with food loss and waste can be a good reference point for other sectors in the industry.

The sample will consist of chained QSR restaurant managers. Being familiar with the operation by overseeing and managing QSR overall procedures is important in ascertaining the inclusion criteria that will address the research question. Having said that, QSR restaurant/outlet managers are the most suitable candidates to be the informants for this study. Their knowledge and experience from proper training programs and direct involvements in the operation on a daily basis will be valuable to meet the overall purpose of this study. The researcher's expertise in this industry will also aid in facilitating the ease of communication especially in overcoming potential barriers such as the use of metaphors by prospective candidates.

With regards to interview protocol, it will be developed to guide the interviews. This protocol will consist of open-ended questions and prompts to encourage participants to share their experiences and insights. Probing questions will be used to explore specific issues in depth.

Interviews may be conducted in person, over the phone, or via video conferencing, depending on participant availability and preferences. Audio recording and note-taking will be used to document the interviews. Data collection will continue until data saturation is reached, meaning that no new significant themes or insights are emerging from the interviews.

3.2 Plan for Data Analysis

The recorded interviews will be transcribed verbatim. Thematic analysis will involve the systematic coding of interview transcripts. Initial codes will be generated based on recurring patterns and themes emerging from the data.

Codes will then be organized into broader themes and sub-themes. Themes will represent key concepts and findings related to food loss and waste factors, government policies, challenges, and solutions or strategies. Data analysis will involve interpretation and sense-making to provide a rich and contextually informed understanding of the issues and insights shared by participants. The thematic analysis of interview data will help identify areas for policy improvement and best practices within the foodservice industry to mitigate food loss and waste.

3.3 Ethical Considerations

Informed consent will be obtained from all participants. Anonymity and confidentiality will be maintained in reporting and publications. Data will be securely stored and only accessible to the research team.

4 Expected Findings

It is anticipated that the study will yield a range of insightful findings and perspectives from key personnel in the Ministry of Agriculture and Food Security, as well as restaurant and foodservice providers. While the specific findings may vary based on the data collected and participants' insights, the following are expected outcomes. First, the causes of food loss and waste. The study is likely to reveal various factors contributing to food loss and waste within the context of Malaysia. These causes may include inefficient supply chain management, food safety concerns, overproduction, consumer behavior, and regulatory challenges. Secondly, as for the government policies and initiatives, participants from the Ministry of Agriculture and Food Security are expected to provide insights into existing policies and initiatives aimed at addressing food loss and waste. The study may highlight the strengths and weaknesses of these policies and their impact on the industry. Thirdly, interviews with restaurant and foodservice providers are likely to uncover the challenges they encounter in managing food loss and waste. These challenges may encompass issues related to portion control, inventory management, staff training, and sustainable practices. In addition, the study may identify sustainable practices and solutions that some restaurant and foodservice providers have adopted to reduce food loss and waste. These solutions could include food donation programs, composting, portion control strategies, and innovative menu planning. Next, both government representatives and industry participants may highlight collaborative efforts between the public and private sectors to address food loss and waste. Partnerships, awareness campaigns, and regulatory compliance may be discussed. Lastly, the research may result in policy recommendations and suggestions for improving government strategies and regulations related to food loss and waste reduction. These recommendations could be based on the insights provided by study participants. By understanding all the above pieces, a holistic framework that can drive sustainable and integrative food waste management practices will be developed, tailoring it to the situational needs of the country specifically.

5 Conclusion

This research hopefully will illuminate various aspects of this critical issue. It will provide a platform for key personnel in the Ministry of Agriculture and Food Security, as well as restaurant and foodservice providers, to share their insights and experiences. In conclusion, the study will underscore the multifaceted nature of food loss and waste, with causes rooted in both the supply chain and consumer behavior. It will emphasize the role of government policies and initiatives in shaping industry practices and

highlights the challenges faced by foodservice providers in managing food loss and waste.

The research will also shed light on the sustainable practices and solutions adopted by some industry players to minimize food loss and waste, indicating the potential for positive change. Ultimately, the study holds the potential to inform policy recommendations and strategies for reducing food loss and waste in the Malaysian context and perhaps with a model that may fit all relevant parties. It will also contribute to the ongoing efforts to create a more sustainable and responsible food industry, with implications for environmental conservation, economic efficiency, and food security.

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